KFW

Remote Management, Monitoring, & Verification (RMMV) Guidebook

for International Financial Cooperation

Disclaimer

This *Guidebook* was developed for all practitioners in preparing and implementing *Financial Cooperation* (FC) projects and provides them with assistance and examples of how to manage, monitor, and verify FC projects remotely.

This *Guidebook* was carefully drafted by KfW, its advisers, and experts on the topics covered, reflecting the extensive experience gained in KfW's own FC projects. The material and information provided in this *Guidebook* are, however, general in nature. It can only provide an initial general overview and some broad practitioner guidelines over relevant aspects, risks, and issues that typically occur in this context and that KfW deems to be generally of interest and importance when dealing with such types of projects and questions. It does not constitute any form of legal, technical, or other advice and therefore does not purport to replace such legal, technical, or other advice for a specific project or question by a user.

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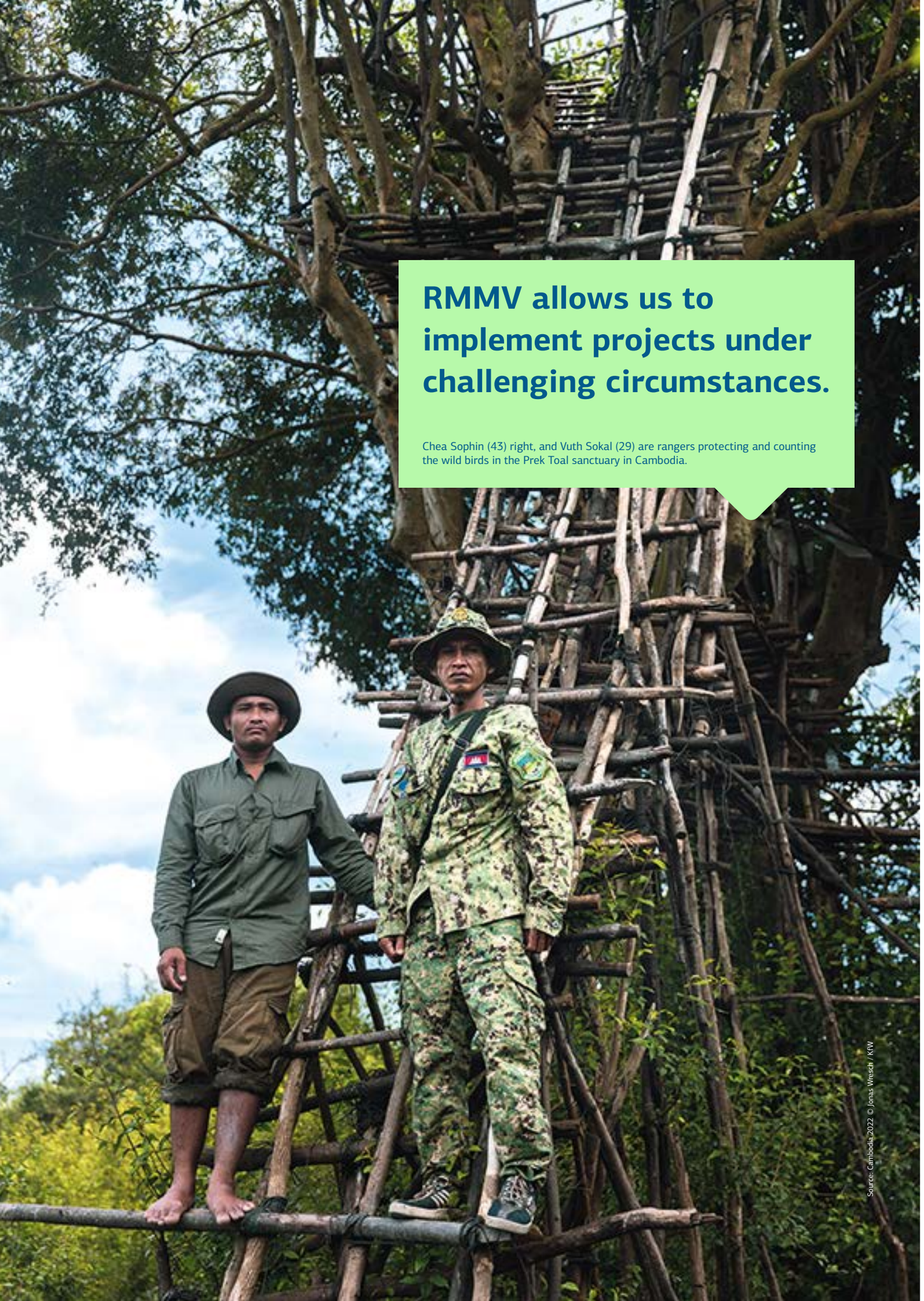
Abbreviations

BDSG	German Federal Data Protection Act
BIM	Building Information Modeling
BMZ	German Federal Ministry for Economic Cooperation and Development
CAP	Corrective Action Plan
CHIRPS	Climate Hazards Group InfraRed Precipitation with Station
CRS	Catholic Relief Service
DHS	Demographic and Health Surveys
DIAL	Digital Impact Alliance
DTMF	Dual-Tone Multi-Frequency signaling
E&S	Environmental and Social
EMS	Energy Monitoring System
EO	Earth Observation
EPC	Energy Performance Calculation
EPE	Ex Post Evaluation
ESA	The European Space Agency
ESCP	Environmental and Social Commitment Plan
ESHS	Environment, Social, Health, and Safety
ESIA	Environmental and Social Impact Assessment
ESMP	Environmental and Social Management Plan
EVI	Echo Volume Imaging
FC	Financial Cooperation
FC-E	KfW's Ex-Post Evaluation Department
FI	Financial Institution
FPIC	Free, Prior, and Informed Consent
FPA	Financial Participatory Approach
GADM	Global Database on Administrative Areas
GDPR	General Data Protection Regulation
GFSAD	Global Food Security-support Analysis Data
GHG	Greenhouse Gas
GID	Geographic ID
GIS	Geographic Information System
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit GmbH (German Corporation for International Cooperation GmbH)
GPP	Gross Primary Productivity
GPS	Global Positioning System
HRIA	Human Rights Impact Assessment
IATI	International Aid Transparency Initiative
IBAT	Integrated Biodiversity Assessment Tool
ICT	Information and Communication Technology
IFC	Industry Foundation Classes
ILO	International Labour Organization
IoT	Internet-of-Things
IP	Indigenous Peoples
IPC	Integrated Food Security Phase Classification
IPEX	KfW IPEX-Bank for international project and export finance
IPRODI	Project on Small-Scale Irrigation in the Inner Delta in Mali
IT	Information Technology
JRC	Joint Research Center
KCUS	Competence Centre for Environmental and Social Sustainability
KML	Keyhole Markup Language
LMIC	Lower-Middle-Income Country
M&E	Monitoring and Evaluation
MDC	Mobile Data Collection
MDTF	Multi-Donor Trust Fund
MIS	Management Information System
MMS	Maintenance Management System
MOOC	Massive Open Online Course
MOOCs	Massive Open Online Courses
NAS	Network Attached Storage
NC	Non-Commercial
ND	No-Derivs
NDVI	Normalized Difference Vegetation Index
NGO	Non-Governmental Organization
NZE	Near Zero Energy
OCHA	Office for the Coordination of Humanitarian Affairs
OGC	Open Geospatial Consortium
OSCAR	Common Decision Support System for Health Emergencies financed through KfW
PAP	Project-Affected Persons
PEA	Project Executing Agency
PM	Portfolio Manager
PMT	Portfolio Management Tool
PN	Internal Project Number of a KfW-financed FC project
PRA	Participatory Rural Appraisals
RAP	Resettlement Action Plan
REDD	Reducing Emissions from Deforestation and Forest Degradation
REM	REDD Early Mover
R/MIS	(Remote) Management Information Systems
RMMV	Remote Management, Monitoring, and Verification
SDGs	Sustainable Development Goals
SMS	Short Message Service
STaR	Stabilization and Reconciliation in the Lake Chad Region Project
ToR	Terms of Reference
TPM	Third-Party Monitoring
TPV	Third-Party Verification
UAV	Unmanned Aerial Vehicle
VR	Virtual Reality
XML	Extensible Markup Language



Executive Summary

Remotely managed and monitored international development projects have been an expanding mode of practice in environments where security risks are high. This trend has been further accelerated and broadened by the COVID-19 pandemic. The ensuing travel restrictions and social distancing measures have caused a shift in thinking about how work can be accomplished remotely and may significantly expand the use of *Remote Management*, *Monitoring*, and *Verification* (RMMV) methods to allow international development cooperation practitioners to continue operating in areas with severely limited or no access.

In addition, RMMV approaches and tools may improve the quality of monitoring for projects without access problems, but covering many locations (e.g. in decentralization, health or education sectors) or widespread areas, such as forestry, biodiversity or agricultural programs.

RMMV is a framework developed by KfW that responds to challenges that arise for stakeholders of KfW-financed development cooperation projects if they cannot travel to project sites and opens opportunities for digitally supported project implementation and management. It offers a methodology, institutional approaches, technical tools, data sources, and practical advice for ways to overcome difficulties when managing, monitoring, and verifying projects remotely (for the KfW definition of RMMV, > Section 1.2 What is RMMV from a KfW Perspective? as well as a short video explaining the concept: https://youtu.be/aBWp2OzEUCE)

An earlier internal version of this *Guidebook* had been developed in 2018 and was substantially updated and expanded during the pandemic. During this overhaul, it became more and more obvious that this version might be not only useful for KfW but all its partners and the international development community globally. For this reason, the RMMV *Guidebook* is now being published as a basis for the further collective development of RMMV approaches and tools as a global public good.

The purpose of this *Guidebook* is to give an overview of KfW's current RMMV approaches and how to apply them in donor-funded projects. After an introduction to RMMV and an overview of institutional approaches, technical tools, and data sources, the core of the *Guidebook* explains how to utilize RMMV within a typical KfW project cycle. The *Guidebook* assembles KfW's experience and complements it with the experience of other development partners in using RMMV approaches. It synthesizes the knowledge of relevant projects and builds on their best practices and lessons learned. After introducing the general concept of RMMV in > Section 1 Introduction to RMMV, > Section 2 RMMV Approaches and Tools explains the main types of institutional RMMV approaches, technical tools, and data sources, as well as the most important legal, regulatory and human rights aspects to be considered with regards to RMMV and IT-infrastructure aspects. These aspects need to be considered when using the updated and expanded RMMV Decision Matrix in > Section 2.5. This RMMV *Decision Matrix* serves as the basis for selecting and combining the appropriate institutional approaches, tool types, and data sources for the project. In > Section 3 RMMV within the FC Project Cycle, the *Guidebook* includes practical tools that can be chosen to assemble the appropriate mix of RMMV approaches at each stage of the FC project cycle—from project preparation to project end, including such topics as government negotiations, feasibility studies, tendering of consulting services, project progress, and final reviews. > Section 4 KfW RMMV Project Experience includes best–practice project examples. Additional resources, such as a glossary of RMMV terms, *Fact Sheets* on the RMMV tool types and data sources, the new KfW project location data collection guidelines, and a list of relevant literature are included in the > Annexes.

Box 1: KfW's Mandate in International Development Cooperation

KfW, the development bank of the German government, is one of the world's leading development banks. Its ownership is split between the Federal Republic of Germany (80%) and the German Federal States (20%), and it has been committed to improving economic, social, and environmental living conditions across the globe on behalf of the German Government since 1948. Through international Financial Cooperation (FC), KfW finances development cooperation projects around the world on behalf of the German Federal Ministry for Economic Cooperation and Development (BMZ). KfW's FC division has local offices in almost 70 countries around the world. The spectrum of projects supported ranges from investments in large-scale infrastructure—for example, renewables, urban transport systems, water supply, and wastewater disposal—to credit lines for small- and medium-sized enterprises and the development of basic social services. In addition to the direct impact of its individual projects, KfW also supports structural reforms to contribute to sustainable development on a permanent basis.

As an experienced bank and specialist institution for development cooperation, KfW promotes and verifies the progress of each project from its conception and implementation to the final review and ex-post evaluation (project cycle).

The information gathered in this *Guidebook* has been collected from a review of KfW project documents, RMMV guidelines and studies, input from experienced KfW staff who are already applying RMMV approaches in their daily work, internal and external workshops, as well as input from KfW technical experts, legal, contract and procurement specialists, team leaders and sector economists since 2017. KfW's experience is complemented by a body of literature on RMMV and interviews with partners, other donors, consultants, RMMV service providers, and other non-development actors that use RMMV approaches, for example in the private sector.

Although this *Guidebook* refers to KfW's mode of operation, the RMMV principles, recommendations, approaches, methods, tools, and data sources can be transferred to the needs and business models of other international development stakeholders.

RMMV can be implemented within a project using the most appropriate combination of institutional approaches, technical tool types, and data sources:

- **Institutional RMMV approaches:** Project stakeholders with continued access to the region—such as national/local staff, local consultants, and/or the target group itself—collect information, thus substituting and/or complementing KfW international staff and the Project Executing Agency (PEA) and/or consultant. For a full overview of institutional approaches, > Section 2.1.1.

- **Technical tool types**: Information and communication technology (ICT) that facilitates collecting, transmitting, aggregating, structuring, analyzing, verifying, visualizing, and interpreting information. For a full overview of technical tool types, > Section 2.2.1.

- **Data Sources:** There is a wealth of internal and external, open and proprietary data sources already available that can be used for comparison with the data collected via institutional approaches and technical tools. This helps in verifying the information given in feasibility studies and progress reports. For a full overview of the uses of data sources, > Section 2.2.3.

In any given project, institutional approaches, technical tools, and data sources are combined and tailored to the respective project needs and environment.

How To Integrate RMMV Into the Financial Cooperation Project Cycle

Choosing an adequate RMMV approach for a project depends on a variety of parameters. KfW staff, together with the PEA, and/or the consultant need to decide:

- **What information** and what level of data insight are required, and how often (the project partners staff may compare this with the general reporting requirements set out for the consultant to answer this question)?

- **Who** needs to have remote access to the information and which stakeholders need to be involved to obtain the information?

- **What** could be an adequate source of information (e.g., Open Data, national KfW experts, Third-Party Monitoring, satellite pictures, video proof, 360° images/films, local consultants conducting focus group discussions or environmental sensor data) or a suitable (technical) tool type to collect the required information?

KfW's RMMV *Guidebook* provides advice on how to integrate RMMV approaches throughout the different steps of the project cycle. In each step, specific aspects need to be taken into consideration to ensure the effective and efficient integration of RMMV approaches.

Throughout the project cycle, RMMV activities need to be planned and agreed upon as early as possible, especially if they require significant investment, are exceptions from current regulations, or potentially entail data risks. For example, project preparation and appraisal can be informed through feasibility studies that are facilitated by consultants using RMMV approaches.

During implementation, RMMV requires increased effort from KfW and project implementation staff since data and information collection is often more complex and requires the triangulation of different data sources. Also, RMMV approaches often come with additional requirements regarding standard project management procedures—more frequent communication with the PEA and other stakeholders may be needed throughout the project cycle if the portfolio manager cannot visit the PEA in person. Training and involving the national KfW office staff in establishing and implementing RMMV approaches require additional time and resources. In some cases, deviations from standard management procedures may be necessary, such as replacing progress review missions to project sites with virtual progress reviews.

An appropriate institutional setup is crucial for successful RMMV, distinguishing between the following three roles: the controller of the data/tool, the monitoring agent/data collector, and the data verifier; > Section 2.1.2 Institutional Setup and Changing Stakeholder Roles in RMMV. To plan and implement projects correctly, a clear distinction is necessary between the two levels of monitoring: the first level is the *Remote Monitoring* conducted by the PEA/the project's *Implementation Consultant,* which informs the regular project monitoring reports (i.e., usually the data owner and data collector) and the second level is the *Remote Verification* of the project monitoring information to be conducted by the KfW project staff responsible for the respective project (usually the data reader and data verifier); > Section 1.2 What is RMMV from a KfW Perspective?

To provide orientation on the usefulness of different institutional approaches, technical tools and data sources, information needs have been clustered into five general types that occur at different stages throughout the project cycle:

Table 1.1: Clustering of Information Needs within the FC Project Cycle

Type of Information Need	Government Negotiations	Project Preparation & Feasibility Study	Project Appraisal	Grant or Loan Agreement	Tender of Consulting Services	Project Implementation	Start of Operation	Final Review	Ex-Post Evaluation
Infrastructure quality & project progress incl. use of funds						✓	✓	✓	✓
Target area(s)/ target group(s) identification	✓	✓	✓						
Target groups' needs & feedback		✓	✓			✓	✓	✓	✓
Project outcomes & impact (incl. usage)						✓	✓	✓	✓
Environmentally and socially adverse impacts & risks		✓	✓			✓	✓	✓	✓

Because of the multitude of different institutional approaches, technical tools and data sources a *Decision Matrix* has been developed to help KfW portfolio managers (PMs) determine which of them are particularly useful for which type of information to be collected for the specific project and if there are potentially limiting human rights or legal conditions to be considered; > Section 2.5 The RMMV Decision Matrix for Selecting the Appropriate Mix of Institutional Approaches Approaches, Tool Types and Data Sources.

Limitations and Risks of RMMV

Under certain conditions, projects **cannot be implemented even when** using RMMV:

- **Complex projects** that require a constant international staff presence or that have obvious **high environmental and social risks**, such as large hydropower plant construction, should be avoided in regions where international staff do not have access.
- **Project areas** that are mostly or completely **inaccessible to national staff** and/or where the use of electronic data collection devices is not allowed should be avoided.
- Projects that **require the direct involvement of target groups** in RMMV should not be implemented in countries/regions that have a **significant lack of freedom of expression** if this risk cannot be sufficiently mitigated within the project design, since the social risk would be too high that an individual becomes negatively affected by his/her participation or feedback, which would be unacceptable for KfW.

Despite the use of RMMV approaches, KfW's ability to detect and counter undesirable developments early might be limited for projects with access issues. One of the biggest challenges is usually the collection of the necessary data. Often, the existing or accessible data does not address the questions that need to be answered or the data quality is too low for meaningful interpretation. Local project staff who take over monitoring and verification responsibilities may not have the same perceived capacity, neutrality, or authority as their international team leaders and may be at higher risk of extortion than their HQ-based colleagues. Regular site supervision and other quality assurance mechanisms may be more difficult to implement. This leads to higher reputational risks for KfW and quality deterioration risks that can only be partially mitigated. In the long term, direct human contact between project stakeholders cannot be entirely replaced by technical means.

Even if a project has successfully set up an RMMV system and KfW HQ staff have direct access to the project's monitoring/management information systems, KfW's liability risks remain since it is not feasible in terms of cost and effort for financing institutions such as KfW to review all of the information available in such systems. To mitigate these risks, the responsibilities of KfW staff need to be clearly defined, by establishing clear procedures for when and how the system's data is reviewed by KfW, for example, through "virtual project review missions"; > Section 3.3 Remote Verification of Project Progress by KfW.

Further, the following main risks are involved in projects using RMMV:

- **Do-no-harm risks.** The lack of international staff presence may increase pressure, as well as social and political expectations, on local or national project staff to ignore, exclude, or favor parts of target groups over others, especially from authoritarian governments, extractive industries, or other powerful third parties. Partiality in targeting beneficiaries, contractors, and suppliers is a potentially damaging outcome. The results could be land grabbing attempts towards indigenous groups, project-affected persons entitled to compensation being left out, or women receiving more workload than benefits from the project.
- **Increased risk of corruption.** In many cases, RMMV approaches cannot fully replace international staff visits that are critical for preventing and detecting corruption.
- **Increased security threats and risks to project personnel, communities, and target groups.** RMMV approaches may imply a shift of threats and risks from international staff to national or local staff. Often, consultants or partner organizations may not have the same security systems in place for local staff. To mitigate this risk, appropriate security management strategies must be implemented. Security strategies based on deterrence may interfere with security strategies based on local assimilation and acceptance.

A full overview of all the risks is provided in > Section 1.5 Limitations and Risks of RMMV.

Recommendations

Vis-à-vis development partners and donors:

- ✓ **Develop RMMV pilot projects with partner countries and evaluate them.** This enhances everybody's knowledge and experience and broadens the mix of RMMV approaches available. **Intensify the exchange on RMMV with other development partners, thus reducing risks for all.**

- ✓ **Explain the potential of RMMV for FC in fragile and conflict-affected states to donors.** In contexts such as Afghanistan or Somalia, where travel limitations for international staff are severe, the ability to successfully implement projects may be questioned. Therefore, financing and implementing institutions should present their RMMV experience in a consolidated manner to inform their donors about RMMV's potential, while not neglecting its limitations.

- ✓ International development partners should intensify their efforts in **financing third-party monitoring (TPM) approaches for several projects or a whole country portfolio** to benefit from economies of scale.

- ✓ In **contexts prone to human rights issues** (such as exclusion or harm of parts of the population, data privacy, information access issues, etc.), **risks need to be addressed during government negotiations** to surface issues that might present themselves at later stages in the project cycle; > Section 1.5 Limitations and Risks.

- ✓ **Use approaches to involve target groups and project-affected people more systematically in RMMV processes.** KfW is piloting approaches to involve target groups more systematically in RMMV processes through technical tools. However, these initiatives are still in the early stages and more testing is required. Being able to verify whether the projects could be improved by addressing the needs of different parts of the target group is crucial in contexts of conflict and fragility. Therefore, such approaches should be implemented more systematically in relevant projects, especially when direct access to target areas is limited. The dangers of technology-driven programming as opposed to Human-Centered Design also apply to RMMV and therefore need to be taken seriously.

Vis-à-vis PEA, consulting companies and firms:

- ✓ **Continue to foster RMMV innovation in collaboration with PEA and Implementation Consultants.** Much of the innovation in technical tools for RMMV has occurred in collaboration with PEA and consultants—for example, the development of (Remote) Management Information Systems (R/MIS) and the use of webcams and low-cost sensors or satellite images. PEA and consulting companies are encouraged to propose innovative and successfully tested approaches and tools in projects using RMMV and to develop the relevant capacities of their staff.

- ✓ **Develop partnerships with satellite operators.** Development partners are currently engaging in collaborations with satellite operators across their portfolios to obtain satellite imagery at lower costs. Consulting companies and other firms may wish to evaluate whether such a collaboration could be beneficial in their respective cases as well.

1 Introduction to Remote Management, Monitoring, and Verification

Source: KfW-Bildarchiv / Rentzel Freude 2013

1.1 KfW's Mandate and Role in German Development Cooperation

KfW is one of the world's leading development banks and has been committed to improving economic, social, and environmental living conditions across the globe on behalf of the Federal Republic of Germany and the federal states since 1948. In this regard, KfW is both an experienced bank and a development institution with financing expertise, expert knowledge of development policy, and many years of national and international experience. On behalf of the German Federal Government, and primarily the Federal Ministry for Economic Cooperation and Development (BMZ), its main client, KfW finances and supports programs and projects that mainly involve public–sector players in developing countries and emerging economies—from their conception and implementation to monitoring their success. KfW's goal is to help partner countries fight poverty, maintain peace, protect both the environment and the climate, and shape globalization in an appropriate way.[1]

KfW Development Bank supports projects in Sub-Saharan Africa, North Africa, the Middle East, Asia, Latin America, and South-East Europe. In this way, KfW is continually building its global presence to ensure close cooperation with its partners. In addition to KfW's offices in Frankfurt, Berlin, and Brussels, the institution has offices in almost 70 countries. The spectrum of projects promoted ranges from investments in large-scale infrastructure—for example, renewables, urban transport systems, water supply, and wastewater disposal—to national credit lines for small- and medium-sized enterprises, and the development of basic social services. In addition to the direct impact of the individual projects, it also often initiates structural reforms to contribute to sustainable development on a permanent basis.

To do this, KfW Development Bank committed EUR 9 billion in new financing in 2021 alone. Its financing and promotional services are aligned with the United Nations' Agenda 2030 and contribute to the achievement of the 17 Sustainable Development Goals (SDGs).

KfW receives part of its funding for development projects and programs from the German federal budget. In 2021, this figure amounted to about EUR 3.6 billion. KfW also uses funds received from other public-sector clients, such as the European Union (abou EUR 400 million in 2021) or those raised on the capital markets, which are referred to as KfW Funds. In 2021, KfW Funds totaled about EUR 4.6 billion. This allows KfW to multiply the impact of the public budget funds used.[2]

KfW's funding instruments include pure, non-repayable financial contributions, loans from budget funds (standard loans), loans financed by KfW with interest subsidized by grants from the German Federal Government (development loans), loans financed by KfW at near-market conditions (promotional loans), and equity participation. In poor and underdeveloped countries, KfW mainly uses financial contributions and budget-funded standard loans, which are offered on soft terms. A large proportion of these (51%) went to Africa and Asia in 2021. KfW uses development and promotional loans in advanced developing countries and emerging economies for projects that are both useful from a development policy perspective and economically profitable. The partner countries benefit from the favorable refinancing conditions obtained by KfW because of its AAA rating, the subsidizing of interest partly by using German Federal Government funds, and the partial assumption of risk by the German Federal Government.[3]

The projects and programs promoted by KfW Development Bank are proposed by the governments of its partner countries. The respective country's development strategies and structures form the basis. On behalf of the German Federal Government, and primarily BMZ, KfW checks whether the projects and programs are developmentally sound and eligible for funding. The promoted projects and programs are proposed during bilateral government negotiations and the German Federal Government decides on the maximum amount of financial funds to be com-

[1] https://www.kfw-entwicklungsbank.de/International-financing/KfW-Development-Bank/Tasks-and-goals/Unsere-Arbeitsweise/

[2] Profile "KfW Development Bank—facts and figures" May 2022, https://www.kfw-entwicklungsbank.de/Service/Publications-Videos/Publication-series/General-publications/

[3] ibid

mitted. An intergovernmental agreement is generally concluded on this matter. KfW's experts assist partners in any way they can and support projects for their duration.

Working together with the partner, specialized consulting firms draw up a *Feasibility Study*, which provides answers to all of the project's key questions—economic efficiency, developmental impacts and possible risks.

Social, cultural, and ecological aspects are taken into account. Once all of the preparatory measures have been taken, the KfW Development Bank concludes a *Grant or Loan Agreement* including a *Separate Agreement* with the PEA. For example, the *Separate Agreement* may specify what must be observed when building a hydropower station or school, or how the operating costs are being covered. The PEA is responsible for the project itself. It puts goods and services out to tender and monitors the building phases. KfW PMs assist clients during these steps and provide the German Federal Government with regular progress reports.

Following completion, KfW closely examines the project during the final review. The aim here is to determine whether productivity levels are being reached, the specifications have been complied with, and the funds have been used as planned. KfW has an independent evaluation department that assesses whether projects and programs have achieved lasting success. About five years after completion, the KfW ex-post evaluation department takes samples of completed projects and programs, analyzes the impacts achieved, evaluates the costs, and compares the results. In the long term, the development bank's projects and programs have an average success rate of about 80%.

The type of funding KfW opts for depends on the size of a country's debt, its economic output, and level of development, the performance capacity of the project partner, and the type of project or program in question.

1.2 What is RMMV from a KfW Perspective?

Remote Management, *Monitoring*, and *Verification* (RMMV) is a framework developed by KfW Development Bank. It describes the challenges that arise for stakeholders of KfW-financed projects if they cannot travel to (all) project sites and offers a methodology, institutional approaches, and practical advice on how to overcome them.

The use of RMMV requires new methods for KfW and its project partners, especially PEAs and consultants. To describe them, the distribution of roles and responsibilities typical for *Financial Cooperation* (FC)—i.e., KfW's limited involvement in project execution—was used as a starting point, resulting in the following key definitions; > Glossary in Annex 1 for more details:

"Remote Management" is the overarching framework for developing and managing projects/portfolios based on the information gathered through *Remote Monitoring and Verification* (and potentially remote country office management). *Remote Management* refers to the management of development projects remotely, that is, without the ability of the project managing entity to be physically where the activity is carried out. This includes remote site supervision in projects involving infrastructure construction and remote country office management where no international staff (including the country office director) can enter the country.

As part of *Remote Management*, stakeholders responsible for the implementation of activities might also have to apply ***"Remote Monitoring"*** of costs, cash flow and financing, progress, as well as *Remote Monitoring* of outputs, outcomes, and/or positive or negative impacts, including social and environmental impacts by substitute actors (e.g., local instead of international staff) and/or technical tools (e.g., satellites and smartphones). In KfW-financed projects, *Remote Monitoring* is usually the task of the PEA and/or a consulting company designated as the "*Implementation Consultant.*"

In this framework, KfW portfolio management and technical staff are tasked with verifying the reported information and/or project activities. Should they be unable to conduct such a verification in the location in which the activity is carried out, ***"Remote Verification,"*** which can involve substitute actors and/or technical tools, by comparing information from different sources and/or verifying the quality and coherence of large data sets is used.

Remote Verification is KfW's core task for verifying the available information while conducting remote project appraisals, final inspections, and ex–post evaluations. During project execution, *Remote Verification* is used to remotely control progress and the correct use of funds, compliance with KfW quality standards, and verify project monitoring reporting. This is especially necessary in highly fragile or corrupt environments with weak partners; > Annex 1 for a full glossary of relevant terms. In the implementation phase, the partner country's PEA is usually responsible for all activities—executing the project and monitoring outputs and outcomes. Sometimes, an *Implementation Consultant* may also take over some or most *Remote Management* and *Monitoring* roles of the PEA. During this time, KfW only verifies project progress, the use of funds, and project completion by special missions of staff from KfW headquarters to project locations in the partner country. So, in fact, for the largest part of the project cycle—during project implementation—KfW already works mostly remotely.

However, the following processes change when RMMV is applied:

- KfW international staff also works remotely for project appraisal, verification of project progress and completion, and impact evaluation.
- Consultants supporting KfW and the PEA during project preparation may not be able to visit project sites and project stakeholders
- The PEA and the *Implementation Consultant* may also have limited access to the site. In some contexts, even qualified national staff or any staff not from the specific village or town where project sites are located may not be able to visit the sites.

1.3 KfW's Expectations vis-à-vis RMMV

RMMV approaches are expected to enable KfW to continue providing its standard functions even when KfW international staff cannot visit the country and/or (all) the project location(s). KfW has used RMMV approaches when working in areas where it is too dangerous to travel, such as in conflict environments and areas affected by natural disasters. There are also instances where the distance between project sites makes it difficult to complete work in a timely fashion. The COVID-19 pandemic has introduced new challenges. Travel restrictions, lockdowns, and quarantines have made areas that were once routinely safe to work in and easy to reach, extremely difficult or impossible to work in, requiring KfW staff and consultants to work from a distance on a routine basis. KfW portfolio management and technical experts need sufficient information to prepare and appraise projects. During implementation, they need to identify undesirable developments early on, so that they can counteract them in time. For this purpose, decisive influencing factors, such as the schedule, cost, impacts, and risks must be observed regularly. Furthermore, KfW must verify project progress and completion and the correct use of funds and provide regular reporting to its client, the German government represented by its ministries, for example, BMZ. Overall, RMMV is being used to enable KfW to obtain some of the following information—depending on the respective information needs of the projects:

- information on the project context allowing target area and target groups selection
- target group baseline information and needs
- target area baseline information
- construction/works progress and quality (to the extent feasible) or other project progress data
- level of usage of the infrastructure/service(s) financed by KfW
- environmental/climate impact of the project
- social impact, including do-no-harm monitoring of the project
- use of funds disbursed by KfW
- operation and maintenance of the infrastructure/service(s) financed by KfW
- target group and other stakeholder feedback on the project
- target groups' level of satisfaction with the project
- sector development and project impact
- communication with the PEA, ministries, donors, other partners, and stakeholders

In international development, expectations about quality standards or sustainability have sometimes been reduced in projects in fragile contexts with access constraints that heavily rely on RMMV. Judging from the indicators used by such projects and the quality of reporting, project outcomes and impacts are sometimes only approximated, if measured at all. Furthermore, higher risks, such as lower construction quality and higher sustainability risks (less monitoring of operations and maintenance) have often been accepted.

RMMV needs to ensure that KfW and its project partners can not only gather information for management, implementation, monitoring, and verification but also can assess the quality of this information and consider different perspectives (see > Box 2 for the main principles for assessing data quality) to reach acceptable and sustainable project outcomes and impacts even in high-risk environments.

This requires different types of triangulation:

- triangulation of methods and types of information (e.g., verify quantitative indicators through qualitative information);
- triangulation of stakeholder perspectives (e.g., asking the PEA, target groups, and third parties about the same situation); and
- triangulation of investigator/consultant (e.g. asking the PEA whether information provided by a consultant in a *Feasibility Study* is correct).

Box 2: Six Principles to Assess Information Quality

Information reliability:
Will we get the same data when we collect again?

Information validity:
Are we measuring what we say we are measuring?

Information integrity:
Is the information free of manipulation?

Information accuracy/precision:
Is the data measuring the indicator accurate?

Information timeliness:
Is the information recent and does it arrive on time?

Information security/confidentiality:
Is loss of information/loss of privacy prevented?

Source: joyn-coop based on Shukla and Sen, 2014, > Annex 4 List of Literature

The COVID-19 pandemic has also introduced new opportunities and related expectations: the pandemic-induced proliferation of online videoconferencing and related tools, for instance, made the inclusion of target group representatives in project steering committee meetings possible. It was not possible to include these representatives in personal meetings at the PEA level in the past. This can considerably help in building trust and improving collaboration among all project parties.

1.4
The Principles for Digital Development Applied to RMMV

Digital transformation does not only impact the personal space but also influences and changes social and economic development processes, making them more efficient, more sustainable, and faster. It can also aid in structuring them more democratically, allowing for participation and co-creation. Because of the transforming nature of digital elements in development cooperation, KfW has endorsed the Principles for Digital Development established by the Digital Impact Alliance (DIAL) of the UN Foundation. The nine principles are international best practices, which are created as a set of living guidelines for planning and implementing effective, efficient, and sustainable digital approaches in development projects. > Digital Principles

The Nine Principles for Digital Development are:

- **Design with people:** Good design starts and ends with people that will manage, use, and ideally benefit from a given digital initiative. To design with people means to invite those who will use or be affected by a given technology policy, solution, or system to lead or participate in the design of those initiatives. Those who ideally benefit from the initiative and those who will maintain/administer the initiative need to participate and engage in the initial design phase and in subsequent iterations Meaningful participation means to create opportunities for people to innovate on top of products and services; to establish avenues for feedback and redressal that are regularly monitored and addressed; and to commit to agile methods that allow for continual improvement. > Section 2.1 Institutional Approaches and Digital Rights Check.

- **Understand the existing ecosystem:** Digital ecosystems are defined by the culture, gender and social norms, political environment, economy, technology infrastructure and other factors that can affect an individual's ability to access and use a technology or to participate in an initiative. Understanding the existing ecosystem can help determine if and how we should engage, as ecosystems can have both positive and negative dynamics. Through this understanding, initiatives should adapt, to the extent appropriate, existing technology, and local actors. This includes understanding existing government policies, sector policies, and efforts to expand digital public infrastructure. This also includes understanding existing access to devices, connectivity, affordability, digital literacy, and capacity strengthening opportunities so that initiatives are designed to accommodate or strengthen these realities. > Section 3.1 Project Preparation.

- **Design for inclusion:** Digital initiatives can drive social progress by dismantling systemic barriers related to gender, disability, income, geography, and other factors. Technology initiatives should be designed to be accessible and usable for a diverse range of people, including those with disabilities, low digital literacy, those who speak different languages, who face obstacles to device access/affordability/connectivity, and those from different cultural backgrounds. This can be achieved by adopting iterative, agile methodologies and by leveraging redressal systems to quickly identify – and address – challenges that negatively impact certain groups of people including those who are not online. > Section 3.1 Project Preparation and Digital Rights Check.

- **Build for sustainability:** Build for the long-term by intentionally addressing financial, operational, and ecological sustainability. Building for sustainability means presenting the long-term cost of ownership–both technology licenses, operations and maintenance, capacity building, etc. Ecological sustainability requires considering an initiative, solution, or system's potential to help people and communities adapt to the changing climate. At the same time, they should seek to minimize the environmental impact of any initiative, solution, or system, particularly the CO2 emissions generated by any hardware or software during the entire lifecycle. Building for sustainability does not mean that all products, services, or policies will last forever. Optimizing for sustainability may result in consolidating services, transferring knowledge, software, and/or hardware to a new initiative, planning for the secure transfer (or deletion) of data at the end of a project, or helping clients to transition to a new, more relevant product or service. > Annex 2 Tool Type Fact Sheets.

- **Use evidence to improve outcomes:** Evidence drives impact: continually gather, analyze and use feedback. Over time, good practices in understanding monitoring and evaluation of technology initiatives have evolved to emphasize outcomes on people and communities, rather than just access and usage. To understand outcomes for people and communities, it is necessary to use a variety of methods – both technology-enabled and analogue – to gather, analyze, and use feedback to get a holistic view of the impact of technology on people and communities. This also includes providing redressal channels for people to submit feedback and complaints, which are regularly monitored, addressed, and analyzed. Involve people in the design and implementation of the monitoring and measuring of outcomes as well, so that the outcomes being measured are relevant and meaningful to them.
> Section 2.2.3 The Use of Data Sources.

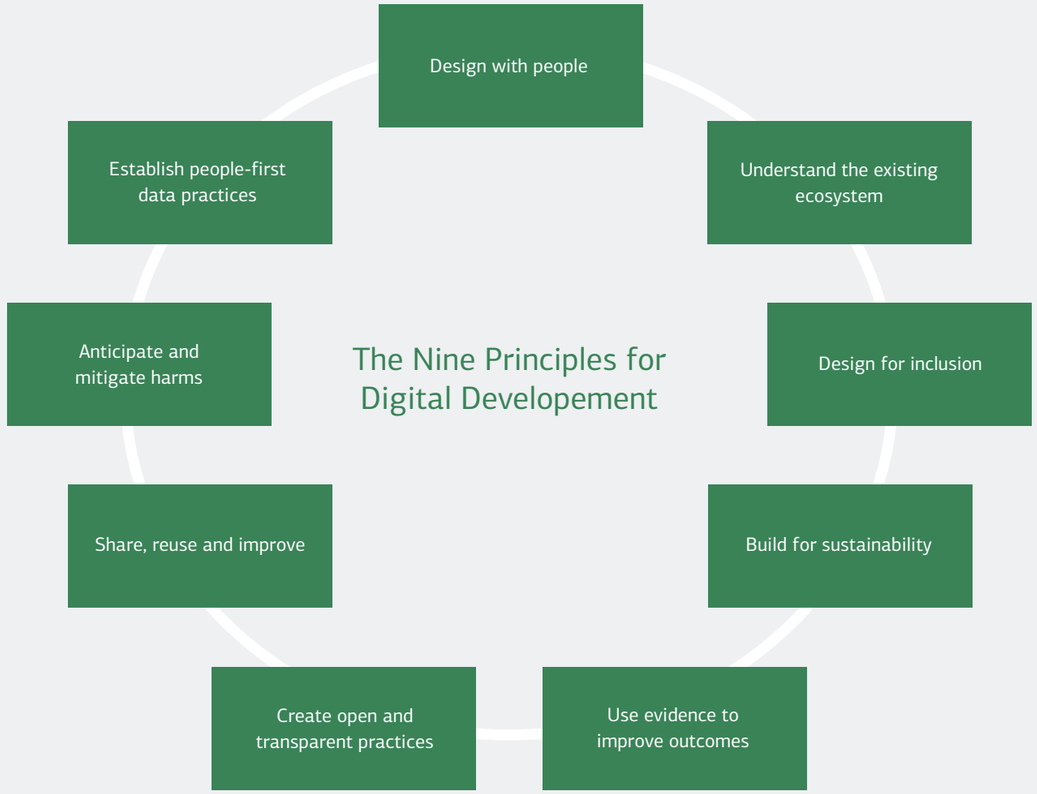
- **Create open and transparent practices:** Effective digital initiatives establish confidence and good governance through measures that promote open innovation and collaboration. Open and transparent practices can include but are not limited to: clear and accountable governance structures that define roles and responsibilities; open and proactive communication, decisions, policies, and practices; mechanisms that allow stakeholders to provide feedback, ask questions, and raise concerns; and quick and transparent responses to feedback. In terms of technical design, they can include the use of open standards, open data, open source, and open innovation. When organizations do not prioritize transparency and openness, it results in a lack of trust. Trust is critical to encourage participation, and without it, people will rationally choose to avoid the risks associated with engaging with digital services and sharing their data – thus foregoing any potential benefits. > Section 2.2.2 on Open-Source as well as > Section 2.2.4 on Open Data and > the RMMV Guidebook repository on Github.

- **Share, reuse, and improve:** Build on what works, improve what works, and share so that others can do the same. Avoid innovation for the sake of innovation. By sharing, reusing, and improving existing initiatives, we pool our collective resources and expertise, and avoid costly duplication and fragmentation. Ideally, this collaboration leads to streamlined services for people. This requires organized and accessible documentation, and is greatly facilitated by adopting open standards, building for interoperability and extensibility; using open source software; and contributing to open source communities. Following this principle can save time and money and lead to better products and servicest. > Section 2.2.2 on Open-Source as well as > Section 2.2.4 on Open Data and > Annex 2 Tool Type Fact Sheets and > the RMMV Guidebook repository on Github.

- **Anticipate and mitigate harms:** To avoid negative outcomes from any given digital initiative, plan for the worst while working to create the best outcomes. Examples of harms include enabling digital repression (including illegal surveillance and censorship); exacerbating existing digital divides; technology-facilitated gender-based violence; undermining local civil society and private sector companies; amplifying existing, harmful, social norms; and creating new inequities. These harms are particularly relevant, and the impacts are less known, when it comes to machine learning and artificial intelligence (AI). Harm mitigation is context-specific, and requires a multi-faceted approach that integrates technical, regulatory, policy, and institutional safeguards. Without these types of safeguards, specific groups of people may decide to disengage or systems may be used to intentionally target certain groups of people, undermining all sustainable development goals. > Section 2.3 Legal and Regulatory Conditions and Recommendations and Digital Rights Check.

Figure 1.1: The Nine Principles for Digital Development

(Source: https://digitalprinciples.org)



- **Establish people-first data practices:** People-first data practices prioritize transparency, consent, and redressal while allowing people and communities to retain control of and derive value from their own data. This principle emphasizes the need to avoid collecting data that is used to create value (financial or otherwise) for a company or organization, without delivering any direct value back to those people from whom the data is derived. It is thus critical to put people's rights and needs first when collecting, sharing, analyzing, or deleting data. In this context, 'people' includes those who directly interact with a given service, those whose data was obtained through partners, and those whose are impacted by non-personal datasets (such as geospatial data.) When collecting data, it is important to consider and follow relevant data standards and guidelines set at the international, regional, national, or local level. Digital initiatives should obtain explicit and informed consent from people before collecting, using, or sharing their data;and consider to invest in people's capacity to navigate the tools, redressal systems, and data practices. People-first data practices also include sharing data back with people, to use this data as they see fit, and providing access to individual, secure data histories that people can easily move from one service provider to the next, wherever this is feasible. > Section 2.3 Legal and Regulatory Conditions and Recommendations and Digital Rights Check.

With the endorsement of the Principles for Digital Development, KfW emphasizes the importance of digital solutions in development projects and as an important means of reaching the development bank's goals. The aim is to integrate the principles within the organization as well as in the approaches, policies, and processes guiding all development activities.

These digital principles assist in choosing the right procedures and structures for the specific project context, especially in the detailed planning of such tools within development projects and within a selected RMMV approach. The principles can be applied in all areas of RMMV and along with all institutional approaches and technical tools. However, it is important
to emphasize that the principles are heavily context-dependent and cannot always be applied simultaneously, since there can be certain trade-offs that have to be weighed up for the specific context.

In line with the above principles, the Danish Institute for Human Rights and GIZ have developed a "Digital Rights Check" to help identifying human rights risks when designing and implementing digital tools or solutions within international development cooperation projects > Digital Rights Check.

1.5 Limitations and Risks of RMMV

Although RMMV employs a multitude of well-developed approaches and tools, accessibility challenges limit KfW's influence on projects and its ability to mitigate risks in time. These challenges, together with project complexity and governance issues, may mean that the use of RMMV is not sufficient for successful project implementation. At times, some risks can only be partially mitigated and need to be accepted by KfW and BMZ. Overall, the use of RMMV can also imply that KfW's reputational risks are increased.

Trust is crucial for the implementation of all KfW projects—including projects that are remotely managed, monitored, and/or verified. The challenge is that trust is usually created through frequent in-person interactions, reliable monitoring, and transparent reporting. Therefore, the chosen RMMV approach should ensure that this trust can be developed despite the increased remoteness between stakeholders by assuring sufficient in-person interaction between national KfW staff and the PEA or regular videoconferences between the KfW PM, the PEA, target groups, and representatives, and/or other relevant stakeholders, for example. This can help considerably in building trust and improving collaboration among all project parties.

1.5.1 Limitations

Wherever possible, RMMV tools should be used to complement on-site verification and personal exchange with the partners and the main stakeholders on the ground. Remote communication bears the risk of misinterpretations and the development of trust amongst stakeholders remains a challenge.

There are changes in situations due to which a planned or ongoing project may have to be suspended or closed if no feasible RMMV approaches and tools are available to overcome the sudden challenges and mitigate the respective risks. Some examples:

- **Complex projects that require continuous or frequent onsite international expertise** may not be deliverable through RMMV. For instance, works that require a very specific skillset that might only be available through international experts/consultant staff being onsite during construction. Such projects should be avoided if travel for international staff is not possible.
- **Projects with high environmental and social risks,** and/or projects for which sufficient environmental and social data to inform decision-making cannot be collected in a timely or reliable manner.
- **Projects in regions that cannot even be accessed by non-resident PEA or local consultant staff** must be avoided. While technologies can facilitate even some data collection from areas that cannot be accessed in person, this is not sufficient to deliver FC projects.
- **Projects that require direct involvement of target groups in RMMV** should not be implemented in countries/regions that have a **significant lack of freedom of expression** (freedom of speech, opinion, the press) if this risk cannot be sufficiently mitigated within the project design, since the social risk would be too high that an individual becomes negatively affected by his/her participation or feedback, which would be unacceptable for KfW.
- **Projects in areas where the government does not allow any independent data collection** and the use of electronic data collection devices, such as smartphones, by any non-residents. This may prevent RMMV approaches crucial for verification from being carried out, thus rendering remotely managed projects not implementable.
- **PEAs that do not share data or allow external data collection may not be suitable partners for remotely managed projects.** A PEA's refusal to share the data that KfW may require for their verification or a lack of support for additional information gathering by third parties may make RMMV approaches impossible. Therefore, PEAs must be willing to cooperate on these issues. Since FC funds cannot be reprogrammed, this condition may have to be addressed during intergovernmental negotiations; > Section 3.1.1 Government Negotiations.

1.5.2 Risks

Project Implementation and Monitoring Risks

- **Increased risk of corruption.** In many cases, RMMV approaches cannot fully replace visits of international staff that are crucial to prevent and detect corruption.
- **Access to project sites by local or national staff may deteriorate during the implementation of the project.** Even if national staff replace international staff for site visits, it must be recognized that their access is not continuous. Frequently, staff or consultants may overstate accessibility to certain sites to win a contract. Furthermore, they may underestimate that access conditions may change frequently. If this happens, it may be the case that project sites are completely shut off from RMMV.
- **Limitations in monitoring affect program quality.** The national staff that take over the monitoring responsibility may not have the expertise of international staff typically responsible for monitoring. Regular site supervision and other quality assurance mechanisms may be more difficult to implement, thus leading to lower quality outcomes.
- **Capacity challenges may be difficult to recognize and respond to.** If international staff cannot access project sites, some staff capacity deficits may be difficult to recognize. Furthermore, on-the-job training and other tangible capacity-building measures built into the project may be limited if they cannot take place in the real-life context of project site visits.
- **Technological equipment used for RMMV has a high value, thus making it prone to theft.** This should be considered when setting up such equipment. For instance, it may be possible to install equipment at less obvious locations (e.g., integrate a water sensor into a bridge) or to have equipment guarded by security staff on construction sites.
- **The potential leaking, theft, or disappearance of project monitoring information might hamper project progress or impact and additionally pose security risks** to project stakeholders and project-affected people, in particular if this involves personal data. This risk needs to be mitigated through appropriate privacy, data protection, and data security procedures and provisions; > Section 2.3 Legal and Regulatory Conditions and Recommendations.
- **The quality of monitoring and data may deteriorate.** RMMV makes it more difficult to gather qualitative information. Overall, information standards may be lower if triangulation is lacking, and international staff cannot make targeted visits to improve and/or verify information quality. Furthermore, there is a danger of gathering too much data that cannot be analyzed and interpreted in an appropriate timeframe or too little data (e.g., not asking an important follow-up question about a problem encountered) or the wrong data (e.g., interviewing only household heads, i.e., men, about food security matters).
- **Lack of triangulation may erode trust** between the KfW PM and the PEA. In an RMMV setting, it is more difficult for KfW staff to triangulate information received from the PEA and other stakeholders. This lack of triangulation may erode trust in the PEA even if the PEA reports correctly. Using a coherent mix of RMMV approaches and continuous triangulation can help mitigate this problem.
- If the PEA or *Implementation Consultant* does not report correctly and *Remote Verification* does not manage to pick up on it, there is a **risk of information/data being falsified**, potentially resulting in corruption, harm, and failure of the project.
- There is a **risk of relying too much and too long on already established RMMV systems** and tools to economize efforts in conducting physical on-site progress reviews, so that KfW management or staff might be tempted to conduct their field missions less frequently, even though the trips would, in principle, be possible. This may result in increased corruption and do-no-harm risks.
- **Trust may further be eroded by communication difficulties.** Although information and communication technologies go a long way towards improving communication, it may not be possible to replace regular face-to-face communication. Some local stakeholders face language barriers, are not used to virtual communication, or take it less seriously. In other cases, videoconferences or calls with many different stakeholders may lack balanced moderation/chairing. If this is the case, it may cause frustration on all sides, or even a lack of trust between KfW, the PEA, and the other stakeholders.

Do-No-Harm Risks

- **Projects that rely exclusively on an RMMV approach are at a higher risk of not reaching the intended target group or all project–affected persons (PAP) or favoring parts of the target group over others.** The lack of international staff presence may increase pressure and social and political expectations on national staff. In a context where family, tribal, ethnic, and political affiliations are strong and chronic poverty is high, local and national staff may be susceptible to pressure to provide assistance to certain groups or to favor certain suppliers. Furthermore, authoritarian governments that discriminate against specific target groups may be freer to do so if international staff are not present. Perceived or real favoritism in targeting project beneficiaries, contractors, and suppliers is a potentially damaging outcome in this case.
- **If the views of target groups are not sufficiently incorporated into project committees, projects may suffer.** When considering local communities, remotely managed projects commonly rely on local committees that are usually composed of local representatives. Consequently, the views and opinions of women and vulnerable population groups may systematically be overlooked. On a more general level, RMMV approaches may be prone to focusing on the technical aspects of collecting information, especially in terms of project progress, while neglecting "softer" aspects that are very relevant to the target groups.

Security threats and risks to personnel and/or communities

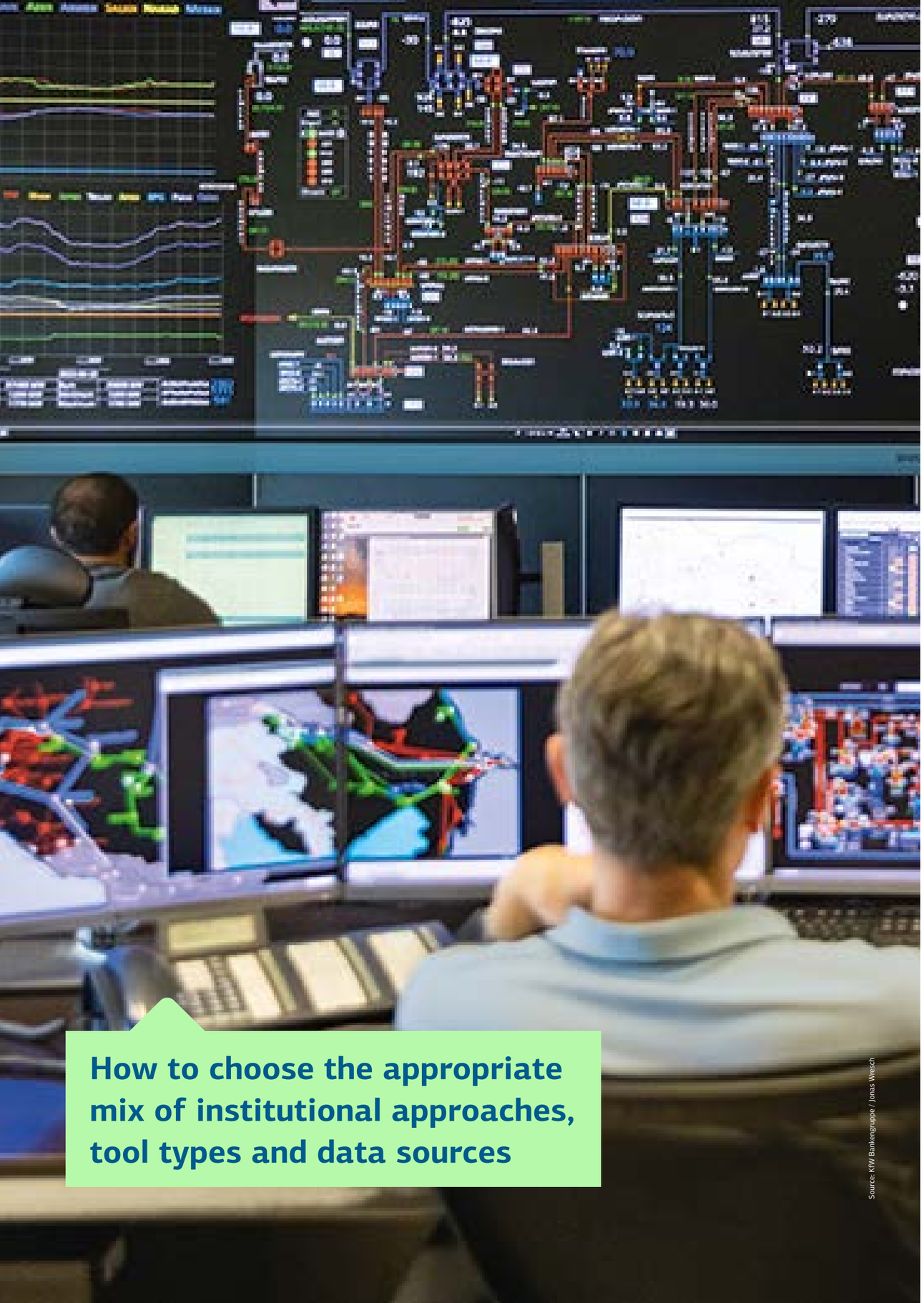
RMMV approaches may imply a shift of risk from international staff to national staff. A central question is whether national staff always face the same vulnerabilities as international staff. Frequently, consultants or partner organizations may not have the same security and risk management systems in place for national staff. > Table 1.2 shows, however, that many of the typical risks that lead to the application of RMMV approaches also affect national staff and target groups:

Table 1.2: Sources of Security Risks and Affected Stakeholders

Please note, that this table (status as of May 2022) only intends to provide some general considerations and examples for risks and vulnerabilities in the absence of RMMV and other mitigation measures. So, it would need to be re-assessed for the respective situation and context of a project including RMMV and other risk-reducing mitigation measures.

Security Risks	Country Example	International Staff	National staff	Communities/Target Groups/Beneficiaries
Terrorism	Pakistan, Somalia, Nigeria, Mali, Iraq	Extremely high risk: International staff are declared argets for terrorist organizations, however by mitigation measures such as improved security systems, the risk level might be decreased to a certain level but never fully diminished	Increased risk as there are often limited security systems in place	Increased risk as there are often limited security systems in place
Kidnapping	Yemen, Somalia, South Sudan, Pakistan	Increased risk due to assumptions about potential ransoms	Moderate risk depending on the context	Low risk depending on context. In Pakistan, e.g., this risk is higher for the local population than for international staff
Criminality	El Salvador, Honduras, Venezuela	High risk	High risk	High risk
Social unrest	Libya, Palestinian territories, Central African Republic	Low/moderate risk as international staff are often not present at affected sites	Increased risk due to potential exposure for national staff	Increased risk due to potential exposure/involvement of communities
Armed conflicts	Ukraine, Pakistan, India, Yemen, Syria	Low risk as international staff are often not present at affected sites due to the security concept	Moderate risk, depending on the security concept	Increased risk
Natural disasters	Various (e.g., Bangladesh, Brazil, India)	Moderate risks depending on the early warning systems in place, international staff often spend less time in potentially affected areas	Moderate/high risks depending on early warning systems in place	Increased risk as there might be a lack of early warning systems
Risks related to transport and traffic	Somalia, South Sudan, Western Sahara	High risk	High risk	High risk
Health risks	Yemen, South Sudan, Central African Republic	Increased risk as staff might not be familiar with local standards	Increased risk depending on available resources and systems	Increased risk depending on available resources and systems

Source: KfW Bankengruppe / Photographer: Mika Schmidt / ausloser photographie



How to choose the appropriate mix of institutional approaches, tool types and data sources

Source: KfW Bankengruppe / Jonas Wresch

RMMV Approaches and Tools — an Overview

2

This Section describes how RMMV approaches, and tools, including data sources are classified. Although one may immediately think of technology when considering RMMV, the success of RMMV approaches depends on involving the right people and planning the right courses of action. Projects using RMMV can be implemented without special technology, but only with good routines, good management, and the involvement of substitute actors.

RMMV approaches can be classified as either institutional approaches or as using technical tools and additional data sources. Institutional approaches are defined by the setup and roles and responsibilities of project stakeholders to ensure effective management, monitoring, and verification of projects. They are crucial for interaction with others, especially if qualitative data needs to be collected. Technical tools are defined by the technology used. They ease or enable the collection, transmission, aggregation, structuring, management, analysis, verification, visualization, and interpretation of information. Technical tools may support local staff (e.g., supporting an enumerator with a survey app) but may also be used to collect information from independent data sources (e.g., satellite data) or manage several types of information from various sources (e.g., (Remote) Management Information Systems). Overall, an appropriate mix between institutional approaches, technical tools, and data sources needs to be chosen for each project.

2.1 Institutional Approaches

2.1.1 General Description of the Institutional RMMV Approaches

When deciding on which institutional approach(es) to use, the underlying question is always who will take over the specific responsibility of monitoring or verifying project data if international project staff (*Remote Monitoring*) or international KfW staff (*Remote Verification*) cannot access the project sites?

KfW has categorized institutional approaches for RMMV as follows:

Figure 2.1: Overview of Institutional RMMV Approaches

In KfW's experience, the type of institutional RMMV approach used depends on the structure, resources, and capacity of the Project Executing Agency (PEA). Table 2.1 provides an overview. Institutional RMMV approaches cover all stages of the project cycle; this will be further explored in > Section 3 RMMV within the FC Project Cycle.

Table 2.1: Overview of Institutional RMMV Approaches by PEA Capacity

Use	PEA with strong capacities/ sufficient resources	PEA with limited capacity/insufficient resources or No PEA
Always recommended when using RMMV	Increased Responsibility for National KfW Experts in Remote Verification (A1)	Increased Responsibility for National KfW Experts in Remote Verification (A1)
Always choose either A2 or A3 as your main institutional RMMV approach	PEA-led Monitoring: Monitoring by PEA staff (A2) PEA-led Monitoring: PEA staff supported by an Implementation Consultant (A2)	Consultant-led Monitoring: Implementation Consultant with increased local capacities (A3)
Additional institutional approaches (in addition to A2 OR A3)		Third-Party Monitoring (as part of the project) or Third-Party Verification (commissioned directly by KfW) (A4)
	Involving Target Groups and Project-Affected Persons (PAP) (A5)	Involving Target Groups and Project-Affected Persons (PAP) (A5)
		Engaging Other Partners (A6)

Note: Institutional RMMV approaches are designated with a code from A1 to A6.

A1 Increased Responsibility for National KfW Experts

(Default Remote Verification Approach)

Providing KfW national experts with increased responsibility for verifying important information related to the project throughout the project cycle is always an excellent way to fulfill KfW's verification duties wherever KfW can rely on country offices or satellite offices, and security risks are not too high; > Table 1.2: Sources of Security Risks and Affected Stakeholders. The KfW office in Pakistan has, for instance, hired a national technical hydropower expert who is taking over some of the verification tasks that are usually part of the KfW headquarters-based international technical expert's duties, under their technical supervision. National KfW experts may also take on increasing responsibility in coordination and interaction with the PEA, as agreed with the KfW PM. This requires an adaptation of the national expert's job description in terms of qualifications and tasks. This change in responsibility often implies a higher workload for national and technical KfW experts and their inclusion into more KfW portfolio management procedures, such as the new collaboration model. For this purpose, KfW national experts need to have access to a wider range of training courses and coaching from PMs and technical experts, including training on RMMV, digitalization, and other important topics like participatory M&E approaches (> A5) or geospatial tools (> Fact Sheet Geospatial Tools) and data sources (> Fact Sheet Data Sources). For an example of *Remote Verification* involving an increased responsibility for national KfW experts, please see > Section 4.2.3 Construction Site Supervision Using an MIS in Pakistan.

A2 PEA-led Monitoring: PEA Staff Supported, in Most Cases, by an Implementation Consultant to Conduct the Remote Monitoring and/or Remote Management of the Project (FC Default Institutional Monitoring Setup)

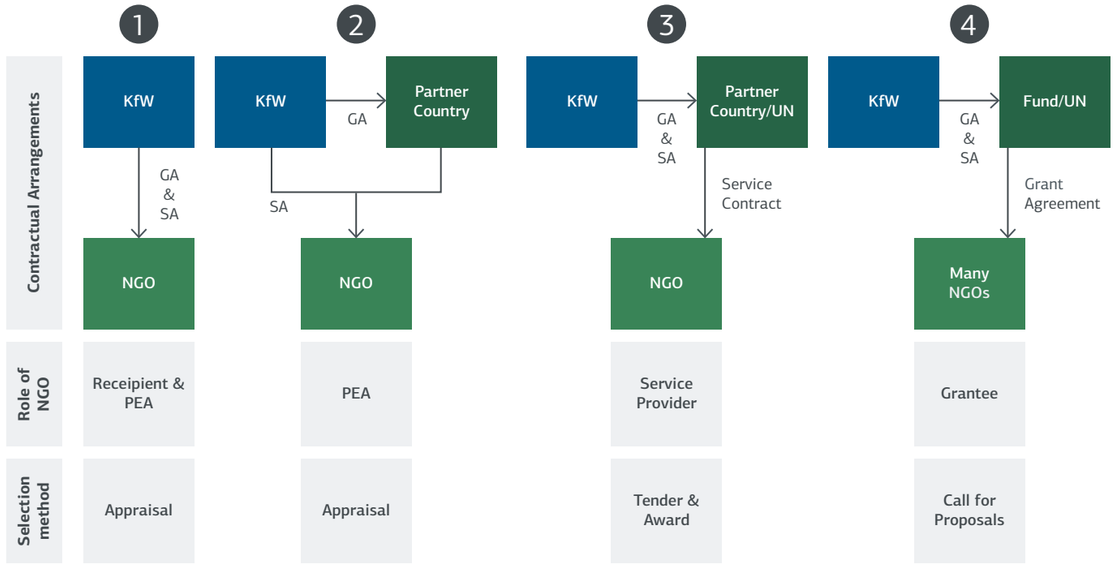
In this default (i.e., most frequent) scenario, the PEA leads *(Remote) Monitoring* via its own staff, frequently with support from an international *Implementation Consultant* or a consulting consortium. In some projects, the PEA's staff take the lead in *(Remote) Monitoring*. This is the case when the PEA is a strong partner and experienced in German *Financial Cooperation* projects (government entity, public company) or is a UN agency or non-governmental organization (NGO) > Section 2.1.2 Institutional Setup. Often, the PEA is supported by the international and national staff of an *Implementation Consultant*, who strengthens the PEA's monitoring capacity, immediately checks the PEA's reporting, supports data cleaning, and assures monitoring quality. For a project example, please see > Section 4.2.2 Remote Monitoring of Small-Scale Irrigation Systems in Mali.

A2 Special Case: Main Modalities of KfW Cooperating with NGOs as PEAs

In fragile contexts, KfW often partners with NGOs who take over the role of the PEA. Since RMMV is most frequently applied in these environments, the main modalities of such collaborations are highlighted below:

Cooperation between KfW and an NGO can be either based on a direct contractual agreement between KfW and the NGO (> Figure 2.2, 1 and 2) or on an indirect contractual agreement that requires further parties in the contractual concept (> Figure 2.2, 3 and 4):

Figure 2.2: Main Modalities of KfW Cooperating with NGOs



GA = Grant Agreement, SA = Separate Agreement

(1) In the first example, KfW and the NGO have a direct contractual agreement and the NGO is both the direct contract partner of the *Grant and Separate Agreement.* In this case, the NGO is both recipient of the funds and the PEA and is selected by KfW through appraisal, example, > Section 4.2.1 Remote Project Progress Monitoring and Verification in the Lake Chad Region.

(2) In the second case, the recipient of the funds is the partner country with whom KfW concludes the *Grant Agreement*, while the NGO holds the role of PEA. The *Separate Agreement* is concluded by KfW and the NGO. Beyond that, the NGO is also contractually linked to the partner country by a channeling agreement. This channeling agreement determines the transfer of funds from the partner country to the NGO. The NGO is jointly selected by KfW and the partner country by appraisal, for example, > Section 4.2.4 Using a 360˚Camera to Remotely Verify Construction Quality in Inaccessible Areas of a Hospital in Tanzania.

(3) The cooperation between the NGO and KfW can also be of an indirect nature and does not need to be based on direct contracts between the two. In this case, both the *Grant* and the *Separate Agreement* are concluded by KfW with the partner country or an UN organization who then conclude a separate contract with the NGO acting as a service provider. Here, KfW has no contractual relationship with the NGO itself but only through the partner country or UN organization. The NGO is selected by the partner country or the UN organization through tendering and/or awarding. In special cases, KfW can award the NGO on behalf of the partner country (agency contract). However, this should be an exception, for example, > Development of Hydropower and Renewable Energy in Pakistan (PN: 29937).

(4) In the last case, KfW concludes direct contracts (*Grant Agreements* and *Separate Agreements*) with a fund/foundation or UN organization that subcontracts to many NGOs. In this case, the NGOs are contractually bound to the fund/foundation or UN organization through a grant agreement and therefore have the role of a grantee. The NGOs are usually selected by the fund/foundation or the UN organization through a call for proposals. An example of a foundation being the PEA is PATRIP, see > www.patrip.org. This foundation was initiated by KfW on behalf of the German Foreign Office.
If KfW is financing a fund through a basket funding modality, the requirements for controlling the use of funds are delegated by KfW on behalf of the German government to the respective fund administrator, for example, the World Bank. An example of such a financial intermediary fund or multi-donor trust fund (MDTF) is the ARTF Afghanistan.

A2 Special Case: Main Modalities of KfW Cooperating with UN Agencies as PEAs

In fragile contexts, especially, UN agencies are often chosen as the PEA and Project Implementing Agency. A full accounting audit of the use of funds is generally not possible as UN agencies usually apply the single audit principle; > Annex 1 Glossary. International Public Sector Accounting Standards are applied. The respective UN agency is thus responsible for the correct use of funds during the entire project, including the funding of potential subcontractors or NGOs. Certified and uncertified financial statements are provided. This reduces KfW's requirements for *Remote Verification*. However, regular physical audits of the use of funds by KfW are practiced.

For an example of *Remote Monitoring* in such a UN-administrated project, please see > Project Makani Center (PN: 43247), where UNICEF is remotely monitoring the participation of the student beneficiaries of the Makani centers in Jordan. An example of *Remote Verification* of physical progress by KfW in WASH projects is the Drought Resilience III Project in Ethiopia (PN: 38307), where the mobile data collection software mWater was used together with video calls, photos, as well as a team of two international engineers, substituting for KfW technical experts, who visited 80% of the project sites.

[6] PN is the internal project number which can also be used to find information on the project in KfW's public Transparency Portal (in German language).

A3 Implementation Consultant-led Monitoring: Consultant with Increased Local Capacities for Remote Monitoring and/or Remote Management (Alternative Institutional Monitoring Setup-up to A2)

A consultant-led monitoring approach can be used at different stages of the project cycle: during preparation for conducting *Feasibility Studies* (when there is no designated PEA yet) and ex-post evaluations (after the PEA has already completed the project), and during implementation as *Implementation Consultants* or monitoring consultants. In fragile countries, *Implementation Consultants* may take over extensive responsibilities from the PEA and may even act as a de facto PEA, executing the entire project. This may be the case, if there is no capable PEA for the envisaged project type or if the mandated PEA has very limited capacities. Also, international consultants are sometimes in a better position to conduct monitoring by increasing their local staff capacities. In some cases, national consulting companies are better suited to fulfill certain tasks, or a mix of international and local consulting companies is required. For onsite monitoring and site supervision, teams of *Implementation Consultants* are frequently jointly led by an international and a national team leader or include local staff from the region who speak the local language and who can move more freely in the project area. For a project example, please see > Section 4.2.3 Construction Site Supervision Using an MIS in Pakistan.

Additional institutional RMMV approaches:

A4 (Remote) Third-Party Monitoring or Verification (in Addition to Other Institutional Approaches)

Third-party monitoring (TPM) or verification (TPV) is conducted by an international or national TPM consulting firm that is contracted more or less independently of the PEA and *Implementation Consultant* during the implementation of a project. The goal is to complement and/or verify monitoring information gathered by the PEA and/or *Implementation Consultant* to ensure that the project is executed in line with agreed procedures and is headed toward the agreed objectives. Unlike *Implementation Consultants,* information collected by TPM Consultants is not (only) automatically integrated into the PEA's data systems but is (also) directly communicated to KfW. TPM thus provides helpful information to the PEA and/or *Implementation Consultant,* and more importantly, constitutes an independent source of information that can additionally be used by KfW for its verification task. In those cases, where regular financial audits are already foreseen in the project design (e.g., if the project is using the disposition fund modality for disbursements) technical audits can be added as an additional task to the financial auditing of the project, the auditors thus playing a similar role as a TPM Consultant (in this case, the respective audit Terms of Reference (ToR) need to include the respective technical audit task). While TPM is part of the project and financed from its budget under the project's *Grant or Loan Agreement*, TPV is directly commissioned by KfW (and other donor agencies), if the primary objective is *Remote Verification* for KfW. This can also be useful if more than one project is being remotely verified. While progress and final reviews are mostly conducted by KfW staff remotely, TPM consultants may add the ability to collect and triangulate additional qualitative information, since they can act as the KfW PMs' "eyes and ears on the ground" and thus support KfW staff in preparing progress and final reviews based on *Remote Verification.*

In the > Decentralization Program in Niger (PN: 32221), for instance, a TPM Consultant financed by project funds independently monitors infrastructure, training outputs, and program impacts. For a project example on TPV, please see > Section 4.2.8 Monitoring Forest Area Changes in Ecuador Using the REDD Monitoring System.

2.1 Institutional Approaches

A5 Involving Target Groups and PAP (for Remote Monitoring and/or Remote Verification, in Addition to Other Institutional Approaches)

Participatory approaches can be used throughout the project cycle—for example, during the project design, selection of measures, location, infrastructure design, outcome monitoring, and impact evaluations. In contexts of fragile and conflict-affected states, as well as in cases with social and environmental risks, participatory approaches are particularly important to ensure the conflict sensitivity of the project and the application of the do-no-harm principle.

Target groups usually have a strong intrinsic interest in monitoring. Involving a defined target group through different methods may help generate valuable ideas and feedback during project preparation, implementation, and operation. It is often crucial for the project's impact to include representatives of different parts of the local population considering gender, age, vulnerabilities; locally elected representatives; local government staff; traditional leaders; citizen volunteers, and other formal or non-formal committees and groups in monitoring. Methods range from telephone interviews, focus group discussions, panels for representative surveys, > fuzzy cognitive maps, > social network analysis, > topic modeling, > interactive radio shows, and > micro-narratives (> Annex 1 Glossary) to community-led monitoring and mapping, such as > participatory statistics and > participatory rural appraisals (PRA), > community-based participatory research (CBPR), and > participatory action research (PAR), or > financial participatory approaches (FPA) sometimes combined with e-participation and crowdsourcing; > Fact Sheet Crowdsourcing Tools.

More comprehensive participatory assessments, such as PRA, CBPR, FPA and PAR, can reach out to target groups and strengthen their ownership of the project activities. The main goal is to receive answers to qualitative questions from specific target group representatives (e.g., women, vulnerable groups, children, and different ethnic groups) to ensure that their needs and interests are taken into consideration. A range of PRA methods is used to facilitate information gathering from the target groups. They usually have a strong visual component and may use techniques relying on symbols, which is why they are also accessible to people with varying literacy levels. For instance, matrixes can be drawn with symbols and the target group can weight them by placing stones. Techniques may also include observational methods, such as community walks, where participating locals show specific features and observations that can be visualized afterward on a jointly drawn community map. Falsification of the results can be prevented by having trustworthy persons (e.g. TPM consultants, *Feasibility Study* consultants or local NGO or university staff of both genders speaking the local language) conduct the surveys and by visualizing results (if possible) and asking critical questions during bilateral meetings with key stakeholders.

Following the principles of good data protection (> Section 1.4 Principles for Digital Development), the methodology and results of these exercises should be digitally archived (after thorough anonymization > Section 2.3.1 Privacy Check) for review during and after the implementation of the project, especially regarding the outcomes and impact, as well as environmental and social issues.

If data collection is managed remotely, it is not advisable to only rely on free focus group discussions. Instead, the process should be pre-structured and use visualization, so the valuable information is gathered and can be shared and stored. This approach requires project staff to have excellent communication skills. Generalizability needs to be treated carefully since the methods are usually applied in certain geographic areas. However, some introductory sources on PRAs are provided in > Annex 4 (List of RMMV literature). This *Guidebook* also mentions a few innovative participatory methods (see also an overview at http://www.participatorymethods.org), such as > micro-narratives (> Annex 1 Glossary), or > participatory statistics (> Annex 1 Glossary) that may help facilitate data collection from a large number of target group members.

Feedback from unspecified, anonymous target group representatives can be generated through crowdsourcing (> Section 2.5 Decision Matrix and > Annex 2.4 Fact Sheet on Crowdsourcing Tools) or offering targets groups and PAP to directly submit their grievances to the *Implementation Consultant* staff, as in the grievance redress mechanism applied by the project > UFK Iraq, PN: 3758, for example. Sometimes such a mechanism may include additional incentives, such as airtime/phone credits for mobile phone using respondents if this is necessary.

In some projects, target groups can be directly involved as clients whose access to the provided service is monitored remotely: > Section 4.2.5 Remotely Managing Maternal and Child Health in Yemen Using a Mobile Voucher App - or as co-owners of the intervention, such as the indigenous representatives in the project presented in > Section 4.2.8 Monitoring Forest Area Changes in Ecuador Using the REDD Monitoring System or as (co-)project-owners such as in > FPAs in the project > Transboundary Joint Secretariat in the Southern Caucasus (PN:34918).

A6 Engaging Other Partners (for Remote Verification in Addition to Other Institutional Approaches)

Engaging (other) government entities, development partners, NGOs, and research institutes may also support *Remote Monitoring* and *Verification*. These actors frequently have access to areas inaccessible to international development staff and may perform basic output monitoring (like a TPM Consultant) or generate other project-relevant data. In addition, they can conduct external ex-post evaluations and help KfW in triangulating monitoring results, sometimes even in research cooperation. For project examples, please see > Section 4.1.1 Forecasting Floods Using Open Data for Project Preparation in Gaza and > Section 4.1.2 Building a National Health Emergencies Monitoring and Management System in Nepal.

Source: KfW Bankengruppe / phototek.net

2.1.2 Institutional Setup and Changing Stakeholder Roles in RMMV

An appropriate institutional setup based on a solid project governance structure is crucial for successful *Remote Management*, *Monitoring*, and *Verification*. It enables the triangulation of data and verification. When developing the project setup and the institutional RMMV approach, the roles, interests, and functions of the stakeholders need to be considered.

In a monitoring setup, one can distinguish three roles:

- **Controller of the data/tool:** controls (and/or owns) the tool (if existent), evaluates and processes data, ensures data quality
- **Monitoring agent/data collector:** gathers data in the field (e.g., during site supervision)
- **Data verifier:** verifies and triangulates data

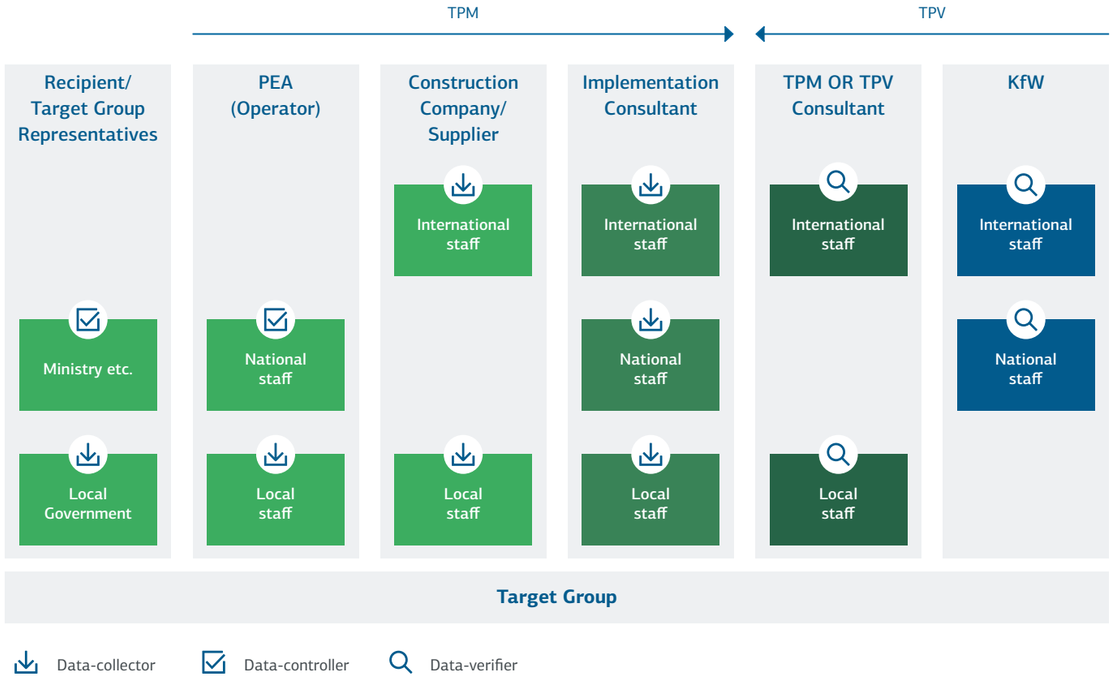
Depending on the project, different actors exist, and they have different monitoring functions. The following example illustrates this point.

Example of PEA-led Monitoring (> A2) with additional TPM (> A4), target group representatives (> A5), and Engaging Other Partners (> A6): local PEA staff and local government staff supported by an international *Implementation Consultant* and a TPM Consultant.

In the > Decentralization Program in Niger (PN: 32221), data is collected by the PEA's local staff, the *Implementation Consultant*, and the local government. It is processed by the PEA and the *Implementation Consultant*. A TPM Consultant (> A4) validates the accuracy of the data, which is then verified by KfW international staff remotely (> Figure 2.3).

2.1 Institutional Approaches

Figure 2.3: Example of an RMMV Governance Structure from the Decentralization Program Niger



Although the roles of various stakeholders may differ in each project, the following observations regarding the changing of certain roles and the resulting issues and potential conflicts of interest can be made:

Direct data access by KfW: The roles and interests of KfW rarely change in a project using RMMV. However, KfW may receive direct remote access to project data for verification purposes, which is usually not the case in a project that does not use RMMV. Also, such direct access might require special data privacy and IT security considerations (> Sections 2.3.1 on Privacy and 2.3.2 on Information Security).

KfW international staff remain remote data verifiers since they continue to receive reports from the PEA, but they lose the ability to directly verify and triangulate the information received. Instead, KfW international staff can assign KfW national experts (if the security situation permits) or indirectly rely on verification by gaining access to the PEA's lower-level disaggregated data (see above) or by assigning a TPM Consultant to gather data on their behalf. This requires KfW international staff to coach and manage these staff and explain verification routines to them. Furthermore, the additional verification sources may lead to the challenge that KfW international staff may receive too much or too little information (e.g., if follow-up questions are not asked when a problem is detected). These are factors that considerably increase their workload.

KfW national experts may have increasing responsibility: If international KfW PMs and technical experts cannot travel to the target area, the role of KfW national experts in interaction with the PEA may increase (see above, > A1).

Changing role of the PEA: Project executing agencies (PEA) remain data controllers, collectors, and users. The PEA may view an RMMV setting as an opportunity to execute the project(s) more independently. The PEA may have to be more transparent to better facilitate collaboration with KfW and other partners. Even within the PEA's organization, functions may change. PEA international/senior staff may also lose the ability to be a verifier/triangulator of information they receive from project sites, while on-site staff may take more responsibility and act more independently.

Changing role of the Implementation Consultant: The *Implementation Consultant's* role changes in a similar fashion to the PEA's role. Even within *Implementation Consultant* teams, local staff may take increasing responsibility. In addition, *Implementation Consultants* may take additional responsibility for providing technological expertise, for example, to manage a software development process (e.g., Management Information System or Building Information Modeling software) if the PEA does not have such IT experts. In other cases, the *Implementation Consultant* may have to closely collaborate with an IT consultant employed for such tasks. An additional role sometimes taken by *Implementation Consultants* is to support data cleaning and to validate the accuracy of data provided by the PEA (e.g., Global Positioning System (GPS) coordinates).

A Third-Party Monitoring (TPM) Consultant is a new actor that plays an important role as a verifier/triangulator of data provided by the PEA (> A4 above). With their external perspective, TPM Consultants may be particularly critical of projects and detect problems (to justify that they are necessary). On the other hand, TPM can be useful in proposing useful solutions ("out of the box"). In addition, TPM can act as an independent environmental and social consultant monitoring the implementation of Environment, Social, Health and Safety (ESHS) requirements. This is good industry practice in private sector infrastructure projects and is particularly useful in projects with high environmental and social risks, e.g., projects that affect many people (PAP) or projects in critical habitats. Similarly, to the private sector, TPM for environmental and social (E&S) issues and impacts has also been established for some large KfW infrastructure projects and should be considered more often in high-risk environments for ensuring that ESHS provisions are implemented adequately. TPM becomes even more important in the remote context as national consultants might be able to travel even if international travel is restricted or not possible due to security risks or travel restrictions. In most cases, TPM Consultants are contracted by the PEA or the *Implementation Consultant* as part of the project to provide an additional independent source of information for the *Remote Monitoring* of the project. However, TPM Consultants can also be directly hired by KfW to conduct Third-Party Verification on behalf of KfW.

Target groups, including community representatives and other project–affected persons (PAP), may play a more active role in data collection (> A5 above). Since they directly benefit from the services provided, they may have an intrinsic interest in detecting and reporting issues. However, it is important to not view the target group as a homogeneous group. Within the target group, there are usually different interests (e.g., between richer and poorer parts of the population or between men and women) or hidden motives (e.g., by powerful and vocal spokespersons). Vulnerable groups are particularly disadvantaged if international staff (often seen as a relatively neutral broker of interests) are not present locally to ensure a balance between more active and vulnerable community members or stakeholders. Also, such a target groups or PAP involvement might prove quite challenging in fragile contexts and remote areas and requires additional resources, training and experienced consultants.

Construction companies' role does not change in projects using RMMV. Usually, they have a profit-making motive. PEA and *Implementation Consultants* use RMMV, in particular, *Remote Management* (> Section 3.2.4) and Remote Site Supervision (> Section 3.2.5), as well as *Remote Monitoring*, if their access to the project site is restricted.

Direct site access by KfW's clients such as BMZ (> A6 above): Sometimes, (inter)national client representatives may have direct access to project sites even though KfW international staff do not have access. The information collected by them can be used by KfW to verify the project's monitoring reports.

Other development partners, such as government entities, research institutions, NGOs, and other development agencies may take up roles in monitoring (> A6 above). They might also do this out of their own interest (research institutions) or reciprocity (e.g., if a TPM Consultant of another development partner is used). Yet, the agenda and interests of other development partners, as well as their (past) relationship with stakeholders, also need to be considered.

Tool and data providers may be for-profit and nonprofit organizations. For-profit providers usually offer proprietary solutions and charge licensing or subscription fees or they sell user data to advertising companies (see below > Section 2.1.3 Conflicts of Interest, and > Section 2.2.2 Open-Source vs. Proprietary Tools/ Software).

2.1.3 Possible Conflicts Between Actors and Conflicts of Interest

Changing the roles of the stakeholders may heighten tensions or lead to new types of conflicts. This section will present challenges that can occur when roles are changed and describe how they can be prevented or mitigated.

PEA and KfW (> A2)

The PEA may not accept *Remote Verification* by KfW. PEAs may not be comfortable with the different or heightened involvement of KfW in controlling the project and may even resist it. Therefore, if this is considered a risk, KfW should introduce RMMV approaches early and make them a requirement for implementing projects (> Section 3.1.1 Government Negotiations, 3.1.3 Project Appraisal, and 3.1.4 Contractual Considerations).

Some PEAs may resist the introduction of technology-based automated data sharing, e.g., through a *Remote Management Information System* (> Annex 2.01 Fact Sheet R/MIS), Building Information Modeling (> Annex 2.10 BIM), or data-sharing room (> Annex 2.11 Fact Sheet Collaboration Tools). If KfW receives instant access to low-level disaggregated data, the PEA may feel tightly controlled. PEAs may also have concerns about tracking changes made to the data (that may be justified or unjustified). It may be possible to explain the advantages of the tool as an opportunity for staff, management, and donors to have instant access to well-structured, quality data on individual projects, which increases overall efficiency, supports PEA management business analysis and decision-making, and reduces the workload for collecting information for ad-hoc requests.

PEA and Implementation Consultant (> A2 and > A3)

The potential conflict between the PEA and the *Implementation Consultant* about what is being reported may be enhanced. If external verification is weak, PEAs may be tempted to underreport problems encountered during implementation. If KfW expects the *Implementation Consultant* to ensure the accuracy of the reported data, this may increase the *Implementation Consultant's* conflict since he must ensure a good working relationship with the PEA while ensuring accurate reporting to KfW. This conflict can in some cases be reduced by using an agency contract for recruiting (and managing) the *Implementation Consultant*, although the PEA has still to approve every step of the recruiting and management process. Ensuring sufficient external verification, for example, through KfW national experts (> A1 above) and/or a TPM Consultant (> A4 above) is also useful.

PEA and TPM Consultant (> A2 and > A4)
Tensions between the PEA and TPM Consultant may arise if they have different opinions, particularly about the deficiencies of a project. The PEA may feel that it is being criticized without a full understanding of the particular history and context of a project. This is particularly the case if the PEA does not have the opportunity to explain its viewpoint. This risk can be mitigated if the TPM Consultant is introduced as additional support to the PEA rather than only as a control mechanism. Appropriate briefings and background information should be provided. The TPM Consultant may, for instance, develop practical recommendations to address potential critical points he or she has identified. KfW PMs should allow the PEA to comment on the TPM Consultant's findings and fairly weigh both points of view.

The TPM Consultant's interest in having easy access may conflict with the PEA's interest in minimizing reputational risks. TPM Consultants are usually asked to present themselves as being independent of the agency. However, a TPM Consultant's field monitors may not respect this rule, since using the PEA's name makes it easier for them to be accepted. If TPM Consultants misrepresent the project objectives and approach or the organization's values (such as humanitarian principles), they can confuse the target group and even damage the agency's reputation. Therefore, this issue must be elaborated in the TPM Consultant's ToR and contract. If the PEA does have a code of conduct, the TPM Consultant may be encouraged to sign the code of conduct for the duration of the assignment. On the other hand, TPM Consultants may be overly critical of a competitor or overreport issues to justify that their work is necessary. It may be possible to mitigate this by considering any potential conflict of interests beforehand resulting in specific requirements to avoid such conflicts of interest and/or specific wording in the TPM Consultant's ToR and contract.

International and national and local PEA, Implementation Consultant, and/or TPM Consultant staff (> A2, > A3, > A4)
Local staff may discourage development partners such as KfW or senior management from visiting sites. Local staff may feel empowered by the lack of travel from senior management or international actors and attempt to maintain this situation and discourage others from visiting sites, e.g., citing security reasons. Some observers even argue that local staff have occasionally created security incidents to discourage senior management from visiting project sites.

Local monitoring staff often rely on local networks to access an area, which is why they may have incentives to underreport critical issues about corruption or wrongdoing, fearing their future access and personal safety. In other instances, site reports of local staff may be ignored or falsified by their senior management to downplay issues or the lack of progress to donors.

Local government representatives or traditional leaders and target groups or project-affected persons (> A5)
Local representatives engaged in monitoring may have conflicts of interest. They may be affiliated with the selected contractors or suppliers or their competition, which may harm their objectivity in monitoring and increase risks for corruption.

Local government representatives and traditional leaders may have a bias toward more powerful parts of the population, while women and vulnerable groups are usually underrepresented. This may be due to social norms and structures. Therefore, it is not advisable to rely exclusively on local government stakeholders and/or traditional leaders for *Remote Monitoring* and *Verification*.

This means that even though local government representatives and traditional leaders' observations and opinions are more easily collected in RMMV, other sources of target group feedback need to be considered, this is especially important for considering women, youths, and vulnerable groups.

Target groups may fear and face repression by local authorities. Therefore, they may not be willing to share criticism and improvement suggestions for the project or face dangerous consequences if they do. Usually, international consultants or KfW staff would be able to solicit such observations since they may be perceived as impartial or trustworthy. If they cannot directly interact with target groups, specific ways to incorporate their observations safely need to be established.

Between (different parts of the) target groups or PAP (> A5)
There may be conflicts between different (parts of the) target groups, for example, ethnic groups, residential vs. herder groups, landowners vs. landless, women, youths, and other vulnerable groups. This should be considered while soliciting the target groups' feedback as well as feedback from PAP. Appropriate formats, such as speaking to each (part of the) target group separately need to be devised, to be aware of their sometimes-differing opinions and avoid do-no-harm risks.

RMMV tool provider and PEA (> A2, > A3, or > A4)
The RMMV tool provider's profit interest may conflict with the sustainable use of a tool. Providers of proprietary tools may establish pricing schemes with continuous costs, which may be difficult for a PEA or operator to pay. Tool providers may try to bind clients to themselves as the only provider of regular security updates, e.g., by not sharing source code or information on the software development process (i.e., software vendor lock-in). To mitigate this risk, open-source solutions are usually preferred (see below > Section 2.2.2 The Use of Open-Source vs. Proprietary Tools/Software). The tool development process should be carefully managed, and tool providers must be requested in their ToR to document the software development process.

2.1.4 Creating an Incentive Model for Truthful Project Reporting

Incentives can help ensure correct, good quality reporting that addresses all important aspects of the project, including the risks and challenges. These three examples illustrate this point:

- The consultant may be incentivized to ensure adequate data quality. If verification by KfW and ex-post evaluations depend on the quality of data, especially GPS data, the accuracy of this data is crucial and should be the consultant's responsibility. Therefore, it is possible to condition the payment on the delivery and quality of the consultant's work.
- Municipalities may be incentivized to use a citizen feedback-loop system. Performance-based donor-funding of local community development can create a positive incentive for governments to allow greater citizen scrutiny and participation, e.g., through crowdsourced monitoring and reporting platforms. For this purpose, the selection of municipalities could be based on the results of the citizen feedback-loop system to create competition and thus incentivize them to improve governance.
- Citizens may need to be incentivized to participate in a citizen feedback-loop system. In some approaches, citizens receive a small benefit for their active participation in monitoring, especially if they are not directly benefitting from a project or if their share of the benefit may seem small to them. For instance, they may receive a small credit top-up on their mobile phone. This, however, is usually not sustainable. More indirectly but sustainably, the main incentive for citizen monitors is that their concerns are considered and attended to. The long-term participation of citizens depends on whether municipalities react to their input or not. For these approaches to work, it is recommended that both sides (municipalities and citizens) are incentivized by making citizen participation and municipality responsiveness to citizen feedback special provisions of any project documentation; > Fact Sheet Crowdsourcing Tools.

Source: KfW Bankengruppe / Johnny Miller

2.2
Technical Tools and Data Sources

2.2.1 Overview of Technical Tool Types

Technical tools are information and communication technology (ICT) that facilitates the collection, transmission, aggregation, structuring, analysis, verification, visualization, and interpretation of information. Technical tools are usually combined with institutional RMMV approaches (> Section 2.1), that determine which actors use and control the respective tools. When deciding on which technical tool types to use for RMMV, the underlying question is which types of technology — including software, hardware, and their application — are needed to meet the information needs of the project? Overall, technical tools can be classified into the 12 types in > Figure 2.4 below. They provide additional or alternative ways to collect, transfer, store, organize, manage, aggregate, structure, analyze, verify, visualize, and interpret data.

Most importantly, technical tools require technology to function. They usually use ICT and are enabled by a technological boom—increasing coverage by 3G or 4G internet or satellite access and increasing mobile phone ownership, for example. Even in rural communities, mobile communication sometimes becomes available even before access to electricity is provided. The emergence of smartphones also caused a massive drop in price for different sensor technologies, allowing new ways of data collection. These developments helped expand application areas, higher technological quality, and cost reductions for ICT products.

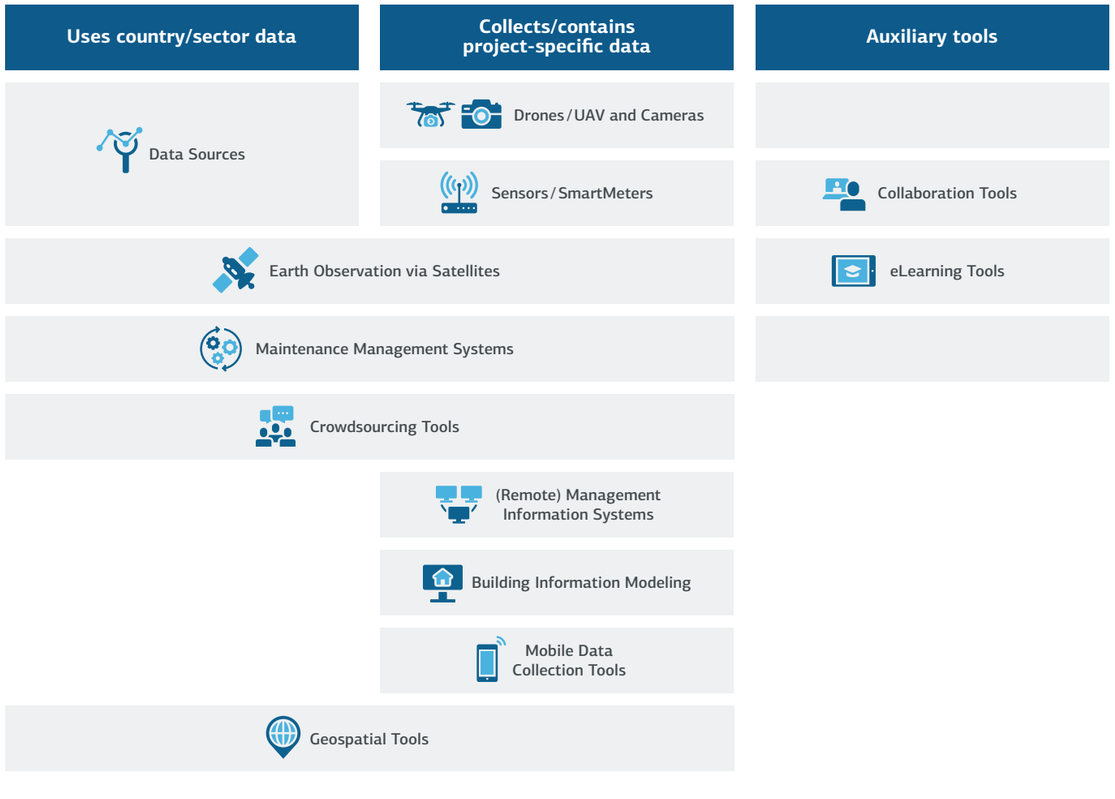
However, there are frequently limitations: although 3G/4G internet might be widely available, the quality and reliability of the connection plays a key role. When PAP are concerned, certain aspects must be considered, such as whether they truly have access (proper connection, digital literacy, familiarity with the selected tools) and whether the selected method is appropriate (data protection concerns, people being comfortable with expressing their opinion through a given platform, cultural appropriateness, etc.). The RMMV *Decision Matrix* in > Section 2.5, as well as the Tool Type *Fact Sheets* in > Annex 2, provide information on the respective considerations.

Figure 2.4: Tool Type Categorization

In > Annex 2, you will find *Fact Sheets* for each of the above-described technical tool types as well as a *Fact Sheet* on data sources.

Please note, that although eLearning and collaboration tools are not monitoring tools per se, they are usually necessary for the successful implementation of an RMMV approach, since project staff always need to communicate and collaborate remotely via collaboration tools, and frequently, project staff also need to be remotely trained in using the other tool types via eLearning tools.

Figure 2.5: Tool Types According to Data Type



2.2.2 The Use of Open-Source vs. Proprietary Tools/Software

A fixed and essential component of the use of technical tools in RMMV is the associated software. Software licenses govern the use and redistribution of software. According to their license, software can be divided into two main types: proprietary software and open-source software. The difference lies in whether the software grants the right to use, modify, and reuse a software product obtained by a customer or user. In general, in international development, the use of open-source software is highly encouraged > Section 1.4 Principles for Digital Development.

Open-source software (i.e., non-commercial software): The term "open-source" refers to a software product people can alter and redistribute because it is released without the usual (copyright) use restrictions. This means the developers who designed the software are happy for other people to use their software for their own purposes, and adapt and develop it as they see fit, without paying any fees to the original creator. Often, open-source software is freely distributed and modifications to the software are permitted. In addition, the source code is released for use by everyone.

Open-source software grants everybody the right to use and alter its source code, design, documents, or content free of charge. The license determines the permissions and conditions of the software.

Examples of open-source products are WordPress, Open Office, the internet browser Mozilla Firefox, Wikipedia, the GNU/Linux operating system, and its derivative Android, an operating system for mobile devices. Such open-source software products use common licenses such as GNU Public License, Affero General Public License, Mozilla Public License 2.0, or Apache License 2.0, which are roughly equivalent. Differences in the licenses can be checked at the website > https://choosealicense.com/licenses/

Proprietary software (i.e., commercial software): The opposite of open-source software is proprietary software, where only the individual creators, or the business that created it, has the right to control or modify the source code. Examples of proprietary software include Microsoft Office and Adobe Photoshop – paying customers may use the software, but they may use it only

for the purposes expressly permitted by the creators. The software publisher retains intellectual property rights, usually in the form of copyright over the source code. Usually, the use of proprietary software requires regularly paying license fees. Proprietary software can have different pricing schemes with implications for their licenses.

The use of the proprietary software may be restricted in many ways, such as the number of users or the use of a certain type of hardware.

To compare all software licenses, visit: > https://joinup.ec.europa.eu/collection/eupl/solution/joinup-licensing-assistant/jla-find-and-compare-software-licenses

The following lists the advantages and disadvantages of open-source and proprietary software. Generally, the software development costs connected to the adaptation and setup of the software are the highest cost driver, regardless of the software type. The long-term software costs however can severely limit the project's sustainability, even if the license fees are not high.

Open-Source Software Pros and Cons:

- Open-source software tends to have relatively high setup/configuration costs, but low running costs. Even though the source code is readily available, open-source software frequently requires initial adaptation by a software developer. Running costs are relatively low since open-source software usually does not imply a licensing fee. This is a major advantage, as it increases its chance of being sustainably used. However, some basic costs for maintenance, upgrades, and troubleshooting remain during the operation phase.
- Open-source software is generally highly reliable due to the higher number of developers included during the software development. Based on the freely available source code, every software developer can participate in the programming process, which increases the quality of the source code. This has positive effects on the security and stability of the software. The output tends to be extremely robust, tried, and tested code. Additionally, not having to request permission from the original authors to modify software means that development happens more quickly, and software evolves faster. As with reliability, open-source software's code is often more secure because it is much more thoroughly reviewed and vetted by the community.
- Versatility: Using open-source software means that software operators are not locked into using a particular vendor's system that only works with their other systems. Operators can adapt it to their needs and use it in conjunction with other vendors' products. However, there might be a smaller risk of a single supplier lock-in, if changes by one supplier to the original open-source software are considerable.
- However, open-source solutions do not exist for all application purposes. Specialized tool types (e.g., Building Information Modeling) may be not attractive enough for open-source developers or just a few developers contribute to the open-source solution, which could impact the quality negatively. Depending on the tool type, the PM needs to assess whether there is a risk that the tool receives no support. Sometimes, a proprietary tool dominates the market in such a way that it possesses a de facto monopoly (e.g., Google Earth).
- Lack of support: In contrast to proprietary software, there is no institutionalized helpdesk users can turn to if things go wrong. Open-source software tends to rely on its community of users to respond to and fix problems. While there is no shortage of help available in the wider community, users may have to pay the price for external support, and it may take substantially longer than had they paid for software under a commercial license.
- Liabilities and warranties: Open-source software licenses typically contain only a limited warranty and no liability or infringement indemnity protection.

Proprietary Software Pros and Cons:

- Proprietary software offers customer service and is tailored to market needs. The purchase of a proprietary software product normally includes long-term license fees, maintenance, and other services (updates, hotline) that facilitate the software's use. For some products, proprietary software companies can capitalize on existing market experience that enables them to adapt the product to the market.
- However, long-term licensing fees and (later) adjustments to the proprietary software increase the operation and maintenance costs and thus long-term sustainability risks. The payments can take place on a monthly or yearly basis and/or can depend on the number of acquired licenses. Necessary adaptation during the project can cause additional costs if customer service does not cover them. The PM needs to clarify from the outset if the institution that will be responsible for the long-term operation and maintenance is willing and capable of financing these long-term costs.
- Another disadvantage of proprietary software is the dependency on one company (the lock-in effect). Besides the limited duration of the license, the customer has minimal influence on the product and is strongly reliant on the capacities and survival of one company, which implies a higher risk of obsoleteness than widely used open-source software. Proprietary software can quickly become out-of-date if the provider ceases to support it.

A general statement that open source is always better than proprietary is impossible. However, in the tools market analysis conducted by KfW, open-source software received preferential attention due to its higher potential for long-term sustainable use because of the lack of license fees (> Section 1.4 Principles for Digital Development).

The selection of the preferable software type is important, but it results from the objectives and the circumstances of the project. At the end of the day, IT support services (e.g., for customization), onboarding, and training are needed for both open-source and proprietary software. The pricing can be similar, or extremely different, so careful comparison is needed. The major difference with an open-source model is that this is potentially more likely to be taken over by the PEA later on, due to the lack of license fees. However, this is not without challenges as it requires substantial IT capacities within the PEA.

The following questions can guide the decision-making process when determining whether to use open-source or proprietary software:

- Will the software be used by national authorities after the project ends?
- Do additional capacity-building measures have to be taken to ensure the continuation of its use?
- What is the most cost-effective option?
- Who will be the user of the software?
- Can the software be reused or replicated for other projects with few adaptations?
- Is the required country expertise for operation and maintenance of the proprietary or open-source solution available (support hotline)?

Considering these exemplary and additional questions, the choice becomes clearer.

The *Feasibility Study* (> Section 3.1.2) should already make a recommendation regarding whether the use of open-source software shall be a requirement. If this is the case, the PEA and KfW need to ensure that this is included in the Terms of Reference for the implementing consultant respectively the software developer.

After deciding on your preferred software ownership model, you may use the model ICT contract clauses currently being developed for the FC.

2.2.3 The Use of Data Sources

Today, data is an important resource for operations in virtually every field and sector. Data helps us to gain a better understanding and thus make better decisions. Data-based work does not mean relying solely on data and numbers but incorporating them into decision-making. Data helps to systematically record and describe past and current situations and to measure effects. In addition to this great potential of data, more and more data is being generated and made available. It is therefore not only possible but necessary to use data systematically and to leverage its potential for informed decision-making. For this reason, data sources (open data and media, as well as big data) have been included in the RMMV *Decision Matrix* as an important means of *Remote Monitoring* and/or *Verification* throughout the project cycle > Section 2.5 RMMV Decision Matrix. Due to the wide range of different data sources available, data can be compared, plausibility checked, or special features identified. If, for example, the data on girls' access to schooling in a municipality collected by surveys deviates greatly from the publicly available figures for a region, this immediately raises the question of the reasons. These may be different data collection procedures, omission of significant factors (urban and rural areas), but also indications of specific problems in the municipality under consideration that may need to be investigated further. Such deviations from comparative data can also be good arguments in site selection.

2.2.3.1 Key Elements in the Identification of Data Sources within the Project Cycle

Project Preparation Phase:

Before using any data, it is necessary to formulate adequate questions. Being very clear about the information needs, formulating key questions and information collection goals is the first step in data analysis and often is not adequately done beforehand. This creates many problems later because often data is collected that is not fit for the purpose. So, framing concise and good questions is key before data collection planning begins.

For example, when planning new hospitals, the question "How good is health care in the northeast of a given country?" is not precise enough and may result in data being collected for specific localities and regions that are not actually relevant. A better question is "What is the need for additional hospitals in District XY?"; an even better and more precise formulation might be "For each municipality in District XY, how long is the walking distance to the nearest hospital?" or "For each hospital in District XY, for how many people is this the nearest (by walking distance) hospital and what is its capacity?" The search for suitable data can be started by visiting the (open) data portals mentioned in the > Fact Sheet Data Sources and by accessing the KfW Open-Data Platform currently under development. According to the information needs of the respective project, the search can then be continued towards more targeted sources and more specialized portals.

In the identification of target areas and target groups, the identification of relevant data sources is an important complement or even substitute to on-site visits. Statistical data on your target population may provide a better overview and can be more representative than, e.g., individual interviews in the considered region. Such preliminary desk research also informs the preparation of government negotiations and feasibility studies > Sections 3.1.1 Government Negotiations and > 3.1.2 Feasibility Study. The different aspects of the intended project and the underlying theories of change and related hypotheses can be checked with structured and unstructured data > Fact Sheet Data Sources. The suitability often depends on the topic and the precise question. While the identification of sites for new power plants can be well supported by structured (quantitative) data, such as energy demand or availability of resources and infrastructure, the effect of the presence of park rangers on the local population can be assessed by evaluating written reports (qualitative). Often consultants help in the feasibility phase with on-site exploration and data collection. By comparing those findings with external open-data sources, the assessments of the consultants can be cross-checked, validated, and triangulated. This deepens the understanding of the project aspects, helps identify biases, strengthens the basis for further action, and enables the specification of further research if new questions arise from this comparison. Ideally, the consultants themselves should perform the comparison with external data and comment on possible deviations and their potential reasons.

During Project Implementation

During the implementation of a project, it is important to track its progress via its activities and outputs and its impact on its social and natural environment. The same applies to external

factors that may jeopardize the success of the project. For this purpose, suitable variables/indicators must be defined that can be used to monitor these points. In the case of a reforestation incentive program, for example, progress can be tracked through satellite imagery; as a possible negative impact, the decline in economic activity can be monitored, for example, through production volumes in the target districts; and potential risks from armed conflicts near the project site could be considered. The number of data sources used should be regularly scrutinized and, if necessary, supplemented if new aspects emerge.

End of Project

In the later stages of the project cycle, in addition to the outputs, the evaluation of the project outcomes and the impact can be significantly informed by external data sources. Here the achieved indicator values can be compared with the indicators of control groups or areas or the general population > Section 3.4 End of Project. In the case of environmental protection projects, the development of the area can be compared with the development of the surrounding area via processed satellite images. To proceed based on evidence, data from more than one source should be considered. For this purpose, in addition to satellite imagery, on-site data collection (ideally analogous to that conducted at the beginning of the project) and data from project partners and local authorities can be considered. More examples in the evaluation of projects can be found in > Section 4.2 Project Implementation Examples.

2.2.3.2 Key Elements in Data Analysis

Data samples as well as all information derived from them (e.g., by statistical models) can only ever represent a section of reality, therefore, it is important to understand the data and model limitations (i.e., not all relevant factors might be covered in a statistical data model), and maintain critical thinking. When considering a data set, the methods used to collect the data must be questioned and presented transparently. After downloading structured data and loading it into a suitable program, the data in the given context and the corresponding statistical representativeness must be examined more closely. Representativeness can be achieved by choosing an appropriate sampling strategy that randomly chooses a subset of the population under consideration, (stratified) random sampling, to minimize systematic biases. In this case, relatively small samples can be utilized to represent a potentially very large population. For evidence-based and data-driven work, data quality is key. This can be broken down into process quality (Is the data always available? Is it captured in a timely manner?), compilation quality (no duplicates, uniform units, accuracy), and content quality (relevance, history, granularity). When using external sources, potential processual flaws cannot be prevented, but only detected, e.g., when the number of data points (observations) fluctuates extremely over time. Compilation mistakes may occur when merging data from different sources (and different surveyors). Content quality (fitness of data), especially, is always to be seen in the context of the underlying question. For example, the development of harvest volumes at the country level may be suitable for the comparison to local numbers but cannot be used to monitor the impact of a local agricultural project. Triangulation (comparison) with similar data from other data providers on the respective topic validates the plausibility and specialist truthfulness. Transparency about utilized methods, data sets, and tools, as well as a critical discussion of the results, are key elements in data analysis. For example, there are several potential sources for rainfall precipitation time series and maps generated from different approaches. One of them considers ground-based rain gauges and interpolates the values between those stations to obtain (almost) worldwide coverage. Another approach considers satellite (radar) measurements and estimates the amount of rain from that based on statistical/machine learning models. Differences between such maps can only be understood by knowing the respective tools, data sets, and methodologies used to generate the map.

2.2.3.3 Systematic Bias and Potential Risks

Systematic biases, that is, unintended distortion in your data, due to an unbalanced choice of observations, pose a risk of incorrect conclusions being drawn from it, leading to erroneous decisions and project interventions. When conducting surveys, in particular, care must be taken to ensure that the type of survey or the selection of respondents does not exclude any social groups. Therefore, make sure that the demographic characteristics (such as gender, age, religion, ethnicity, vulnerability, wealth, etc.) of the respondents match those of the total population (or your target groups, i.e., the subset relevant to your research question). Common errors here include the underrepresentation of women, youths, and people with disabilities. The time and place of the survey or the approach can also promote systematic biases. For example, a survey in the early afternoon during the week will underrepresent working people, and in many countries, a street interview approach will mainly reach men. Thus, the task when designing surveys is to answer the question of how to reach all segments of the population. Also, household interviews must address men and women in the household with separate questions related to their respective roles and tasks. Externally collected data must be examined for the quality of the survey methodology, as well as demographic anomalies, to assess their usefulness. Special care regarding legal issues must be taken when processing personal data > Section 2.3.1 Privacy Check. Even though removing names (anonymization) from questionnaires or replacing them with pseudonyms eliminates the obvious relation to natural persons, other answers from that questionnaire may be so specific that the individual may still be recognized by these attributes. In these cases, the data must still be considered personal and must not be published. To share the results from the surveys, an aggregation (summarization) needs to be performed beforehand, so that individual persons are no longer traceable.

Data has great power by providing new insights and allowing for precise measurements and improved forecasts. Along with it comes great responsibility to handle the data in such a way that it cannot do any harm to individuals or groups from which the data has been collected. The concept of responsible data usage goes beyond data protection and especially current legal requirements. The basic principle is to question data collection, including whose data is being collected, who benefits from it, what data is really needed, what is not, and is any (demographic) group being omitted (cf. biases). For example, data on the consumer behavior of private individuals should not be collected, if the resulting information will primarily benefit the regional or state government or individual companies. However, if this analysis helps the entire economy of a region and thereby improves the living conditions of all, the collection is legitimate from an ethical point of view. The unintended consequences must be kept in mind and are addressed by the initiative Responsible Data (> https://responsibledata.io). This can be achieved by implementing values and practices of transparency and openness, e.g., questioning and clearly presenting the methods for data collection and the analysis methods used. The prioritization of people's rights to consent, privacy, security, and ownership when using data can be implemented with consideration of data protection and privacy > Section 2.3.1 Privacy Check or > KfW Digital Rights Check Reliefweb has published a Responsible Data Toolkit > https://reliefweb.int/report/world/responsible-data-toolkit

2.2.3.4 Equal Access to Data Sources

The aforementioned issue of the responsible use of data also includes facilitating access to data (sources) for those from whom the data was collected and who form the target group of the projects. This includes not only the project partners but also the local people, communities and the whole public. Therefore, the public provision of data (Open Data) (in a data catalog) should play an important role in the context of the use of data in the projects. KfW is currently developing an Open–Data Platform that features a crowdsourced and publicly accessible catalog of (open) data sources relevant to international development cooperation. KfW is also publishing its RMMV Guidebook as Open Content on > Github.

2.2.4 Open Data

Open data includes all data that can be freely used, reused, modified, and redistributed by anyone—subject only, at most, to the requirement to attribute and share alike. In many organizations the term "Open Data" is used in a broader way, also including data that may be used for any purposes but may not be redistributed in a general fashion without the provider's permission or data where the use is restricted to non-commercial purposes only. In any case, the licensing terms of the data must be respected in any further usage, for example, citation/attributions to the source must be provided properly. If the data is published or shared, the original licenses must be provided, too. With Open Data, in addition to the non-existent licensing costs for data use, universal participation is strengthened. This also includes the use of non-commercial data formats, so that it can be evaluated by anyone. In addition to low-threshold analysis, this enables intersection with other data and interoperability with other systems.

Relevant data portals are a starting point for open-data sources. The specific requirements can be implemented with their respective filters. After finding a suitable data set, the relevant data portals in particular offer visualizations and intuitive download options that allow for a quick and easy overview of the data.

Especially in the case of Open Data, the reliability and the trustworthiness of the provider, as well as data collection and analysis methodology, should be checked, in particular, to identify potential bias. Official authorities and (independent) research institutions tend to be trustworthy. It is important to note how the data was collected, by whom, and whether it is offered already processed by the provider.

Open Licenses

By definition, Open Data (or data sources) should be provided along with an open license that ensures that the data can be used openly as described above. This allows for quick verification of openness without having to go through all the terms and conditions. The most important licenses for Open Data are:

- Creative Commons Attribution 4.0 (CC-BY-4.0)
- Allows the open usage of data, attribution is required (indicated by the addition "BY")
- Creative Commons Attribution Share-Alike 4.0 (CC-BY-SA-4.0)
- Allows open use of data, requiring attribution (denoted by "BY") and publishing the derivative product under the same terms ("share-alike"— denoted by "SA")
- Open Data Commons Attribution License (ODC-By-1.0)
- Allows the open usage of data, attribution is required (indicated by "BY")
- Open Data Commons Open Database License (ODbL-1.0)

Allows open use of data, requiring attribution and publishing the derivative product under the same terms ("share-alike")

An extensive list of open licenses is provided by the Open Knowledge Foundation (> https://opendefinition.org/licenses/) which also lists some nonconformant licenses (> https://opendefinition.org/licenses/nonconformant/). The most important exclusions are "Non-Commercial" (NC) licenses, which restrict the purposes for which the data may be used, and "NoDerivs" (ND) licenses, which do not allow the data to be modified but only to be downloaded and shared. Such non-Open Data will be discussed in the following section.

2.2.5 Non-Open Data from External Sources

Non-open external data refers to third-party owned data whose availability or usability is technically or legally restricted. It may be freely available, but its use may be restricted to specific purposes (e.g., > FAOSTAT under > CC BY-NC-SA 3.0 IGO license), or it may be exchanged or acquired for payment as part of data partnerships (e.g., > https://datapartnership.org/). The differences from Open Data are price and utilization possibilities. If conflict-sensitive data is provided by the UN, it cannot be published for security reasons, whereas internal evaluations and discussions are possible. In any case, the respective license conditions must be complied with at all times, and it must be ensured that the data is only passed on and used within these conditions. This may require both procedural (a reference to license condition) and technical measures (encryption, access control) to protect the data. Sometimes different pricing models are available for data acquisition. These usually depend on the number of users, permission for storage, or volume limits. In such cases, the need should be carefully assessed again to avoid unnecessary costs (even in the medium term). Despite any quality statements made by the providers, the quality of the data must be checked, and the data compared with data from other sources and thus checked for plausibility. This should also be performed before signing on a sample data set.

When working with external data, it must be considered that the definitions of terms and key figures, as well as data formats, may differ from your own. Here it is helpful if the data refers to

2.2 Technical Tools and Data Sources

established standards, such as the International Aid Transparency Initiative (IATI) (Standard for data publication by donors) or ISO (International Organization for Standardization, providing standards for various topics such as currencies or countries' measurement types). Otherwise, it will be necessary to merge the data from different sources yourself.

2.2.6 Existing Data from Project Stakeholders

Using your own data, if available, is the easiest way. Organizations specify rules, principles, and guidelines of data management in a data policy. Provided that a corresponding data policy has been implemented in your organization and is known to you, definitions of terms and quality standards are uniform, and technical access is usually not a problem either. If uniform data governance has not yet been established or is unknown, internal data should also be scrutinized and checked in the same way as external data and as described in > Section 2.2.3 The Use of Data Sources. The same applies to data from other project partners. In addition, it must be clarified here (also like third-party data) what the data may be used for by the project partners and on which infrastructure it may be stored. Seen from a data governance perspective, this situation represents a (project-related) data partnership which should be mentioned in the related contractual agreement (see the respective step(s) in the project cycle > Section 3 RMMV within the FC Project Cycle.

2.2.7 Big Data

The term "big data" is not precisely defined, but there is a general understanding of what type of data is being referenced. As a rule of thumb, big data describes a quantity of data that cannot be processed or stored by a normal computer. This may be due to the actual volume, the variety of data formats (esp. unstructured/non-tabular), or the speed at which new data sets are added or generated.

One possible application is the use of already collected data from private organizations for the public good in a privacy-conscientious, scalable, socially, and economically sustainable manner. This is the vision of > OPAL (OPen ALgorithms), an initiative founded by MIT Media Lab, Imperial College London, Orange, the World Economic Forum, and Data-Pop Alliance which aims to use private data for social good, and has been operationalized by the Flowminder Foundation, a Swedish non-profit organization, in the use of mobile operator data. Compared with traditional phone or field surveys, call detail records metadata has the advantage of being generated automatically on a real-time basis as a by-product of cell phone network subscriber interactions. This data, therefore, provides a real-time overview of how many people are in a particular place at a particular time, which can be used for urban planning or used to plan rescue operations in the event of a disaster or can be used to create mobility profiles that help predict the spread of infectious diseases while considering issues regarding data protection and privacy, as well as security; > Section 2.3 Legal and regulatory conditions and recommendations and > KfW Digital Rights Check.

Besides the use of existing data, it is possible to capture the data itself and evaluate it. With smart meters, a large amount of live structured data can be used for the monitoring or ideally control of traffic flows. A high number of sensors measures the traffic density in a certain area and transmits it in real time. Properly processed, this can be used to derive short-term measures for route planning for public transport. The development of learning traffic planning and management systems strengthens the digital transformation in the mobility sector and thereby increases people's mobility while reducing carbon dioxide emissions.

Another application can be the automated extraction of information from texts. For example, internal or external reports or news articles can be efficiently evaluated (named entity recognition, information extraction) or the general mood or relevant topics can be determined from social media posts.

Automated information extraction methods (from the field of natural language processing) can monitor local (digital) newspapers and websites and social media (Twitter) portals for articles or posts concerning companies that are involved in the implementation of a project. If the algorithm detects texts questioning the trustworthiness of one of these local companies (e.g., an allegation of corruption), this may trigger an internal investigation which in turn will reduce risks for the project's success. Social media posts may also be used to measure the changes in mood and the trending topics in a region. This can be used as an indicator of recent changes in the living conditions of people. Since social media posts are personal data, legal issues must be considered; > Section 2.3 Legal and regulatory conditions and recommendations and > KfW Digital Rights Check.

Technical and Professional Requirements Regarding Big Data

The rigorous processing of big data requires appropriate infrastructure (hardware and software) to deal with its characteristic properties (volume, velocity, and variety) and the resulting challenges. Instead of setting up this infrastructure oneself, it is reasonable to search for technical partners (as in the telecom example). In the case of external big data, many providers (such as Reuters) are proprietary and therefore there are costs to consider. The relevant data volume can often already be reduced on the provider side by giving precise filtering conditions (e.g., for news articles: topic, spatio-temporal coverage, etc.) in such a way that the in-house effort and the costs are significantly reduced. Given the volume of big data and the corresponding effort in processing it, the precise formulation of the question to be answered and the clear delimitation of the scope are even more important, because adjustments and unnecessary data retrieval cost time and money.

Since big data is rarely processed manually, but in an automated (model/algorithm-based) manner, it is even more important to check for systematic biases within the data (which may result in biased models). For example, when considering social media data, western-centered networks may not be as popular in the project country or may only be used by well-situated users. An evaluation of the trending topics within these networks therefore can only reflect the values of these upper-class users and may completely miss the concerns and needs of most of the population. Therefore, not only technical but also methodological expertise and support are required, covering statistical (data forensics) as well as domain knowledge.

Further information regarding data sources can be found in > Fact Sheet Data Sources and the use of data sources in a project phase is presented in the project examples Gaza and OSCAR > Section 4.1 Examples of Using RMMV for Project Preparation.

Source: KfW Bankengruppe / Dave Tacon

July 14, 2018, Huainan, China - Control room with multiple screens monitoring local traffic conditions at the Traffic Police Headquarters. KfW is partnering with local authorities to develop a system to improve local traffic.

2.3 Legal and Regulatory Conditions and Recommendations

Successful application of institutional RMMV approaches, tools and data sources depends on the situation in the country or target area, including political, social, legal and regulatory conditions, as well as local ICT access conditions. Issues that should be considered include the human rights situation, unmanned aerial vehicle (UAV)/drone regulation, information privacy (how personal data is handled), data security (how data is preserved), local IT access conditions, and software ownership types (whether to use open-source or proprietary software). Some tools or technologies may not be usable due to the legal and regulatory environment, others may require specific care. This section describes the most relevant general legal and regulatory topics that can arise, specifies which tools and technologies are relevant, and makes recommendations regarding when and how they should be addressed.

Not all issues are relevant for all types of approaches and specifics must always be taken into account. The following table shows which condition is relevant for each approach, tool, and data source.

Table 2.2: Which Legal or Regulatory Issues are Relevant for Each Type of Approach, Tool Type, and Data Source?

Legal/regulatory issue	Approaches, tools and data sources for which they are to be considered:
Drone/UAV regulation	Drone/UAV-based remote sensing; > Fact Sheet drones/UAV and > Section 2.3.5 
Data Protection and Privacy	All approaches that (implicitly or explicitly) collect personal data; > Section 2.3.1 Privacy Check and > Digital Rights Check In particular: cameras, drones, mobile data collection tools, crowdsourcing tools, big data, *Remote Management* Information Systems (R/MIS), Maintenance Management Systems (MMS), eLearning tools, collaboration tools, some sensors. 
Information Security and Confidentiality	All approaches where sensitive data is stored, especially in fragile and conflict contexts; > Section 2.3.2. In particular: cameras, drones, sensors/smart meters, mobile data collection tools, crowdsourcing tools, big data, R/MIS, MMS, some geospatial tools, some satellite data, eLearning tools, Building Information Modeling (BIM) and collaboration tools. 
Human rights aspects/ issues	All approaches, tools, and data sources where target groups and project stakeholders are requested to express their observations, experiences, and opinions; > Section 2.3.3 and > Digital Rights Check In particular: crowdsourcing tools, mobile data collection and all other participatory approaches.
Rights of Use and Copyright	All tools (> Section 2.2.2 The use of open-source vs. proprietary tools/software) and data sources (> Section 2.2.3 Data Sources and > Section 2.3.4 Rights of Use and Copyright), in particular photos, videos, satellite and drone imagery, drawings, designs, etc. 
Country-specific regulations	All approaches using mobile phones and local internet connections, as well as certain tool types, such as drones/UAVs; > Section 2.3.5 In particular: mobile data collection tools, crowdsourcing tools, big data, R/MIS, MMS, and camera-based and intelligent sensors. 
Software ownership type	All approaches where software is purchased/used. Open-source software is to be considered with preference, wherever possible > Section 1.4 Principles of Digital Development and > Section 2.2.2 The Use of Open-Source vs. Proprietary Tools/Software.

2.3.1 Data Protection and Privacy Requirements in Financial Cooperation

As a first rule and best-practice approach, avoid collecting any personal data if it is not absolutely required. Wherever possible, avoid using personal data and strictly limit your information needs to an aggregated data level that protects the privacy of data providers. For example, if population data collected from villages would violate the privacy of or disclose information about vulnerable groups, data must be aggregated at a higher level, for example, at the district level.

Also, avoid collecting personal information while gathering information. For example, do not collect names, etc., in a survey or do not require the entering of personal information during a crowdsourcing activity. The following applies if the collection and or processing of personal data cannot be avoided:

Data privacy, also known as information privacy, refers to the necessity to preserve and protect any personal data collected by any organization from being accessed and processed by a third party.

Data privacy checks help an individual or an organization determine what data within a system can be shared with others and what should be restricted. Personal data is defined in Box 3.

Box 3: Personal Data

Definition of personal data in EU law: Personal data is defined as "any information relating to an identified or identifiable natural person." A low bar is set for "identifiable"—if anyone can identify an natural person using "all means reasonably likely to be used," the information is personal data, even if the organization holding the data cannot itself identify a natural person. A name is not necessary either—any identifier will do, such as an identification number, location data, an online identifier, the birth date and place, an image of a face, or other factors which may identify that natural person.

Sensitive personal data and therefore particularly worthy of protection can be information about the racial or ethnic origin of the data subject; political opinions; religious beliefs or other beliefs of a similar nature; trade union membership, physical or mental health conditions; the subject's sexual life, marital, and family status; the commission or alleged commission of any offence, any proceedings for any offence committed or alleged to have been committed, and the disposal of those proceedings or the sentence of any court in those proceedings.

Data privacy needs to be considered for all RMMV approaches, tools, and data sources that potentially, or actually process[7] (including implicitly or explicitly collecting or recording) any personal data. They are mainly mobile data collection and crowdsourcing tools, (R)/MIS, MMS, cameras or UAVs/drones, some other types of sensors, eLearning tools, collaboration tools, and big data.

Data privacy is a real concern, particularly in contexts of fragility and conflict, as well as in countries with authoritarian government regimes. Actors who have access to the data unintentionally or intentionally may abuse it for tactical purposes or endanger people acting as information sources. This may cause real harm to project target groups or other stakeholders and actors involved in the project. Therefore, it is crucial that organizations manage and protect personal information and address their legal responsibilities in relation to the processing of personal data.

The protection of personal rights involves various measures in the areas of anonymization, pseudonymization, and minimization of data. In consideration of data minimization, anonymization and pseudonymization can be used from the beginning of the data processing, e.g., by using an anonymized questionnaire for data collection, or they are included as independent processing steps after data collection, which also need a legal basis and purpose.

The following issues are typically addressed in legislation:

- **Lawful data processing (e.g., collection, storage, and disclosure – see footnote no. 6):** How, by whom, and for what purpose(s) is personal data collected and processed? How is sensitive data handled?
- **Data transfer into third countries:** When is the transfer of personal data into third countries allowed?
- **Data security:** What measures does the organization have to take for data protection?
- **Data breach notification:** How, when, and to whom is a data breach reported?

Having control over personal data is seen as a **basic human right within the European Union and Germany**. Any information, which identifies an individual directly or indirectly in combination with other information, is personal data (or personally identifiable information). Personal data may be names, addresses, telephone numbers, and ID numbers but also photos, videos, voice recordings, and any mentioning of individuals in reports. The processing of such data is subject to the EU General Data Protection Regulation (**"GDPR"**) and, in Germany, by the Federal Data Protection Act (Bundesdatenschutzgesetz—**"BDSG"**) and further national legislation.

[7] Definition of data processing according to Art. 4 No. 2 of the GDPR: Processing includes collection, recording, organization, structuring, storage, adaptation or alteration, retrieval, consultation, use, disclosure by transmission, dissemination or otherwise making available, alignment or combination, restriction, erasure, or destruction.

Globally, in most jurisdictions, the protection of personal data is now regulated, sometimes in a manner closely related to the GDPR, but in many situations according to another national regime. Further, depending on the individual circumstances, the GDPR can additionally apply (> Privacy Check below).

KfW is subject to the GDPR and the BDSG and, as a government entity, is committed to the protection of basic human rights like privacy. Violations of the GDPR and the BDSG may cause severe penalties for KfW, any entity involved, and individual associates of KfW (e.g., consultants). Such violations may also give rise to claims for damages by individuals whose data rights have been violated. These are sufficient reasons to safeguard privacy rights carefully, especially when processing RMMV information, which may contain quite a lot of personal identifiable information about vulnerable people.

Independently of the question of whether legal provisions apply or not, it is recommended that FC projects observe minimum standards regarding data privacy. The following principles should be assured:

- ✓ **Notice**—persons should be given notice when their data is being processed, for instance before contacting an interview partner or conducting a focus group discussion
- ✓ **Purpose**—data should only be used for the predefined purpose stated and not for any other purposes
- ✓ **Disclosure**—persons should be informed as to who is collecting their data
- ✓ **Consent**—data should not be disclosed without the data subject's consent (if no specific legal obligation exists).
- ✓ **Security**—collected data should be kept secure from any potential abuses
- ✓ **Access**—data subjects should be allowed to have access to their data and be able to make corrections to any inaccurate data (so far, we have not found an example yet of this principle being implemented. One possibility would be to provide interviewees with a contact they can access to receive information about their data and request changes or deletion of their data).
- ✓ **Accountability**—persons should have a method available to them to hold data collectors accountable for not following the above principles (this is possible by enabling principle 6 (Access) and additionally by providing interviewees with the contact information for a complaints hotline or another complaints mechanism accessible to them).

The following steps should be taken up by the data-processing entity (in most cases the Implementation or Monitoring Consultant) and should be included in their ToR:

- ✓ Develop and document a process for data collection, in which the above-mentioned principles are applied (including sharing contacts that allow individuals to request correction and/or deletion of their data).
- ✓ Conduct a do-no-harm analysis and risk assessment of the approach chosen. Analysis of what data is collected is particularly sensitive. Recommend how this data should be treated, for example, no collection, anonymization, security measures, etc.
- ✓ Train national and international staff in data processing that respects privacy. Special attention should be paid to the collection or recording part of data processing: no pictures should be taken that include individually identifiable persons without their consent. Meetings should take place in public places.
- ✓ In fragile or conflict environments: Mobile apps and R/MIS or any other types of project-related databases containing personal data should integrate a delete button for emergencies. The button would allow local monitoring staff to wipe out all relevant information from their smartphone or database in the event they are checked or their hardware is obtained by any unauthorized third parties, for example.

KfW, when acting abroad, may also be subject to other national privacy laws. Individual associates of KfW—like employees and consultants—are subject to the privacy laws of project countries. If abroad, the GDPR and the BDSG may not apply if no transfer of or access to data to/from Germany occurs, but the relevant national laws must be observed. KfW expects its staff and all concerned parties to inform themselves about such regulations.

Box 4:
What is Data Processing?

Definition of data processing according to Art. 4 No. 2 of the GDPR: Processing includes collection, recording, organization, structuring, storage, adaptation or alteration, retrieval, consultation, use, disclosure by transmission, dissemination or otherwise making available, alignment or combination, restriction, erasure, or destruction.

To support the development of a better understanding of how to handle privacy for *Remote Monitoring* and *Remote Verification*, a ***Privacy Check*** has been developed that must be applied for each data processing step see > Figure 2.6:

1 Firstly, any data not being dealt with in this privacy check is subject to local law!
If partner countries have privacy laws, these need to be respected by the projects. Although most developing countries do not have data privacy laws, there are some exceptions, such as Madagascar. Whether a country has data privacy legislation can be checked on the website > https://www.dlapiperdataprotection.com/index.html.

2 The next guiding question is, who is responsible for managing the RMMV data source? Who is the controller of the data?

2.1 If KfW and its associates control data sources from Germany for their ***Remote Verification*** purpose, the GDPR, and the BDSG must be respected. Any direction from Germany is controlled by these two laws, at least. Data sources that include personal information must always be managed and protected in line with the principle of the GDPR, e.g., purpose, legal basis, data minimization, accuracy, and storage limitation.

2.1.1 Data minimization means that only the personal data that is really needed to fulfill the predefined purpose may be processed (e.g., no identifiable individuals should be visible in photos or videos without legal justification (see below); voice recordings, reports with individuals' names, phone numbers or addresses should not be recorded without legal justification (see below). If minimization of the collection is not possible, means of anonymization (like redaction or pixelation) must be applied if none of the reasons stated below under paragraph 3 apply.

2.1.2 Personal data processing must be based on a legal basis as explained in point 3 of this *Privacy Check*.

2.1.3 The personal data must be accurate. The processing of incorrect personal data, e.g., outdated personal information must be avoided.

2.1.4 All processed personal information may only be processed and stored for as long as it is needed for the predefined purpose and must be deleted as soon as possible (storage limitation).

2.1.5 Additionally, all personal information must be processed in a manner that ensures appropriate security of the personal data, including protection against unauthorized or unlawful processing and accidental loss, destruction, or damage, using appropriate technical or organizational measures.

2.2 If data sources are controlled from abroad by the PEA or a PEA-contracted consultant (based outside of the EU) for ***(Remote) Monitoring*** purposes, and without any primary influence from Germany or the EU (this also includes individual associates of KfW operating locally), the **local privacy requirements** must be observed. It may be that KfW has contractually agreed with local PEA, suppliers, and consultants to introduce privacy safeguards like issuing privacy notices and collecting consent declarations. Local active persons must ensure that these measures are applied as agreed. Any non-compliance should be reported immediately to the relevant PM at KfW.

Please note: Avoiding the controlling of tools or data sources from Germany, although KfW may be obliged to provide such directions, just to avoid the application of GDPR or BDSG is a violation of this law and may have the above-mentioned consequences.

2.2 As soon as the same data sources are accessed and processed by KfW HQ (for *Remote Verification* purposes), the GDPR and the BDSG must be observed. Please note that watching personal data purely on a screen may not be considered data processing if this data is not saved, for example, in the form of a screenshot.

2.3 If it is not possible to minimize or anonymize all personal data before data processing or to anonymize all personal data during each data processing step, the following guiding questions help determine if the personal data can be processed or not:

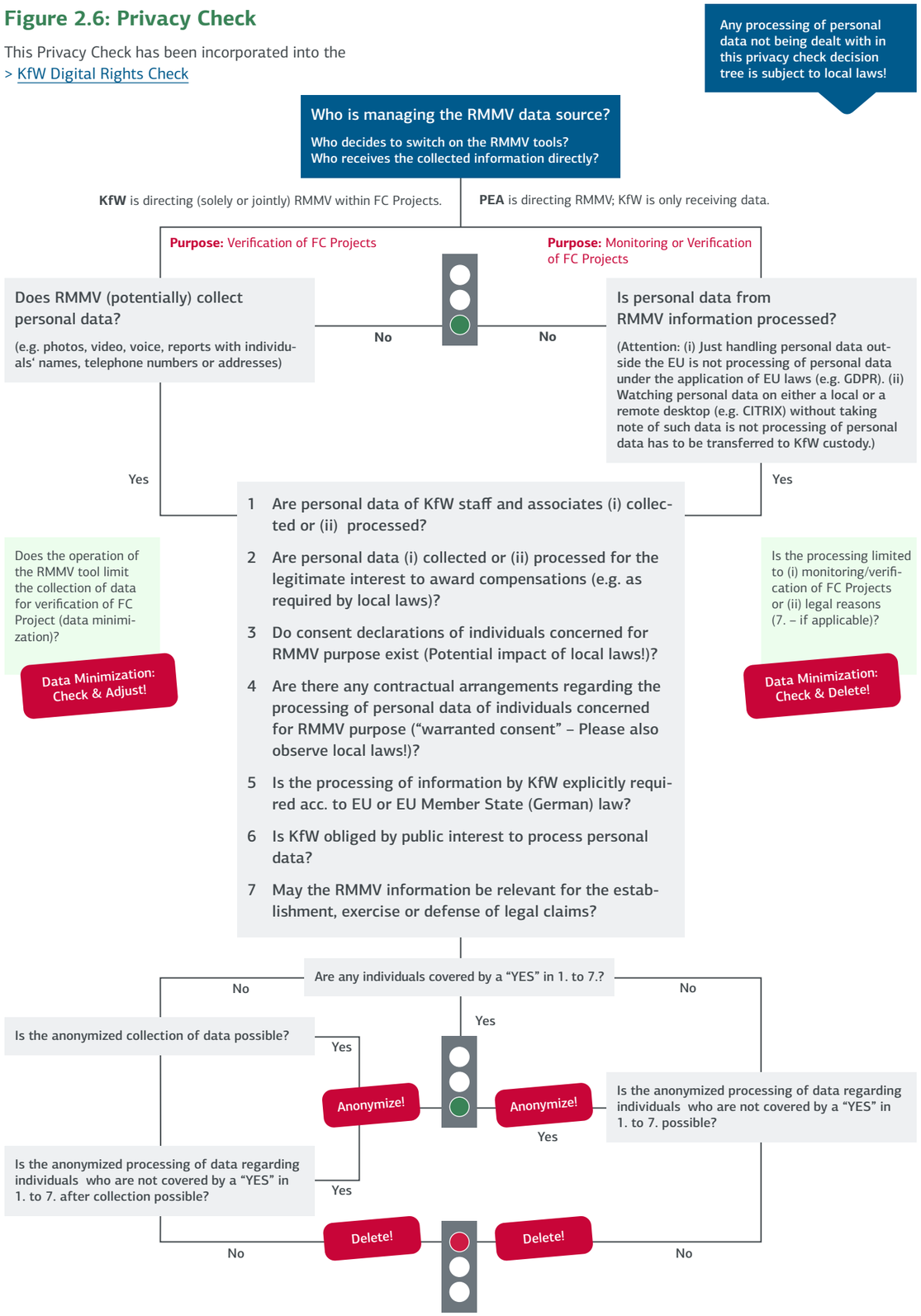
If any of the questions below can be answered with a Yes, the data can be processed (> Box 4 data processing definition) while taking the necessary data protection and IT security precautions. If none of the following questions can be answered with a Yes, the data must be anonymized or destroyed:

1. Is personal data of KfW staff and associates (i) collected or (ii) processed?
2. Is personal data processed for the legitimate interest to award compensation (e.g., as required by local laws)?
3. Do consent declarations of individuals concerned for RMMV purposes exist (potential impact of local laws!)?
4. Are there any contractual arrangements regarding the processing of personal data of individuals concerned for RMMV purposes ("warranted consent"—Please also observe local laws!)?
5. Is the processing of information by KfW explicitly required according to EU or EU Member State (German) law?
6. Is KfW obliged by public interest to process personal data?
7. May the RMMV information be relevant for the establishment, exercise, or defense of legal claims?

Please note that there must be a legal basis and a predefined purpose for each processing step: You must go through the Privacy Check decision tree again for each data processing step! For example, to be entitled to collect pictures involving individuals does not automatically mean that you are entitled to publish them, e.g., as part of an ESIA report. Collecting and publishing personal data are two distinct processing steps requiring their own respective legal basis.

Figure 2.6: Privacy Check

This Privacy Check has been incorporated into the
> KfW Digital Rights Check



A detailed evaluation process is defined above in the RMMV *Privacy Check*. If RMMV information must be deleted, please follow your organization's data erasure policy. Anonymization should be pursued in accordance with your organiation's anonymization policy. Storage and further processing shall be in line with the RMMV *Privacy Check* above. Personal data may only be processed and stored as permitted by your organiation's data retention policy (e.g., using the > ISO/IEC 27001Requirements for an Information Security Management System or similar policies).

If there are any unclear cases or questions, the KfW focal point for the project should be contacted. That person will consult with the KfW Data Protection Team, if necessary.

Iris scanning-based payment system for refugees in Jordan whose meta data are used for monitoring purposes.

Box 5: Illustrative Examples of Applying the *Privacy Check*

- **Example of *Remote Monitoring*:** KfW is partnering with the Namibian government in wildlife protection. To better monitor the progress of the project, they have agreed on the implementation of an MIS. The *Implementation Consultant* based in the same country accesses this MIS to extract data for monitoring purposes and sends an aggregated monitoring report without any personal data to KfW. Only the national privacy law applies since the PEA is directing the MIS which contains personal data, while KfW is only receiving aggregated data.
- **Example of *Remote Verification*:** As the project progresses, KfW staff conduct a > Remote Progress Review (Section 3.3.1.1) for this project. They request direct access to the MIS to verify the use of funds. If they only look at the MIS, do not make any screenshots that include personal data, and produce an aggregated report on the use of funds, no further action is necessary. If KfW staff need to process some personal data (e.g., pictures of the PEA staff from the MIS) for documentation to its client, these pictures must be pixelated according to the GDPR.

2.3.2 Information Security and Confidentiality in Financial Cooperation

Information security refers to protective measures that are applied to achieve the following primary goals and objectives

- **Confidentiality:** Objects are not disclosed to unauthorized subjects
- **Integrity:** Objects retain their veracity and are intentionally modified only by authorized subjects
- **Availability:** Data, objects, and resources are accessible uninterrupted and efficiently

These three principles are considered the most important within the realm of security. In practice, these security objectives come into play whenever we work with mobile data collection and management, communication, and collaboration devices, such as smartphones and tablets, sensors, computers, databases, and websites. Ensuring an adequate security level for the entire IT infrastructure requires a formalized security structure that consists of policies, standards, guidelines, and procedures. Information security measures must be taken for both critical business information and personal data. For the security of any IT service, a central challenge is to verify the identity of the respective users (authentication/identity verification and user rights management). This is necessary to prevent unauthorized access to data.

The most common problems regarding data security are the following:

- **Insufficient data protection:** The organization's capability is not adequate to thwart advanced persistent threats and hack attacks, or detect data breaches.
- **Employee negligence:** Employees tend to open attachments or click links embedded in spam, leave their systems unattended, infrequently change their passwords, and visit restricted sites.
- **Employee mobility:** Employees frequently store sensitive data locally on their laptops, smartphones, tablets, and other mobile devices. Since business data is stored or accessed by devices that are not fully controlled by IT administrators, the likelihood of data loss incidents caused by improperly secured personal devices will continue to rise.
- **Failure to routinely back up data:** Without an automated backup and recovery strategy in place, organizations have very few responses to any type of data loss.

2.3 Legal and Regulatory Conditions and Recommendations

The information security standard ISO 27001 cannot be enforced for FC projects, as it is a standard for organizations but might serve as a guideline. An organization obtains this standard through an audit that analyzes, among other things, access to rooms, the sensitization of all people within the organization, the handling of data, IT security, such as firewalls, etc. The most important aspect of ISO 27001, managing projects, however, may involve a multitude of stakeholders, usually including at least the PEA and an *Implementation Consultant*, which is risk management.

According to > Annex A of ISO 27001 (A.6.1.5. – Information Security in Project Management), the responsibility of the *Implementation Consultant* is to identify the information and resources which need to be protected. In the next step, the consultant should perform a risk analysis to identify the risks related to the entire IT infrastructure of the project. For this purpose, the following should be included in the ToR:

The consultant should respect and regularly check IT security rules, including:

- Clearly defining roles and responsibilities related to information security and developing/updating the information security objectives or policy. Developing/updating a **strategy for the security of the processed data and information** that includes:
  - the reduction of incidents
  - improving the confidentiality of privileged information by securing the assets against external threats.
  - security audits (please choose appropriate approaches): 3rd party professional hackers to discover security leaks and/or train administrators, always training the users, backups, disaster coverage, and aspects of data priwvacy. This applies both to technical and non-technical solutions.
- protective measures against unauthorized or unlawful processing and accidental loss, destruction, or damage using appropriate technical or organizational measures.
- Updating all software regularly to ensure that all security holes are closed.
- The PEA or consultant (whichever is responsible) shall ensure that all users are allocated a unique user ID and password, and that they are registered and de-registered in a timely manner.
- Encryption shall be mandated to store, transmit or transport all critical data, including user IDs and passwords, and institutions should employ protect their wireless networks through the most recent encryption standard, such as Wi-Fi Protected Access 2 (WPA2).
- Protection from viruses and malware: ensure that effective antivirus software is installed on all computers and mobile devices and that firewalls are active.
- Protecting workstations and laptops from access by third parties. This is to prevent theft of these devices and to prevent unauthorized use of the information stored on them. For mobile devices—for example, tablets or smartphones—physical and logical protection measures must be put in place. A startup password and an automatic time-controlled lock with a password should be used. Modern asset management also includes the registration of all devices used in the enterprise.
- Regular data backups ensure the prevention of data loss: To avoid data loss, it is recommended that data is saved externally by a highly reliable provider (e.g., in Germany). Additionally, regular and automated backups increase data integrity. The recording of data is normally outsourced to private server companies, which demand regular service fees. To secure the data, it is sometimes necessary to provide financing after the end of the project for ex-post evaluation purposes[8]. Since the PEA or operator may not fill financing gaps, it is especially important that the PEA or *Implementation Consultant* conducts regular data backups to make sure that the data does not get lost.[9]
- Providing training for all staff with access to sensitive data regarding IT and data security issues, make each concerned staff member accountable for data privacy and security, for example, by establishing a code of conduct.
- The proper implementation of the mentioned security rules on-premises is a complex and resource-intensive task, which requires specialized staff, infrastructure, and continuous monitoring. Adequate cloud providers have specialized in the secure storage of data following the security rules at a sophisticated level. If such services are under consideration, they should be thoroughly investigated to ensure that they are trustworthy and properly implement the data storage. Additional questions are about the location of the data storage as this has legal and security implications. Further, it is crucial to ensure that data is never lost in case of financial lapses.

[8] To be agreed within the Separate Agreement or one of its addenda
[9] ibid.

2.3.3 Human Rights Aspects

All RMMV approaches where target groups and other project stakeholders are requested to express their experiences, observations, and opinions may be affected by limited respect for human rights, particularly limited freedom of speech and opinion and limited freedom of the press. This may be particularly relevant for crowdsourcing or mobile data collection, where (however anonymized) observations, experiences, and/or opinions of individuals are frequently gathered and sometimes even made available publicly.

Limited freedom of speech or limited freedom of the press may render RMMV approaches for which target groups share observations and experiences inapplicable or may put individuals at risk. People may be hesitant to express negative experiences or dissatisfaction with projects or government programs in general since they may fear disadvantages or retaliation by the government. Furthermore, those people who express criticism may be exposed if they can be identified publicly or if their data is not properly secured and anonymized.

If the level of freedom of opinion is considered acceptable for the selected RMMV approach but shows considerable limitations, the project design should take these limitations into account. The government may, for instance, tolerate criticism at the local level, if it does not touch on politically sensitive issues, but people may still have some hesitations to provide their feedback. In these cases, project frameworks should stipulate relatively low target indicators for target groups by participation and allow for relatively generous timelines compared with projects that are implemented in a more favorable political-institutional environment. It is particularly important that the RMMV approach has officially been agreed upon between BMZ/KfW and the national government to allow for BMZ and KfW to officially address any potential social impact or human rights issues that may arise related to the implementation of the RMMV approach.

The current political situation in the project country regarding human rights, freedom of opinion, or freedom of the press must be examined during the *Feasibility Study* and be regularly monitored during project implementation (or within project reporting or do-no-harm monitoring) and initially foreseen RMMV approaches may be adapted as required.

There are also human rights risks related to tools that potentially allow the identification of individuals or groups of people who are especially vulnerable to human rights abuse (e.g., ethnic minorities): these are photos and videos, drone images, high-resolution satellite images, and detailed geospatial tool-based maps combined with other data allowing the identification of individuals or specific groups of people. Drones may additionally create fear (a chilling effect), especially in conflict areas or areas where drones are unknown. Some types of big data may also involve potential risks of monitoring user movements in conflict or of triangulating information using big data and/or other data sources to identify and target PAP, negatively affecting them > Section 2.5 Decision Matrix and > Tool Type Fact Sheets an > Digital Rights Check.

Independent data sources that help KfW staff or consultants to determine in a first assessment what the human rights situation is in a country or target area are:

- The “Freedom in the World” report, > https://freedomhouse.org/report/freedom-world and the “Freedom on the Net” report, > https://freedomhouse.org/report/freedom-net - both reports by Freedom House
- Reporters Without Borders’ “World Press Freedom Index”, > https://rsf.org/en/index
- Human rights reports by Amnesty International, > https://www.amnesty.org/en/countries/

The information from these sources should then be used to inform the design of the RMMV approach, in articular, the selection of institutional approaches, tools, and data sources presented in the RMMV *Decision Matrix*, > Section 2.5.

2.3.4 Rights of Use and Copyright

The KfW consulting contract (written from a German law perspective) should stipulate the following (or similar clauses if governed by other laws):

"To the extent not otherwise stated in the Special Conditions, the consultant shall transfer to the Employer" (i.e., usually the PEA) and KfW all rights to the services performed under this Consulting Contract on the date any such rights arise, and in any event at the latest on the date they are acquired by the consultant. Insofar as a transfer of such rights is not possible, the consultant shall irrevocably grant the Employer and KfW an unrestricted, transferrable, licensable, and exclusive right of use and exploitation that is unlimited with respect to time and place of use. Such transfer shall include the right to adapt any transferred rights. The consultant shall ensure that no third-party rights exist or will be exercised that would preclude the aforementioned transfer of rights or their exercise."

KfW and its partners need to ensure that all required rights of use for tools, software, and data sources to be used with regard to the project are covered by such an agreement.

In the case of software and data sources, this sentence needs to be amended, because both open-source and proprietary software, as well as most data sources' rights of use, are usually restricted by their respective license model; > Section 2.2.2 The Use of Open-Source vs. Proprietary Software and > Sections 2.2.3–2.2.7 The Use of Data Sources.

If you plan to publish data sources from the project, check national rights of use (copyright) regulations and make sure you have obtained a signed agreement on the use of the data (both by the person(s) whose information you might plan to share (e.g., pictures including people) as well as the author of the publication (e.g., photographer) in case this use is not covered in an existing consulting contract.

2.3.5 Country-Specific Regulations Regarding the Use of Certain Tool Types

When planning to deploy a specific tool or software or to publish a data source, always check for country-specific regulations on copyrights, rights of use (> Section 2.3.4), privacy (> Section 2.3.1 Privacy Check), and Information Security (> Section 2.3.2). Some project partners may have equally committed to the digital principles (> Section 1.4) providing a common ground for joint development or deployment of the agreed technical tool(s).

In particular, certain tool types are frequently subject to national regulatory restrictions: > Fact Sheet Drones/UAVs, > Fact Sheet Mobile Data Collection, > Fact Sheet Crowdsourcing respecting the anonymity of internet/smartphone app users, GPS tracking, use of high-resolution > Fact Sheet Satellite Imagery of certain areas, the permission for certain > Fact Sheet Collaboration Tools, as well as regulations on machine learning/AI relevant to > Fact Sheet Big Data generation and use. Some software applications are cloud-based; some countries/PEAs restrict the location of cloud servers or require physical backup servers.

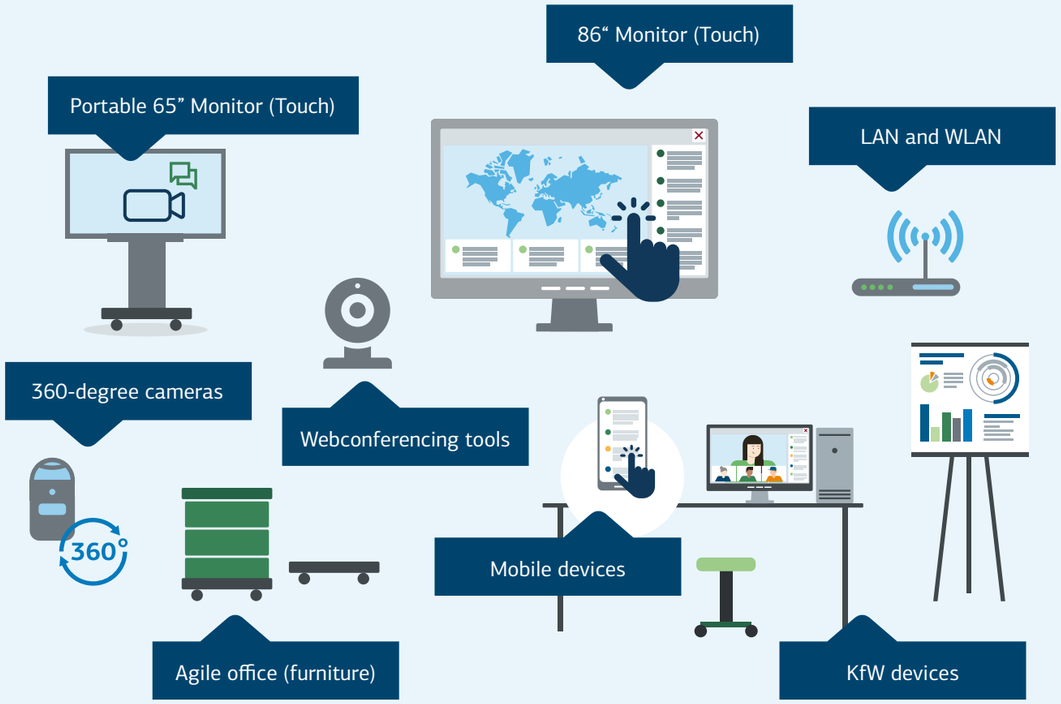
Also, potential restrictions, requirements, and delays regarding the **import of certain hardware and software** tools need to be considered. PEA must be aware, that import tariffs cannot be financed by the German FC.

2.4
Supporting IT infrastructure for Remote Verification

2.4.1 RMMV Rooms at KfW HQ

For collaborative work in the context of RMMV, KfW has installed so-called RMMV rooms at its headquarters in Frankfurt. From these special rooms, many tools like Skype, MS Teams, Zoom, Webex, etc. can be used, as well as software like Google Earth Pro and QGIS.

Figure 2.7: Standard RMMV Room Equipment



2.4 Supporting IT infrastructure for Remote Verification

Various operating systems are available in the RMMV rooms, which enables a very high level of interoperability. There are many use cases that can be covered in the RMMV rooms.

Examples of use cases:
- Virtual site surveys
- Evaluating satellite images
- Collaborative work via web and video conferences
- Conducting virtual workshops with the virtual whiteboard software Conceptboard

The rooms are equipped as follows:
- One fixed large touch screen (86 inches)
- One mobile touch screen (65 inches)
- A conference solution with a 360-degree camera
- Access to the KfW network and access to the public internet via WLAN
- Conference telephone
- Android and iOS Tablet
- KfW laptop with docking station
- Many adapters to connect the different devices

Booking: The booking is done via the Outlook calendar.

Access: Access can be requested or enabled through the department secretaries or RMMV department focal points. Access is via card or separate key.

2.4.2 IT Infrastructure at the Country Office Level

KfW's core business includes maintaining a large and ever-changing number of international country offices. KfW's IT department is currently managing approximately 2,300 operationally relevant IT infrastructure components at 75 FZ and IPEX locations. KfW IT's job is to provide a highly standardized, scalable, and appropriately available basic infrastructure for these country offices and to guarantee the running of the same. In so doing, it also allows KfW's country office staff to fulfill their increased responsibilities within the RMMV framework; > Section 2.1 Institutional Approaches.

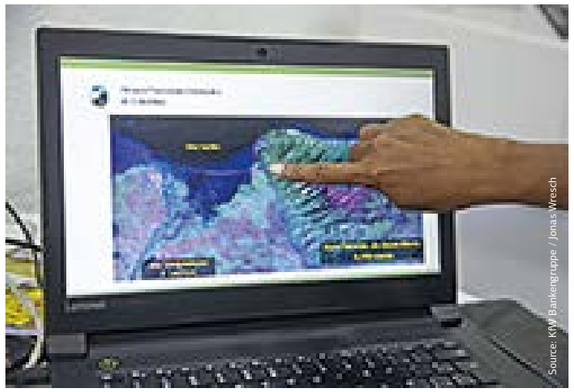
Most KfW country offices have a large local data storage facility called NAS (Network Attached Storage). Migration to cloud storage solution is planned for 2025.

For all country offices, however, there is the challenge of data transfer from the remote location to a) country office and/or b) directly to HQ in Frankfurt. This is done either via a secure intranet connection from the country office to the HQ or via the internet from the end device to a secure external data room (cloud) as intermediate storage space for later retrieval from the country office or the HQ.

The continuous strengthening of its IT equipment and IT capacity development allows KfW's country office staff, in particular, its national coordinators and technical experts, to access the same technical tools used by KfW HQ staff for their *Remote Verification* purposes via KfW's HQ-based RMMV rooms (> 2.4.1 RMMV Rooms at KfW HQ) and thus allows KfW's national country office staff to fulfill their increased responsibilities within the RMMV framework, especially in facilitating communication and collaboration between KfW's clients, partners and target groups with KfW HQ, in accessing or collecting relevant project information for KfW HQ, as well as preparing or conducting virtual or personal site visits on behalf of KfW HQ-based PMs and technical experts.

Because the vast number of the offices are in crisis regions and, additionally, country-specific legislation must be taken into consideration when handling IT, the responsibility for particular sub-areas of the overall IT infrastructure is left with the international offices or KfW country offices, while other sub-areas are handled centrally.

The following equipment essential for *Remote Verification* is currently being generally rolled out in KfW's country offices: Centrally serviced standard smart phones for all national project staff thus providing them access to the relevant KfW apps and collaboration tools (> Tool Type Fact Sheet Collaboration Tools), video conferencing and video documentation hardware and software including meeting owls (for conducting hybrid meetings) as well as hardware and software for conducting virtual site visits including 360˚cameras and virtual reality (VR) goggles and satellite communication devices; > Section 3.3.1.2 Conducting a Virtual Progress Review Mission.



National expert verifying the viability of potential target areas.

2.5 The RMMV Decision Matrix for Selecting the Appropriate Mix of RMMV Institutional Approaches, Tool Types, and Data Sources

Because of the multitude of different institutional approaches, tool types and data sources, a *Decision Matrix* has been developed to help KfW as well as PEA and consultant staff to jointly determine which mix of institutional RMMV approaches, technical tool types and data sources is particularly useful for the specific project. The *Decision Matrix* indicates which institutional approach, tool type and data source is suitable for which type of information that needs to be gathered and if there are potentially limiting human rights or legal conditions to be considered.

It is important to note that this matrix does not only facilitate the decision of KfW on the suitable mix of institutional approaches, tools, and data sources to select for the *Remote Verification* of the respective project, but also facilitates the joint decision of the PEA, different consultants, and other project stakeholders on the corresponding suitable mix of institutional approaches, tools and data sources for the *(Remote) Monitoring* of the respective project by the PEA and /or consultant.

To provide orientation on the usefulness of different institutional approaches, technical tool types, and data sources, information needs have been clustered into five general types that occur throughout the project cycle. These are information on:

1) Infrastructure quality and project progress including the use of funds
2) Target area(s)/target groups' identification
3) Target groups' needs and feedback
4) Project outcomes and impact (including usage)
5) Environmentally and socially adverse impacts and risks

They relate as following to the project cycle:

Table 2.3: Clustering of Information Needs within the Project Cycle

Type of Information Need	Government Negotiations	Project Preparation & Feasibility Study	Project Appraisal	Grant or Loan Agreement	Tender of Consulting Services	Project Implementation	Start of Operation	Final Review	Ex-Post Evaluation
Infrastructure quality & project progress incl. use of funds						✓	✓	✓	✓
Target area(s)/ target group(s) identification	✓	✓	✓						
Target groups' needs & feedback		✓	✓			✓	✓	✓	✓
Project outcomes & impact (incl. usage)						✓	✓	✓	✓
Environmentally and socially adverse impacts & risks		✓	✓			✓	✓	✓	✓

Applicability of certain institutional approaches or technical tool types and data sources per information need category

The matrix below shows how each institutional approach and tool type (incl. data source) supports information gathering for a respective information need category. If the approach or tool type is particularly useful for the respective information need, the box is marked green. If the approach or tool type is potentially useful, but there are limitations or risks (including potential violation of do-no-harm) regarding the ability of the approach or tool type to respond to the specific information need, the box is marked beige. In these cases, mitigation strategies are required.

If the institutional approach or tool type is considered potentially harmful in environments with human rights issues, particularly regarding freedom of expression, the box is marked red. If the approach or tool type is not relevant to the respective information need, the box remains white.

⊕	The approach/tool type is particularly useful
⊕⊖	The approach/tool type may be applied, but risks need to be taken into consideration
⊖	The approach/tool type is potentially harmful (human rights risks) if risks cannot be mitigated
	The approach/tool type is not relevant or useful

Context conditions that might limit the use of an approach or tool type (incl. data source):

In addition, the *Decision Matrix* specifies in its last two columns on the right-hand side, the conditions that may render using a specific approach or tool type difficult or impossible. For each approach or tool type, the two columns on the right show the two most important factors regarding context conditions that may limit or exclude the use of a specific institutional approach, tool type, or data source:

1) A fragile or conflict context implying a low level of governance, represented by "a low level of freedom of expression in a target country" is proposed as the most useful proxy indicator for a country or area, since there is an independent source in the international "Freedom House Index" > https://freedomhouse.org/report/freedom-world). Such a context may result in human rights risks that need to be considered when selecting the respective RMMV approaches, tool types, and data sources (e.g., the risk of crowdsourcing citizen feedback in an authoritarian environment); and

2) legal and/or regulatory restrictions on the respective RMMV approach or tool type within a given country or area (e.g., the use of drones is restricted in most countries).

If this means that caution (including mitigation measures) is required for a particular institutional approach, tool type, or data source, the box is marked beige. If the context condition is potentially harmful, the box is marked red. This means that the respective institutional approach or tool type is rarely recommendable with a low level of freedom of expression or if legal and/or regulatory restrictions exist.

▲	Limitations, but mitigation measures may be applied
↯	Severe limitations
	Not applicable/no obvious limitations

Information in the cells of the *Decision Matrix* includes i) the type of information that can be gathered ii) constraints that might be faced and iii) specific examples.

The information drawn from the *Decision Matrix* is by no means complete and has been shortened/summarized to not jeopardize the readability of the matrix. Conclusions drawn from it need to be checked for plausibility and reflected within the specific design of the RMMV institutional approach, tool, or data source, and its respective project context KfW can therefore not be held liable for any use or any conclusions drawn from this *Decision Matrix*, and specific advice should always be sought.

More information on the respective institutional approaches, technical tool types, and data sources can be found in > Sections 2.1 and > 2.2 as well as in the respective > Technical Tool Type and Data Sources Fact Sheets. Additional information on legal and human rights aspects can be found in > Section 2.3.

We also recommend you, the PEA and/or consultants to conduct the > KfW Digital Rights Check during the RMMV component design, implementation, progress and final review as well as ex-post evaluation to check for human rights risks related to the use of digital technologies.

Meeting of a water users committee in a Senegalese municipality.

2.5 The RMMV Decision Matrix

Table 2.4: RMMV Decision Matrix

Selection of suitable institutional RMMV Approaches for your Project

Type of Institutional RMMV Approach	Type of information need					Context conditions making use of approach difficult or impossible	
	Infrastructure quality & project progress incl. use of funds	Target area(s)/target group(s) identification	Target groups' needs & feedback	Project outcomes & impact(s) (incl. usage)	Environmentally & socially adverse impacts & risks	Low-level freedom of expression (e.g., according to Freedom House Index)	Challenging legal or regulatory conditions
A1 Increased Responsibility for National KfW Experts *(FC default Remote Verification approach)*	Always useful; Requires training ⊕	Always useful; Requires training ⊕	Always useful; Requires training ⊕	Always useful; Requires training ⊕	Always useful; Requires training, tools/checklists and briefing upfront site visit; for all projects backstopping needed from KfW E&S experts ⊕		
A2 PEA-led Monitoring: PEA Staff, in most cases supported by an Implementation Consultant *(FC default institutional monitoring setup)*	In the absence of international consultant staff, simple milestone-based monitoring by local PEA staff with little qualification ⊕	PEA can conduct ad-hoc surveys but may lack incentive to report. Teams need to be diverse, speaking local languages and require training to collect feedback inclusively ⊕⊖	PEA can conduct ad-hoc surveys and collect local data regularly but may lack incentive to report.Teams need to be diverse, speaking local languages and require training to collect feedback inclusively ⊕⊖	PEA can conduct ad-hoc surveys and collect local data regularly but may lack incentive to report. Teams need to be diverse, speaking local languages and require training to collect feedback inclusively ⊕⊖	Good for capacity development: PEA can collect data for internal monitoring but might need training and tools. Not applicable for external verification purposes (e.g., on resettlement implementation), but data provision and progress data from PEA possible). PEA staff may lack incentive to report ⊕⊖	PEA may have conflict of interest in publishing monitoring data △	
A3 Consultant-led Monitoring: Consultant with Increased Local Capacities *(Alternative institutional monito-ring setup to A2)*	In the absence of international consultant staff e.g., site supervision by regional/local engineer (risk of inadequate technical capacity) ⊕	Assign local consultant for e.g., context and needs analysis in project region/risk of inadequate assessment capacities/risk of bias. Teams need to be diverse, speaking local languages and require training to collect feedback inclusively ⊕	Assign local consultant for e.g., context and needs analysis in project region/risk of inadequate assessment capacities/risk of bias. Teams need to be diverse, speaking local languages and require training to collect feedback inclusively ⊕	Assign local consultant e.g., to collect additional data (EPE)/risk of risk of inadequate assessment capacities/risk of bias. Teams need to be diverse, speaking local languages and require training to collect feedback inclusively ⊕	Useful and often applied approach. Arrangements for solid backstopping services incl. Quality Assurance/Quality Control, capacity development, adaptedreporting/ monitoring with consultant team needed. PEA mgt. may have conflict of interest collaborating with local consultant staff ⊕⊖	PEA mgt. may have conflict of interest collaborating with local consultant staff △	

Table 2.4: RMMV Decision Matrix

Selection of suitable institutional RMMV Approaches for your Project

Type of Institutional RMMV Approach	Type of information need					Context conditions making use of approach difficult or impossible	
	Infrastructure quality & project progress incl. use of funds	Target area(s)/target group(s) identification	Target groups' needs & feedback	Project outcomes & impact(s) (incl. usage)	Environmentally & socially adverse impacts & risks	Low-level freedom of expression (e.g., according to Freedom House Index)	Challenging legal or regulatory conditions
A4 Third-Party Monitoring or Verification *(in addition to other institutional approaches)*	Main types: – Third-Party Monitoring visits project sites. – Technical audit as part of financial audit ⊕	Third-Party Monitoring visits project sites. TPM team needs to be diverse and speaking local languages to collect feedback inclusively ⊕	Third-Party Monitoring collects data locally. TPM team needs to be diverse and speaking local languages to collect feedback inclusively ⊕	PEA may have conflict of interest collaborating with TPM. TPM team needs to be diverse and speaking local languages to collect feedback inclusively ⊕⊖	PEA may have conflict of interest collaborating with TPM. TPM team needs to be diverse and speaking local languages to collect feedback inclusively ⊕⊖	PEA may have conflict of interest collaborating with TPM △	
A5 Involving Target Groups and PAP *(in addition to other institutional approaches)*	Main types: – Virtual Focus Group Discussions – PRA / CBPR / PAR – Traditional local decision-making and conflict solution bodies Citizen monitors (different ages and genders) – Community based monitoring (context dependent) ⊕	Main types: – Participatory community mapping – Participatory rural appraisal (PRA) / CBPR, PAR – fuzzy cognitive maps, social network analysis, topic modeling – Traditional local decision-making and conflict solution bodies – address disadvantaged groups separately ⊕	Main types: – Virtual Focus Group Discussions – Participatory community mapping – PRA /CBPR, PAR – fuzzy cognitive maps, social network analysis, topic modeling – Traditional local decision-making and conflict solution bodies – address disadvantaged groups separately – Citizen monitors (different ages and genders) – interactive radio shows ⊕	Main types: – Virtual Focus Group Discussions – Participatory community mapping – PRA/CBPR, PAR – Traditional local decision-making and conflict solution bodies – address disadvantaged groups separately – use participatory statistics – use micro narratives – Citizen monitors (diff. ages and genders) – Community based monitoring (context dependent) ⊕	Main types: – Virtual Focus Group Discussions – Participatory community mapping – PRA/CBPR, PAR – address disadvantaged groups separately – Citizen monitors (different ages and genders) – Community based monitoring (context dependent) – Risk of non-inclusion of vulnerable groups, esp. women and girls – Communication strategy needed for each group ⊕	Human rights risks Traditional local decision-making and conflict solution bodies: Risk that only the most powerful get heard Human rights risks for the citizen monitors △	Traditional local decision-making and conflict solution bodies: Potential conflict trad. and formal law, exclusion of groups disadvantaged by trad. law (e.g., women and girls) △
A6 Engaging Other Partners: other government agencies, other donors, research institutes, civil society, media, private sector *(In addition to other institutional approaches)*	Main types: – peer monitoring, if not too complicated to organize – monitoring by reliable local government institutions, if they exist ⊕⊖	– Peer monitoring/planning ⊕	– Peer monitoring – monitoring by reliable local government institutions, if no risk of bias/ distortion/ lack of capacities ⊕	– Peer monitoring – monitoring by reliable local government institutions, if no risk of bias/distortion/ lack of capacities ⊕	– Peer monitoring if not too complicated to organize – monitoring by reliable local government institutions if no risk of bias/distortion/lack of capacities – In case of potential conflicts of interests: NGOs and CBOs to be included in monitoring – Analysis of incentives and agendas needed ⊕		

Selection of suitable Technical Tool Types and Data Sources for your project

Note: All Tool Types can be used for *Remote Monitoring* and *Remote Verification,* some Tool Types can also be used for *Remote Management*

Technical Tool Type/ Data Source	Type of information need				Context conditions making use of tool type difficult or impossible	
	Infrastructure quality & project progress incl. use of funds	Target area(s)/ target groups identification	Target group needs and feedback	Project outcomes and impact (incl. usage)	Environmental and social adverse impacts and risks	Low-level freedom of expression (e.g., according to Freedom House Index)	Challenging legal or regulatory conditions
(Remote) Management Information Systems (R/MIS)	Useful for complex projects and many sites	Usually target areas and group types are already defined before tool is set up	Risk of biased data collection: monitoring agents require training to collect feedback inclusively	Ideally, the R/MIS workflow connects project activity data to outcome/impact data	Ideally, the R/MIS workflow connects project activity data to E&S risks & impact data	Check for human rights risks Data protection: Wherever possible, the collection of personal data should be avoided. Data security must be warranted > Digital Rights Check	Data security and privacy laws: – Data protection: Wherever possible, the collection of personal data should be avoided. – Data security must be warranted
Maintenance Management Systems (MMS)	Useful, if already installed before the end of construction/ implementation.	Not useful	Useful, if it includes a user–feedback application (e.g., to report broken installation)	Ideally, the MMS workflow aggregates maintenance data to related outcome/impact data	Not useful	Data protection: Wherever possible, the collection of personal data should be avoided. Data security must be warranted > Digital Rights Check	Data security and privacy laws: – Data protection: Wherever possible, the collection of personal data should be avoided. – Data security must be warranted
Mobile Data Collection (MDC) Tools (often part of R/MIS and MMS)	Especially useful for many sites	Risk of biased data collection: monitoring agents need to be diverse, speaking local languages and require training to collect feedback inclusively	Useful, but risk of biased data collection: monitoring agents need to be diverse, speaking local languages and require training to collect feedback inclusively	Often during final inspection/ex–post evaluation, but risk of biased data collection: monitoring agents need to be diverse, speaking local languages and require training to collect feedback inclusively	GSM-based surveys of certain stakeholder groups are a very useful tool and widely used in the private sector (e.g., worker surveys on working conditions etc.) Risk of biased data collection: monitoring agents need to be diverse, speaking local languages and require training to collect feedback inclusively. Data protection may be an issue	Check for human rights risks Data protection: Wherever possible, the collection of personal data should be avoided Security of the collected data must be warranted > Digital Rights Check	Local legal requirements can restrict collecting project–related data with mobile data collection tools, e.g., photographing certain types of infrastructure Data security and privacy laws: – Data protection: Wherever possible, the collection of personal data should be avoided. – Security of the collected data must be warranted
Crowdsourcing Tools (e.g., citizen feedback, complaints mechanisms)	Useful, if many project implementing partners/staff or if target groups/users can provide useful feedback/ideas.	Potentially useful for brainstorming, but high risk of bias towards tool users (digital divide)	Potentially useful for expression of needs/feedback, but risk of bias towards tool users (language, (digital) literacy, access)	Potentially useful for expression of level of satisfaction, but risk of bias towards tool users (language, (digital) literacy, access)	Potentially useful for complaints mechanism, but risk of bias towards tool users (language, (digital) literacy, access)	Human rights risks: – Local requirements can restrict collecting project-data with crowdsourcing tool – Data protection: Wherever possible, the collection of personal data should be avoided (e.g., through anonymization) – Security of the collected data must be warranted > Digital Rights Check	Data security and privacy laws: – Data protection: Wherever possible, the collection of personal data should be avoided. – Security of the collected data must be warranted. – In case social media are being used, the future deletion of the content incl. any personal data, must be ensured > Digital Rights Check

Selection of suitable Technical Tool Types and Data Sources for your project

Note: All Tool Types can be used for *Remote Monitoring* and *Remote Verification,* some Tool Types can also be used for *Remote Management*

Technical Tool Type/ Data Source	Type of information need			Context conditions making use of tool type difficult or impossible			
	Infrastructure quality & project progress incl. use of funds	**Target area(s)/ target groups identification**	**Target group needs and feedback**	**Project outcomes and impact (incl. usage)**	**Environmental and social adverse impacts and risks**	**Low-level freedom of expression (e.g., according to Freedom House Index)**	**Challenging legal or regulatory conditions**
Cameras	For in-door work, on-site inspections with very high detail information. Monitoring agents require training to take useful photos ⊕	Not useful	Not useful	Comparison ex ante and ex post situation, pure retrospective analyses difficult. Monitoring agents require training to take useful photos ⊕⊖	Useful for site visits; interviews with project-affected persons (PAP) (e.g., cell phone livestream) For details, better than UAV/ drones and useful for ground truthing. Difference btw livestream or camera surveillance (e.g., on construction areas) needed. Potential security risks for camera operators in volatile settings; privacy and prevalent cultural norms in project setting may inhibit use of cameras for certain monitoring aspects (e. g. in a community setting) Only small area covered, risk of biased data collection: monitoring agents require training to take useful photos ⊕	Camera surveillance can be an invasion of personal privacy (as for UAV/drones/ airborne. Avoid taking photos or videos depicting individuals also if captured automatically. Images/videos could be used against individuals or group(s) of people who are especially vulnerable to human rights abuse (e.g., ethnic minorities) > Digital Rights Check △	Camera surveillance (by PEA) might be restricted. Potential access constraints to sites (such as critical infrastructure) △
Drones/UAV (Airborne Observation)	Possible, but usually not cost-effective (Exception: very high detail resolution 10-30 cm required)	Comparing planned sites with drone data for extended areas/ low population density, if satellite data is not sufficient airborne photography for areas > 100 sqm, but few providers; rel. expensive ⊕	Not useful	Comparison ex-ante and ex-post outcomes/impacts for extended areas /low population density, if satellite data is not sufficient; for very large areas (>100 sq km) airborne photography is more cost-efficient; pure retrospective analyses difficult ⊕	Useful for (virtual) site visits and real-time evaluation Useful as support for various baseline studies Beneficiaries and PAP might need to be informed about drone use. Useful for measuring, e.g., size of resettlement sites (orthophotos); must be close to the object or area (viewing distance), very large areas (>100 sq km) can be lengthy and expensive, and no retrospective analyses possible ⊕	Human rights risks: Drone images could be used against Images/ videos could be used against individuals or groups of people who are especially vulnerable to human rights abuse (e.g., ethnic minorities) Drones may create fear (chilling effect), especially in conflict areas or areas where drones are unknown > Digital Rights Check ↯	National UAV/drone regulations may not allow or severely restrict the use of UAV/drones, check third-party insurance, emission, and import regulations; there may be UAV/drone restrictions in certain areas, such as critical infrastructure. Check how the inadvertent collection of personal data by UAV/drones can be avoided or minimized △
Earth Observation via Satellites	Possible, but usually not cost-effective, because mostly, commercial data is required (recent data, very high resolution (30cm–1m), etc.)	Comparing planned sites with satellite and Geographic Information System (GIS) data ⊕	Not useful	Comparing baseline and impact satellite data is almost always useful: public high-resolution data (1m–30m) mostly cost-free, very large areas, retrospective and repetitive analysis possible ⊕	Useful especially in combination with GIS. Various application possibilities, e.g., for assessing right of way, resettlement census, the progress of establishment of resettlement sites (PAPs), land use and land-use changes, biodiversity offsets (e.g., afforestation as a compensation measure), etc. Frequencies of flyovers may limit real-time follow-ups. Problems for optical systems in areas with heavy cloud cover (equatorial) ⊕	Human rights risks: High-resolution satellite images could be used against individuals or groups of people who are especially vulnerable to human rights abuse (e.g., ethnic minorities) > Digital Rights Check ↯	High-resolution satellite images (finer than 0.31 m can make a person visually exposed, resulting in an invasion of personal privacy. Check how the inadvertent collection of personal data can be avoided, for instance by choosing a lower resolution of the images or blurring individuals visible in the images. Data protection and privacy impact assessments are recommended △

Selection of suitable Technical Tool Types and Data Sources for your project

Note: All Tool Types can be used for *Remote Monitoring* and *Remote Verification,* some Tool Types can also be used for *Remote Management*

Technical Tool Type/ Data Source	Type of information need					Context conditions making use of tool type difficult or impossible	
	Infrastructure quality & project progress incl. use of funds	Target area(s)/ target groups identification	Target group needs and feedback	Project outcomes and impact (incl. usage)	Environmental and social adverse impacts and risks	Low-level freedom of expression (e.g., according to Freedom House Index)	Challenging legal or regulatory conditions
Geospatial Tools/Geographic Information Systems (GIS)	Comparing the status of many project sites on a map ⊕	Comparing planned sites with external geographical data ⊕	Not useful for planning, but potentially useful for visualization of impacts	Comparing outcomes/impacts of many project sites on a map ⊕	Comparing E&S impacts & risks of (many) project sites on a map, many applications e.g., deforestation, population influx, resettlement, environmental degradation, etc. Visualization of impacts ⊕	Human rights risks: detailed maps could be used against individuals or groups of people who are especially vulnerable to human rights abuse (e.g., ethnic minorities). Security of exact geographic data needs to be contractually ensured by all other external providers and users > Digital Rights Check ⚡	Avoid the (inadvertent) collection of personal data. Ensure security of the GIS data. Use open-source GIS if possible. Secure intellectual property rights for using the GIS information ▲
Sensors/Smart meters (Internet-of-Things)	Useful, if installed before the end of the implementation ⊕	Not useful	Not useful	Useful for measuring usage/ operation/generation/production etc. ⊕	Useful for various measurements/ monitoring, e.g., flow data of river. Useful in low-bandwidth countries and sites that are not easily accessible. Level, flow, or pressure sensors can be useful, or photo/ audio traps for wildlife assessments and monitoring impacts and risks related to usage/operation/ generation/production, etc. ⊕	Human rights risks: if sensor/ Internet-of-Things-generated data can be linked to individual persons, this could create human rights risks > Digital Rights Check	Privacy laws are only applicable if personal data (such as names of individuals) are attributed to the data Human rights risks: if sensor/ Internet-of-Things-generated data can be linked to individual persons, this could create human rights risks > Digital Rights Check ▲
Building Information Modeling (BIM)	For technically complex projects with many implementing partners ⊕	Not useful	Not useful	Not useful	Not useful	N/A	N/A
Collaboration Tools (e.g., video conferencing, digital whiteboards, TruBudget)	Project team collaboration ⊕	Not useful	Virtual focus group discussions Risk of exclusion/further marginalization of groups without access ⊕	Virtual focus group discussions Risk of exclusion/further marginalization of groups without access ⊕	Project team collaboration Virtual focus group discussions Technically challenging in some regions Risk of exclusion/further marginalization of groups without access Good add-on for traditional methods ⊕	Potentially reduced credibility if participants do not dare to speak openly; potentially prohibited by national regulations or informal rules > Digital Rights Check ▲	Check if the use of the planned tool type is restricted in the target area/country. Check ownership of the data shared via the tool and the terms of their use. The tool must have adequate security to protect personal data ▲
eLearning Tools	Useful, if implementing staff/ contractors need training ⊕	Not useful	Useful, if target groups need training to provide feedback ⊕	Useful, if the monitoring and evaluation (M&E) team/staff need training for assessments ⊕	Useful for various E&S capacity development activities, e.g., training for financial institution (FI) staff, PEA staff, or as a blended learning approach for sub-consultants trained by international consultants ⊕	Please add here: "If eLearning-generated data can be linked to individual persons without the necessary safeguards, this could create human rights risks > Digital Rights Check	Data security and privacy laws: – The personal data of the students must only be collected and processed to the extent necessary for the training purpose. – Security of the collected data must be warranted ▲

2.5 The RMMV Decision Matrix

Selection of suitable Technical Tool Types and Data Sources for your project

Note: All Tool Types can be used for *Remote Monitoring* and *Remote Verification,* some Tool Types can also be used for *Remote Management*

Technical Tool Type/ Data Source	Type of information need				Context conditions making use of tool type difficult or impossible	
	Infrastructure quality & project progress incl. use of funds	Target area(s)/ target groups identification	Target group needs and feedback	Project outcomes and impact (incl. usage)	Environmental and social adverse impacts and risks	Low-level freedom of expression (e.g., according to Freedom House Index)	Challenging legal or regulatory conditions
Data Sources: Open Data and Public Media	Not useful	Always useful for project planning	Secondary data might support needs analysis	Comparing baseline and impact project data with external data sources is always useful.	Comparing baseline E&S risk & impact project data with external data sources is always useful if relevant and reliable sources exist. Media monitoring: Assessment of project-relevant news to support E&S due diligence and risk reporting, as well as project management and monitoring/reporting, e.g., Google Alerts with specific keywords (incidents, protests, drought, flooding, etc.); Newspaper, TV, radio channels; specialized search engines like Prewave or Bankwatch	N/A	N/A
Data Sources: Big Data, Artificial Intelligence (e.g., cell–phone user movements, use of AI for analyzing social media data)	Not useful	Potentially useful for humanitarian planning, but potential bias toward cell-phone users	Not useful	Potential bias toward cell-phone users	Potentially useful, e.g., regarding reputational risks one can set up lists with names of organizations to be monitored. This can be quite helpful for financial institutions (FI), media monitoring (participation in dodgy deals), and possibly for larger direct investment in conflict settings. Potential data protection issues	Human rights risks: Potential risks of monitoring user movements in conflict or of triangulating information using big data and/ or other data sources to identify and target PAP negatively affecting them If big data-generated data can be traced back to individual persons or AI creates bias against marginalized groups, this could create human rights risks > Digital Rights Check	Data security and privacy laws: – Wherever possible, the collection of personal data should be avoided. – Security of the collected data must be warranted If big data-generated data can be traced back to individual persons or AI creates bias against marginalized groups, this could create human rights risks > Digital Rights Check

Source: KfW Bankengruppe / photothek.net

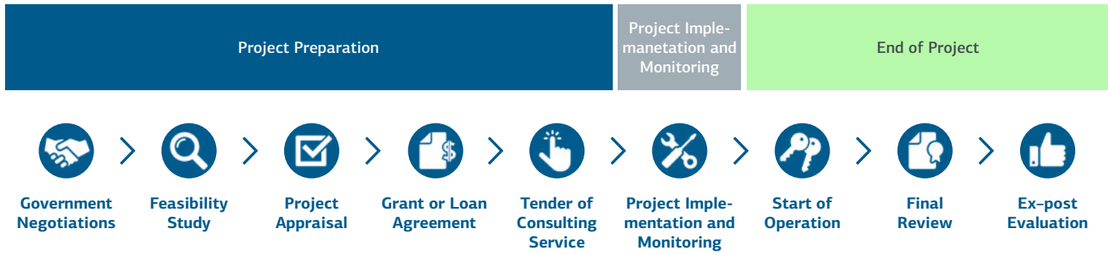
RMMV within the Financial Cooperation Project Cycle

3

This Section offers concrete practical advice to all *Financial Cooperation* (FC) project stakeholders for managing a FC project remotely. It describes the relevance of RMMV for each step along the FC project cycle and provides tangible recommendations on what needs to be considered during each step, as well as checklists, templates, and examples. KfW must adapt its own approaches and tool types to be able to conduct its crucial verification tasks (project appraisal; progress reviews, including verification of the use of funds; final reviews; and ex-post evaluation) despite limited access to project sites and target groups. It is important to note, however, that the recommendations of this *Guidebook* do not replace or change any official KfW procedures during the FC project cycle, but rather provide assistance to KfW and its implementing partners in how to execute these procedures in a remote modality.

Although this *Guidebook* refers to KfW's mode of operation, the principles can, of course, be transferred to the business models of other development stakeholders.

Figure 3.1: Most Relevant Steps for RMMV in the Financial Cooperation Project Cycle



3.1 Project Preparation

For KfW to fulfill its obligations stemming from the general contract with BMZ and the > General Guidelines for the German Technical and Financial Development Cooperation (only available in German) along the FC project cycle, the mix of RMMV approaches, technical tool types and data sources must be developed as early as possible in the project cycle, agreed with the implementing partners, and designed to suit the project stakeholders' needs. This Section outlines the key steps in project preparation and outlines central considerations around the integration of RMMV at this stage: This covers both the use of RMMV during project preparation in a situation with limited access to project sites and the design of the RMMV approach for project implementation that needs to be developed and agreed on during the project preparation phase.

3.1.1 Government Negotiations

The FC implemented by KfW is based on the country strategy of the Federal Ministry for Economic Cooperation and Development (BMZ) and the development strategies of the partner country. The projects and programs supported are proposed at bilateral government negotiations, and the German government decides up to what level funding is to be committed. An intergovernmental agreement is concluded on the sector and type of projects that are going to be supported. This first step in the project cycle is important for RMMV for the following reasons:

1) Government negotiations present an opportunity to **define the (sub-)sectoral focus** of the future financial engagement, > Section 3.1.1.1 below

2) They require preparatory work by KfW and the potential project partners in pre-assessing the feasibility of proposed project ideas within the defined (sub-)sector, so that non-feasible ideas can be dropped in time, > Section 3.1.1.2 further below.

3) They present an opportunity to anchor the **prerequisites for the mix of RMMV approaches** for the proposed project idea early on, including particularly:

- agreeing on **granting KfW access** to the relevant project **data sources** (e.g., to the project-related part of the PEA's management information system), > Section 2.2.3 Data Sources and > Fact Sheet (Remote) Management Information Systems
- **protecting the interests of target groups** and other stakeholders involved in RMMV where their data privacy and security or any other human rights aspects might be affected (e.g., by agreeing on a citizen feedback crowdsourcing mechanism as part of the project design), > Sections 2.3.1 on Data Protection & Privacy, > 2.3.2 on Information Security & Confidentiality and > 2.3.3 Human Rights Aspects
- **enabling the use of intended RMMV technical tool types** (e.g., UAVs/drones) via exemptions from respective laws or regulations, as necessary, > Sections 2.3.4 Rights of Use and Copyright and > 2.3.5. Country-specific Regulations.

3.1.1.1 Choice of Sector, Region, and Financing Instrument

Before and in parallel with government negotiations, KfW is requested by its German government clients to gain an overview of the (sub-)sector under discussion and to identify potential interventions based on the proposals submitted by the partner government. At this stage, KfW starts reviewing whether the proposed projects are developmentally sound and realizable. The choice of (sub-)sector depends on both countries' development strategies and policies, the core areas of intervention agreed upon between the German government and the respective partner country government, the needs and capacities of the prospective target groups, the capacity of the potential PEA and the evaluation of potential issues and risks.

With regards to RMMV, there are some sectors and financing instruments that are less affected by challenges and risks resulting from reduced site access because these largely rely on partners systems and do not require any physical checks on project progress and use of funds, such as program-based approaches like policy-based lending or basket funds in the governance sector or financial sector support projects or (co-)financing of UN programs (they do however require other pre-conditions to be met). Most bilateral infrastructure or environment projects do require physical checks of at least a sample of (prospective) sites. The more complex a project is, the more challenging its remote implementation becomes. This needs to be considered when agreeing on the (sub-)sector and financing instrument > Section 3.1.1.2 below. Flexibility in choosing target regions for the intervention is especially important in fragile and conflict-affected environments, so that in case a proposed target region becomes inaccessible, another region can be selected instead. If the target region has been defined during government negotiations without alternatives or flexibility, adaptation strategies become difficult.

3.1.1.2 Pre-assessing the Feasibility of Proposed Project Ideas

Before the government negotiations take place, the project partners need to make sure that the sectoral and regional focus of an FC engagement and possible project ideas can realistically be implemented, if necessary through a mix of institutional RMMV approaches, technical tool types and data sources. While institutional RMMV approaches, technical tool types and data sources can go a long way in enabling KfW to finance projects in areas inaccessible to international staff, KfW may have to recommend its clients and partners to drop a project idea entirely from the list of projects before or during government negotiation in the following cases:

- Complex project ideas that require constant international staff presence or that have obvious high environmental and social risks, such as dam construction
- Projects for which sufficient environmental and social data to inform decision-making cannot be collected in a timely and/or reliable manner
- Project areas that are completely inaccessible most of the time to local project staff
- Project regions or areas where electronic data collection devices cannot be used
- Projects that require the direct involvement of target groups in RMMV that are being implemented in countries that have a significant lack of freedom of expression, because the social risk would be too high that an individual becomes negatively affected by his/her participation or feedback, which could, in addition, create unacceptably high reputational risks for KfW, > Sections 2.3.3 Human Rights Aspects, > 2.5 RMMV Decision Matrix and > 3.1.1.3 Environmental and Social Risks Categorization.

If one of the chosen RMMV approaches requires significant investment or requires the partner government to collect, share, publish or improve data or its own data systems (see also Case A mentioned in the > Fact Sheet (Remote) Management Information Systems), it is advisable to refer to the respective RMMV clauses to be agreed during project appraisal (> Section 3.1.3 Conducting Project Appraisals Remotely) and for this to be stated in the project's *Grant or Loan* or *Separate Agreement* (> Section 3.1.4 Contractual Considerations) and/or in the respective consultant contract (> Section 3.1.5 RMMV Aspects in the ToR, Tendering and Contracting of Consulting Services) upfront in government negotiations, as this may affect the overall feasibility of the project idea. Partner governments may be hesitant to share their own data, publish critical information, or update their systems for various reasons. They may be concerned about criticism appearing online or may not prefer information of religious or ethnic composition to become publicly available. However, government willingness is crucial for some RMMV approaches, such as crowdsourcing tools that require an online platform where people can provide feedback or government-owned (Remote) Management Information Systems or Maintenance Management Systems where KfW requires access to partner country systems. If this is the case, a mix of institutional RMMV approaches, technical tool types and data sources should be discussed during government negotiations and recorded in the minutes of meeting to secure government buy-in early on. Mentioning planned institutional RMMV approaches, tool types and data sources during government negotiations demonstrates the transparency of the FC partners' objectives and outlines the government's responsibility for their appropriate uses. This creates mutual trust and allows BMZ and other KfW clients to officially address any upcoming RMMV issues in the future. This was for instance successfully done in the > Decentralization Support Program in Togo (PN: 30205), where a mobile crowdsourcing-based citizen feedback-loop system was introduced and already mentioned during government negotiations.

What to write in the Summary Records of the Government Negotiations

If relevant, briefly mention the proposed mix of institutional RMMV approaches, tool types and data sources in the summary records and refer to the RMMV *Guidebook* published on KfW's website for further information. For example, "Creation of a monitoring system by citizens in selected towns for the citizens to be able to participate in infrastructure planning and to monitor construction progress in their town."

3.1.1.3 RMMV Approaches for E&S Risk Categorization at the Stage of Project Idea

In preparation for the government negotiations, every new project must be categorized by KfW into an environmental and social risk category (A, B, B+, C) at the stage of the project idea before submitting the project concept note to the BMZ or another KfW client. Therefore, the KfW-HQ-based PM, decentralized Environmental & Social (E&S) expert and the respective technical expert fill out the project categorization table and assign a category which is verified by the Competence Centre for Environmental and Social Sustainability (KCUS). For the E&S category verification, the KCUS is regularly applying RMMV approaches for all projects, including those that could be developed and managed with physical presence. The reason for using RMMV approaches is that this verification is an initial screening of potential E&S risks and impacts where KfW wants to get a quick indication of potential risks.

For this task, satellite images are used to see the potential project site(s), screen as to whether natural or critical habitats may be affected and identify deforestation. Databases and data analysis tools like > IBAT (Integrated Biodiversity Assessment Tool) or > protectedplanet.net are frequently used to identify protected areas and migration pathways, for example. Similarly, satellite pictures can reveal whether physical resettlement or economic displacement will be necessary by identifying houses, agricultural fields, grazing grounds, and other relevant structures. This enables gauging losses early on in the project in order to estimate the costs and resources needed for the resettlement and livelihood restoration process.

Currently, > Google Earth Pro images are used as well as > OpenStreetMap, > Bing maps, and similar. Google Earth has a useful functionality: in the history you can see images taken in the past, which often yields a good indication of movements of people into the project region over time and changes in land use over time and by season. However, Google Earth images are not updated very frequently for several regions of the world, which means that current images may not be available, especially in remote areas. Urban areas are updated more frequently. In addition, the resolution of Google Earth images varies for several regions, with rural areas often having lower resolution. Due to the limitations of Google Earth, the use of publicly available data (e.g, from the Copernicus program) and/or commercial data (e.g., Planet Labs, Maxar, or Nearmap), where custom tasked imagery or regular revisit imagery can be purchased, is also recommended. Some companies provide data on a daily or sub-daily basis, which makes it very suitable for E&S assessment, > Fact Sheet Earth Observation via Satellites and > Fact Sheet Data Sources.

The application of satellite data can be also used for the early estimation of losses and those data can be also used for avoiding opportunistic behavior, such as people moving into the project area before the cut-off date.

Besides geographic information, there are several other information sources (> Section 2.2.3 The Use of Data Sources) for screening environmental and social risks, such as for screening indigenous peoples (IP) in Latin America. For such screenings, you can use > http://peoplesoftheworld.org/bycountry or LandMark (> https://landmarkmap.org) and > https://www.iwgia.org/en/. The two latter sites also offer maps and reports.

Google searches can also assist with getting contextual information, for example, on the application of International Labour Organization (ILO) core labor standards or searching for similar projects in the region as well as on pre-assessing human rights risks, > Section 2.3.3 Human Rights Aspects. KfW is currently developing an Open Data Platform to facilitate easy access to the main relevant open–data sources in the context of international development cooperation. This platform will include data sources needed for assessing environmental and social risks and impacts.

3.1.2 Feasibility Study

Following the government negotiations, KfW examines whether the proposed projects are adequate to address the development needs of the respective country and are feasible. Specialized consulting firms work with partner governments to prepare a *Feasibility Study* to address all the important questions about the project—economic viability, developmental impact and possible risks. Social, cultural, and ecological aspects are taken into account.

RMMV needs to be considered in the *Feasibility Study* in two ways:

1. Consultants conducting a *Feasibility Study* can be encouraged or obliged to use institutional approaches, technical tool types and data sources themselves for their assessments, especially if they cannot access the (entire) project region or all prospective project locations, and/or if they have to work remotely themselves. Consultants should be obliged to systematically use existing (open) data sources in all cases.

2. During the *Feasibility Study*, the project design and thus the mix of institutional RMMV approaches, tool types and data sources to be applied is typically developed.

3.1.2.1 Application of RMMV Approaches in Conducting the Feasibility Study

International feasibility consultants are to use RMMV approaches themselves, especially, but not exclusively when they are unable to visit the project region and target group(s). Feasibility consultants need to analyze the context and needs and the target group(s), consult with stakeholders, and collect baseline data. The consultant is to propose the best institutional RMMV approaches, tool types and data sources to carry out the *Feasibility Study*. A few examples are outlined below:

- **Use relevant RMMV (open) data sources** including satellite data (> Fact Sheet Earth Observation via Satellites) as part of the desk study/mission preparation. This is especially useful to determine the baseline indicators, control groups and relevant context factors and risks.
- **Assign national/local consultants** (ideally male and female speaking local languages) **for context and needs analysis in project region:** the feasibility consultant subcontracts local experts to assess needs, speak to stakeholders and target groups and visit potential project sites > Institutional RMMV Approach A2.
- **Assign local consultants to collect target groups' opinions through participatory methods:** local consultants can use participatory methods (e.g., village mapping or other methods of rural participatory appraisals) to gather feedback from target groups in order to improve project design, identify risks and devise mitigation measures, including identifying do-no-harm and environmental and social risks (> Box 2 above for a description of participative methods).
- **Survey target group using mobile survey application**: classical surveys of target groups can be supported through smart phone apps > Fact Sheet Mobile Data Collection.
- **Evaluate population movement through use of mobile phone big data:** This can be helpful to identify target areas, analyze needs and establish baselines, particularly for emergency, migration, biodiversity and transport projects (to be repeated during project launch) > Fact Sheet Data Sources.

According to KfW's evaluation department, publicly available open-data sources and satellite data in particular are chronically underused for *Feasibility Studies*.
It is therefore recommended to use some technical tool types and data sources in general within the *Feasibility Study*, even if there is no access problem as part of the desk study:

- **Analyze socioeconomic and other open–data platforms:** needs assessment is conducted based on quantitative indicators contained on socioeconomic and other open–data platforms, > Section 2.2.3 The Use of Data Sources
- **Use satellite imagery to identify target areas/sites/locations and target groups** and triangulate information from other data sources, > Fact Sheet Earth Observation via Satellites.

For recommendations on how to develop the adequate mix of institutional RMMV approaches, tool types and data sources for the RMMV of the project, > Section 2.5 RMMV Decision Matrix.
As not all PEA and feasibility consultants may be aware of the diversity of potential institutional RMMV approaches, tool types, and data sources or of KfW's strategy and experience in applying RMMV to its projects, this RMMV *Guidebook* has been published on the > KfW Website and to > Digital Rights Check allow them to learn from current practices and lessons.

3.1.2.2 Drafting ToR for the Feasibility Study to Analyze and Conceptualize the Use of RMMV in a Project

The ToR for a *Feasibility Study* include the entire content necessary to assess the project feasibility as well as its major design elements. Herein, only potential RMMV-specific elements of such ToR are described. These RMMV elements will then have to be adapted to the actual environment and project objectives.

a) Context and project conditions

- **Sector analysis and needs assessment:** the consultant can be encouraged or obliged to use relevant RMMV (open) data sources, including satellite data (> Fact Sheet Data Sources) as part of the desk study/mission preparation.
- **Analysis of human rights situation:** if RMMV approaches require target groups or other local stakeholders to be directly involved in the RMMV approach, the level of freedom of expression must be analyzed and discussed, > Section 2.3.3 Human Rights Aspects and > Digital Rights Check.
- **Analysis of access to ICT** in the target region(s) by different parts of the target group(s) to determine the feasibility of certain technical tool types and the need for mitigating potential digital divides, > Section 3.1.2.6 Local ICT Access Conditions.
- **Analysis of legal and regulatory framework regarding RMMV:** the consultant is to analyze the legal and regulatory framework regarding prospective institutional approaches, technical tool types and data sources (> Section 2.5 RMMV Decision Matrix) to assess whether these are legal and feasible in a given context, or if it is necessary/recommendable to negotiate exceptions. This assessment must also include as a focus the country-specific data protection, privacy, information security, rights of use and hardware and software import regulations relevant to the prospective approaches, tool types and data sources, > Section 2.3 Legal and Regulatory Conditions and Recommendations.
- **Analysis of the PEA's capacity, management and monitoring structure and processes** to jointly determine the institutional project setup, including the related suitable institutional RMMV approaches and the role(s) of the PEA within the project's RMMV approach. The assessment of PEA capacity gaps also informs the ToR of the consultant(s) required to assist with the project implementation and monitoring, > Section 3.1.2.4 Stakeholder Analysis and Incentive Model.

- **Analysis of the security situation and access to the project region** for all stakeholders (KfW international and national experts, PEA staff, suppliers, NGO and (local) government staff, international and local *Implementation Consultant* staff): the consultant is to assess the security threats and the degree of access to the project region and the freedom of movement for all stakeholders in order to evaluate suitability for taking over monitoring tasks.
- **Development of security strategies for all stakeholders.** The analysis is to differentiate between international, national, and local staff and consider multiple sources of security threats and their likelihood and severity for each group of staff, taking the current international security situation of the country as starting point, > Section 1.5.2. Risks.
- The consultant is to evaluate the **PEA's existing security and risk management approaches** to assess whether these are suitable and recommend adaptations as necessary. In particular, the consultant is to assess potential unintended negative consequences of protection measures on the security of local staff (e.g., obviously protected compound may render local staff visible after office hours, and thus vulnerable for attack).

b) Project concept: Propose an RMMV Approach (mix of institutional approaches, technical tool types and data sources):

- **Design of a monitorable project:** The consultant is to design the project in such manner as to allow cost-effective project monitoring. This is true for all FC projects, but even more so in remote contexts. Depending on the situation, this can mean for instance that the geographic spread of the measures must be limited to keep monitoring cost acceptable, or that individual project measures have to be similar in terms of design, scale, and implementation mode. If a project finances infrastructure measures of very different funding volumes, this would require different monitoring concepts, which become all the more difficult to organize if monitoring can only be done remotely.
- **Development of the mix of institutional RMMV approaches, tool types and data sources as part of the project concept:** The consultant is to propose an appropriate mix for project appraisal, implementation, monitoring project progress and use of funds, outcome and impact monitoring, and verification of progress and completion as well as ex–post evaluation by KfW. Furthermore, the consultant is to outline how the RMMV approach will be prepared and implemented. This includes defining responsibilities, contractual relations, tool types and data sources to be used and outlining the implications in terms of cost and duration. If software is to be used, the consultant must consider whether open-source software will be required within the ToR for the project implementation or not. Especially for projects with high or substantial E&S risks, the consultant is to propose how RMMV approaches, tool types and data sources will be used for managing those risks adequately.
- **If the RMMV approach includes a (Remote) Management Information System, a Maintenance Management System, a Geographic Information System or similar complex software,** the *Feasibility Study* must already outlined recommendations regarding their ownership type:
  - A general statement that open-source software is always better than proprietary is not true. However, open-source software has greater potential for long-term sustainable use because there are no license fees involved.
  - The selection of the appropriate software type is determined based on the objectives and the circumstances of the project. Who will be the user(s) of the software? Should the software be used by the local authorities after the project ends? Do additional capacity–building measures have to be taken to ensure its continued use? What would be the most cost-effective option? Can the software be reused or replicated for other projects with little adaptation? Is the required local expertise on hand for operating and maintaining the proprietary or open-source solution? Considering these exemplary and other questions, the choice becomes clear; see also, > Section 2.2.2 The Use of Open-Source vs Proprietary Software.
  - The *Feasibility Study* should make a recommendation regarding whether use of open-source software is to be a requirement. If this is the case, KfW PMs need to ensure that this is included in the *Separate Agreement* with the PEA, in the Terms of Reference for the *Implementation Consultant* and/or the software developer, > Cases A, B, C in the Fact Sheet (Remote) Management Information Systems.
- **The concept must include recommendations for data-sharing agreements** between the PEA, KfW and potentially other project stakeholders, on privacy and rights of use aspects and regarding a strategy for the security of collected data and information, > Section 2.3 Legal and Regulatory Conditions and Recommendations.
- **Requests for Proposals** should emphasize that consultants are to **propose a RMMV concept** that is context-specific as part of their technical offer.

c) Analysis of RMMV-specific risks to project success in fragile environments:

- **Analysis of potential implementation risks due to the security context.** The consultant is to assess the risk that lack of access and the difficult security situation may endanger the implementation of the project. If adequate monitoring cannot be ensured, it may be necessary to stop project preparation and evaluate whether the project is unfeasible.
- **Analysis of access risks and contingency plans to mitigate them.** In fragile contexts, access to project sites is usually fluid and projects need to be able to adapt. This may require contingency plans for the project concept (e.g., shift to a different region) and for the monitoring (e.g., assigning another stakeholder for monitoring if one stakeholder loses access).
- **Analysis of environmental and social and specifically do-no-harm risks:** environmental, social and do-no-harm risks of the proposed RMMV approach, including increased risks of biased reporting due to inadequate use of technical tools or unqualified local project staff, which need to be assessed and minimized through recommended mitigation measures.

The following sub-sections highlight certain key aspects relating to RMMV which the *Feasibility Study* is expected to cover:

3.1.2.3 The Collection of Project Location Information Based on a New Geodata Standard for Financial Cooperation Projects

This standardized Data Model for FC project location information collection has been developed by KfW to facilitate project location data collection, storage, management, and visualization of location information from *Financial Cooperation* projects (FC) for KfW and its partners and clients, and is to be used by consultants when conducting the *Feasibility Study* and by the *Implementation Consultant* during project implementation, > Section 3.2 Project Implementation and Monitoring.

What is Project Location Information?

Project location information is data point information on the geographical end point of an international development assistance financial flow that is part of the respective project. In case exact geographical end points cannot be defined, approximate end points can be chosen which can relate to an administrative unit, or if that too is unfeasible, to the location of the project's executing agency, in order to ensure that all FC projects can be visualized on a map. Some examples:

- The location of a public infrastructure investment such as a school, hospital, road, etc.
- A location where a long-term project activity takes place, such as wildlife protection at a national park.
- A location where short-time services are offered, such as the distribution of training vouchers in a certain neighborhood of a city.

This geo standard for the FC is mainly based on the standard of the International Aid Transparency Initiative (so-called IATI standard, > https://iatistandard.org) utilized by BMZ, OECD DAC, the World Bank, the UN and other relevant international organizations. The IATI standard is used to make the data produced by the major development actors comparable, transferable, and aggregable. As further explained below, the uniform presentation of disaggregated spatial project data is to be given at the same time for internal project and portfolio management and for aggregated external publication or requests from the German government (> e.g., via the KfW Transparency Portal).

What Are the Benefits of Collecting Project Location Information?

Project location data yields a unique contextual presentation of FC activities that allow for visualizing and analyzing project activities in a geographic dimension. This allows project stakeholders to answer a range of questions, such as: "What is the contextual situation of the project location?", "To what extent, how well or how poorly connected are daily activities of the population to related infrastructure (e.g., local commerce to the road network)?", "Which environmental risks could affect potential infrastructure sites, and what are the implications for site selection?", "To what extent does the project activity (e.g., support for a protected area) achieve certain outcomes or impact objectives (e.g., reduction of deforestation)?" These are just some examples of how geospatial analysis can answer specific questions or highlight risks or impacts that may not been asked before. Project location data are crucial to making other geodata sources, such as open satellite images, useful, > Section 2.2.3.1 Key Elements in the Identification of Data and Fact sheets, > Fact Sheet Data Sources, > Fact Sheet Earth Observation via Satellites and, > Fact Sheet Geospatial Tools. Furthermore, combined location data from multiple projects allow unique aggregated views on sector approaches, cumulative risks, combined impacts achieved, etc.

Benefits for KfW Portfolio Managers and Technical Experts:
Overview of the geolocations of all project sites, improved analysis and comparability of geographically assignable project data with internal and external data sources, structured transfer of project location data to other external systems, improved data quality and time savings regarding the above tasks.

The KfW GeoApp, which is part of the organization's internal Portfolio Management Tool (PMT) application, receives the collected data which is to be used under the standardized FC Project Location Data Model. This enables KfW PMs to record project-related location data systematically and uniformly to make it available for regular reporting, progress reviews and verifying use of funds.

Above all, this avoids double entry of project data and enables partially automated data validation, further reducing the effort involved for data entry and data cleaning. The data collection templates (> Annex 3) become part of the ToR for FC projects (> Section 3.1.2 Feasibility Study and, > Section 3.1.5 Drafting ToR for the implementation of different RMMV approaches), so that these data are not recorded by KfW, but by the FC consultant or PEA in such a way that it can be uploaded to the KfW system without additional effort.

Geospatial information about the (prospective) project implementation sites is furthermore of great relevance to facilitate project site identification, field visit preparation, monitoring and verification (e.g., during project appraisals or progress reviews), for portfolio and risk analysis and for evaluation of FC-supported projects (see above) as well as many further information needs across the entire FC portfolio.

Some KfW clients are already requesting geographically differentiated project portfolio information, which is currently very time-consuming to provide. Using the GeoApp will significantly reduce this effort. The representation of the project location information on a map makes it easier to understand the situation, allowing for direct comparison of planned or actual project activities against local contexts using additional map layers from external, mostly open–data sources, > Section 2.2.3 The Use of Data Sources.

Benefits for KfW Management, Competence Centers and Country Teams:
Comprehensive overview of all project locations, location-related risk and SWOT11-assessments

Once collected in the standardized format, location-related project data can be filtered, aggregated and disaggregated across countries, sectors and portfolios and analyzed and compared against each other without any additional manual effort. The automated retrieval of project location data (replacing the previous manual collection via Excel lists) reduces the effort involved in processing requests from clients and government decision makers for the competence centers and country teams. The uniform definition of location types with their geo-coordinates contained in the FC Project Location Data Model enables the use of risk analysis tools from international insurance providers, which reduce the effort involved in estimating credit default risks, risks for achieving development goals and expected damages. At the same time, gap analysis is facilitated and business opportunities can be identified more easily.

Benefits for clients, partner countries, other development banks, the public:
Greater external transparency, easier identification of opportunities for cooperation with external actors, improvement in the international IATI ranking

The platform-independent structuring of key project location information based on the IATI standard enables automatic import and export of these data to other internal and external applications, e.g., for the, > KfW Transparency Portal at www.kfw.de, as well as for clients and partner systems. This facilitates the identification of synergies, gaps and collaboration opportunities for all relevant actors and stakeholders in the target area(s).

How Is the Project Location Information Collected and Stored within KfW?
The collection of location information is to be organized within KfW in accordance with the FC Project Location Data Model, which is based on the IATI standard, and with a number of best practices of other development organizations and already existing standards for geospatial data. The FC Project Location Data Model specifies which location data and how location data are to be collected by the projects. The location data are to be provided by PEA staff, *Implementation Consultants* and/or other stakeholders who work for the respective project. Data collection should be conducted following the FC Project Location Data Model and specific technical requirements detailed below > Annex 3 KfW's Project Location Data Collection and Management Approach.

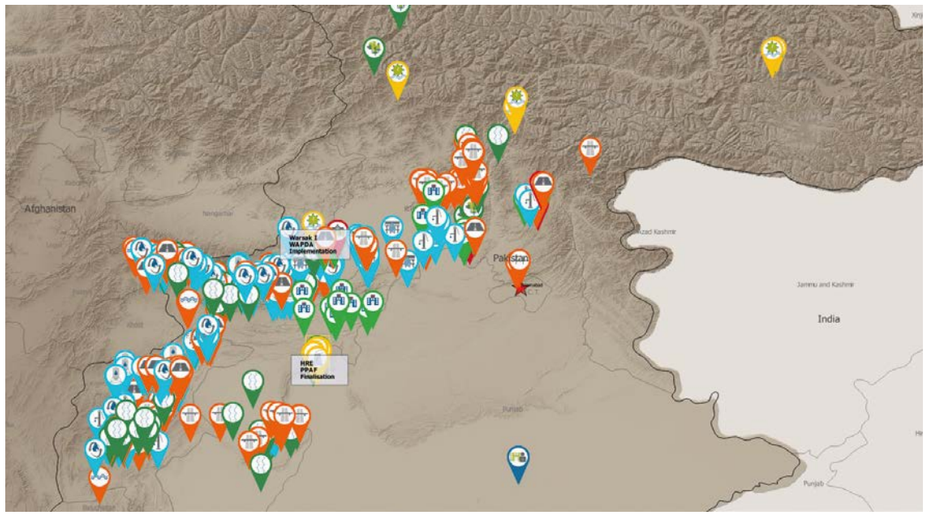
[11] SWOT stands for Strengths, Weaknesses, Opportunities and Threats

KfW furthermore offers a standard Sample Terms of Reference (ToR) for project location data collection (> Annex 3.2), which also includes the technical specifications from > Annex 3.1.

These ToR should ideally be part of the *Feasibility Study* if the potential project locations can already be identified at this stage. The ToR should then be part of the Reporting Annex of the Project's *Separate Agreement* and/or the ToR and Contract of the consultant to be tasked with project monitoring and reporting and/or project location data collection and management, > Section 3.1.4.2 Separate Agreement and > Section 3.1.5.1 General ToR Aspects for the Implementation of an RMMV Approach.

After collection, the provided project location data is uploaded in a KfW-internal application called GeoApp within the Project Management Tool (PMT). Data entry in the GeoApp is easy and the application offers different options to link existing project data and activities to the provided location data (e.g., distribution of the project budget between the target provinces or districts). The data is securely stored and made available for internal use during the whole project cycle, where it can be combined with other internal and external data–sources to obtain a better impression of the local context. An example illustration below shows collected project location information based on the FC Project Location Model.

Figure 3.2: Visualization of Location Data Following the FC Project Location Data Model Showing All FC Project Locations in Pakistan in 2021



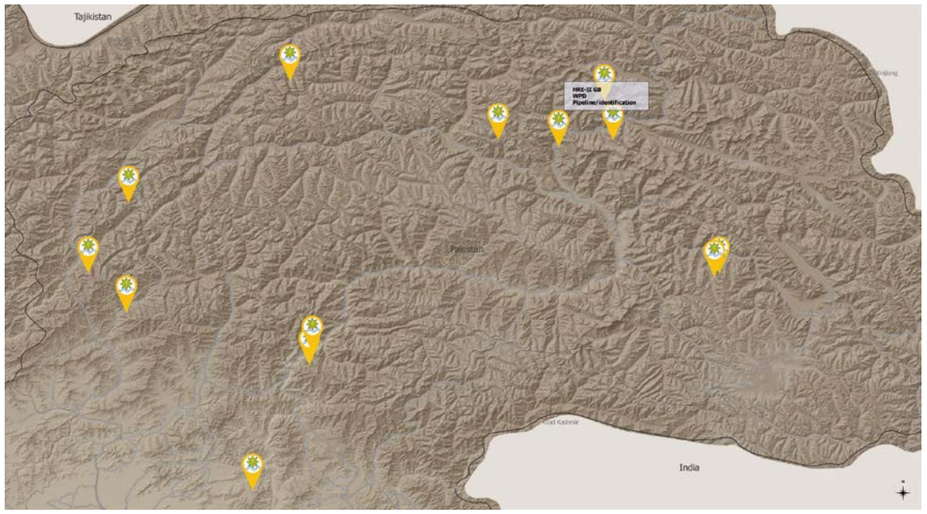
Source: based on qgis.org

The above map shows all FC project locations under preparation and implementation in Pakistan in a uniform way.

Some of the locations are showing a selection of filter criteria (e.g., project title acronym, name of the PEA, implementation status of the location activity).

Now, all hydropower plant locations in Pakistan can be selected with one click:

Figure 3.3: An Illustration of a Use Case: Overview of All Hydropower Stations Financed by the FC in Pakistan



Source: based on qgis.org

This map of Pakistan shows the hydropower plant location, acronym of the project title "the respective project location is part of", "name of the PEA responsible for the project this location is part of" as well as the "implementation status of the main activity at the respective location".

The detailed **FC Project Location Data Model and Management Approach,** including the specific technical requirements, data collection ToR are presented in > Annex 3.

The same data collection Terms of Reference (ToR) have to be included as Sub-Annex to the Reporting Annex 8 of the project's *Separate Agreement* (> Section 3.1.4.2 Addressing RMMV in the Separate Agreement) as well as in the ToR of the respective consultant in charge of data collection, > Section 3.1.5.1 General ToR Aspects for the Implementation of an RMMV Approach.

3.1.2.4 Stakeholder Analysis and Incentive Model

As part of the *Feasibility Study*, project stakeholders and their respective positive and negative incentives are generally analyzed and incentive models for stakeholders are developed.

If RMMV approaches are to be used in the project, the analysis of such positive and negative incentives must include the following aspects:

- **Target group analysis:** if the target group is supposed to participate in the use of technical tools, the consultant must analyze local IT access conditions as well as the target groups' incentives as well as their actual IT–access disaggregated by gender, relative wealth, age, literacy (digital divide), relative remoteness (urban/rural divide) etc. to avoid unacceptably high levels of bias, and/or create awareness of bias considered acceptable or desired (e.g., bias towards youth in mobile feedback systems, which is underrepresented in traditional decision-making systems).
- **Peace and Conflict Assessment**: The Peace and Conflict Assessment is to propose methods for reliable *Remote Monitoring* of do-no-harm indicators and their assessment as to potential capacity gaps and conflicts of interest among the project stakeholders, forming the basis for the do-no-harm matrix (KFG-Matrix).
- **Analysis of PEA willingness to appropriately use RMMV approaches:** The PEA's willingness to use/allow RMMV approaches appropriately is crucial to the success of a remotely managed and/or monitored project. If different potential PEAs are considered, the organization's willingness may be a crucial selection factor. Therefore, the consultant must analyze whether the potential PEA(s) is/are willing to share relevant data, and which set(s) of institutional approaches and technical tool types they are or propose using.
- **Analysis of PEA(s) experience and capacity with RMMV and proposed approaches:** The consultant is to analyze the reliability of monitoring approaches and tools currently used by the PEA(s). If the PEA(s) already use(s) tools, the consultant is to assess whether these can be used or extended or additional tools or tool types are required. If the PEA uses a (Remote) Management Information System, see also, > Fact Sheet (Remote) Management Information System ToR Case B.
- **Analysis of the local market for architects/planners and construction firms:** If international and national firms cannot access the project sites, the project may have to rely on local planners and construction firms. In such cases, the consultant is to analyze whether there are local firms capable of and potentially willing to perform the required tasks.
- **Analysis of the (local) market of monitoring consultants, IT experts and technical tool providers:** the proposed set of RMMV approaches and tool types may require specific (local) expertise. How can this expertise be identified and engaged? Some tool types may be only accessible through certain public providers determined by the government (e.g., satellites or drones in some countries). How can these be procured? These issues need to be considered in the *Feasibility Study*.

3.1.2.5 Environmental and Social Impact Assessment as Part of the Feasibility Phase

If RMMV approaches are to be used due to limited project site access, it must be clarified first, if potential environmental and social risk and impacts can be identified, whether these can be adequately assessed and subsequently managed and monitored via the applied RMMV approach or whether there are limitations or the project may even be unfeasible in a remote modality. Similarly, with regard to the aspects mentioned in the subsections above, the *Feasibility Study* consultant needs to analyze the possibilities and limitations of RMMV approaches for the a) identification and analysis of stakeholders and PAP, and b) socioeconomic baseline surveys, as well as census for resettlement and livelihood restoration.

Ideally the Environmental and Social Impact Assessment (ESIA) should be designed as an integral part of project design, such as in mainstreaming ESIA and ESMPs as part of participatory planning processes, or as a self-selection mechanism for small investment funds or programs (self-selection could for example result in exclusion of all proposals for sites where there have been any complaints by PAP).

The identification of environmental and social risks and impacts should be an integral part of the feasibility phase. Depending on the project type, scope and identified environmental and social risk category (A=high risk, B+=substantial risk, B=moderate risk and C=low risk), the *Feasibility Study* should include an assessment of environmental and social risks (for programs, an environmental and social framework is needed, as subprojects are not identified before appraisal). This should always include an E&S screening and scoping study or a section within the *Feasibility Study*. For high and substantial risks, an ESIA needs to be conducted within an independent document in the *Feasibility Study* phase by competent consultants as adequate preparation for the project appraisal. For moderate risk it has to be discussed whether an ESIA is needed or whether a site risk assessment, as part of the Environmental and Social Management Plan (ESMP), in the implementation phase is sufficient. The consultant needs to discuss with KfW and PEA whether and how RMMV approaches can be applied for the assessment of E&S aspects in the *Feasibility Study* phase.

For some risks related to category A and B+, the application of RMMV approaches may be limited and/or may involve challenges. In general, social aspects are more difficult to manage in a virtual environment. For example, applying RMMV approaches for World Bank ESS 5 on involuntary resettlement is challenging. Conducting socioeconomic baseline studies or census surveys for resettlement and livelihood restoration, including stakeholder engagement, may be difficult and require a tailored solution depending on the institutional approach used and on the technical RMMV tool types and data sources available, > Section 2.5 RMMV Decision Matrix. ESS 5 requires that the PAP be compensated before the impact materializes, thus there is a need for sufficient data to be available in a timely and reliable manner, while the compensation and livelihood restoration process needs to be implemented and monitored adequately as well. The same holds true for WB ESS 7 on indigenous people (IP), especially regarding the obtaining of the free prior informed consent (FPIC). In addition, one must be careful in applying RMMV approaches in the context of resettlement and IPs, as civil society actors view technical tools and approaches critically. Also, biodiversity baseline studies in natural or critical habitats may not be possible with all institutional approaches.

In addition, it needs to be clarified whether local consultants are available and competent enough to conduct screening, scoping and full-fledged ESIA (if required), whether or not guided by international experts. Many RMMV approaches feature a strong emphasis on consultants or even local consultants, thus the ToR for these assignments must be carefully developed and the consultants must demonstrate in their technical offer how they would apply RMMV approaches for each project task. For instance, it should be clarified which (satellite) data and tools they intend to use for what task. As an example: onsite bird flight monitoring in sensitive locations to determine if a given site is a critical habitat.

If in the pre-assessment **considerable human rights risks are identified connected with the technical tool types** you are planning to use, you may include a **human rights risk assessment** as part of your scoping or *Feasibility Study*. The Danish Institute for Human Rights provides useful guidance on > Human Rights Impact Assessment (HRIA) of Digital Activities, such as what to consider in the **Terms of Reference** for planning and scoping digital activities:
> https://www.humanrights.dk/sites/humanrights.dk/files/media/document/Phase%201_Planning%20and%20Scoping_ENG_accessible.pdf

If the technical tools you are planning to use for your project contain one or more of the following elements, you may consult the **digital rights check** developed jointly by KfW, GIZ and the Danish Institute for Human Rights: > https://digitalrights-check.bmz-digital.global/kfw/ and check the recommendations for the respective element(s) as well as the respective Tool Type Fact Sheets referenced below:

- Smartphone app > Fact Sheet Mobile Data Collection Tools
- eLearning tool > Fact Sheet eLearning Tools
- Internet-of-Things (IoT) device > Fact Sheet Sensors/Smart Meters
- Digital social or communications platform (incl. social media) > Fact Sheet Crowdsourcing Tools and > Fact Sheet Collaboration Tools
- Cloud services > Fact Sheet R/MIS and > Fact Sheet Data Sources
- Artificial intelligence solutions > Fact Sheet Data Sources
- FinTech solution > Fact Sheet Collaboration Tools
- Digital ID systems > Fact Sheet R/MIS and > Fact Sheet MMS

3.1.2.6 Local ICT Access Conditions

Local ICT access conditions must be assessed as part of the *Feasibility Study* because these are relevant for all tool types using mobile phones and a local internet connection. These may be mobile data collection tools, crowdsourcing tools, big data sources, R/MIS, Maintenance Management Systems, camera-based remote sensing, sensors or smart meters (internet–of- things), > Tool Types Fact Sheets. Considering the precarious data situation in most partner countries, choices are often limited for the collection of accurate and representative data. The likelihood of reaching a near-representative or at least socially inclusive share of the population through mobile survey technology will increase along with rates of mobile phone penetration, household mobile phone ownership, the functional and ICT literacy of women and other vulnerable or marginalized groups, ICT affordability, and ICT connectivity. At least, the following topics are to be considered.

- **Access to electricity:** In Sub-Saharan Africa, some 600 million people (almost two-thirds of the region's population) do not have regular electricity, while 15% have no electricity access at all. [12] However, this however only severely limits mobile phone network access for people with no electricity access at all.
- **Mobile phone ownership:** In 2024, 5.61 billion people worldwide used a mobile phone (equaling 69.4% network access, of which an estimated half are smartphones). [13] However, Asian-Pacific and African countries in particular lag behind. While the percentage of smartphone use is increasing (by the end of 2020, over 4 billion people were using mobile internet, representing 51% of the world's population) [14], poor and rural populations in particular only have access to simple mobile phones without broadband access or the advanced computing functions of a smartphone. Currently, cross-national data sets on mobile phone penetration, such as provided by the World Bank, are based on estimations of the number of cellular subscriptions. However, this may not accurately reflect penetration (i.e., the percentage of phone owners among the population), as one person may own multiple mobile phones. An increasing but still limited number of national statistical institutes of developing countries are providing more accurate information on mobile phone ownership.
- **Access to internet:** Basic access to broadband internet is available in every capital and larger city around the world, but rural communities are often excluded. In January 2024, 5.35 billion people use the internet (66%). [15] Merely 45.5% of people in Africa have access to the internet today though [16], and current growth trends suggest we will be well into the second half of the 2020s before we see internet access levels across the continent pass the 50% mark. Broadband access rates are even worse, especially in remote and rural areas. In many countries, broadband internet is quite expensive. High prices may exclude poor people from usage, even when network access is available.
- **Network infrastructure:** One common reason why people do not access the internet is poor mobile network infrastructure. For projects where mobile phones needed to transfer data, it is recommended to use a mobile operator with at least 3G net coverage, otherwise long waiting times may occur. 3G net coverage is given in most countries in the world, but the available net coverage differs regionally. 4G coverage had increased to 84% in lower-middle-income countries (LMIC) by the end of 2020.
- **Usage gap:** Even though the coverage gap has narrowed in recent years (see above), there is still a huge gap in usage. In 2022, 38% or 3 billion people did not use mobile internet despite living in areas with mobile broadband coverage. [17]
- **Gender gap:** There is also a sobering gender gap online. In developing countries, the parity between male and female internet users can be startling. In Sub-Saharan Africa, the gender gap can range from 10–62%. [18] Women in low and middle-income countries are, on average, 17% less likely to own a mobile phone than men, and 19% less likely to use mobile internet. [19] The gender gap is significantly lower in urban than in rural areas, and for younger versus older women. In addition to mobile phone access, there is also a gender gap regarding phone use due to illiteracy, functional literacy or limitation to the local language (as opposed to the official language), which must be considered.
- **National ICT expertise:** Moreover, the existence of progressive and pro-competitive regulatory ICT-policy frameworks and national ICT R&D funds are usually associated with higher levels of in-country ICT expertise. This, in turn, would be an enabling factor for realization of the technical infrastructure for the project. National ICT experts will likely be better qualified to develop software solutions that are suited to the specific local context and to sustainably maintain the necessary hardware than external international consultants.

During the *Feasibility Study*, to gain a better understanding of the telecommunications environment we recommend consulting the following sources to analyze the local ICT access conditions:

- **International Tele-Communication Union:** ICT Development Index > https://www.itu.int/en/ITU-D/Statistics/Pages/IDI/default.aspx;
- **Alliance for affordable internet:** Affordability Report > https://a4ai.org/research/affordability-report/affordability-report-2021/;
- **GSMA:** Mobile Connectivity Index > https://www.mobileconnectivityindex.com/ and > https://www.gsma.com/solutions-and-impact/connectivity-for-good/mobile-for-development/connected-women/, and > https://www.gsma.com/solutions-and-impact/connectivity-for-good/external-affairs/
- **Internet World Stats** (offers statistical indicators about internet usage for every country) > https://data.worldbank.org/indicator/IT.NET.USER.ZS.

Solutions should be adapted to local energy and ICT access conditions, but adaptations may be possible. For example, electricity can be provided through solar panels. If the network signal is too weak to transfer data immediately, mobile phones can be used as buffer memory and the data can be transferred later when there is better net coverage. Camera and UAV/drone-based sensors can load data onto a data storage device which can then be manually read at regular intervals.

[12] https://openknowledge.worldbank.org/bitstream/handle/10986/31333/9781464813610.pdf?seq and https://www.iea.org/reports/world-energy-outlook-2023

[13] https://wearesocial.com/uk/blog/2024/01/digital-2024/

[14] https://www.gsma.com/r/wp-content/uploads/2021/09/The-State-of-Mobile-Internet-Connectivity-Report-2021.pdf

[15] https://wearesocial.com/uk/blog/2024/01/digital-2024

[16] https://www.statista.com/statistics/1318881/internet-usage-rate-in-africa-by-gender/

[17] https://www.gsma.com/r/somic/

[18] https://www.weforum.org/publications/global-gender-gap-report-2024/

[19] https://www.gsma.com/r/somic/

3.1.2.7 Implications of Using RMMV Regarding Project Cost and Duration

RMMV may have different effects on project cost and duration that should be taken into consideration when assessing project feasibility and drafting the project budget and time schedule outline as part of the *Feasibility Study*. The implications are discussed in this Section.

Cost and resource implications at KfW–level

At KfW-level, **transaction cost may increase.** *Remote Management* and *Verification* of projects may be more expensive than regular project management and verification. Even though international staff may spend less time traveling, remote project management and *Remote Verification* imply greater workload. Portfolio managers may have to recruit and manage additional consultants, including preparations for their missions, managing their contracts and addressing findings after the mission. If KfW national experts take more responsibility, for example, in supporting *Remote Verification* and coordination among KfW staff, partners and stakeholders , they must be trained and coached by international KfW staff. Finally, communication with the PEA may take more time and require more rescheduling and troubleshooting effort in the absence of a possibility to hold clarifying meetings during a mission.

Cost implications at project–level

At project-level, cost implications depend on the institutional RMMV approach(es), tool types and data sources chosen > Section 2 RMMV Approaches and Tools – an Overview. Some empirical data indicative of the cost implications of different institutional approaches is available (> Section 2.1 for a discussion of institutional approaches):

- **The cost implications of an Implementation Consultant with increased local capacity** (> Section 2.1.1, A3) may vary: while increasing reliance on local staff may be cheaper, the cost of training and supervising them may be significantly greater, as well as security and flight costs (for intermittent trips by international staff). For some projects relying strongly on RMMV because of conflict-related site access issues, consulting cost has tripled.
- **Costs for monitoring consultants depend on the range of services they provide** (> Section 2.1.1, A2 and A3): In general, monitoring consultants have the same monthly rates as *Implementation Consultants*. However, the range of services demanded of monitoring consultants can differ substantially. If monitoring consultants have a limited mandate, they may only cost a small fraction of the total project volume. The more implementation responsibility the consultant takes on, the more expensive it gets.
- **Third–party monitoring consultants are relatively affordable** (> Section 2.1.1, A4). Usually they also cost a small fraction (1 to 5%) of the total project volume, assuming that only a sample of outputs and/or outcomes is monitored. It must be considered however that frequently a TPM consultant is recruited in addition to an *Implementation Consultant*, which increases overhead cost.
- **Third–party monitoring through technical audit is even more affordable** (> Section 2.1.1, A4): this approach, used for example in a KfW–financed project in Yemen, was estimated to cost less than 1% of the overall project sum. This was of course also due to its limited scope.

The cost of hiring additional national technical experts at KfW country office level is not included in the project budget, as they are tasked with conducting KfW *Remote Verification* activities and usually cover KfW's entire sector portfolio in the country (> Section 2.1.1, A1).

For technical tools, cost is not the main selection criterion, and it is also more difficult to estimate their cost implications, as these include software, hardware, training, promotion activities, etc. However, some empirical data is available:

- **Hardware and data can come at relatively low cost.** Examples of this are socioeconomic databases (mostly open and free), satellite-based remote sensing (usually less than EUR 10 per image per sqm) and camera–based remote sensing (a 360-degree camera can cost between EUR 150 and EUR 1,000) and intelligent sensing (sensors cost can vary between EUR 1 and EUR 500 per unit).
- Standard monitoring or data analysis and visualization tools can be significantly cheaper if existing (open) data sources are initially or from periodically combined with project-generated data through a data dashboard solution (e.g., Power BI, Tableau etc.).
- **Software development services and software licensing fees can be relatively expensive.** The original development of a proprietary remote project management information system did cost about EUR 120,000 in 2018 in addition to annual licensing fees. If open-source software is used, these costs can be substantially lower. Adaptation of the open–source Rapidpro software for the citizen monitoring project in Togo was only a fraction, without any licensing fees, > Decentralization Support Program in Togo (PN: 30205).
- **Other cost items required for technical tool types also need to be considered.** These include IT equipment (computers, smartphones, servers), training on software development, content management and /or user training, promotion and social mobilization activities, subsidizing of short message service (SMS) fees (e.g., for mobile data collection or crowdsourcing) and regular updates and maintenance.

Implications of RMMV for Project Duration

Implications regarding duration depend on the selected institutional approach as well as the software requirements for the selected technical tool(s):

- **Setting up a *Remote Management* Information System (R/MIS) takes time.** If software crucial for progress monitoring needs to be developed or adapted, this can delay the start of construction works in a project. Software development usually requires a sequence of programming and feedback from users. This process may take up to six months and delay project start. Therefore it should be part of the ToR of the *Implementation Consultant* (or additional IT consultant), and start in parallel with the planning stage or be procured by the PEA parallel to the procurement of the *Implementation Consultant* (as done in the > Stabilization Program Ménaka, Mali, (PN: 38771).
- **Deployment of UAV/drones** may also take time. Drones frequently need to be imported and may be stuck at customs. Furthermore, obtaining the necessary permits to operate the drone may take additional time.

3.1.2.8 Considerations on Designing KfW's Remote Verification Approach

If due to the security situation or other project-specific circumstances the physical verification steps (appraisal, progress and final review, including the verification of the use of funds as well as ex post evaluation) are not possible or cannot be carried out by KfW itself wholly or in part, this must already be taken into account in the *Feasibility Study* if such a risk has already been identified at that stage. In such case, all these steps have to be conducted using the RMMV approach (choice of institutional approaches as well as types of technical tools and data sources) in accordance with > Section 2, in particular > Section 2.5 RMMV Decision Matrix as well as > Section 3.3 Remote Verification of Project Progress by KfW. In designing the RMMV approach as part of the *Feasibility Study*, the expected reporting from the *Remote Monitoring* of project implementation is considered (> Section 3.2 Project Implementation and Monitoring by The PEA/Consultant) and combined with additional, independent sources of information. The RMMV approach design is then agreed in the contractual setup for procuring technical tool types, > Section 3.1.5.1 General ToR Aspects for the Implementation of an RMMV Approach.

If adequate *Remote Verification* procedures cannot be identified, the feasibility of the project needs to be discussed with the respective KfW client for the project, > Section 1.5.1 Limitations.

3.1.3 Conducting Project Appraisals Remotely

It is important to consider RMMV in this step within the FC project cycle because it constitutes the first verification process for KfW, enabling KfW to verify the results of the *Feasibility Study*. Furthermore, crucial elements of the project, including the relevant mix of institutional approaches and tool types, are defined with the PEA in the appraisal, and KfW's client is informed of the chosen RMMV approach and related RMMV risks.

Please note that this Section does not outline guidelines for the general KfW project appraisal process but rather only discusses additional aspects that should be considered when conducting project appraisals remotely.

If due to the security situation or other specific circumstances of the project a physical appraisal mission is not possible or cannot be carried out by KfW itself, wholly or in part, this must already be taken into account in the project planning phase if such a risk has already been identified at that stage. In such case, remote appraisal has to be conducted using the RMMV approach (choice of institutional approaches as well as types of technical tools and data sources) in accordance with Section 2, in particular > Section 2.5 RMMV Decision Matrix as well as the sections below. The proposed RMMV approach should already be stated in the appraisal concept and discussed during the appraisal peer review.

If adequate *Remote Verification* procedures are not available, the feasibility of the project needs to be discussed with the respective client of KfW for the project, > Section 1.5.1 Limitations.

3.1.3.1 Preparation of Remote Appraisals

A well-designed appraisal concept is necessary to successfully conduct a project appraisal remotely. Sufficient time should be reserved for the preparation of a remote appraisal mission to ensure an optimized process and efficient data collection. The PM has responsibility for coordination and ensuring that the appraisal is well planned. External inputs are essential to the success of a project appraisal, thus it is recommended to involve the relevant parties (in particular the relevant PEA, recipient government and target groups representatives, as well as other partners and stakeholders) as early as possible, and to ensure their availability and access to the required IT–infrastructure. Frequently, additional data needs to be collected in advance of the remote appraisal mission which otherwise would have been collected on site during the mission.

The following should be considered and planned for in coordination with the PEA/recipient:

Table 3.1: Checklist on How to Prepare a Remote Appraisal

Aspect/Topic	Key Considerations	Time Frame
Agenda setting	• Avoid national holidays and festivities • Check time differences • Availabilities of technical experts (incl. KfW technical expert and environmental and social impact expert) • Are KfW national experts and country office support available (check potentially conflicting schedules)? • Are key personnel from partners and consultants available? • Check alignment with KfW Appraisal Concept • Define topics to be discussed – optimize scheduling by aligning with PEA/recipient's organization structure and division of responsibilities	Finalize a provisional agenda at least one month before start of the appraisal
Access to technology	• Are there any challenges or limitations for the PEA/recipient in accessing equipment to attend the meetings? • Will there be internet access? • Is there a preferred telephone/video conferencing platform? Is this compatible with the KfW system? • Plan for an alternative platform (Plan B)	Prior to starting of the project appraisal
Planning virtual site visits	• Sites to be selected by KfW staff • Ensure access to site(s) • Organize permit (as legally required in target areas) • Plan interviews with target groups and project–affected people (PAP) – to be facilitated by KfW or 3rd parties (e.g., local consultants, NGOs) including (female) interpreter (s) if required Check adequate mode(s) of communication > Section 2.1.1 A5 and adequate tool types > Collaboration tools, > MDC, > Crowdsourcing etc. as per > Section 2.5 Decision Matrix • Plan interviews with other partners > Section 2.1.1 A6 • Provide for security and safety • Availability of image capturing tool types > Drones, > Cameras etc.	In parallel to agenda formulation
Document sharing	• Define information needs – share a documents and data request list • What are the preferred documents/data–sharing platform for the PEA/recipient? • Ensure documents and data accessibility for KfW • Ensure data protection and data security	Share the documents and data request list as early as possible. Aim to have documents and data prepared and readily available by start of the appraisal
Communication	• Understand and respect cultural norms • Define communication rules ("Rules of Engagement") and channels • Consider organization structure and hierarchy at PEA/recipient organization • Agree on how the project appraisal will be documented and what will be shared between KfW, PEA/recipient and other relevant parties at the end of the appraisal in the Minutes of the Meeting of the Appraisal Mission • Agree in advance on the date of signing of the Minutes of Meeting at (or as soon as possible after) the end of the remote appraisal mission	Define and agree with the PEA/recipient at project kick-off

3.1.3.2 Conducting Virtual Appraisal Missions

A Virtual Appraisal Mission is likely to take place over a series of telephone/video conferences and involve accessing of technical tool types and data sources, depending on the setup as determined during the preparation phase. The approach should allow a level of flexibility, and potentially for the participation of additional technical experts. However, a high level of coordination is required to ensure efficient use of time and that the information obtained reflects as accurately as possible the likely risks and impacts of the project. It is therefore recommended to confirm the appraisal agenda with the PEA/recipient at least two weeks prior to start of the project appraisal as well as other logistical aspects mentioned above.

The following illustrates the process of conducting a typical virtual project appraisal and aspects to be considered:

Table 3.2: Checklist on How to Conduct a Remote Appraisal

Step	Aspects to consider
Kick–Off Meeting with PEA/ recipient representatives (and potentially other partners/stakeholders)	• Introduction • Present an overview of the agenda. Discuss and agree on any last-minute changes and logistics including technical access • Discuss the detailed agenda, including division of responsibilities and tasks • Any other aspects worth discussing and taking into account
Conduct PEA management Interviews	• Conduct joint or separate interviews with relevant departments/functions • Involve relevant persons as defined during the preparation phase • Understand processes and structure at the PEA/recipient organization
Focused Discussions with individual PEA departments/ functions of various topics	• Facilitated by the PEA/recipient management or the designated point of contact at the PEA/recipient organization – responsibilities have to be determined during the preparation phase, ensuring active participation and access to technology • Protocol the meetings consider data protection, > Section 2.3.1 Privacy Check
Conduct virtual site visits	• Access to sites by PEA/recipient and KfW national experts • Check safety and security of the site(s) • Check deployment of tools and equipment to allow capturing of site situation (e.g. > Drones, > Cameras, 360˚Cameras – as planned, see above) • Where possible, conduct interviews with project–affected people (PAP) by KfW staff in the absence of parties whom they may perceive as intimidating (two alternative modalities: or remote interviews by KfW PM and technical experts using > collaboration tools or interviews by KfW national expert to be conducted and reported in advance • Follow permit requirements
Document Review	• Request to receive the relevant documents well ahead of the start of the appraisal mission. It is useful to have already reviewed the documents prior to the interviews in order to ask relevant questions • Where necessary, ask the PEA/recipient representatives to be available during the document review sessions to allow clarification of questions • Cross check against applicable standards and legal requirements and against the existing management system. Appropriately challenge information provided • Highlight any information gap and request supplemental info
Closing Meeting	• Date and time should be confirmed during the kick-off meeting at the latest • Share draft appraisal meeting minutes with all invited participants at least two days (or as agreed with the PEA) before the closing meeting • The key project parties (e.g., PEA/recipient representatives and management, PM, technical expert, E&S expert, etc.) should be present at the closing meeting. Representatives of other relevant sector ministries and authorities should be invited as well • Ensure the meeting dial-in details are circulated in advance • Summarize the key appraisal findings in a PowerPoint presentation or similar, including the timeframe of the next steps in project preparation • If the closing meeting presentation is to be distributed, care should be taken to remove or redact confidential and sensitive information • Thank participants for their time and support during the project appraisal mission • If possible, conclude with signing of the appraisal mission meeting minutes or agree on the expected date by which KfW will receive the signed appraisal mission meeting minutes, on the basis of which the Separate Agreement will be drafted

3.1.3.3 Environmental and Social Considerations of Virtual Appraisal Missions

In general, the pre-appraisal phase consists of a desktop review of the conducted studies (*Feasibility Study*, ESIA, etc.) and discussions with consultants and partners on open issues. A list of open questions should be sent to the partner before the appraisal mission so they can prepare for the appraisal mission. Based on the conducted studies, it is also good practice—required—to develop a draft version of the Environmental and Social Commitment Plan (ESCP) before the appraisal mission and send the draft to the partners for discussion during the mission. In addition, we recommend using the KfW > Digital Rights Check before or during the appraisal mission, if you need to identify and mitigation potential human rights risks from the use of RMMV tools or other digital technologies within the project.

This approach is also feasible for virtual appraisal missions. Physical presence in the country and/or project region is not possible in this case, so the meetings and/or site visit have to be conducted virtually. It is good practice to prepare the virtual appraisal as diligently as one would a "normal" appraisal, with a clear agenda and stating exactly who has to be present at which meetings. For instance, the E&S team of the partner and KfW obviously have to be present at the meetings on environmental and social topics, but the KfW project team needs to analyze and discuss at what further sessions the E&S staff need to be included, as it is vital to include them in the sessions on the project *Implementation Consultant* or the procurement documents, for example (as there are relevant ESHS requirements which need to be discussed).

Virtual site visits can be conducted via web conferencing, image-assisted site assessment, 360°/helm mounted cameras, etc., see Fact Sheets on > Collaboration Tools, > Mobile Data Collection Tools, and > Cameras.

Virtual meetings with communities/PAPs may be difficult, but at least interviews with PAPs can be conducted using a mobile phone with camera and streamed within a web conferencing tool, > Collaboration Tools.

Ad-hoc discussions with stakeholders are difficult to do, and triangulation of information by interviewing stakeholders randomly is difficult as well. But if the security situation allows, KfW national experts can be present in the project area before or during the appraisal mission and can interview stakeholders randomly chosen by KfW from a list made available by the *Feasibility Study* consultant or PEA.

Virtual Meetings with PAPs without project partners would be a possibility to get unfiltered information for unbiased opinions, but this requires that partner institutions' staff are not involved in the interviews,being organized and conducted for example by KfW national experts. It is additionally important that the PAPs/communities are randomly chosen by KfW (e.g., from the list of PAPs from the resettlement action plan) for such virtual interviews, and are not proposed/selected by the project partners.

Similarly, any necessary meetings with NGOs or workers unions must be organized and it must be clarified in advance whether those meetings are to be done with or without the presence of partner institutions. Interpreters are required in any case. Finally, care must be taken, that the integrity of interviewed PAPs is assured.

3.1.4 Contractual Considerations

To ensure the successful implementation of a RMMV-strategy it is imperative that the key underlying project agreements (*Grant or Loan Agreement*, *Separate Agreement* and consultancy contract(s)) clearly regulate the RMMV-related rights and obligations of the respective parties in a legally binding way.

3.1.4.1 Addressing Crucial RMMV Prerequisites in the Grant or Loan Agreement

In rare cases, if RMMV-related prerequisites have been identified during project preparation are so crucial for the success of the project that it would otherwise fail, or KfW cannot other verify the use of funds, those prerequisite(s) should be agreed during the course of the government negotiations (> Section 3.1.1 Government Negotiations) or during the project appraisal mission (> Section 3.1.3 Conducting Project Appraisals remotely). In such cases, and given the importance of such prerequisites, it may be appropriate to include these in the respective *Grant or Loan Agreement* (e.g., as undertakings, covenants or conditions precedent to disbursement). One example for such a prerequisite is the need to ensure access by KfW or the respective third party to necessary information from a partner's R/MIS. If this is considered uncertain or if there is a risk of potential RMMV-related human rights issues (e.g., data protection provisions in citizen feedback loops or use of AI-assisted big data), consideration in the a.m. agreements is strongly recommended.

The issues/prerequisites have to be identified (e.g., in the *Feasibility Study*) and discussed at an early stage (ideally at the project preparation kickoff-meeting) with the KfW contract manager and/or the KfW legal team to clarify what changes if any will have to be made to the relevant *Grant or Loan Agreement* template [20], and which will therefore have to be included in the Project Proposal as an implementation condition requiring the approval of the BMZ.

For less crucial RMMV–prerequisites/project-specific RMMV-requirements it may however still be appropriate to address these in the *Grant or Loan Agreement* (e.g., Art. 1.2 Purpose of the Grant/Loan or Art. 6 Obligations of the Recipient/Borrower/PEA), or alternatively in the *Separate Agreement* which is the part of the respective *Grant or Loan Agreement* that describes the project purpose and details [21]. Such RMMV prerequisites/project–specific requirements may, for example, be included in Art. 2.4.2 Special Implementation Agreements of the *Separate Agreement*, or elsewhere therein, as appropriate (see below).

3.1.4.2 Addressing RMMV in the Separate Agreement

In the *Separate Agreement* of a FC project, all its more technical details and other important aspects are described, including the project objectives, activities, timeline, budget, reporting as well as the roles and responsibilities of all project parties. Therefore, the RMMV approach should be mentioned in Art. 1.1 Details of the Project of the *Separate Agreement* and should state the **mix of institutional approaches and technical tool types and data sources** that was proposed in the *Feasibility Study* (> Section 3.1.2 Feasibility Study) and/or agreed in the Minutes of Meeting of the Appraisal Mission (> Section 3.1.3.2 Conducting Virtual Appraisal Missions) or subsequently. If there are **any important prerequisites** to successfully implementing the agreed RMMV approach which are not already covered in the *Grant or Loan Agreement* (> Section 3.1.4.1 Addressing Crucial RMMV Prerequisites in the Grant or Loan Agreement), these should be reflected in Art. 2.4 2.4 Special Implementation Agreements of the *Separate Agreement*.

The main RMMV-related activities of the project should be also considered in Art. 1.2 Time Schedule as well as Art. 1.3 Total Cost and Financing and in the Procurement Plan (Annex 7), as appropriate, and if they are not purely related to *Remote Verification* by KfW (such as a consultant for Third-Party Verification, which would be managed and financed by KfW only):

- **Cost and Financing Schedule:** The financing of the costs for each of the RMMV approaches should be clearly allocated between the project parties. These include initial "setup" costs (such as software, staff training, etc.) and potential long-term costs (e.g., software license renewal). RMMV costs should be clearly stated in the Total Cost and Financing Annex to the *Separate Agreement*. If additional parties are to be contracted independently by the PEA to implement the RMMV approach, e.g., for Third-Party Monitoring, these also need to be considered in the Procurement Plan Annex and the Disbursement Procedure Annex.
- If RMMV approaches require **procurement methods** deviating from international competitive practice, this should be specified in the *Separate Agreement* inappropriate for inclusion in the *Grant or Loan Agreement*. Some RMMV approaches, technical tool types or data sources may require direct procurement or limited bid solicitations, for instance of the Third-Party Monitoring consultant or of a specific software. If such is the case, the respective internal standard procurement procedures of KfW apply and the corresponding outcomes must be documented in the Procurement Plan (Annex 7) of the *Separate Agreement*.

The respective responsibilities and obligations of the project parties with regard to implementation of the RMMV approach are to be set out clearly in Art. 2.1 of the *Separate Agreement*: Responsibilities and Time, Cost and Financing Schedule or in the respective Annexes to the *Separate Agreement* (including Annex 8 Content and Form of Reporting to KfW). This concerns in particular obligations of the recipient, the PEA and any additional project parties, as well as of the *Implementation Consultant* with regard to project implementation and reporting. This could include the rationale for and development of the RMMV approach, provision of information, procurement, use of tool types, data sources, and so on.

In any case where RMMV activities or outcomes are expected to continue after the project ends, the obligations of an institution responsible for the operation of the project or its infrastructure or services must additionally be stated in Art. 2.1 of the *Separate Agreement*.

[20] (i.e., the template Grant or Loan Agreement agreed with the BMZ)

[21] The Separate Agreement is the agreement entered into by and between the KfW and the Recipient and/or PEA, in which all project-specific implementation details are set out and which is part of its respective Grant or Loan Agreement.

The respective **rights and obligations** of the parties should include the following:

i) **The types of information to be collected, by whom and by when (timing), and with whom such information can be shared** (as applicable: the Recipient and/or PEA should be obligated to share information with the *Implementation Consultant* and with other relevant parties, such as third-party monitoring consultants (to be stated for example in Annex 8 on Reporting)

ii) **Access to data or tools by KfW for (Remote) Verification:** If the RMMV approach includes technical tools and/or data sources to which KfW requires access for its *(Remote) Verification* purposes, this should be mentioned in Art. 2.1 or Annex 8 (Reporting). In case project location data are to be collected, the Terms of Reference (ToR) for Project Location Data Collection have to be added as a Sub-Annex to the Reporting Annex 8 of the *Separate Agreement* (> Annex 3.2 The Project Location Template)

iii) A clear allocation of responsibility with regard to ensuring that **data security and data protection requirements** (including those of the relevant jurisdiction) are complied with. For example, if information is to be collected from target groups, the Recipient and/or PEA must ensure that such information will be collected in a secure, anonymous and uncensored manner (to be stated in Art. 2.1 or Annex 8 on Reporting);
In fragile contexts, special data protection and security provisions should be addressed as part of the *Separate Agreement* (e.g., in Art. 2.1 or Annex 8) or as part of the ToR of the *Implementation Consultant* or other parties charged with the implementation of the respective RMMV technical tools and data sources (> Section 2.3.2 Information Security and Confidentiality in FC)

iv) **If target groups or PAP are directly involved in monitoring,** the PEA needs additionally to be obligated to share the unbiased and uncensored observations and feedback of target groups and to ensure inclusiveness in the selected approach, including the mitigation of digital divide risks regarding the exclusion of women or other vulnerable groups (e.g., in Art. 2.1 or Annex 8)

v) **RMMV staffing requirements:**
The RMMV approaches may require the recipient and/or PEA to have suitably qualified staff (for monitoring, managing IT solutions, etc.). These requirements should be clearly specified in Art. 2.1 and/or Annex 3 (Total Cost and Financing);
The assignment of any necessary consultants or other parties required to implement the RMMV approach should be stated in Art. 2.1. Such consultants may include *Implementation Consultant*, a monitoring consultant, a third-party monitoring consultant, an NGO or research institution and/or software/IT *Implementation Consultants*. It should be clear what the responsibilities of each such consultant/entity are and what interaction is required between the consultants/entities, if any. The responsibilities of each consultant and how the different actors are supposed to interact to achieve a set goal should therefore be included.
In some cases, such as if procurement capacities are limited, it may be useful to include an agency contract in the *Separate Agreement* in which KfW agrees to procure the necessary consultants on behalf of the recipient and/or PEA

vi) **Software, licenses, data ownership and their respective costs:** The *Separate Agreement* (and/or Consulting Contract) should define who will obtain and maintain the software required for the chosen RMMV approach and who will cover which related costs during and after project implementation. Depending on the individual case, the details on software/license ownership, ownership of data derived therefrom and responsibility for software/license management and renewal may be defined at a later stage during project implementation as part of preparations for software procurement (> Section 2.2.2). If these matters have already been agreed, the specifics can be stated in Art. 2.1 and/or Annexes 3 and 8 of the *Separate Agreement* or Consulting Contract.

If any of the above aspects are considered **uncertain or a considerable risk,** they can be included in addition to or instead of the provisions per Art. 2.4 2 of the *Separate Agreement*, Special Implementation Agreements.

Any aspects of the RMMV approach relevant to Art. 2.2 of the *Separate Agreement*, **Environmental, Social and Health and Safety Compliance,** will need to be mentioned there and/or in its Annex 6 Environment.

3.1.5 RMMV Aspects in the ToR, Tendering and Contracting of Consulting Services

RMMV is important to consider in this step in the project cycle because the Drafting of the ToR and the Tendering and Contracting of Consulting Services are crucial to ensure that the respective consultants are assigned the tasks necessary for the mix of institutional approaches, tool types and data sources selected for the project, and are sufficiently and adequately staffed, equipped and qualified.

Ideally, the general ToR for the *Implementation Consultant* are already drafted as part of the *Feasibility Study* (> Section 3.1.2 Feasibility Study) or of the project appraisal (as stated in the appraisal mission Minutes of Meeting (> Section 3.1.3 Conducting Project Appraisals remotely), but they usually need to include considerations regarding the institutional setup of the project (> Section 3.1.5.1 General ToR Aspects for the Implementation of an RMMV Approach), be described in greater detail, be adapted to changing circumstances during the project preparation period and be supplemented with additional legal, technical and procurement details, > Section 2.1 Institutional Approaches, > Section 2.2 Overview on Technical Tool Types and > Section 2.3 Legal and Regulatory Conditions and Recommendations.

3.1.5.1 General ToR Aspects for the Implementation of an RMMV Approach

Develop Consulting setup and Terms of Reference (ToR): If any RMMV-related roles and obligations of the recipient and/or PEA are to be delegated to an *Implementation Consultant*, a (third-party) monitoring consultant or to other monitoring entities (e.g., technical and/or financial auditor, NGOs or research institutions), such roles and obligations must be included in the respective ToR and the consultancy contract to be agreed during contract negotiations. Depending on the RMMV approach applicable, the necessary tasks, equipment, tool type(s) and staffing concept must be specified in the ToR.

What to write in the ToR with respect to RMMV:
At a minimum, the ToR should state what mix of institutional approaches, technical tool types and data sources has been agreed, thus defining the RMMV approach of the project [22], including the respective roles and responsibilities of the respective parties involved in implementing the RMMV approach.

A few recommendations worth highlighting from our past experience working with consultants on RMMV:

- **Data quality:** Independently of the type of consultant, the consultant should be responsible for ensuring data quality, including the quality of georeferencing (see below). This is important to have valid data, and also with the goal in mind that collected key data can later on be used by the KfW evaluation department FZ-E as well; this also requires determining modalities of its storage and eventual transmission to KfW at the end of the project, > Section 3.4 End of Project.
- **Project Location Data:** Collection, validation and management of project location data are particularly important for RMMV. Therefore, the KfW standard geo data model and its respective geodata collection ToR have to be included in the ToR of the consultant charged with this task, > Section 3.1.2.3 The Collection of Project Location Information and > Annex 3.2 The Project Location Template.
- **Data protection, privacy, security, and other legal aspects:** where personal(ized) and sensitive data are collected, ensuring data protection, privacy and security have to be part of the respective consultants' responsibilities, > Section 2.3 Legal and Regulatory Conditions and Recommendations.
- **In fragile contexts, the security situation in consultant activity planning and budgeting needs to be considered:** The security situation is very critical and volatile in some target regions or areas. The consultant's offer must contain procedures/methods for taking into account the security situation and obtaining professional advice from relevant risk professionals and state options for different security scenarios that include *Remote Management and Monitoring* of consultant activities and tasks – be it by replacing international with local consultant staff or by deploying appropriate technical tools (that feature auto-lock and data destruction safeguards for the technical tools and data sources that contain personal or other sensitive data).
  To protect staff members during work and travel to and within the project areas, the financial proposal must contain reimbursable costs for reasonable security measures for staff members, offices, living accommodations, vehicles, technical tools, data sources and other needed equipment, as recommended by professional security advisors.

[22] Please Note: This Section only covers additional specifications on RMMV for ToRs.

Detailed ToR Templates have been developed for KfW staff and PEA for consultants to design RMMV approaches as part of the *Feasibility Study* and for consultants to design the setup or expansion of R/MIS for remote project management and monitoring. These ToR can be accessed by KfW staff via the internal KfW knowledge management system.

3.1.5.2 Contractual Setup-up for Procuring Technical Tools

Technical tools that have been selected to implement the RMMV approach of the project which are not already in the possession of the PEA or the *Implementation Consultant* need to be procured out of the project budget (in case of *Remote Monitoring*) or directly by KfW out of a separate budget (if used for *Remote Verification* only). There are three options for such procurement:

- **Option 1: PEA contracts the tool provider:** The PEA contracts with the tool provider directly, independent of any potential *Implementation Consultant* or (third-party) monitoring consultant. This option is recommended if the tool also serves to support the PEA over the long term or if the PEA is the lead for monitoring the project (> Section 2.1.1 Institutional Approach A2). However, the consultant still supports the PEA in developing ToR for the tool provider and supports the process of procuring or developing software and hardware in many cases. This option is chosen if sustainability is an important aspect of using the tool(s) for *(Remote) Management* and/or *Monitoring*.
- **Option 2: Consultant contracts tool provider.** The tool provider is directly contracted by the *Implementation Consultant* or *Monitoring Consultant*. This option is advisable if the consultant is the lead for project implementation, or is even executing the project almost entirely on behalf of the PEA (> Section 2.1.1 Institutional Approach A3), and if sustainability of the tool used is not of primary importance. In such case, procurement of the tool should be included as a task in the Consulting ToR. This option is chosen if independent data collection for *(Remote) Monitoring* is an important aspect of using the tool(s).
- **Option 3: KfW contracts with tool provider:** The tool provider is contracted directly by KfW. The contract is financed from a special BMZ fund or from KfW funds. This allows use of the tool overarchingly across multiple projects and/or may be advisable if the tool is mainly to be used for KfW *(Remote) Verification* purposes (> Section 3.1.2.8 Considerations on designing the KfW Remote Verification approach). However, ownership by the PEA and the consultant to use the tool may be lacking, particularly if the use of the tool is not contractually agreed. Also, in such case KfW has directive authority regarding the technical tool(s) used, and therefore GDPR applies in addition to local data protection regulation (> Privacy Check in Section 2.3.1). This option is chosen if independent data collection for *(Remote) Verification* by KfW is the main reason for using the tool(s).

3.1.5.3 Contractual Setup-up for TPM Consultants and Technical Audits

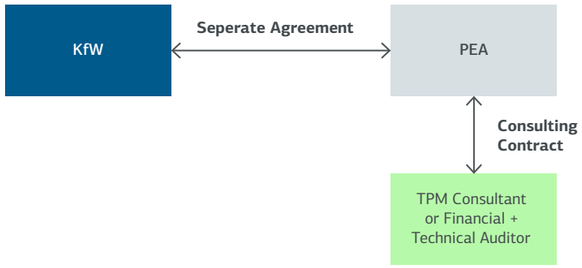
Ideally, the basic contractual setup for TPM consultants and/or auditors (> Institutional Approach A4) is already drafted as part of the *Feasibility Study* (> Section 3.1.2 Feasibility Study) or of the project appraisal (as stated in the appraisal mission Minutes of Meeting, > Section 3.1.3 Conducting Project Appraisals remotely), but the setup usually needs to be spelled out more clearly as part of the institutional setup of the project in the *Separate Agreement* (> Section 3.1.4.2) and in the respective Consulting ToR (> Section 3.1.5.1 General ToR Aspects for the Implementation of an RMMV Approach), and needs to be described in greater detail, adapted to changing circumstances during the project preparation period and supplemented with additional legal, technical and procurement details, > Sections 2.1 Institutional Approaches, > 2.2 Overview on Technical Tool Types and > 2.3 Legal and Regulatory Conditions and Recommendations.

The contract setup for a Third-Party Monitoring (TPM) consultant or auditor firm needs to ensure the consultant's/auditor's independence. To ensure such independence, a TPM consultant can be procured by KfW on behalf of the PEA – either directly financed out of a special BMZ-fund separate from the project budget, or as part of the project budget through an agency contract between KfW and the PEA (> Section 3.1.4.2 Addressing RMMV in the Separate Agreement, point iv), or from KfW funds in the case of Third-Party Verification. A technical auditor can be procured from the project budget as part of the financial audit (in such case the respective audit ToR need to include the respective technical audit).

Option 1 (*Remote Monitoring*): KfW contracts TPM consultant on behalf of the PEA via agency contract: KfW signs an agency contract with the PEA delegating the PEA's responsibilities for procurement, contracting and/or managing of the TPM consultant to KfW. In such an agency arrangement, KfW submits the procurement and contract drafts to the PEA for non-objection. This approach allows financing the TPM consultant through project funds and as part of the project. The agency contract reduces the procurement workload of the PEA, allows KfW to directly assure the quality of the TPM consultant selection process and reduces the risk of payment delays to the TPM consultant in case of reporting conflicts between the PEA and the TPM consultant.

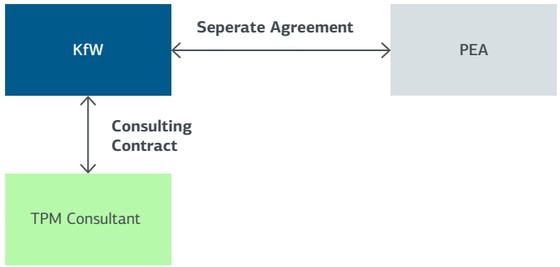
Option 2 (*Remote Monitoring*): Technical Audit is part of Financial Audit: A technical auditor can be procured as a subcontractor under the contract with the financial auditor. This is typically financed from project funds.

Figure 3.4: Contractual Setup: TPM Consultant (Option 1) or Technical Audit As Part of Financial Audit (Option 2)



Option 3 (*Remote Verification*): KfW independently contracts TPM consultant conducting *Remote Verification* from its own funds for TPV: The TPM consultant can be directly contracted by KfW without the consultant having a direct legal relationship with the PEA. This allows for complete independence of the TPV, but has to be agreed in the appraisal minutes of meeting, *Grant or Loan Agreement* (condition precedent) or *Separate Agreement* (implementation agreement).

Figure 3.5: Contractual Setup: KfW Directly Contracts TPM Consultant for Third-Party Verification (Option 3)



Directly contracting the TPM consultant for *Remote Verification* purposes allows the consultant to not cover only one project, but to provide *(Remote) Verification* services for the whole portfolio in the target country. The consultant is fully independent, being contracted and managed directly by KfW.

3.1.5.4 Weighting of RMMV Capacity as Part of Evaluating Technical Offers

Different RMMV approaches require different levels of institutional and technical complexity, different international and local staff competencies and capacities and technical requirements for and qualifications on the part of consulting companies. To ensure the consultant has sufficient RMMV capacity it is recommended to consider the proposed RMMV design and/or relevant RMMV capacities of the bidders for *Implementation Consultant*/(Third-Party Monitoring/Verification consultant in the evaluation grid of the technical offer. The following changes are recommended:

- Include "RMMV approach" as a separate line under proposed concept and methods and assign a specific number of points that appropriately relate to the quality of the RMMV approach design, the complexity of the situation and how much effort RMMV requires relative to other consulting tasks.
- In case of national staff replacing international staff, increase the relative importance of the national team lead vis-à-vis the international team lead. Local staff may take up a considerably higher share of the points usually assigned for the qualifications of proposed international staff.

3.2 Project Implementation and Monitoring by the PEA/Consultant

Once all preparations have been made and the *Grant or Loan Agreement*s and *Separate Agreement*s have been concluded with the PEA, project implementation may start. The PEA is usually responsible for the project itself, managing the project, conducting tenders for suppliers and services and monitoring implementation. KfW experts oversee these steps via various RMMV approaches, tool types and data sources as needed.

If a considerable time lag has occurred between the Feasibility Study stage and the start of implementation, a renewed risk assessment that includes security risks is considered mandatory in fragile contexts.

The following recommendations are ideally to be considered as part of the *Feasibility Study* (> Section 3.1.2 Feasibility Study) or the project appraisal (as stated in the appraisal mission Minutes of Meeting, > Section 3.1.3 Conducting Project Appraisals remotely), and must be agreed in any case within the *Separate Agreement* (> Section 3.1.4.2) and/or the respective Consulting ToR (> Section 3.1.5.1 General ToR Aspects for the Implementation of an RMMV Approach). These recommendations are most relevant to projects or programs the implementation details of which were not yet fully defined in the project preparation phase—for example, specific project sites or specific activities at each site—as is frequently the case in decentralization programs, policy-based financing, multi-donor trust funds, etc.

3.2.1 Remote Investment Identification, Prioritization and Selection

Even if investment information was already collected during the preparation phase, RMMV is important for this step as there can be considerable time lags between the *Feasibility Study* and the start of implementation. Therefore, recent information from the project area is often necessary to establish or update the project's baseline and successfully identify, fairly prioritize, appraise, update and verify the feasibility of individual investments/measures during the inception phase of the project. [24] Various RMMV approaches can be taken for this step. The following are examples of RMMV approaches that could be utilized according to the RMMV Decision Matrix, > Section 2.5:

- **Establishment of infrastructure baseline through satellite imagery:** satellite imagery enables the monitoring of all infrastructure sites, and even their usage within a determined area, > Fact Sheet Earth observation (EO) via Satellites
- **Analyze access to public services through GIS:** GIS modeling enables to gauging access to existing public services in order to strategically select locations for new roads and socioeconomic infrastructure, > Fact Sheet Geospatial Tools/GIS
- **Participatory approaches to factor in target group preferences:** local staff or consultants conduct participatory approaches and photo-document the results in order to take into account the priorities of the community, > Section 2.1.1 Institutional Approach A5 and > Fact Sheet Mobile Data Collection
- **Crowdsource information for planning in emergency situations:** in emergency contexts, crowdsourcing of information on local population needs is obtained using the respective crowdsourcing tools, > Fact Sheet Crowdsourcing Tools

[24] Depending on the extent of project preparation, aspects from remote project preparation may also be relevant in this section. An open program, for instance, may require a needs assessment at the be-ginning of project execution.

3.2.2 Investment Planning

For financing an individual project, the investment planning and impact assessment should typically be done in the project preparation phase. At the start of implementation, the focus lies on updating the initial assessments (as necessary), implementation of the E&S plans (such as ESMP, RAP etc.) and using RMMV to monitor their implementation.

For program approaches, the concrete E&S impact assessment is done for the sub projects in the implementation phase applying an environmental and social management framework that is prepared in the preparatory phase and forms the base for the appraisal. In such case, RMMV is utilized to conduct an initial survey of the selected construction site(s) and the initial Environmental and Social Impact Assessments.

After the initial surveys, monitoring and verification of the ESMP and the RAP will have to be conducted using institutional approaches, tools, or data sources. Various technical tool types can be used for this. The following are examples:

- **Evaluate satellite images to identify environmental and social risks:** key environmental and social risks can be identified through satellite imagery, such as current land use (resettlement) and the natural environment, such as ecosystems (environmental risks), > Fact Sheet EO via Satellites
- **Use UAVs/drones to identify environmental risks:** for a more detailed assessment of environmental risks, UAVs/drones can be used, > Fact Sheet Drones/UAV
- **Mobile Data Collection and Crowdsourcing citizen feedback:** mobile data collection and crowdsourcing tools can help participatory planning by soliciting beneficiary/target groups recommendations and feedback on individual plans and measures from a wider audience than through traditional participatory approaches, > Fact Sheets Mobile Data Collection and > Crowdsourcing Tools

3.2.3 Selection of (Construction) Contractor(s)

Projects using RMMV may face a higher risk of collusion of bidders and delays during contractor selection because projects with locations with access problems are less attractive to bidders, construction cost being more difficult to calculate. Security conditions may make it difficult for international *Implementation Consultant* staff and PEA staff to gather in the same place for the bid openings and evaluations, thus suitable procurement procedures have to be agreed, such as virtual pre-bid meetings, live/web-streaming of national/local openings/evaluation committees, e-tendering, and so on.

Wheresuch risk exists, to avoid receiving bids from "ghost" companies, KfW's national expert or the *Implementation Consultant* may visit potential bidders during the prequalification stage to verify whether they have correct information regarding staff and machine park. This process has been applied in the, > Inclusive Community Development and Decentralization project in Madagascar (PN: 33436).

Limited procurement among a list of preselected contractors may make sense to ensure contractor quality and their ability to respond to difficult security situations. If this has been identified as a useful risk mitigation measure in the respective country, it can already be specified in the ToR for the *Implementation Consultant*.

3.2.4 Remote Management by the PEA

One challenge in an RMMV context is keeping all relevant PEA staff informed and ensuring good communication well with stakeholders in various locations. Various RMMV approaches can be used for this step. The following are examples:

- **(Remote) Management Information System for the project:** a remote management information system is procured for the project. On top of georeferenced photos of different project stages, it can include further project management relevant information, such as preparatory studies, financial and technical documentation per site, and so on, > Fact Sheet R/MIS
- **Data room for construction project management:** a data room is a common tool in the construction industry for communication and document management, > Fact Sheet Collaboration Tools
- **Building information modeling (BIM) for remote site planning and site supervision:** building information modeling can also be used for preparation and management of infrastructure measures, > Fact Sheet BIM

3.2.5 Remote Site Supervision and Acceptance of Works

Site supervision and acceptance of works by the PEA/Implementation Consultant is crucial for project success, thus posing a considerable challenge in RMMV contexts. While in standard FC projects, international staff at least conduct spot checks or are even present on the construction site for the full project duration, this is usually not possible in RMMV contexts. Site visits are furthermore essential, as they form the basis for releasing additional tranches of payments to construction firms, see also, > Section 3.3.2 How to Conduct the Verification of the Use of Funds Remotely. Site supervision is also essential in terms of ESHS. In particular it has to be assessed whether the ESMP is adequately implemented, including occupational health and safety considerations, labor conditions, such as in workers' camps, environmental conditions on the construction site and community health and safety-related aspects like traffic management, and so on.

Collecting evidence on site is thus crucial to demonstrate that mitigation measures as part of the above-mentioned ESMP are actually implemented.

Final output monitoring and release of guarantees usually requires additional inspections that can be executed via different RMMV approaches.

Sending local or regional project staff to do site supervision is a crucial basic element of site supervision. Various RMMV approaches can be used for this step. The following are examples:

- **Simple milestone-based monitoring by local staff:** Rather than paying the construction firm according to the actual amount of material used, payment is made according to the achievement of simple visual milestones (e.g., foundation built, structure completed, roofing finished), allowing monitoring by less technically qualified staff, > Section 2.1.1 Institutional approaches A2 and A3.
- **Site supervision by regional engineer:** a regional engineer (e.g., West African in Northern Mali) regularly visits the site. The same can be applied for a regional Environmental and Social Expert to conduct site supervision and assess whether the ESMP and further sub plans, if any, are being diligently implemented, > Section 2.1.1 Institutional approaches A2 and A3.
- **Monitoring support with ESHS Tools (Apps):** KfW national experts, local consultant staff and/or PEA staff can monitor ESHS items/issues via mobile phone app. The content of the check-list templates in the app needs to be prepared upfront by ESHS experts (KfW KC US can provide advice), > Fact Sheet Mobile Data Collection Tools.
- **Georeferenced photos or videos:** georeferenced photos or videos are taken at the construction site, for example by local engineers, to establish the baseline and then document the progress of works (e.g., reconstruction of transmission lines) and of specific elements and for monitoring of environmental and social conditions > Fact Sheet Mobile Data Collection Tools and, > Fact Sheet Cameras and > Fact Sheet Geospatial Tools.

Remote Sensing technologies can help the PEA and the consultant to triangulate information and monitor progress during those intervals when staff cannot be present:

- **24/7 webcam supervision at a construction site:** webcams can be installed to continuously monitor progress on construction sites. But this may bear some data privacy issues, > Fact Sheet Cameras
- **UAV/Drone recording** to supervise individual construction sites: UAV/drones can be used to supervise construction sites, > Fact Sheet Drones/UAV
- **Progress monitoring of infrastructure via satellite imagery:** infrastructure can be identified on satellite imagery, which is why it can also be used for output monitoring, > Fact Sheet EO via Satellites.

Additional stakeholders can be engaged for site supervision, which is very useful for triangulation:

- **Monitoring by local government institution:** local government and community stakeholders may complement monitoring efforts by PEA and consultants, > Section 2.1.1 Institutional Approach A6
- **Peer monitoring:** other development partners, such as NGOs active in the region, can be asked to support monitoring, > Section 2.1.1 Institutional Approach A6
- **Citizen monitors** are individual citizens who support the monitoring of e.g., construction progress or monitor environmental and social aspects. They can either be recruited through a local committee or by selecting individuals who are actively participating through crowdsourcing tools, > Section 2.1.1 Institutional Approach A5 and > Fact Sheets on Mobile Data Collection and > Crowdsourcing Tools.

3.2.6 Feedback by Target Groups/Beneficiaries and Project–Affected Persons (PAP)

At specific points or regular intervals during project implementation, feedback from target groups, beneficiaries and PAPs is collected via participatory approaches > Section 2.1.1 Institutional Approach A5. Various RMMV approaches can be used for this step. The following are examples:

- Collection of target groups' **needs/feedback/opinions/observations through participatory approaches:** Rural Participatory Appraisal, Village Mapping and so on, conducted by specialized local consultants of all genders speaking the local language(s) > Annex 1 Glossary.
- **Digital Grievance Redress Mechanism** (e.g., > UFK Iraq, (PN: 37581)): the main PEA utilizes such a mechanism so that people can anonymously disclose irregularities on project sites, > Fact Sheet Crowdsourcing Tools.
- **Interactive radio shows:** local radio is asked to host a show about the project where citizens can call in and anonymously voice feedback on the project, > Annex 1 Glossary. Example: Interactive radio project by Deutsche Welle in preparation for the KfW-financed > Decentralization Support Program in Togo (PN: 30205)
- **Local user feedback via automated SMS questions** (via Mobile Data Collection or Crowdsourcing): users are encouraged to participate in an SMS survey regarding Use, Operation and Maintenance Answers (Voice, VoIP and/or text) are recorded and analyzed (semi-)automatically, also > Decentralization Support Program in Togo (PN: 30205).

3.2.7 (Remote) Monitoring of Resettlement Activities

If physical resettlement is necessary, it can be assessed via satellites or UAV/drones whether new houses/structures have been built and/or old structures demolished. The same can be done to assess whether economically displaced land-based affected persons or female traders have received new/substitute agricultural land or market stalls (ex-ante **Detailed Measurement Survey**). In addition, a **Resettlement Completion Audit** is also needed to demonstrate whether all provisions of the resettlement action plan have been implemented and livelihoods restored. For this, satellites and drones can be used to check what exactly has been built. A national social expert, closely supervised and trained by an international resettlement specialist, would then check whether all eligible persons were entitled and compensated as planned in the RAP.

3.2.8 Remote Monitoring of Operation and Usage

Outcome monitoring is also challenging in RMMV contexts, as it requires constant functioning and reliable data generation, even after project ending. It involves measuring usage of infrastructure and monitoring of operation and maintenance. Expectations of what is being measured differ greatly by sector, thus many different RMMV approaches may be used. Technical tools promise to generate reliable data streams at relatively little cost, thus there are many such tools of various types usable for outcome monitoring. The following are examples:

Ad-hoc surveys: an individual standalone survey is conducted on project outcomes and usage among the target group, perhaps one year after operation, > Annex 1 Glossary and, > Fact Sheet Mobile Data Collection

Usage of national data/PEA's MIS or MMS: internal data of the PEA or operating utility can be used for outcome monitoring, > Fact Sheet R/MIS or > Maintenance Management Systems

Local user feedback via automated SMS questions: users are encouraged to participate in an SMS survey regarding use, operation and maintenance answers (voice and/or text) are recorded and analyzed automatically, > Fact Sheet Crowdsourcing Tools.

Sector-specific approaches:

Biodiversity and agriculture sector examples

- Analysis of **vegetation cover through GIS:** satellite imagery enables monitoring the increase of vegetation by measuring the proportion of reflected green light of an area, > Fact Sheet EO via Satellites
- **Audio sensor to record wildlife or hazardous sounds**: audio sensors are installed in protected areas to record sounds of wildlife and hazards through automated detection, > Fact Sheet Sensors/Smart Meters
- **GIS system to supervise marine reserves:** a system where all vessels have to register and install an on-board monitoring system prior to entering the marine reserves, > Fact Sheet Geospatial Tools
- **Measurement of water flow in irrigation canals or in dewatered reaches of hydropower projects to ensure environmental flow:** sensors are placed in irrigation channels or below the weir in case of hydropower projects to measure flow rate, water level and water quality, > Fact Sheet Sensors/Smart Meters.
- **Counting of wildlife via manned airplanes:** certain wildlife species are counted via airplane to evaluate the success of protection measures, > Fact Sheet Drones/UAV.

Traffic/population movement sector examples

- **Inductive-loop traffic detectors:** an insulated, electrically conducting loop is installed in the pavement to measure traffic, > Fact Sheet Sensors/Smart Meters.
- **Evaluate population movement through mobile phone data:** population movement is modeled through an evaluation of mobile phone data received from a mobile network operator, > Fact Sheet Data Sources (big data).

Utilities (water and electricity) sector examples

- **Smart meter:** water or electricity meters that not only record usage but also directly report the information to the utility firm, > Fact Sheet Sensors/Smart Meters.

Regional economic development sector examples

- **Estimate regional economic activity through mobile phone big data:** analyzing big data automatically generated by mobile phones enables estimating of economic activity within a given region, > Fact Sheet Data Sources (big data).

3.2.9 Remote Monitoring of Maintenance

Various RMMV approaches can be used for this phase in the project cycle. The following are examples:

- **UAV/drone flight for maintenance of infrastructure:** UAVs/drones are equipped with special cameras or sensors that can verify the functionality of certain infrastructures (roads – potholes, power cable – flowing electrical current), > Fact Sheet Drones/UAV.
- **Infrastructure maintenance management software:** an infrastructure maintenance management software can be procured to support the operator in managing his infrastructure assets, > Fact Sheet Maintenance Management Systems.
- **Satellite imagery to monitor condition of large infrastructure:** satellite imagery can be used to monitor the condition of large infrastructure and inform maintenance decisions, > Fact Sheet EO via Satellites.

3.2.10 Capacity Development for RMMV

Implementing RMMV approaches, especially participatory approaches, and specific technical tools in most cases requires greater capacity in terms of national and local staff. Training and equipping target group members, representatives and/or extension workers should equally be considered depending on the approach(es) and tool type(s) envisioned. Staff need to understand monitoring procedures and the technology involved as well as participatory approaches, local culture and local languages. Even if staff are experts in participatory approaches, they may need training in how to use specific tools or methods. On the other hand, technical expert staff (engineers/technology experts) may require additional training to ensure quality monitoring and on how to handle or use specific tool types or software.

Moreover, RMMV can serve as an entry point for developing digital capacities and competencies across all project stakeholders, with long-term positive impacts.

Various RMMV approaches and tool types can be used for developing local capacities remotely.

The following are examples:

- **Support to monitoring system by Implementation Consultant:** The *Implementation Consultant* supports the PEA to develop an adequate M&E system and verifies the correctness of these data.
- **Use massive open online courses (MOOCS) to build RMMV capacity:** MOOCs are online available courses that can be easily accessed by staff and other stakeholders for training on general M&E topics and on the relevant RMMV approaches and/or tool types, such as on using specific software. For project-specific user trainings however, tailored training solutions are often necessary, see below > Fact Sheet eLearning Tools.
- **Virtual training:** Specific project-related training needs can be provided via virtual training seminars, developed by the international project *Implementation Consultant*, for example, and administered to the national and local staff, > Fact Sheet eLearning Tools. KfW also offers training seminars on RMMV for its national and international staff, partners and consultants.
- **A tailored capacity development concept must** be developed and implemented for each project by the *Implementation Consultant*, including a blended learning concept with online training seminars as well as face-to-face training if possible and a comprehensive concept on how interaction between local, national and international staff is to be conducted, including backstopping and how information management is implemented. This should be explicitly mentioned in the ToR for the *Implementation Consultant*.

3.3 Remote Verification of Project Progress by KfW

If due to the security situation or other specific circumstances of the project a physical progress review is not possible or cannot be carried out by KfW itself, wholly or in part, this must already be taken into account in the planning phase of the project if such risk has been identified at that stage. In such case, a *Remote Progress Review* has to be conducted using the institutional approaches, technical tools and data sources per > Section 2, including particularly > Section 2.5 RMMV Decision Matrix as well as the Sections below.

In its first regular project progress report, KfW's client is informed about the chosen RMMV approach and related RMMV risks.

It is important to note that even if KfW HQ staff have direct access to the project's monitoring/management information systems, > Fact Sheet (Remote) Management Information Systems, it is not feasible in terms of cost and effort for financing institutions such as KfW to continuously review all information available in such systems. To mitigate these risks, the *Remote Verification* responsibilities of KfW staff need to be clearly defined, for example by establishing clear procedures for when and how system data are reviewed by KfW, such as in "remote or virtual project progress review missions." Such procedures together with the planned RMMV approach should be documented in the planning document for verifying use of funds.

3.3.1 How to Conduct a Remote Progress Review

Progress and final reviews/inspections are necessary steps in the FC project cycle to verify the project implementation vis-à-vis the requirements set forth for the Project Executing Agency (PEA). These are typically carried out by the KfW PM and/or the technical expert. A virtual or remote progress review is a progress review that needs to be conducted outside of the target location or country. General progress and final review procedures as defined by KfW are detailed in the KfW internal standard operating procedures.

It cannot be over-emphasized that virtual reviews can never adequately replace a physical, in-person review visit, as with the former it is difficult to gain access to information that enables impartial and independent assessment. Itis thus advised to first explore all options for obtaining information first-hand. Has the target site been visited by KfW staff before? Is there a local resource (e.g., local consultant) who could be utilized for independent observation, discussion and analysis? This information can then be supplemented by remote or virtual data sources and data collection tools.

The entire process of preparation, conducting the virtual review mission and follow-up activities takes on average 2-3 months to complete. A virtual review or inspection mission can range from 1 to 10 working days in lenght depending on the complexity of the project and the number of issues involved. The steps in conducting a virtual/remote progress review and final review along with key considerations are next summarized below.

3.3.1.1 Preparation of Remote Project Progress Review

Thorough preparation is required for an efficient progress review or final review mission. This is an opportunity to identify key point of contacts, priority issues and limitations, and make appropriate arrangements prior to conducting the review mission. It is important to budget sufficient time to preparations for a virtual or remote review.

The more information we can collect the easier it will be for us to plan. Explore various options and sources of information, including Open Data (> Section 2.2.3. The Use of Data Sources), existing reports, direct consultations with the KfW country office, PEA, government entities consultants, NGOs, research institutions, other partners, and other such options. Where possible, explore whether other international lenders or donors in the country or near the target site could also provide useful information.

Key aspects to consider during the preparation phase include, but are not limited to, the following:

Table 3.3: Checklist on How to Prepare a Remote Project Progress Review

Step	Aspects to consider
Scheduling	• Availabilities of the relevant parties (incl. technical expert, PEA representative, consultant, etc.) • Religious/political events (e.g., Ramadan, elections)
Define goal of the review	• Define goal—what do we what to achieve? • What information do we already have and what is still needed? • Define materiality threshold
Define review scope	• Scope and boundary to be determined by the PM and technical expert • Define threshold values internally • Determine stakeholder groups and PAP to include in the focus group discussions
Define Roles and Responsibilities	• Determine/agree on the review lead–PM, technical expert, KfW national expert, PEA • Define role and responsibilities of the team members
Remote Progress/Final Review Concept	• Guidance and instruction to be given by the PM/KfW national expert to the implementation consultant, and by the international KfW technical expert to the national KfW technical expert • Concept proposal by KfW national expert based on template provided by the PM/technical expert. Draft proposal by KfW national expert to be approved by PM and technical expert • Identify relevant points of contact (with the PEA and the consultant) • Based on the information/data identified as relevant and necessary, draft a document request list and share with the PEA in advance. Consider existing information (i.e. reports, minutes of meeting, etc.) • Verification of the use of funds: Incorporate elements of surprise (e.g., unannounced KfW national expert visits, if feasible) • Sample should be selected/determined by KfW, not the consultant, partner, etc. • Multi-stakeholder engagement – involve partners at different levels (central, provincial, local, etc.)
Tools, Platforms and Interfaces	• IT infrastructure – access to IT tools and platforms. Identify common tools and platforms that work for all parties. • Availability and access to computer and internet. • Specific restrictions? Are we limited to certain tool types and platforms? Which tools can be accessed by all parties? > KfW Digital Rights Check

3.3.1.2 Conducting Remote Project Progress Review Mission

The purpose of a progress review mission is to assess and verify the state of progress as well as the proper use of funds by the recipient or the PEA. In the absence of on-site assessment, information collection is limited to virtual means. Depending on the discussions during the preparation phase, a Virtual Review Mission can take place via telephone/video conference, and documents and access to tools and data sources can be shared, reviewed and/or discussed electronically. It is therefore important to ensure that the aspects considered during the review preparation phase are implemented.

Although key aspects have been agreed with the various stakeholders during the review preparation phase, it is nevertheless recommended to distribute a reminder (e.g., per email) at least one week prior to start of the planned review mission. The agenda of the virtual review mission should also be circulated. The purpose of the reminder is to ensure the participation of key stakeholders and the timely provision of information, and allow time to make adjustments to the agenda if needed. Also, check whether the relevant technical tool types (e.g., Collaboration Tools and R/MIS) are accessible to all review participants.

At least three days prior to the scheduled review mission, check if the meeting dial-in information has been distributed to all required participants. Where necessary, follow up with the key points of contact (e.g., PEA, consultant) if no response to the reminder email has been received.

The aspects to consider in a Virtual Review Mission are very much similar to those of a conventional review mission. These are summarized as follows:

Table 3.4: Checklist on How to Conduct a Remote Project Progress Review

Step	Aspects to consider
Kick–Off Meeting	• Introduction • Present an overview of agenda. Discuss and agree on any last-minute changes • Select projects to be reviewed in detail • Consultants can be invited depending on project type, context and level of trust
Project Review	• Where available, use (Remote) Management Information Systems (R/MIS) to conduct joint project reviews • Involve relevant persons as defined during the review preparation phase
Focus Group Discussions with external stakeholders (e.g., target group(s) and PAP representatives)	• Frequently facilitated by the PEA/recipient, in some cases by consultants or NGOs – responsibility has to be determined during the preparation phase, ensuring active participation and access to the technical tool types to be used during the review mission • Prior to the meeting, determine the appropriateness of having PEA/recipient present during these meetings. Separate meetings without the PEA/recipients and/or contractors can sometimes yield more honest feedback • Be aware of cultural and gender considerations (also as part of preparation activities) and sensitize staff as to respecting these • Conduct “empathy-oriented” interviews (i.e. more than just gathering factual information) • Protocol the results of the meetings but do not process or publish any personal information of participants. Anonymity of the project-affected persons must always be protected, see > Section 2.3.1 Privacy Check
Virtual site visits	• Access to sites by PEA/recipient and KfW national experts • Safety and security of the site(s) • Potential deployment of tools and equipment to allow capturing of the site situation (e.g., drones, cameras, 306 ° cameras) • Permit requirements
Document Review	• If possible, ask to have the documents ready prior to the start of the review mission • Where necessary, ask the PEA/recipient to be available during the review sessions to allow clarification of questions • Cross-check against requirements per the Separate Agreement and challenge information provided • Highlight any information gap
Closing Meeting	• Date and time should be confirmed during the kick-off meeting • To be participated by the key project parties (e.g., PEA/recipient representatives, PM, technical expert, E&S expert, etc.) • Ensure the meeting dial-in details are circulated in advance • Summarize the review findings in a Power Point presentation or equivalent. Where possible, use photos to illustrate findings • If the Closing Meeting presentation is to be distributed, care should be taken to remove or to redact confidential information and any information that could disadvantage or serve to identify target group representatives or the PAP without their explicit consent • Thank participants for their time and support during the review mission

3.3.1.3 Follow-Up Activities

Following the review mission, hold a debriefing meeting with the team members within one week of the Closing Meeting to a) reflect on the review mission process, b) discuss challenges and lessons learned, and c) set the timeline for completing the Monitoring Report and define roles and responsibilities.

Summarize the review findings in a Monitoring Report and submit to KfW Management for review.

Establish a Corrective Action Plan (CAP) based on the findings of the review mission. The CAP should include a concise description of the findings and the corresponding corrective actions, and define individuals/functions responsible for implementing corrective actions. Set timeline for completing the corrective actions. Share the CAP with the PEA/recipient and schedule a call to explain the findings and the corrective actions. Obtain PEA/recipient's acceptance to CAP in writing.

Use CAP as the basis for follow-up and to track progress in the next progress review.

3.3.2 How to Conduct the Verification of Use of Funds Remotely

If due to the security situation or other project–specific circumstances physical supervision of the use of the funds is not possible or cannot be carried out by KfW itself, wholly or in part, this must already be taken into account in the planning phase of the project if such risk has been identified in the planning stage.

The particulars must be justified and alternative procedures selected as part of planning for auditing of the use of funds, > Section 2, in particular > Section 2.5 RMMV Decision Matrix as well as > Section 3.3.1.

If an on-site audit is not not possible, wholly or in part, even if only temporarily

a. this must be documented and justified
b. a procedure should be chosen that adequately implements requirements for auditing of the use of funds, > Section 2.5 RMMV Decision Matrix
c. in case of budget funds and development loans, the respective client, e.g., the Federal Ministry for Economic Cooperation and Development or the ministry that issued the promotional mandate, must be informed.

If adequate verification procedures are not available either, the respective client of KfW for the project must be informed that KfW can only fulfil its monitoring obligations to a limited extent.

In the case of highly fragile contexts, the *Implementation Consultant* is often charged with managing project funds on behalf of the recipient (> Section 2.1.1 Institutional Approach A3, sometimes also > Section 2.1.1 Institutional Approach A2). In such contexts, the *Implementation Consultant* should be requested to keep the original procurement and accounting documents in a safe location, e.g., at the consultant's HQ. *Remote Verification* of the use of funds can then be conducted by KfW staff at that location.

If international transfer of the original documents is not feasible (although the security situation allows such), it is recommended to plan for regular accounting-based audits of use of funds by qualified national auditor firms on-site or in-country during project implementation. You may also consider involving KfW national experts to a greater degree in this regard.

3.4 End of Project

An FC project usually ends once all of its planned activities have been either executed or permanently suspended. Any works completed during the project implementation phase are subject to a provisional commissioning/acceptance procedure, followed by the final commissioning/acceptance procedure after elapse of the warranty/guarantee period (i.e. 12 months in most cases). KfW performs a final review, ideally between provisional and final commissioning/acceptance,. In many cases, an ex-post evaluation of the project impact is conducted after a predefined period following final review.

3.4.1 Commissioning/Acceptance of Works

Generally, the provisional and final commissioning/acceptance of works are conducted by the PEA and/or the *Implementation Consultant* as part of their *(Remote) Monitoring* activities. If they face challenges regarding the accessing of project sites, they may also resort using alternative institutional approaches and technical tools, although this step is very difficult to conduct remotely: a highly qualified technical expert usually needs to touch the items and perform a number of tests. Virtual site visits, > Section 3.3.1.2 Conducting Remote Project Progress Review Mission, may substitute for the required checks in part, but are usually insufficient for a full performance test. If physical commissioning/acceptance of works on site is not possible, this problem needs to be communicated to KfW and solutions be agreed among the main project parties (including adapting the time schedule in case of temporary access problems). Also, the respective client of KfW, e.g., the Federal Ministry for Economic Cooperation and Development (BMZ) or the ministry that issued the promotional mandate for the project, must be informed by KfW.

3.4.2 Remote Final Project Review by KfW

Regarding the preparation and implementation of the remote final review, the same procedures apply as for a remote project appraisal and auditing of use of funds, > Section 3.1.3 Conducting Project Appraisals Remotely and > Section 3.3.2 How to Conduct the Verification of Use of Funds Remotely.

The final review will generally take place:

- once the funds have been disbursed or more than 90% of the funds have been disbursed
- after provisional acceptance of the project equipment or after readiness for operation has been achieved
- in the presence of the *Implementation Consultant* where possible, well in advance of expiry of the warranty/guarantee period.

The final review as a rule involves an on-site inspection. This can only be waived under exceptional circumstances where a rationale is given. In such cases, the necessary data (especially on use of funds) should be gathered by other means and evaluated:

If due to the security situation or other project-specific circumstances a physical final project review or inspection is not possible or cannot be carried out by KfW itself, wholly or in part, this must already be taken into account in the planning or implementation stages of the project, depending on the stage in which such risk has been identified. In such case, a Remote Final Project Review has to be conducted using the institutional approaches, technical tools and data sources per > Section 2, including particularly > Section 2.5 RMMV Decision Matrix. The same recommendations stated in > Section 3.3 Remote Verification of Project Progress by KfW above apply.

When using the RMMV *Decision Matrix* however, the importance of the information needs regarding **Outcome and Impact Monitoring** increases considerably and the RMMV approach needs to be adapted accordingly. Usually, the collection of feedback from target groups and PAP on the projects outcomes and impacts observed so far is part of the final review, which needs to be conducted in a safe manner for all participating parties.

Also, during the remote final project review the necessary data for ex-post evaluation of the project should be recorded and safely transferred to KfW.

If the project uses an R/MIS, we highly recommend including in the ToR of the PEA and/or *Implementation Consultant* in charge of managing the R/MIS the assurance of keeping the R/MIS accessible to KfW until remote final review by KfW. It is also advisable to include an Erasure Policy (> Section 2.3.1 Privacy Check) as well as auto-lock and data destruction safeguards in fragile contexts for technical tools and data sources that contain personal or other sensitive data. We also recommend consulting the > KfW Digital Rights Check.

The remote final project review concludes with jointly drafting and signing of the Minutes of Meeting with the PEA at its end and a back-to-office report including the final review concept stating the RMMV approach chosen and the reason(s) for having to conduct the final review remotely.

3.4.3 Ex-post Evaluation by KfW

RMMV is important to be considered in this step of the project cycle because remote ex post evaluations (EPE) can rely on many of the approaches that were discussed previously. EPEs usually take place more than two years after the project implementation ends, thus the important question is how and under which conditions the above-mentioned tool types can be used for ex-post evaluations.

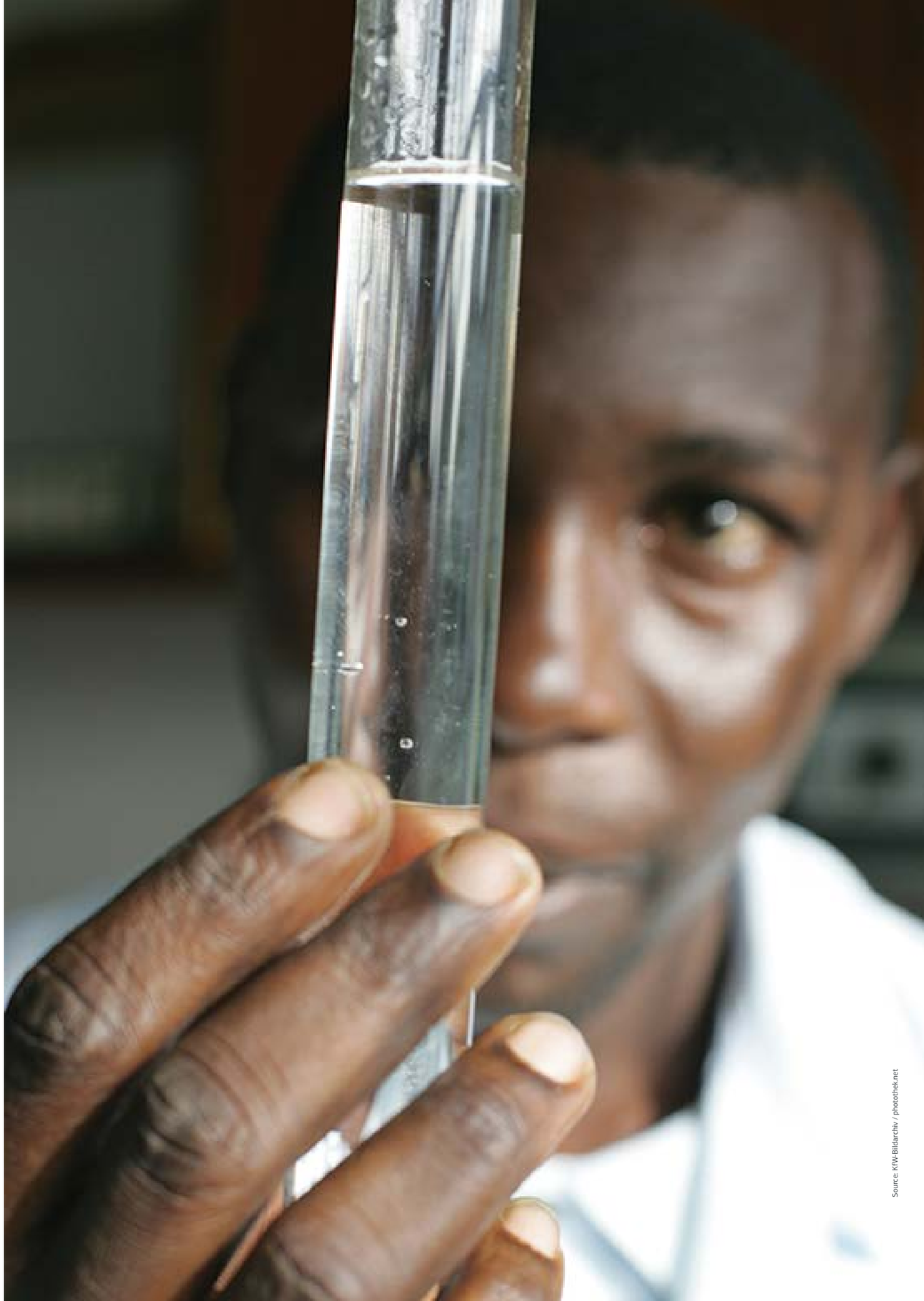
Data visualizations and analyses (data elements) help close information gaps, triangulate available data (e.g., from the project executing agency or consultant) and crystallize and illustrate central statements from larger amounts of data. This is important for targeting a selection of intervention sites and target groups appropriate to the project objectives during project preparation, appraisal, implementation, monitoring and evaluation.

The Evaluation Department of KfW (FC-E) is always looking for new ways to conduct evaluations of projects that are as data and evidence-based as possible. In some cases, data elements are used to triangulate information from on-site evaluations or identify particularly relevant project sites to be looked at more closely in an evaluation visit. In the context of the COVID-19 pandemic, data elements are becoming increasingly important for conducting evidence-based evaluations remotely without travel.

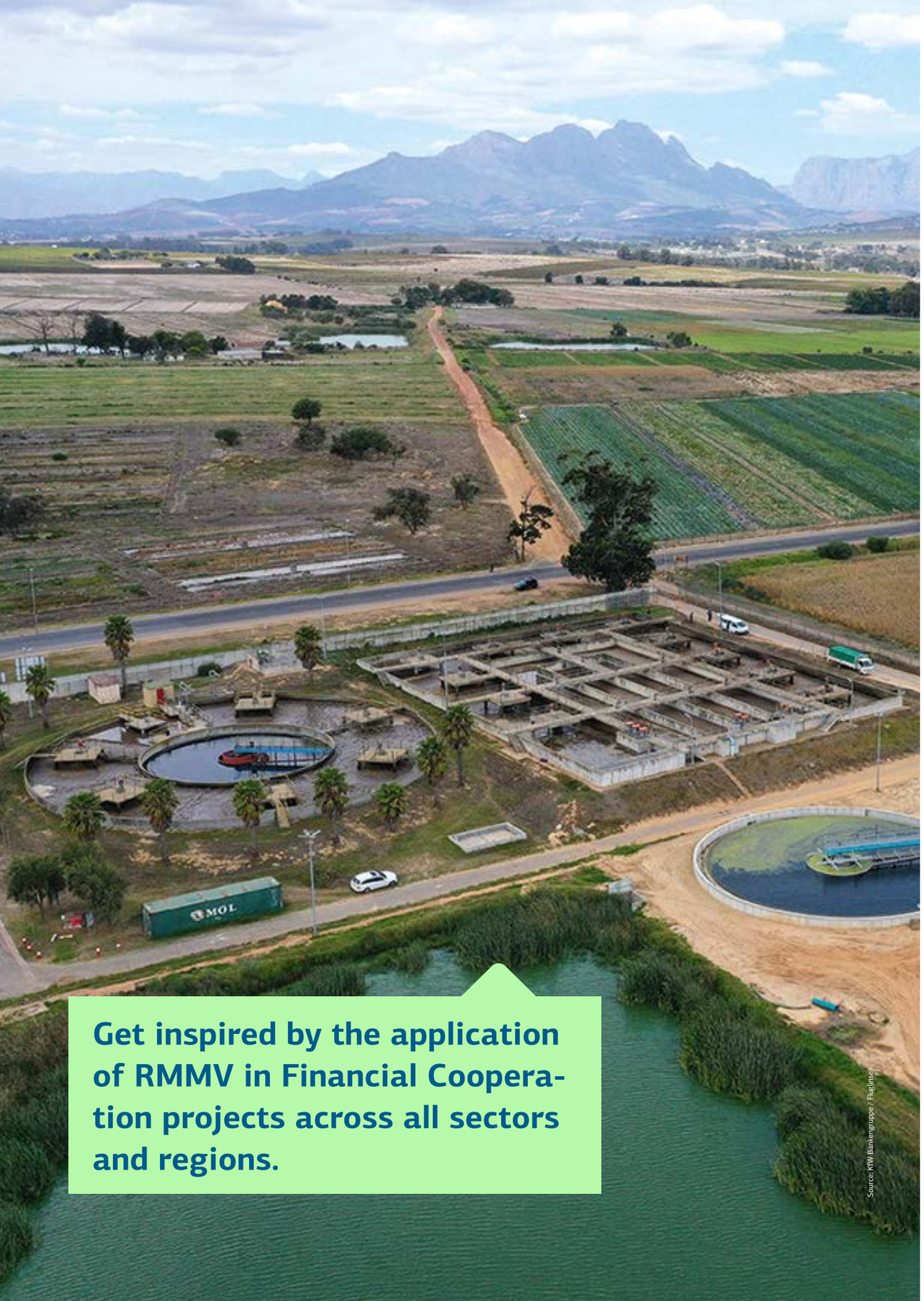
In March 2020, FC-E published a brief guide on remote evaluation techniques. Nevertheless, remote data elements can never fully replace project visits, as some information can only be obtained through interviews and site visits.

FC-E considers whether a local evaluator should be used and/or secondary data can provide insights on a case-by-case basis. It must be noted that statistical methods can only be used to measure the effectiveness of the FC-E intervention in a few cases. Still, descriptive information and visualizations can be helpful, e.g., for assessing the targeting of project sites or analyzing developments between project appraisal and evaluation. However, observed changes are not necessarily causally attributable to the project; rigorous impact evaluation methods are particularly suitable for this purpose. These allow evaluators to look not only at the development of indicators over time but also at in comparison to the development thereof for similar sites/target groups (control group), and to control for other factors not influenced by the project.

In > Section 4.2, examples of data elements that FC-E has previously used in ex-post evaluations and have been prepared remotely are presented.



Source: KfW-Bildarchiv / photothek.net



Source: KfW Bankengruppe / Fluglinse

Get inspired by the application of RMMV in Financial Cooperation projects across all sectors and regions.

KfW RMMV Project Experience

4

4.1 Examples of Using RMMV for Project Preparation

4.1.1 Forecasting Floods Using Open Data for Project Preparation in Gaza

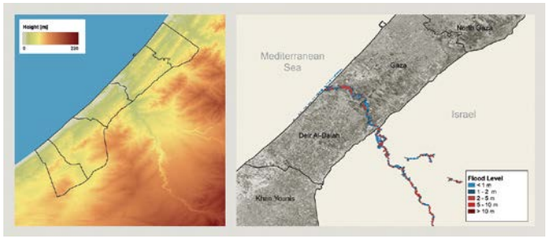
Project: Storm Water and Renewable Energy for WASH Facilities in Gaza (PN: 54338)

Open, freely accessible data was used for the site selection of a flood protection project in the Gaza Strip.

Background situation: In the densely populated Gaza Strip, devastating floods occur regularly. The drinking water situation is extremely tense, with only a very small part of the population having safe access to clean water. The coastal aquifer has been overexploited for years and is affected by salinization due to seawater intrusion, so that water suppliers increasingly have to shut down wells. The project, which is currently being prepared and is to be implemented by the responsible Water and Wastewater Association in Gaza, also aims to regenerate the groundwater, even though the first priority is protecting the population.

Project measures: Which areas in the Gaza Strip are threatened by flooding? To plan flood protection infrastructure and prioritize locations, publicly available data from various sectors was collected and analyzed. This eliminated the need for costly and time-consuming onsite inspection of the area, which in the Gaza Strip would only be possible with a high degree of coordination and stringent security measures. A digital model of the data with a grid resolution of 250 meters was created for the 360 square kilometer area of the Gaza Strip. This showed that there is special risk of flooding in the vicinity of Wadi Gaza. The model also visualizes lower-lying depressions that are at risk of flooding during heavy rainfall.

RMMV approach: The basic information and maps are based on Google Maps and maps from the United Nations Office for the Coordination of Humanitarian Affairs (> OCHA) as well as other data sources (institutional RMMV approach A6, see > Section 2.1.1). The terrain elevation model with 30-meter resolution was provided by > ESA (Copernicus Digital Elevation Model COP-DEM GLO-30). The project received data on flood areas and statistics from the > Joint Research Center (JRC) of the European Commission. Regional precipitation statistics were provided by the > German Weather Service, > NASA and the > Center for Climatic Research at the University of Delaware. Since no public sources of terrestrial precipitation measurements were available, values from neighboring measuring stations and model-based



Left: Digilal elevation model, Right: Flood Hazard Map

Source: OCHA (https://data.humdata.org/dataset/cod-ab-pse), ©2022 Google, TerraMetrics, Flood Hazard Map by European Commission (http://data.europa.eu/89h/1d128b6c-a4ee-4858-9e34-6210707f3c81), ESA (https://spacedata.copernicus.eu/en/web/guest/collections/copernicus-digital-elevation-model)

estimates from satellite data were used. General data on water consumption in the past from the > European Geosciences Union was available. The open data from the various sources was compiled using QGIS software.

Impact and success factors: Analyzing the data afforded better preparation for discussions with project partners and clients. Locations, types and dimensions of the envisioned flood protection infrastructure could thus be determined in advance. If a preparatory visit is not required, the method is not only suitable for areas that are difficult to access but also for large areas and entire stretches of land in order to gain a preliminary understanding of the topographical and morphological site conditions. The visualization of watercourses without costly data acquisition rapidly yielded avisible, pictorial result. The main result in this example is the verification of statements about areas at risk for flooding, the existence of depressions without natural runoff, and the presence of settlements and economic activity in the investigated areas which need to be considered in selecting project sites.

A6 Engaging other Partners

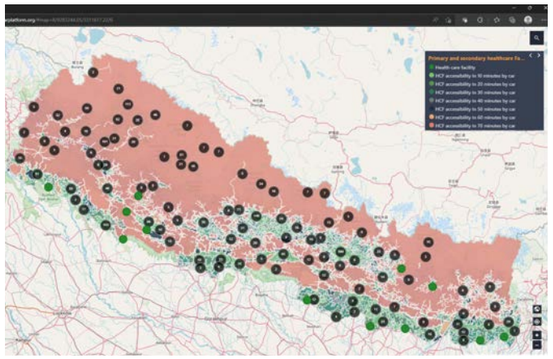
Data Sources

13 Climate Action

4.1.2 Building a National Health Emergencies Monitoring and Management System in Nepal

Project: COVID-19 Emergency Aid—Support for the National Health Sector Program (OSCAR)

The Nepalese health authorities are working with an open-source common digital decision support system for more efficient containment of the COVID-19 pandemic.



Source: KfW Bankengruppe, based on OpenStreetMap.org

Map showing numbers of healthcare facilities in Nepal

Background situation: In humanitarian crises, knowledge on the scope of an emergency and of the available resources is often lacking early on, entailing inefficient allocation in the required responses to those in need. The COVID-19 pandemic hit Nepal particularly hard due to its wide-spread poverty and limited capacities in the health sector.

Project measures: To address this challenge, OSCAR, as an innovative platform and common digital decision support system for humanitarian operations, was employed for the analysis of large datasets for emergency preparedness and response. The platform was used to compile baseline and situational data from various sources to form a common operational picture and enable the respective analyses. This free, open-source platform thus enables the prioritization of scarce human and financial resources. At the same time, OSCAR creates a suitable data basis for decision-making on immediate and longer-term measures.

RMMV approach: OSCAR combines baseline and situational data from health management information systems, household surveys, crowdsourcing, remote sensing via satellites and other geospatial tool types from the national government, its bilateral partners, the UN and nongovernmental organizations. OSCAR is currently being deployed in Nepal to help the country better manage the pandemic. Propelled by swift cooperation between Nepal's Ministry of Health and Population, the World Health Organization Country Office and KfW, OSCAR is at an advanced stage of conceptual and data systemic development: the platform provides an up-to-date overview on daily and cumulative case numbers, disease severity, trends and available versus occupied healthcare capacity.

Impact and success factors: In Nepal, OSCAR will contribute to the implementation of Nepal's health strategy, to improving the health situation of the Nepalese population and to containing the COVID-19 pandemic through a more responsible and equitable health system.

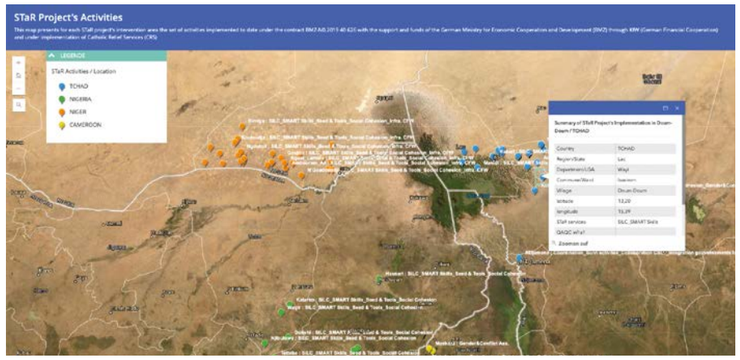
Planned as a *global public good*, OSCAR is fully owned by partner countries while benefitting from the open-source community. Over the long–term, OSCAR will support improved routine planning processes in health systems and support countries in confronting future pandemics. The application of OSCAR will benefit partnering countries in multiple ways, regarding the: 1) monitoring of health trends, 2) rapid detection of outbreaks and health crises, 3) combining of capacity and epidemiological information to determine risks, and 4) gauging of current and future health service demand. The platform is customized to a country's context and needs, is open-source, and can easily be scaled to other countries and sectors. With its Open–Data policy, the OSCAR platform welcomes development partners and developers with global, regional or local reach to combine their efforts and enlarge this open-source tool and community of practice that improves decision-making in health emergencies. Furthermore, an OSCAR open-source community will be established to contribute to the success of the platform by continuously improving code and developing further use cases tailored to emerging needs.

4.2 Examples of Using RMMV for Project Implementation

4.2.1 Remote Project Progress Monitoring and Verification in the Lake Chad Region

Project: Stabilization and Reconciliation in the Lake Chad Region Project (StaR, PN: 39647):

In view of the precarious security situation around Lake Chad, the implementing non-governmental organization (NGO), the Catholic Relief Service (CRS), set up a management information system (MIS) for the StaR project.



Source: STaR map screenshot courtesy of CRS (based on ArcGIS)

GIS-Map of all project locations in the four target countries containing individual decriptions of each location

Background situation: On behalf of the Federal Ministry for Economic Cooperation and Development (BMZ), KfW has been supporting a project to stabilize the political situation in the region since 2019 in the four neighboring countries of Cameroon, Chad, Niger, and Nigeria. This includes the development of social infrastructure and income-generating measures and support for agriculture and good governance.

Project measures: The project, the current phase of which is set to run until 2024, includes almost 150 individual projects in the four countries, from solar power systems to new classrooms and water tapping points. A total of more than 170,000 people will benefit from it.

RMMV approach: In view of the tense security situation in the countries and the associated travel restrictions, CRS, the NGO serving as the Project Executing Agency (PEA) (> Section 2.1.1 RMMV Institutional Approach A2—PEA-Led Monitoring) started setting up an MIS early on. During the pandemic, KfW was able to use the MIS during project progress reviews for individual infrastructure projects in Niger and Nigeria. An interactive project map provided a good overview and contained comprehensive information in the form of photos, videos and documents. Local PEA employees demonstrated the progress of construction sites by means of onsite live video recordings. This virtual tour not only showed the current status but also enabled discussions with stakeholders. The MIS (> Fact Sheet R/MIS) is made up of a variety of software packages. Data, including photos (> Fact Sheet Cameras), are collected and archived via tablet and smartphone with open-source and cloud-based CommCare software (> Fact Sheet Mobile Data Collection), and all project communication for administration, decision-making and monitoring carried out via MS Teams (> Fact Sheet Collaboration Tools). The geolocation of the project locations is done using ArcGIS-geoinformation system software (> Fact Sheet Geospatial Tools/GIS) and the transfer to dashboards and report formats is done using business intelligence software. The system is freely accessible and virtual site visits are possible at any time at > https://arcg.is/1uPL19

Impact and success factors: The COVID-19 pandemic and the increasingly fragile security situation in the region served as catalyst for the development of MIS tools and remote communication. However, there is no personal contact with the population and civil society stakeholders in this format, making it difficult to classify the project's impacts. Nevertheless, many of the formats tested will be retained in the long term.

4.2.2 Remote Monitoring of Small-Scale Irrigation Systems in Mali

Project: Small-Scale Irrigation in the Inner Delta (IPRODI, PN:39309)

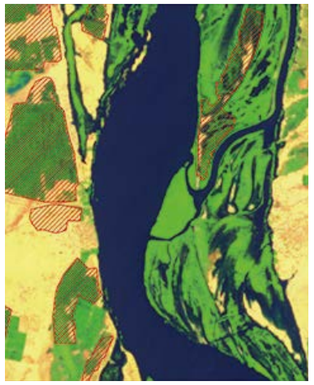
To monitor a small-scale irrigation project in the north of Mali, the Project Executing Agency (PEA), consultant and KfW are using a geographical information system (GIS) for mobile data collection, including photographic and satellite image analysis, as there are several dozen individual projects spread across the region and due to the security situation, no personal onsite visits are possible. A local consultant was commissioned for the final inspection following third-party verification.

Background situation: Northern Mali suffers from drought and desertification. Since 1960, the annual average temperature in Mali has increased by 0.7 degrees. Mali is in the Sahel region, one of the world's regions most affected by climate change. The country is also one of the poorest in the world. Farmers in northern Mali depend on the Niger River for irrigation of their fields, the resources of which must be used sustainably.

Project measures: KfW has been involved in the IPRODI project on behalf of the Federal Ministry for Economic Cooperation and Development (BMZ) since 1994. What started out as an emergency aid program has grown into a project for improved infrastructure for small-scale irrigation. This involves the management of village irrigation, the construction of wells, the use of pumps and measures to protect the soil. Small warehouses are being built, too. The project includes more than 1,100 individual measures dispersed across northern Mali. Project visits are therefore time-consuming. In addition, the security situation is becoming increasingly precarious. KfW relies on *Remote Verification* to keep apprised of the project's progress.

RMMV approach: As early as 2004, GPS data on the irrigated areas and the motorized pumps were entered into a geographical information system GIS, also known as a digital map. What was initially done by mobile phone and manual entry was soon replaced by image recording with automatically embedded GPS data. This made it possible to obtain information remotely about the irrigated areas and the condition of the infrastructure. Since 2014, satellite images have been evaluated and stored in the GIS to monitor the project's status. In addition to the Ministry of Rural Development, which serves as the PEA for the project, a *Financial Cooperation (FC)* consultant has access to the project data (RMMV Institutional Approach A2—PEA-Led Monitoring > Section 2.1.1).

Due to the pandemic and the precarious security situation, KfW also commissioned a local consultant to conduct the onsite final inspection in 2020 (RMMV Institutional Approach A4—Third-Party Verification > Section 2.1). In 2021, a KfW team conducted onsite inspections of several accessible project locations. The progress of the others was determined using *Remote Verification*.



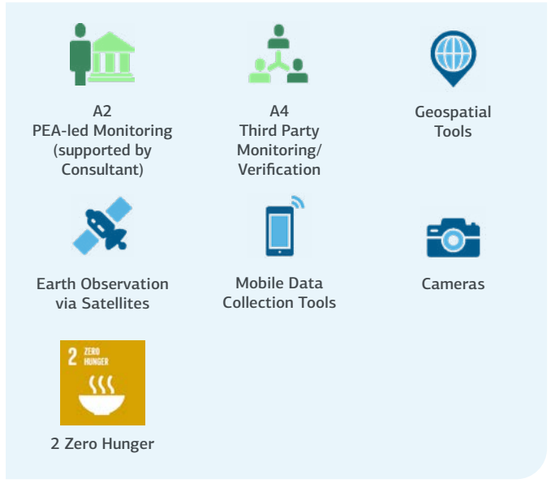
Source: AHT Group GmbH

Monitoring of small-scale irrigation schemes (red marked polygones) near by the Niger river (blue parts) in Mali

Source: AHT Group GmbH

Photo-monitoring of input deliveries to project promoted irrigation schemes in Mali

Impact and success factors: The preparation of systematic *Remote Monitoring* by the PEA using satellite images requires a longer lead time, as an RMMV unit had to be set up and trained by the PEA with the support of the FC consultant. This type of approach is therefore more appropriate for long-term or multi-phase projects. Current and high-resolution satellite images are not available for every location around the world, so it is important to check whether all project locations are covered. This was the case in Mali. The complex project could be efficiently evaluated with the GIS and the analysis of satellite images.

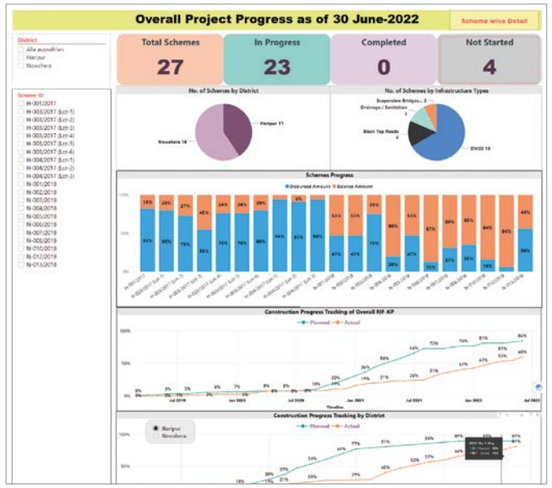


4.2.3 Construction Site Supervision Using an MIS in Pakistan

Project: Regional Infrastructure Fund KP II (RIF-II, PN: 30272, 42975)

KfW remotely verifies the progress of several public infrastructure construction sites spread over a province in northern Pakistan using a management information system (MIS).

Background situation: The province of Khyber Pakhtunkhwa in northern Pakistan is one of the poorest in the country. Unemployment is higher than average and economic growth is low. According to the World Bank's definition, approximately 46% of the population lives in poverty. Most people generate income from agriculture and small businesses. The region is mountainous, and the road network is minimal. In winter, many places are completely cut off from the outside world. Because of inadequate road access, the transport of goods is expensive. Both internally displaced persons and refugees from Afghanistan have sought protection in the province. As a result, the existing—already inadequate—infrastructure is extremely overloaded. A flood disaster in 2010 also destroyed roads and bridges.



Source: AID Associates In Development/Muhammad Shahab Khattak

View of MIS Project Dashboard

Project measures: The goal is to improve government services in the provinces and districts and to strengthen the government's capacity to build infrastructure. On behalf of the Federal Ministry for Economic Cooperation and Development (BMZ), KfW is therefore financing up to 27 small- to medium-sized construction projects, from a suspension bridge to roads, drinking water supply systems and rainwater drainage. The local population was involved in selecting the construction projects to be implemented.

Strengthening the government's capacity should also increase acceptance by the population. The authorities need to develop the ability to plan, tender and implement public construction projects independently.

RMMV approach: An MIS was set up by the *Implementation Consultant* to track construction progress and the use of funds online (RMMV Institutional Approaches A1—National KfW Experts with Increased Responsibility in *Remote Verification* and A3—Consultant-Led Monitoring > Section 2.1). The MIS dashboard shows the geographical location of the construction sites. KfW has read access and can track the status of construction projects in real time in the MIS. An image gallery shows current photos taken by the *Implementation Consultant* as part of the construction supervision process (tool type: cameras). This includes 360-degree images that can be viewed using 3D headsets. Links to videos of construction site inspections are also provided. The MIS also contains the monthly reports to provide all relevant information in one place.

Impact and success factors: With just a few clicks, the KfW PM can access the project reports and the most recent images and videos. The amount of information available is significantly greater than with conventional reporting. The progress of the construction projects can be verified at any time. Expansion of the infrastructure will improve the population's living conditions in the selected districts and boost the government's capacities.

4.2.4 Using a 360°-Camera to Remotely Verify Construction Quality in Inaccessible Areas of a Hospital in Tanzania

Project: Co-financing of the CCBRT Maternity and Newborn Hospital (PN: 30222)

KfW is testing the transmission of images through a 360-degree camera from a hospital in Tanzania that it financed on behalf of the BMZ, to asses performance quality for itself in inaccessible areas.

Source: KfW Bankengruppe

360°-camera view of an operating room

Background situation: The maternal mortality rate in the urban area of Dar es Salaam is significantly higher than in rural areas due to high immigration rates and overloaded health infrastructure. The construction of a new Maternity and Newborn Hospital by the local non-governmental 112 CCBRT (Comprehensive Community Based Rehabilitation in Tanzania) in Dar es Salaam is intended to contribute to reducing persistently high maternal and newborn mortality rates and preventing disabilities in Tanzania.

Project measures: Together with other international donors, KfW is co-financing the construction of the above-mentioned maternity hospital on behalf of the BMZ. As a reference hospital for the Eastern Zone of Dar es Salaam, the facility, with an annual patient admission capacity of 15,000 patients and 12,000 deliveries/year, is intended as a "Super Specialized Hospital" to complement the capacities and competencies of hospitals in the region and improve training and further education for midwives, nurses and gynecologists, particularly on managing high-risk pregnancies and births and neonatology.

The hospital has six operating theatres that have been equipped with state-of-the-art technology.

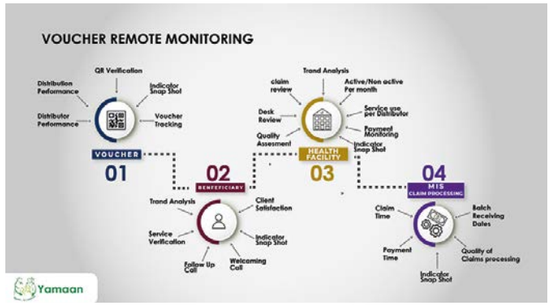
RMMV approach: Due to the pandemic, it was not possible to monitor the progress of work on-site in the spring of 2020. Together with the project-executing agency, the NGO "Comprehensive Community Based Rehabilitation in Tanzania" (CCBRT), which operates the hospital (> institutional approach A2 PEA-led monitoring), and the *Implementation Consultant*, KfW therefore carried out one of the first virtual progress inspections and funded 112 audits *(Remote Verification)* in East Africa in May 2020. Two virtual site visits took place during the period of pandemic-related suspension of progress reviews. After completion of the work and initial commissioning of the hospital, due to ongoing surgeries it was not possible to inspect the completed operating theatres without further action during the first physical progress review. KfW thus used a 360-degree camera the size of a mobile phone within a pilot project. The camera allowed visual recording of the entire room in high quality within just a few minutes, and with little personnel and material input. The data were transmitted securely via mobile phone. The images were then analyzed on the large screens of the RMMV rooms at KfW. Future use of VR goggles will allow virtual inspection of the premises. The technical possibilities are given, and the first necessary data have been secured using the 360-degree camera.

Impact and success factors: The camera walk-through can be used as a complement to physical travel, e.g. if travel is temporarily not possible or if certain questions have to be clarified at very short notice. It can also be used if certain areas of the project are not accessible (turbines, laboratories, operating theatres, etc.). In the present application, KfW was able to visually inspect the scope of the equipment in the operating theatres and the quality of workmanship, such as the suspended ceilings, the functionality of the lighting, etc. The medical experts are currently inspecting the equipment in the operating theatres. Currently, medical experts from KfW are assessing the recordings in order to evaluate future application possibilities from a medical-technical perspective.

4.2.5 Remotely Managing Maternal and Child Health in Yemen Using a Mobile Voucher App

Project: Maternal and Child Health Voucher Program Phase II (PN: 27451)

On behalf of the German Federal Government, KfW is supporting the Yemeni Yamaan Foundation in organizing a voucher system using a mobile app that gives mothers and their children better access to the healthcare system. This app is also used for Remote Monitoring.



Source: Yamaan

Overview of the main features of the Voucher Remote Monitoring System

Background situation: In Yemen, one of the poorest countries in the world, maternal mortality is very high. In this war-torn country, the Yamaan Foundation is committed to improving medical care for women. The foundation was established in 2009 with the support of KfW on behalf of the Federal Ministry for Economic Cooperation and Development (BMZ).

Project measures: Foundation employees distribute mobile phones to mothers supported by the project via vouchers in the form of pre-installed QR codes.

Women receive the vouchers on their mobile phones or as a printout for a nominal fee (or free of charge if required), which enable services such as supervised births, family planning and contraception, and transport to a health center. The recipient also receives a call from a center, which the foundation does to check whether the mother knows where her nearest health center is located. Every woman is notified of the free hotline, which she can contact if necessary. All vouchers are managed online.

RMMV approach: As the Project Executing Agency (PEA) (RMMV Institutional Approaches A2—PEA-Led Monitoring and A5—Target Group Involvement > Section 2.1.1), the Yamaan Foundation has developed an online solution for the distribution, redemption and settlement of vouchers. The system consists of a mobile app (> Fact Sheet MDC), a desktop app and a cloud-based application for the dashboard (> Fact Sheet R/MIS). The vouchers can be tracked online from their creation to their use *(Remote Monitoring* and *Verification)*. The clinic to which the woman is sent scans the QR code, looks after her and later bills her benefits online with the health insurance provider. The vouchers are settled monthly so that the healthcare centers receive regular income. Trends in usage can also be monitored in this way. The foundation can track the number of vouchers distributed per employee. It can also track whether, as intended, the poorest target groups are reached, such as women with disabilities, marginalized families or internally displaced persons. The data also shows the number of vouchers billed by each healthcare center. The foundation can then see whether the project is achieving its objectives at a glance.

Impact and success factors: The war in Yemen, which has lasted for years now, makes it difficult to provide personal care for families in need. The voucher solution seems particularly practical in these circumstances. It eliminates corruption because every step is traceable online, from voucher distribution to redemption and billing. In turn, the foundation's vouchers provide a reliable source of income for healthcare facilities, midwives and doctors.

Recipient mothers can report complaints via a hotline if a healthcare facility does not perform the agreed service.

About 200,000 vouchers have been distributed since 2017, 80% of which have been redeemed. More than 30,000 babies have been born in good care thanks to the vouchers. For the women involved, supervised birth and family planning advice mean better health care for themselves and their children.

4.2.6 Setting up a Monitoring Information System for a Health Project in the Central African Republic

Project: Reconstruction of the Health System (RSS, PN: 34710, 35728)

Project monitoring is to be supported by the establishment of a Monitoring Information System (MIS) that is oriented towards the actual information needs and capacities of the project stakeholders and around technical feasibility considerations in the Central African Republic.

Source: Dr. Roland Kersten

Challenges with regard to accessing project sites is one of the major reasons why efficient Monitoring Systems for projects in the Central African Republic are necessary.

Background situation: After Niger, the Central African Republic is the poorest country in the world, marked by unending waves of violence and displacement in its interior since 2013. After a long suspension of cooperation, initial FC projects in the country were launched in 2014. Due to weak and in some cases non-existent government structures, cooperation is based primarily on the UN, EU and INGOs. FC projects in the Central African Republic focus mainly on covering basic needs, such as health, education, and food security. Due to the armed conflicts in Ukraine in 2022 and the Central African Republic's political proximity to Russia, international support for the country is currently declining and the prospects for long-term cooperation are unclear. The project, "Reconstruction of the Health System," with the International Federation of the Red Cross and Red Crescent Societies (IFRC) as PEA is currently the only project within the Central African Republic financed from bilateral cooperation.

In the project, it quickly became clear that the humanitarian organization IFRC could demonstrate very good operational capabilities in an extremely fragile environment, but that monitoring a complex, development-oriented health project was a new challenge for the PEA. Combined with very limited opportunities for on-site missions and meeting between KfW and partners in the Central African Republic, a comprehensive RMMV approach was developed for a new phase of the project starting in 2022.

Project measures: The objective of the project is to increase the utilization of qualitatively improved health services by the target group (mainly women and children) in the project area (2 prefectures surrounding the capital, Bangui). Output 1 of the project aims to rehabilitate and equip 35 health stations in rural areas. Output 2 of the project serves to strengthen health personnel capacities in the country by rehabilitating and equipping two training institutes in Bangui on the one hand, and by providing scholarships for health training on the other, as well as direct financing of health personnel in the health stations of output 1.

RMMV approach: Monitoring by the PEA (> Section 2.1.1, Institutional Approach A2) is to be supported by the establishment of a Monitoring Information System (> MIS) that is oriented towards the actual information needs and capacities of the project stakeholders and around technical feasibility considerations in the Central African Republic. On the one hand, the platform is intended to make the partner's previous monitoring measures (especially time-consuming and expensive site visits) more efficient and substitute for these, and on the other hand to provide KfW and other stakeholders regular and reliable updates on the project's key performance indicators. The management of important decisions is increasingly carried out jointly between IFRC and KfW within the framework of virtual meetings, although intensive discussions with the partners on site at least every six months remain indispensable as a basis for building trust. Due to the critical security situation, KfW verifies the results of the project through the involvement of a local consultant (> Section 2.1.1, Institutional Approach A4 – Third Party Verification). Virtual site visits > Section 3.3 Remote Verification of Project Progress by KfW with project stakeholders organized by the local consultant are a new standard in FC.

Impact and success factors: Transparency in communication about why RMMV is important, so as not to create the impression of deliberate mistrust of partners. First understand the information needs and capacities of all stakeholders, then talk about technical solutions (Human-Centered Design). Good monitoring costs money and must be budgeted for accordingly.

4.2.7 Remote Monitoring of Protected Areas Using Drones in Mongolia

Project: Biodiversity and Adaptation to Climate Change (PN: 29187)

Drones and GPS devices are used to monitor conservation areas in Mongolia efficiently.

Source: ECO Consult GmbH | Co. KG

Source: ECO Consult GmbH | Co. KG

Rangers being trained in operating drones for monitoring protected areas

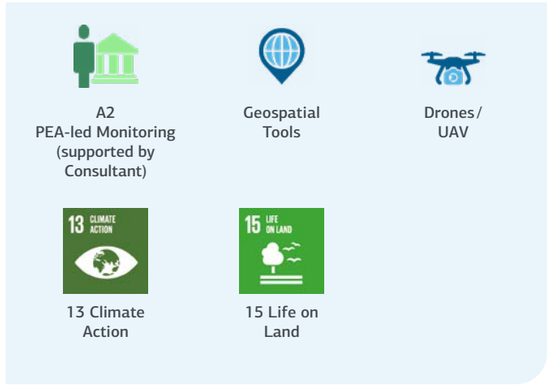
View of drone in flight during training

Background situation: Mongolia plans to protect almost 30% of the country's area, amounting to 465,000 square kilometers. The country has a wide variety of ecosystems and is considered a real biodiversity hotspot. It is also a refuge for numerous endangered animal and plant species in Central and East Asia, further heightening the importance of the protected areas. However, the administrative bodies of the protected areas have limited budgets, which usually cover little more than personnel costs. At the same time, the existing conservation areas are threatened by overgrazing, illegal logging and climate change. This in turn threatens the livelihoods of the rural population.

Project measures: On behalf of the Federal Ministry for Economic Cooperation and Development (BMZ), KfW has been supporting the Mongolian Ministry of Environment since 2014 in preserving biodiversity in select ecologically significant protected areas and safeguarding the livelihoods of people in the region. Management plans for the protected areas are being developed. Investments are also being made in vehicles, IT and research equipment, buildings for the protected area administrations and ranger uniforms.

RMMV approach: KfW has financed 71 drones for 33 natural protected areas as well as for three departments of the Ministry of Environment and the Environmental Tourism Office of the City of Ulaanbaatar. Each protected area administration received two drones. These help the rangers who work there monitor the movements of animals, analyze the animal population and detect forest fires early on occurring in the vast and often impassable terrain of the conservation areas. The drones (> Fact Sheets Drones/UAV) were acquired in 2019 based on a needs analysis for the participating Mongolian protected area administrations (RMMV Institutional Approach A2—Project Executing Agency-Led Monitoring , see > Section 2.1.1, A2). The employees of the organizations entrusted with monitoring of the protected areas have been trained in their use. These employees are also responsible for maintaining the drones. For cost reasons, simple models were chosen. The use of land by pasture cattle, for example, can be monitored as well. A new application has been developed based on field usage: once cattle have penetrated the core zones of the protected areas, they can be driven back to their pastures using drones.

Impact and success factors: So far, drones have proven useful for monitoring terrain that is too expansive to keep track of in other ways, and in areas where particularly sensitive species live. This even allows detecting forest fires at an early stage. Drones help efficiently monitor conservation areas, being especially beneficial because the administrative authorities often have a limited available workforce. Grazing cattle can be moved out of core zones, yielding an additional benefit. The drones' short flight time was identified as a drawback. The use of a second backup set of batteries can compensate for this to a certain extent.



4.2 Examples of Using RMMV for Project Implementation

4.2.8 Monitoring Forest Area Changes in Ecuador Using the REDD Monitoring System

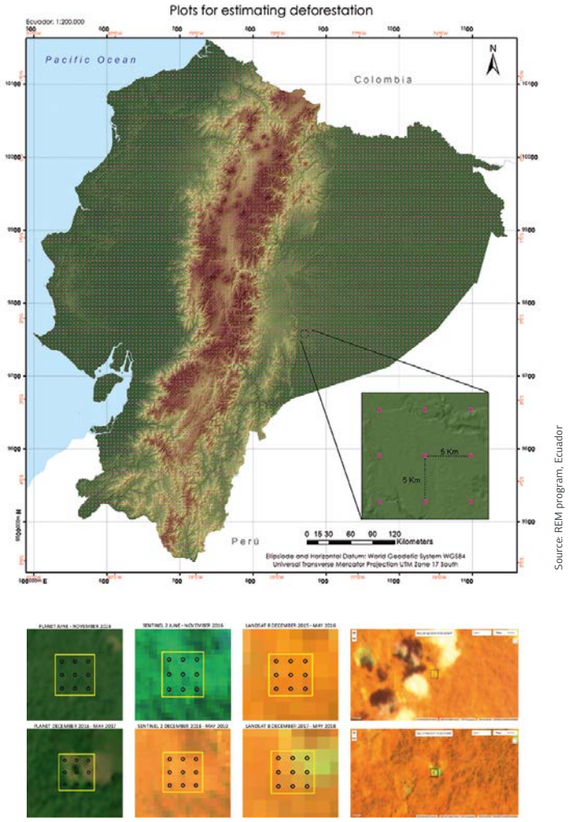
Project: REDD Early Mover (REM, PN: 29763)

On behalf of the German Federal Government, KfW is supporting the protection of old-growth forests in Ecuador, with evidence of the change in the rate of deforestation being provided by a satellite-based REDD monitoring system.

Background situation: The REDD (Reducing Emissions from Deforestation and Forest Degradation) Early Movers (REM) program is an initiative that rewards pioneers in forest conservation and the fight against climate change. The program supports REDD+ bridge financing and includes recognition of payment for results based on reductions in greenhouse gas (GHG) emissions caused by deforestation. In 2014, the Governments of Ecuador, Germany and Norway agreed on a *Financial Cooperation* project based on payments for REDD+ results to acknowledge Ecuador's efforts in reducing deforestation. Ecuador is one of three countries in which the REM program is being implemented. The South American country is one of the mega-biodiverse countries. Forty percent of the 11 million hectares of untouched primary forest are designated as protected areas.

Deforestation in Ecuador has progressed especially in the nineties, with agriculture, in particular, being seen as a driver. However, deforestation rates have declined since 2008. Government controls became more effective, and a rural exodus helped to reduce deforestation.

Project measures: To obtain funding from the REM Program, Ecuador must effectively demonstrate that annual deforestation is decreasing compared to a historic average. In a first step, historical deforestation maps were created showing how forest areas have decreased in the past. These change maps and emissions factors derived from the national forest inventory, estimating the carbon sequestered in the countries different forest ecosystems, form the foundation for the baseline, the forest reference emission level (FREL). Future emission reductions can be measured against this FREL, which is essential for building a results-based, REDD+ compliant payment system.



Source: REM program, Ecuador

Based on a 5 km grid, a systematic sample was distributed throughout Ecuador. For the analysis, satellite images from the Landsat sensor were used as the main input and Sentinel 2 and Planet tiles as secondary inputs. In each sample, nine plots of one hectare each were analyzed to determine the changes in the forest cover. On this basis, the deforestation of Ecuador is calculated.

The rewards from the REM program are used to promote forest protection in the communities living in and deriving their living from the forest, to finance Ecuador's forest protection policies, to secure land ownership and to measure the decline in emissions.

RMMV approach: The REDD Monitoring System in Ecuador consists of a national forest monitoring system (NFMS) managed by the Ministry of Environment (RMMV Institutional Approach A2—Project Executing Agency-Led Monitoring, > Section 2.1.1, A2) based on an MIS (> Fact Sheet R/MIS) with satellite images (> Fact Sheet Earth Observation via Satellites) of all Ecuador forest areas, on the basis of which national GHG inventories are compiled. The NFMS produces a monitoring report, estimating emissions from deforestation for a certain period. Comparing these emissions against the FREL, the system estimates the emission reduction from reduced deforestation in a given year. These monitoring reports are then attested via independent third-party verification (RMMV Institutional Approach A4—Third-Party Monitoring > Section 2.1.1, A4) as a prerequisite for the remuneration of avoided emissions from deforestation. The independent consultant verifies the methodological accuracy (conceptual design and implementation of the methodology), including random sampling checks and safety margins (to take inaccuracies into account). The independent consultant also verifies whether the reported Emission Reductions (ERs) and the Reference Level have been reported via a transparent and coherent step-by-step process that enables reconstruction and meets the REM program requirements. In addition, civil society organizations are involved in decisions regarding use of funds (benefit-sharing based on investment plans) (RMMV Institutional Approach A5—Involving a Defined Target Group, > Section 2.1.1, A5). REDD also requires the provision and publication of regular reporting on REDD Safeguards and emissions reports to the REDD Registry at the United Nations Framework Convention on Climate Change to assure that ERs measured for a given year were achieved in accordance with the Cancun Safeguards.

Impact and success factors: Forest conservation contributes to climate protection and biodiversity. The monitoring system enables Ecuador to demonstrate how it is contributing to reducing emissions in the land use sector, how deforestation rates are developing and where illegal clearing is taking place. The satellite image-based system is an indisputably effective means for substantiating changes in forested area. The remuneration from REM also benefits the indigenous population groups living in the forest.

More information on the project can be found here:
> https://www.kfw-entwicklungsbank.de/PDF/Entwicklungsfinanzierung/Themen-NEU/Factsheet_REM_Ecuador_EN_2019.pdf

A2
PEA-led Monitoring (supported by Consultant)

A4
Third Party Monitoring/ Verification

A5
Involving Target Groups & PAP

(Remote) Management Information Systems

Earth Observation via Satellites

13 Climate Action

15 Life on Land

17 Partnership for the Goals

4.2.9 Sustainable Forest Management Using RMMV in the Congo Basin

Project: Promotion of Certified Forest Management (PPECF) II (PN: 39042)

The Program in the Congo Basin (PPECF) of the Central African Forestry Commission (COMIFAC), financed by KfW on behalf of the German government, uses drones, a Geographic Information System (GIS) and eLearning, as well as data to promote certified logging.

Background situation: The program to promote certified logging in the Congo Basin, financed by KfW on behalf of the German Federal Ministry for Economic Cooperation and Development (BMZ), supports the Central African Forestry Commission (COMIFAC) in the certification process for sustainable logging. Today, more than five million hectares of forest are already certified in the Congo Basin, with another 5 million hectares planned within the next two years. But the increase in certified areas faces obstacles, such as insufficient institutional support, a poorly organized civil society, a lack of scientific data and high costs for the social component of certification, such as the construction of health facilities, schools and roads.

Project measures: KfW supports forestry companies in forest certification and accompanies them through the initial audit for legality and sustainability certification so that they are recognized in accordance with the EU Timber Regulation. The project is aimed at forestry companies in Cameroon, Congo, Gabon, the Central African Republic and the Democratic Republic of Congo.

In particular, the project helps address social aspects of certification, such as worker living conditions and safety, local resident rights and biodiversity protection. Another goal is better monitoring of wildlife protection and the implementation of sustainable use models that cover the entire value chain, all the way to the consumer.

RMMV approach: Over the past ten years, the project's technical approach has evolved considerably. Whereas in the beginning, applications were made for individual corrective measures, today the program invests in technical solutions, such as software, interactive guides and specific platforms for fauna monitoring. These serve to maintain or improve the level of certification achieved. The project is aimed at establishing automated processes that facilitate management of the companies' activities.

These include, for example, mapping of forest areas in the GIS > Fact Sheet Geospatial Tools and the use of drone imagery for forest certification of tropical ecosystems > Fact Sheet Drones/UAV. The GIS is used by forest managers to plan a trail network, for which electronic georeferencing is also employed. Logs are tagged with RFID chips to monitor action plans and logging > Fact Sheet Sensors/SmartMeters. The wildlife population in the forest areas is analyzed by cameras > Fact Sheet Cameras and audio monitoring. Distance learning via eLearning was conducted on the topic of "safe logging," for example > Fact Sheet eLearning Tools. In this way, more economically, socially and ecologically efficient operating procedures are being introduced step by step.

Source: ENEF Mbalmayo/Pallisco

Project staff being trained on using geospatial tools

Impact and success factors: The certified area has risen to 5.5 million hectares for sustainable management, with another 5.5 million certified under a different label. So far, more than 30% of the participating companies have already implemented a social action plan that is accepted by the local population. Half of the companies have already introduced a wildlife management plan.

4.2.10 Establishing an Energy Monitoring System for Public Buildings in Montenegro

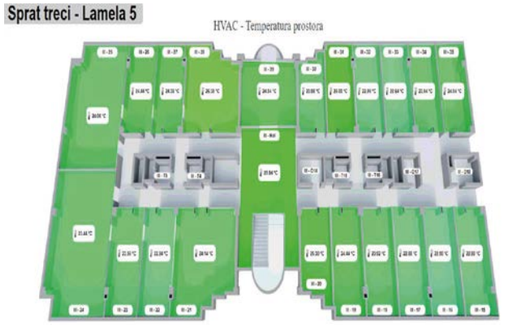
Project: Greening Public Infrastructure Program (PN: 42455)

The project is designed to improve the energy efficiency and life span of public buildings through retrofitting and implementing of an energy monitoring system (EMS) drawing on a centralized database to remotely collect, analyze and manage energy and water consumption data from smart meters and the respective utilities.

Background situation: Many of Montenegro's public buildings are in poor structural condition. Heating systems do not work well, windows and doors are not tight, roofs leak and walls, ceilings and basement are not insulated. As a result, energy is lost unnecessarily. Improved energy efficiency is one of the most important goals of Montenegro's energy policy.

Project measures: While in the first two phases of the program financed by KfW loans and Federal Ministry for Economic Cooperation and Development (BMZ) grants were focused on improving energy efficiency through the rehabilitation and retrofitting of buildings with improved insulation, heating, photovoltaic systems, sanitary facilities, and so on, the third phase is about setting an example for even higher energy efficiency standards by upgrading some of the buildings to Near Zero Energy (NZE). In addition, the second and third phases of the Energy Efficiency Program include introduction of an Energy Monitoring System (EMS) for collecting data on energy and water consumption for the whole public sector. Energy managers will be able to make strategic decisions on energy consumption optimization by benchmarking energy consumption against the calculated energy demand for each facility, observing pre-defined user profiles. Montenegro is receiving an Energy Performance Calculation (EPC) software, which will enable the issuance of energy passports for buildings and the conducting of energy audits. Once audits are certified by the energy auditors, owners of apartments, houses and business premises will receive a document as proof of how energy efficient the property is. In the near future, selling or renting premises will no longer be possible without an energy passport.

RMMV approach: Real–time smart metering in 250 buildings and the transfer of consumption data from electricity and water utilities will enable hour-by-hour *Remote Monitoring* of consumption of electricity, water, CO_2 levels in classrooms, temperature and heating fuel consumption > Fact Sheet Sensors/SmartMeters. For example, when a building consumes a particularly large amount of electricity, the peak loads can be observed on an hourly basis. This kind of consumption data was not available before. The EMS and availability of consumption data nearly in real time allow users to pay closer attention to their electricity, water and fuel consumption and make rapid adjustments accordingly > Fact Sheet R/MIS. This leads to a more conscious use of energy and resources. The EMS users are the energy managers of the up to 2,500 public buildings to be connected, as well as various ministries using it for planning and strategy purposes (institutional RMMV approach A2 – PEA is in the lead, see > Section 2.1.1, A2).



Source: Ministry of Capital Investments of Montenegro

Real time-view of room temperature

Impact and success factors: The annual consumption of energy measured after the rehabilitation measures undertaken in the first two phases of the program was reduced by 35%, and by as much as 63% versus the calculated energy demand baseline before the energy efficiency measures. Lower energy expenditures mean lower operating cost, noticeably relieving public budgets. The energy savings have contributed to a 69% annual reduction of CO_2 emissions in the rehabilitated facilities.

4.3
Examples of RMMV Approaches used for Ex-post Evaluations

4.3.1 Evaluating Energy Project Impact by Measuring Increases in Nighttime Light Intensity in Vietnam

Project: 500 kV Son La—Lai Chau transmission line (PN: 30313 and 26781 or BMZ No. 201366392 and 200966663, page 7 of the online report)

Increase in nighttime light intensity in project areas since the time of project appraisal.

Impact area: Energy efficiency

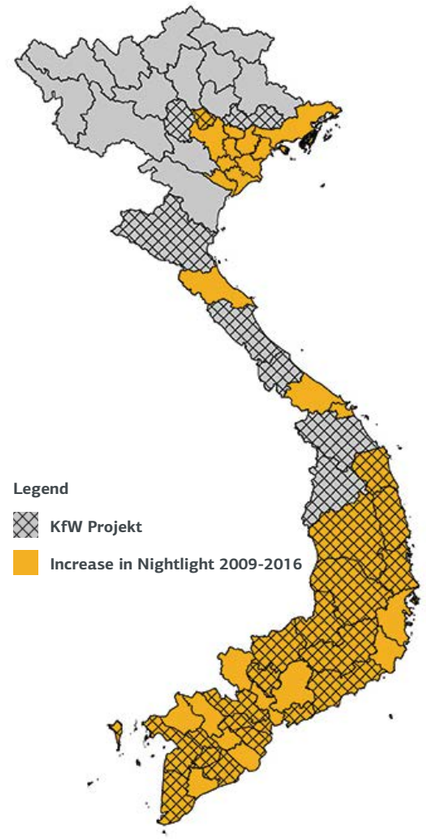
RMMV approach: A QGIS-Map of Vietnam divided into the different regions (regions with KfW projects are shaded), with color highlighting of the regions where there has been an increase in nighttime light intensity > Fact Sheet Geospatial Tools

Data sources: KfW project data, GADM, DMSP-OLS Nightlight Intensity > Fact Sheet Data Sources

Findings: A comparison of the *Financial Cooperation (FC)* project regions at the time of the 2009 project appraisal versus the year of the 2016 final inspection shows that, as measured by nighttime light intensity, there was an increase in economic activity in the FC project regions. The link between increased light intensity and increased economic activity is made by Min and Gaba (2014) in a study that confirmed this hypothesis using satellite data and household surveys. However, there are also increases in light intensity in other regions and no increases in regions with FC-financed projects. The data evaluated do not yet allow a conclusive positive assessment of the KfW-financed rehabilitation of the networks with regard to economic activity.

Difficulty in creating data elements:[25]
moderate ↗↗↗

Change in Nightlight 2009-2016



Data sources: GADM; VIIRS nighttime lights provided by NASA

Picture 4.3.1 Change in nighttime light intensity in Vietnam 2009-2016

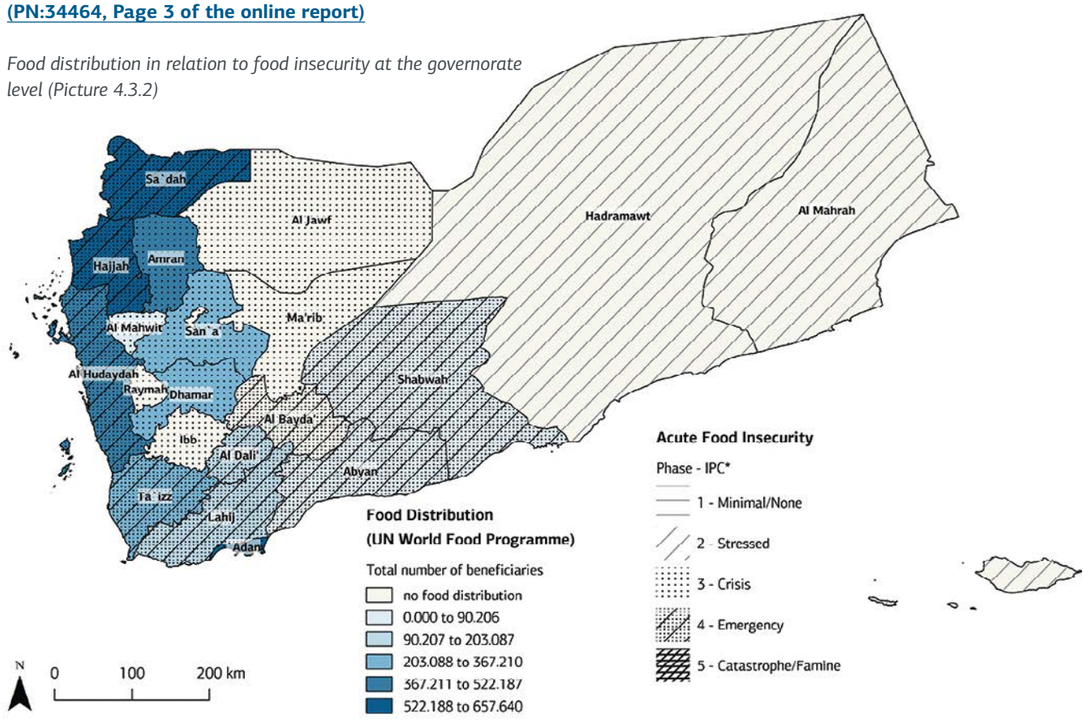
Geospatial Tools | Data Sources | 7 Affordable and Clean Energy

[25] 1 arrow: No difficulty in creating the data elements.
2 arrows: Low difficulty in creating data elements.
3 arrows: Moderate difficulty in creating data elements.
4 arrows: Higher difficulty in creating data elements.
5 arrows: High difficulty in creating data elements.

4.3.2 Evaluating Food Security Project Impact by Comparing Open Data with Project Data in Yemen

Project: Protracted Relief and Recovery Operation (PRRO) (PN:34464, Page 3 of the online report)

Food distribution in relation to food insecurity at the governorate level (Picture 4.3.2)



Sources reference of the map: GADM (Online). Available at: https://gadm.org/download_country_v3.html
Sources reference IPC: Yemen: IPC Analysis - Summary of Findings, Indicative Acute Food Insecurity Current Situation Overview | June - August 2015 (FAO).
Sources reference of food distribution data: WFP (2015) Narrative Report to KfW on Protracted Relief & Recovery Operation (PRRO 200636).

*Integrated Food Security Phase Classification

Impact area: Basic Nutrition/Food Security

RMMV approach: QGIS-based map showing overlaps between food insecurity data with food security data (food distribution data to beneficiaries by UN WFP) > Fact Sheet Geospatial Tools

Data sources: GADM; Food and Agriculture Organization of the United Nations (2015): IPC Analysis Yemen – Indicative Acute Food Insecurity Current Situation Overview (2015); WFP (2015) Narrative Report to KfW on Protracted Relief and Recovery Operation (PPRO 200636) > Fact Sheet Data Sources

Lessons learned: The visualization allows us to draw a balance between needs and actual food distribution and conclude to what extent the choice of project sites met acute food needs in Yemen. The graph shows the needs gap in food distribution. The distribution of food was only partially carried out in the areas that are classified as particularly food insecure according to the IPC classification, so acute needs were not always addressed. The graph was referenced to assess the OECD DAC evaluation criterion relevance.

Difficulty in creating data elements:
moderate ↗↗↗

Geospatial Tools | Data Sources | 2 Zero Hunger | 16 Peace, Justice and Strong Institutions

4.3.3 Comparing Demographic and Health Survey Data for Evaluating Health-Related Impacts in Central Africa

Project: HIV-Prevention in Central Africa Phases II, III and IV (BMZ-No: (200666560, 200866228, 201266329 and 20136651, pages 2, 5 and 7 of the online report)

HIV-related indicators at the subnational level in Central Africa.

Impact area: Reproductive health

RMMV approach: Open Data (see below) and maps (> Fact Sheet Geospatial Tools) were used to compare HIV prevalence among women, knowledge of HIV prevention methods among women, and attitudes toward people living with HIV among the male population at the subnational level for the countries of Cameroon, Congo, and Chad.

Data sources: Demographic and Health Surveys (DHS)
> Fact Sheet Data Sources

Software used: DHS Program STAT compiler (online tool)

Knowledge gain: Indicators on subnational level can be visualized and compared in a few steps, which is also relevant for cross-border contexts in regional projects. Significant regional deviations from the national average can be quickly visualized.

Difficulty in creating data elements:
no difficulty ↗ ↗ ↗ ↗ ↗

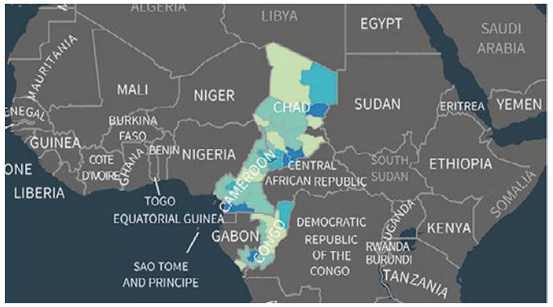
4.3.3.1 HIV prevalence among women in Chad, Cameroon & Congo in 2015.

Source: ICF, 2015. The DHS Program STATcompiler: Funded by USAID. http://www.statcompiler.com. November 23 2020

4.3.3.2 Knowledge of HIV prevention methods among women in Chad, Cameroon & Congo in 2015.

Source: ICF, 2015. The DHS Program STATcompiler: Funded by USAID. http://www.statcompiler.com. November 23 2020

4.3.3.3 Percentage of men expressing accepting attitudes towards people with HIV.



Source: ICF, 2015. The DHS Program STATcompiler: Funded by USAID. http://www.statcompiler.com. November 23 2020

Geospatial Tools | Data Sources | 3 Good Health and Well-Being | 5 Gender Equality

4.3.4 Comparing the Evolution of Vegetation Indices between Control and Intervention Areas Over Time in Burkina Faso

Project: Valorization of floodplains (phases I to IV, BMZ-No. 201165315, pages 1 and 4 of the online report)

Development of rice cultivation areas in intervention and control areas

Impact area: Agricultural resource management, irrigation

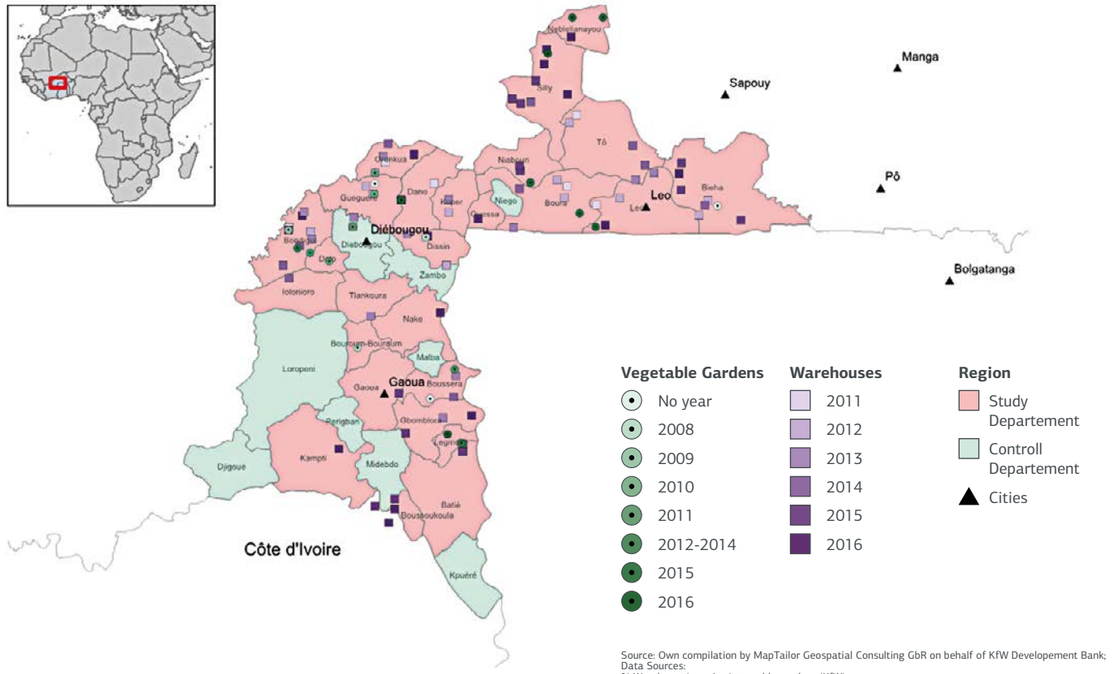
RMMV approach: Using Google Earth Engine/Java, Python, R for a comparison of rice cultivation/irrigated areas between control and intervention areas > Fact Sheet Geospatial Tools

Data sources: KfW project data, GADM, Natural Earth, Terra MODIS Normalized difference vegetation index (NDVI) (MOD13Q1), NASA, for NDVI analysis, Terra MODIS GPP (MOD17A2H) and Terra MODIS NPP (MOD17A3H), NASA, for GPP and NPP, ACMA, USGS, for Annual Crop Maps, based on classification of MODIS 250m 16-day composite EVI product (MYD13), Global Food Security-support Analysis Data (GFSAD) Cropland Extent, USGS, Climate Hazards Group InfraRed Precipitation with Station data (CHIRPS) for precipitation data set
> Fact Sheet Data Sources

Findings: The comparison of the evolution of a vegetation index on rice-growing areas between control and intervention areas over several years at a glance. A residual trend analysis showed that the development of the NDVI on irrigated rice fields was independent of the precipitation development.

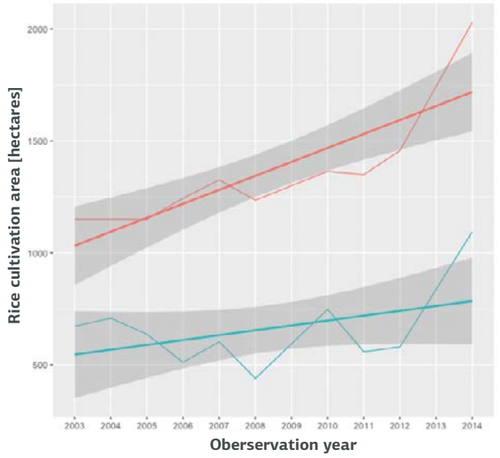
Difficulty in creating data elements:
high ↗ ↗ ↗ ↗ ↗

4.3.4.1 Spatial pattern of vegetable gardens and warehouses in the program area in Burkina Faso between 2008 and 2016

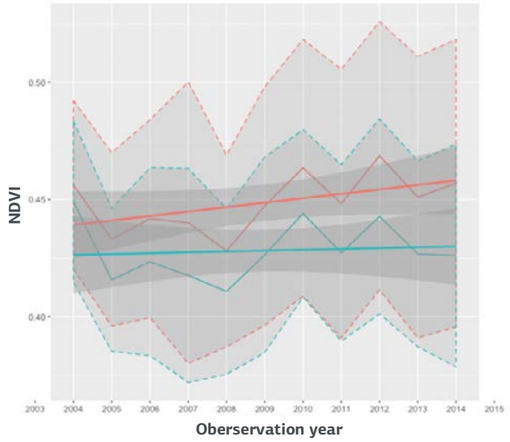


Source: Own compilation by MapTailor Geospatial Consulting GbR on behalf of KfW Developement Bank; Data Sources:
1) Warehouse/crossing/vegetable gardens (KfW)
2) Cities: Natural Earth
3) Administrative units: GADM

4.3.4.2 Change of average rice cultivation area in Burkina Faso 2004-2014



4.3.4.3 Change of NDVI of rice cultivation area in Burkina Faso 2004-2014



Source: Map Tailor on behalf of KfW Developement Bank, Data: Terra MODIS NDVI (MOD13Q1), NASA, for NDVI analysis, Terra MODIS GPP (MOD17A2H) and Terra MODIS NPP (MOD17A3H), NASA, for GPP and NPP, ACMA, USGS for Anual crop maps, based on classification of MODIS 250m 16-days composite EVI product (MYD13), Global Food Security-support Analysis Data (GFSAD) Cropland Extent, USGS, Climate Hazards Group InfraRed Precipitation with Station data (CHIRPS) for the rainfall dataset

Geospatial Tools

Data Sources

2 Zero Hunger

4.3.5 Comparing Satellite Images and Maps to Assess the Change of the Road Condition and Change in Travel Time in Lomé, Togo

Project: Small Bypass Road Lomé, (BMZ-No. 200967182, data elements on pages 9-15 of the annex of the online report)

Comparison of satellite images to assess the change in road condition in Lomé

Impact area: Urban mobility

RMMV approach: comparing different satellite images showing the condition of the road at different points in time.

Data source: Google Earth Pro

Findings: The comparison of satellite images in Google Earth Pro allows a quick assessment of the road condition and of development in the surrounding area (before/after).

Difficulty in creating data elements:
no difficulty

4.3.5.1: Google Earth image of the southern part of the road before start of construction works in 2013

4.3.5.2: Google Earth image of the southern part of the road after the end of the project in 2018

4.3.5.3: Google Earth image of the western part of the road before start of construction works in 2013

4.3.5.4: Google Earth image of the western part of the road after the end of the project in 2018

4.3 Examples of RMMV Approaches used for Ex-post Evaluations

Simulation of travel time savings on a bypass road in Lomé (page 5 of the ex-post evaluation report)

Impact area: Urban mobility

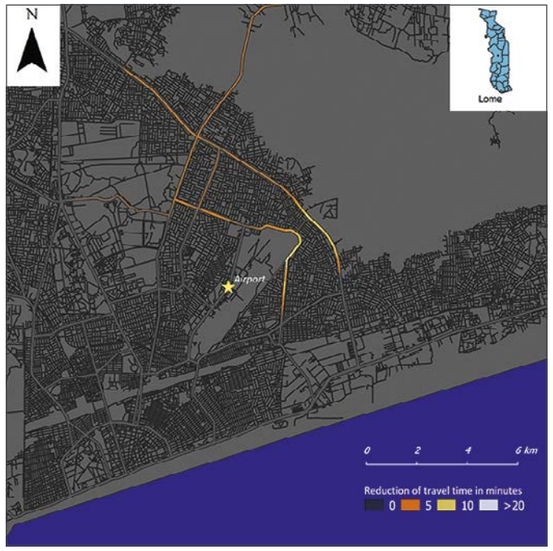
RMMV approach: travel time simulation that visualizes time savings due to road improvements

Data source: Open Street Map (via Geofabrik), Map Library (no longer active, GADM can be used instead, for example), QGIS.

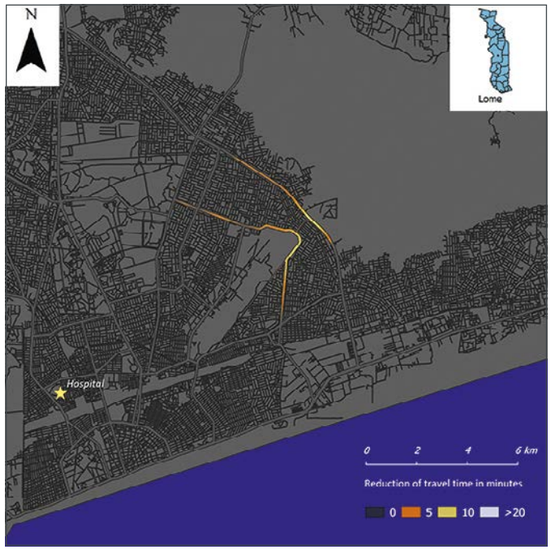
Findings: Simulation of travel time savings to central points of the city afforded by road improvement shows that the greatest time savings are to be had in the immediate catchment area around the implemented project measure.

Difficulty in creating data elements:
high ↗↗↗↗↗

4.3.5.5: Reduction of travel time to airport (in minutes)



4.3.5.6: Reduction of travel time to hospital (in minutes)



Sources: Road network from http://download.geofabrik.de/africa/togo.html

Geospatial Tools

Earth Observation via Satellites

Data Sources

2 Zero Hunger

8 Decent Work and Economic Growth

9 Industry, Innovation and Infrastructure

11 Sustainable Cities and Communities

4.3.6 Calculation and Visualization of Deforestation Trends in Brazil

Project: REDD Early Movers Acre (BMZ-No. 209810953, pages 5 and 6 of the online report)

Deforestation and locations of (indigenous) beneficiaries

Impact area: Forest for Climate Protection (REDD)

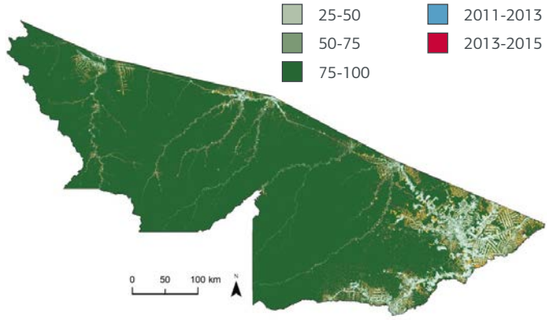
RMMV approach: calculation and visualization of deforestation trends between the year of appraisal and the year of evaluation, as well as visualization of beneficiary locations in QGIS

Data sources: Hansen et al. (2013) Global Forest Change Dataset and data provided by the project sponsor IMC (2017).

Findings: deforestation trends at a glance. Looking at the period from 2001 to 2015, we can see that deforestation increased most between 2001 and 2011 in the east of Acre, along the roads.

Difficulty in creating data elements:
moderate ↗↗↗

4.3.6.1: Comparison of deforestation in Acre, Brazil, between 2001 and 2015

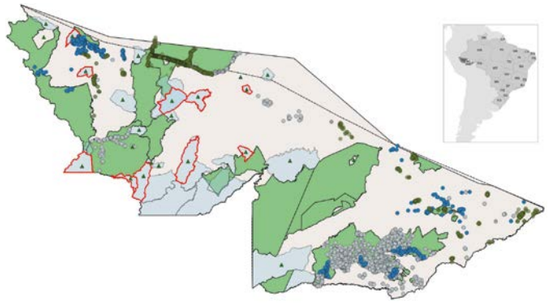


	2001-2010	2011-2013	2014-2015	2001-2015	annually
State of Acre	3.84	0.79	1.06	5.69	0.38
Project areas	0.65	0.3	0.23	1.18	0.08
Other protected areas	2.22	0.86	0.48	3.57	0.24

Comparison of deforestation in periods between 2001 and 2015 (in %)

Data Sources: Forest/Deforestation. Hansen/UMD/Google/USGS/NASA (Online). Accessible at: http://earthenginepartners.appspot.com/science-2013-global-forest

4.3.6.2: Illustration of project beneficiary locations in Acre, Brazil, in 2007



Geospatial Tools

Data Sources

13 Climate Action

15 Life on Land

17 Partnership for the Goals

4.3 Examples of RMMV Approaches used for Ex-post Evaluations

Source: iStock / fizkes

Conclusion

5

Remote Management, Monitoring, and Verification (RMMV) of projects in international development cooperation have become an integral part of project management—in fragile contexts and beyond.

KfW's RMMV approach to remote project management holds tremendous promise for helping project teams and entire organizations continue their work in the face of circumstances that make it difficult to visit project sites in person — such as dangers to personnel due to working in fragile and conflict-affected environments, travel to remote areas being too difficult or costly, or circumstances of worldwide impact that render travel impossible, like the COVID-19 pandemic or other emergencies.

Since the first internal study and toolkit on RMMV in 2018, KfW has made impressive progress in developing RMMV by establishing basic communication channels in conflict zones, through setting up simple Management Information Systems for managing multi-site emergency programs more effectively, up to using sensor networks and Building Information Modeling for complex infrastructure projects or financing forest protection based on the results provided by satellite monitoring systems. The use of Third-Party Monitoring has become more frequent and the role of KfW's national experts in its country offices is being continuously strengthened. The pandemic has further accelerated the capacity development of KfW and its partners and stakeholders in RMMV. The project experience presented in section 4 is illustrating this development as well as the diversity of approaches, tools and data sources being used across all sectors.

Also, the use of RMMV has moved beyond fragile contexts and its tools and data sources are becoming crucial parts of KfW's *Digital-by-Default* strategy, particularly in projects covering large areas or multiple locations.

This Guidebook is based on some key lessons learned from KfW's RMMV experience:

- If possible, consider RMMV already in your project design.
- It's not about the technology, it's about the information need!
- It doesn't need to be complicated to be effective.
- Don't forget the institutional approaches: capacities, roles and responsibilities of national and local actors need to be strengthened as part of the project design.
- Involve target groups and project-affected people more systematically. RMMV may help in this endeavor.
- The primary objective of RMMV is not saving costs, but making project management, monitoring and verification more effective and allowing project implementation under difficult circumstances.
- In spite of all the approaches and tools offered by RMMV, some projects may remain unfeasible.

The information in the *Guidebook* was collected from a review of KfW project documents and studies as well as input from experienced KfW staff who use RMMV approaches in their daily work and from KfW technical, legal, contract and procurement experts, team leaders and sector economists.

KfW's experience is complemented by inputs from consultancies on various RMMV aspects as well as interviews with partner governments and PEA staff, target groups representatives as well as other donors, UN, consultants, NGOs, RMMV service providers and other non-development actors that use RMMV approaches, such as private-sector organizations, and a body of literature and resources on RMMV. Although this *Guidebook* refers to KfW's institutional setup and procedures, the principles in play are of course transferable to the business models of other development stakeholders.

KfW hopes that you find the information in this *Guidebook* useful as you carry out your own RMMV activities. This is a living document that we will be updating regularly, thus we welcome your feedback as you use the *Guidebook* so that we can continue to improve it and add information on new approaches, technical tool types and data sources as it becomes available.

In order to institutionalize the continuous improvements of the *Guidebook* and live the spirit of the *Principle for Digital Development* ***"Be Collaborative,"*** KfW is promoting the establishment of an international Community of Practice on RMMV to exchange experiences and lessons learned, and to share open source-based tools and open data sources. In addition to publishing RMMV-related information and collaborating with others in expanding international standards relevant to RMMV, KfW will be organizing and participating in international events on RMMV.

If you are interested in joining this *Community of Practice* or to provide your feedback on the RMMV Guidebook, please contact KfW directly at > info@kfw-entwicklungsbank.de (please mention ***"RMMV4Dev"*** in the subject).

Annex 1
Glossary of RMMV Definitions in German Financial Cooperation

Term	Definition
360o Camera	A camera which captures images and/or video with a 360-degree field of view
3G	Third generation of wireless mobile telecommunications technology. Up to 2 MB per second. (1 image is between 1 to 5 MB)
4G	The fourth generation of broadband cellular network technology, succeeding 3G. Up to 20 MB per second. (1 image is between 1 to 5 MB)
Ad-hoc surveys	Individual surveys about project outcomes and usage of infrastructure are conducted among beneficiaries/the target group, e.g., one year after start of operation. Depending on the sector, different questions and indicators are used. Added Value: If no other data is available (e.g., collected by the PEA) this may be the only way to monitor project outcomes. Ad-hoc surveys can be used spontaneously and flexibly, allowing the information obtained to flow into decision-making. Collection of specific data on a particular project measure is feasible. Challenges: Compared to comprehensive surveys, conducted by national statistical agencies for example, survey design quality and data quality are relatively poor. Conducting such surveys is relatively expensive.
Algorithm	A process or set of rules to be followed in principally computerized calculations or other problem-solving operations.
Anonymous data	Data which has been recorded in a way so as to protect privacy, preventing the information from being referenceable to the person who supplied it.
Satellite office	KfW sub-country office or country office managed from a neighboring country
Antivirus software	Computer program used to prevent, detect, and remove viruses and malware
Application	A computer program designed to perform a set of coordinated functions, tasks, or activities for the benefit of the user. Various types exist, including desktop applications, mobile, applications, and web applications. A desktop application is an application which runs in standalone fashion on a desktop or laptop computer. Different software applications will have differing operating system requirements, including Windows, Linux, Unix, and MacOS. A mobile application is software designed to run on a mobile device, such as a smartphone or tablet computer. The most common smartphone and tablet operating systems are Android, iOS, and Windows. A web application is a program stored on a remote server that is served over the internet via a web browser interface. Web applications are generally accessible through most standard web browsers, such as Google Chrome, Mozilla Firefox, etc.
Application programming interface (API)	API is an automated interface that allows two software programs or websites to communicate with each other. The interface is similar to a gate through which data can be accessed or contributed if the appropriate authorization is given.
Appraisal	A process in which the results of a project Feasibility Study are verified by KfW and the project design is defined and discussed with the respective representatives and stakeholders of a partner country.
ArcGIS	ArcGIS is a commercial Geographic Information System application.
Augmented reality	A computer-generated simulation of three-dimensional images overlapping with the real environment in the background that a person can be interact with in a seemingly real or physical way via smartphone or other device.

Term	Definition
BI	Business intelligence (BI) comprises the strategies and technologies used by enterprises for data analysis and management of business information. Common functionalities of business intelligence technologies include reporting, online analytical processing, analytics, dashboard development, data mining, process mining, complex event processing, business performance management, benchmarking, text mining, predictive analytics, and prescriptive analytics. [26]
Big Data	Data sets that are too large or complex to be processed using traditional data processing application software.
Building information modeling (BIM)	Method for collaborative integrated planning and constructing of large, complex infrastructure projects in real time to improve construction quality and enable continuous project controlling.
Bundesdatenschutzgesetz (BDSG)	German Federal Data Protection Act
Cameras	Cameras are manual or automatic optical instruments for capturing/recording static, omnidirectional (360˚) or virtual reality (VR) photos and videos. Cameras can be carried by humans (separately or integrated into a smartphone) or mounted statically (on buildings, mountains, etc.) or on drones or satellites.
Catholic Relief Service (CRS)	Catholic Relief Services is the international humanitarian agency of the Catholic community in the United States.
Cellular network	A mobile network that provides services using a large number of base stations with limited power, each covering a limited area, or cell.
Climate Hazards Group InfraRed Precipitation with Station (CHIRPS)	CHIRPS is a quasi-global rainfall data set spanning 50˚S-50˚N (and all longitudes) that ranges from 1981 to near-present. CHIRPS incorporates the Climate Hazards Center's in-house climatology (CHPclim), 0.05˚ resolution satellite imagery, and in-situ station data to create gridded rainfall time series for trend analysis and seasonal drought monitoring. [27]
Cloud computing	The use of a network of remote servers hosted on the internet to store, manage, and process data rather than a local server or a personal computer. Cloud computing allows renting server resources on a per-minute basis as needed. Additionally, cloud computing offers many other on-demand services such as data processing, databases etc. All this is simply referred to as "the cloud."
Collaboration tools	Collaboration tools (aka groupware) are software applications designed to optimize interactions or "group processes" for people working on a common task. Their purposes include increasing teamwork efficiency, allowing multitasking, reducing miscommunication, increasing search capability, and reducing paperwork.
Comma separated value (CSV)	A CSV file is a delimited text file that uses a comma to separate values. Each line of the file is a data record. Each record consists of one or more fields, separated by commas. A CSV file typically stores tabular data (numbers and text) in plain text, in which case each line will have the same number of fields. [28]
Commercial use/license	A product which is produced for sale or that serves commercial purposes, for which license fees are charged. Such systems are usually proprietary.
KCUS	Competence Centre for Environmental and Social Sustainability at KfW.
Community-Based Participatory Research (CBPR)	A partnership research approach that equitably involves community members, organizational representatives, researchers, and other parties in all aspects of the research process, with all partners to the process contributing expertise and sharing in decision-making and ownership. The aim of CBPR is to increase knowledge and understanding of a given phenomenon and integrate knowledge gained through interventions in the interest of policy or societal changes benefiting the community members.
Corrective Action Plan (CAP)	A Corrective Action Plan (CAP) is formulated based on the findings of the review mission. The CAP should include a concise description of findings and their corresponding corrective actions and define the individuals/functions responsible for implementing the corrective actions. It sets out a timeline for completing the corrective actions.
Crowdsourcing	Method for collecting information, observations, ideas, opinions, decisions and/or labor from an undefined and often large group of people

[26] https://en.wikipedia.org/wiki/Business_intelligence

[27] https://www.chc.ucsb.edu/data/chirps and https://www.chc.ucsb.edu/data/chpclim

[28] https://en.wikipedia.org/wiki/Comma-separated_values

Annex 1 Glossary of RMMV Definitions

Term	Definition
Dashboard	A user interface that organizes and presents information via visualizations in an easily comprehensible manner.
Data	Facts and statistics collected for reference, management or analysis.
Data analysis	A process for inspecting, cleansing, transforming, and modeling data aimed at discovering useful information, drawing potential conclusions and supporting decision-making.
Data breach	Intentional or unintentional release of private/confidential information to an untrusted environment.
Data encryption	A process for encoding or translating data into another form or code so that only individuals with access to a secret key or password are able to read it.
Data privacy	Requirement to preserve and protect any personal data collected by any organization from being accessed by unauthorized parties.
Data portal	A specially designed website that brings together information and data from many sources in a uniform way.
Data processing	Data processing includes the collection, recording, organization, structuring, storage, adaptation/alteration, retrieval, consultation, use, disclosure by transmission and dissemination of data as well as the making available of data in other fashion and the alignment, combination, restriction, erasure and destruction of data (from Art. 4 No. 2 of the GDPR)
Data security	Protection of digital data, such as in a database, against destructive forces and unwanted actions by unauthorized users, such as actions constituting a cyberattack or data breach.
Data set	A collection of related sets of information (usually in a tabular format) or data that is comprised of separate elements but can be manipulated as a unit by computer.
Data sources	Data sources can be proprietary (collected and owned by a private entity with no availability to the public), public (collected and owned by a governmental institution with limited access and editing options), or open. Open-data sources are publicly available data sets on all sectors and geographical areas—some having no restrictions as to their use or sharing, some restricted from commercial use.
Data syncing	The process of establishing data consistency between source and target data storage and vice versa; also the continuous harmonization of data over time. Also called 'data synchronization'.
Database	A typically larger volume of information stored on a computer system in such a manner as to allow it to be easily viewed or edited.
Deutsche Gesellschaft für Internationale Zusammenarbeit GmbH (GIZ)	The Deutsche Gesellschaft für Internationale Zusammenarbeit GmbH, aka GIZ for short, is Germany's main development agency with headquarters in Bonn and Eschborn, providing services in the fields of international development cooperation and international education work.
Digital archive	Repository for storing one or more collections of digital information objects with the intention of providing long-term access to the information.
Digital Elevation Model	A 3D computer graphics representation of a terrain's surface, commonly of a planet, moon, or asteroid, created from terrain elevation data.
Digital Impact Alliance (DIAL)	Digital Impact Alliance, a "think, do, replicate"-tank housed at the United Nations Foundation focused on digital technology and data.
Digital recording	The capturing of audio signals by microphone or other transducer or of video signal by camera or similar device and conversion thereof into a stream of discrete digits representing the changes over time in air pressure for audio and the chroma and luminance values for video before these are recorded to a storage device.
Document management tool	Software used to efficiently track, manage, and store large numbers of documents
Drone	A drone (also: Unmanned Aerial Vehicle; UAV) is an aircraft without a human pilot aboard. Drones can be equipped with sensors and cameras for analyzing and monitoring specific project locations (including, infrared, night vision and 3D cameras and video recording)
DTMF	Dual-tone multi-frequency signaling (DTMF) is a telecommunication signaling system using the voice-frequency band over telephone lines between telephone equipment and other communications devices and switching centers.

Term	Definition
Earth Observation (EO)	Earth Observation is a discipline that allows us to gather information about our planet. It often involves remote sensors (usually onboard satellites). The data collected using satellites is designated as satellite or geospatial data. Optical (visible, near- and mid-infrared and thermal infrared). ultraviolet and radar images (microwave) cover the full radiation spectrum beyond the optical domain.
eLearning	Learning conducted via electronic media, typically on the internet.
eLearning tools	Learning tools that can be adjusted for various purposes but are usable in particular for specific courses on RMMV and on individual technologies.
Encryption	Method by which plaintext or any other type of data are converted from a readable form to an encoded version that can only be decoded by another entity which has access to a decryption key.
Energy Monitoring System (EMS)	An Energy Monitoring System is a centralized database for the remote collection, analysis and management of energy (and potentially other) production and/or consumption data from smart meters and the respective utilities in a partner country.
Energy performance calculation (EPC)	Energy Performance Calculation (EPC) is a method for the calculation of energy needs for the heating and cooling of buildings. Different software applications are available for conducting an Energy Performance Calculation, carrying out energy audits and issuing energy passports for buildings.
Environmental and social commitment plan (ESCP)	The environmental and social commitment plan is a document attached to the KfW Separate Agreement or Grant or Loan Agreement that sets out the material measures and actions required for the project to meet the KfW's ESHS requirements within a specific timeframe. The ESCP is an agreement between KfW and the PEA based on the appraisal. As per the Grant or Loan Agreement, the ESCP will be monitored and reviewed regularly during implementation of the project.
Environmental and social impact assessment (ESIA)	The environmental and social impact assessment is a study conducted by consultants to identify E&S risk and impacts and develop appropriate mitigation measures that are consolidated in an ESMP based on the ESIA.
The Environmental and Social Management Framework (ESMF)	The Environmental and Social Management Framework is an E&S instrument for projects with several locations that are not yet set at the time of the appraisal. The ESMF outlines the principles and rules for identifying and addressing E&S risks during the implementation phase.
Environmental and Social Management Plan (ESMP)	The Environmental and Social Management Plan is either a part or outcome of the ESIA study, or sometimes a stand-alone document, outlining all E&S measures with the associated responsibilities along with plan milestones timeline. The EMSP is typically structured into planning, construction and operation phases if these are still relevant at that time. An ESMP also contains references to special plans required to address certain issues which are necessary but as yet unprepared (Biodiversity Action Plan, Resettlement Action Plan, etc.). The ESMP is to be integrated into bidding documents, as implementation of the ESMP is generally the task of the Implementation Consultant and construction providers.
E&S expert	Environmental and Social Expert. At KfW the Environmental and Social Expert is a role supporting KfW Portfolio Managers as a technical expert for assessing and monitoring environmental and social risks in a project.
e-participation	ICT-supported participation in processes involving government and citizens. Processes may concern administration, service delivery, decision making or policy making. E-participation is thus closely related to e-government and e-governance participation.
Ex–post evaluations (EPE)	At KfW, ex-post evaluation is carried out roughly three to five years after a project is completed as an evaluation of impact achieved throughout the entire project cycle. The evaluators examine the project, its contents and the circumstances surrounding it on the basis of the documents and reports available. They conduct interviews on-site, analyze data and statistics and evaluate information provided by other donors and involved parties to ultimately arrive at a final evaluation for the project.
Facility-owned usage information system	System for the collection, storage and management of usage information for the PEA/Facility tasked with operating/maintaining the infrastructure or service.

Term	Definition
FAOSTAT	FAOSTAT is a free-access database of the Food and Agriculture Organization (FAO) with food and agriculture data for over 245 countries and territories, covering all FAO regional groupings from 1961 to the most recent year available.
Feedback loop	A system for improving a system, process, service, product, etc. by collecting and reacting to users' comments
Financial Cooperation (FC)	Financial Cooperation is part of the bilateral Development Cooperation of the Federal Republic of Germany with its partner countries. KfW has a mandate from the Federal Republic of Germany to execute German Financial Cooperation projects`.
Financial Participatory Approach	The Financial Participatory Approach (FPA) has the objective to mobilize local populations through PRA, contests and awards, training, and use of media to take charge of their own development. FPA Manual: > https://impact.dorsch.com/fileadmin/Dorsch_Impact/pdf/TJS-III_FPA_Manual_Toolbox_2020_EN.pdf FPA Sourcebook: > https://impact.dorsch.com/fileadmin/Dorsch_Impact/pdf/TJS-III_FPA_Sourcebook_2020_EN.pdf
First-person view	A method for controlling a radio-controlled vehicle from the driver or pilot's viewpoint. Most commonly used to pilot a radio-controlled aircraft or other type of unmanned aerial vehicle (UAV).
Fixed wing	An aircraft capable of flight using wings that generate lift from the vehicle's forward airspeed combined with wing shape.
For-profit organization	A business or other organization whose primary goal is making money (profit).
Free prior informed consent (FPIC)	Free, Prior and Informed Consent (FPIC) is a specific right accruing to indigenous peoples that is recognized per the United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP). The principle of FPIC allows indigenous peoples to grant or withhold consent to a project that may affect them or their territories. Previously granted consent may be withdrawn at any stage. Furthermore, FPIC enables indigenous peoples to negotiate the conditions under which the project is to be designed, implemented, monitored and evaluated. FPIC is also embedded within the universal right to self-determination. [29]
Freemium	A pricing strategy by which a product or service is provided free of charge but with fees for additional features, services, or virtual goods.
Freeware	Software available free of charge.
Feasibility Study (FS)	A Feasibility Study is a study for assessing the feasibility of a project, taking into account the technical feasibility of physical infrastructure to be financed, economic viability considerations, the developmental impact and potential project risks. Social, cultural and ecological aspects are also addressed.
Fuzzy Cognitive Map (FCM)	A cognitive map showing the relations between the elements (e.g. concepts, events, project resources) in the form of a "mental landscape" usable to compute the "strength of impact" of these elements. Fuzzy cognitive maps were introduced as a formal way of representing social scientific knowledge and for modeling decision making in social and political systems
Gateway	A device which acts as network coordinator for a sensor network.
General Data Protection Regulation (GDPR)	The General Data Protection Regulation (GDPR) is a set of privacy and security laws enacted by the European Union (EU). The Act imposes obligations on organizations located anywhere which target or collect data relating to persons in the EU. The regulation entered into force on May 25, 2018.
Geographic Information System (GIS)	System designed to capture, store, manipulate, analyze, manage, and present spatial or geographic data.
Geolocation	The identification or estimation of the real-world geographic location of an object, such as a radar source, mobile phone, or internet-connected computer terminal.
Georeferenced photo	A photo that is associated with a geographical location. Usually this is involves assigning latitude and longitude to the image at a minimum as well as altitude, compass bearing and other optionally includable fields.

[29] https://www.fao.org/indigenous-peoples/our-pillars/fpic/en/

Term	Definition
Geospatial data	Data or information that identifies the geographic location of features and boundaries on Earth, such as natural features like oceans or constructed works.
Geospatial search engine	A system used to search for and find specific geospatial data.
Geospatial tools	Geospatial tools encompass geographic information systems (GIS) as desktop and web-based (webmapping) software. GIS software is a specialized tool designed to collect, integrate, aggregate, store, edit, manipulate, analyze, manage, share, and present different types of geospatial data in layers of maps. Webmapping is the process of visualizing and sharing maps on the internet. The distinction between web maps and GIS is not entirely clear: maps are often a presentation means in GIS, but are increasingly being imbued with analytical functionalities.
German Federal Ministry for Economic Cooperation and Development (BMZ)	The Federal Ministry for Economic Cooperation and Development, abbreviated as BMZ, is a cabinet-level ministry of the Federal Republic of Germany. The BMZ has its main office at the former German Chancellery in Bonn and a second major office at the Europahaus in Berlin.
Global Database on Administrative Areas (GADM)	GADM is an international open-source database that provides maps and spatial data for all countries and their sub-divisions. GADM provides data at high spatial resolutions that includes an extensive set of attributes.
Global Food-and-Water Security-Support Analysis Data (GFSAD)	The Global Food-and-Water Security-Support Analysis Data (GFSAD) is a database of global cropland data. [30]
GNU	GNU is an open-source operating system. GNU is a recursive acronym for "GNU's Not Unix".
Gross Primary Productivity (GPP)	Gross Primary Productivity (GPP) is the total amount of carbon compounds produced by plant photosynthesis in an ecosystem within a given period of time. [31] [32]
Greenhouse gas (GHG)	A greenhouse gas is a gas that absorbs and emits radiant energy within the thermal infrared range, causing the greenhouse effect. The primary greenhouse gases in Earth's atmosphere are water vapor, carbon dioxide, methane, nitrous oxide, and ozone.
Ground positioning system (GPS)	Global Satellite navigation system used to determine geolocation and the corresponding time information of an object.
Graphical user interface	A type of user interface that allows users to interact with electronic devices through graphical icons and visual indicators such as secondary notation, instead of text-based user interfaces, typed command labels, or text navigation.
Hazard map	A map that highlights areas that are affected by or vulnerable to a particular hazard.
Human Machine Interface (HMI)	The user interface that connects an operator to the controller of an industrial system.
Human Rights Impact Assessment (HRIA)	The Human Rights Impact Assessment can be defined as a process for identifying, understanding, assessing and addressing the adverse effects of a business, project or activities regarding the human rights enjoyed by impacted rights-holders, such as workers or community members. The Danish Institute for Human Rights has developed a practical guideline for businesses and other actors in the digital ecosystem on how to conduct human rights impact assessments of digital activities. See also > KfW Digital Rights Check
Hyperspectral camera	A camera that collects and processes information from across the electromagnetic spectrum. This represents a special type of spectral imaging in which often hundreds of contiguous spectral bands are available.
Hyperspectral imagery	Imagery captured using a hyperspectral camera in which light is displayed from a larger number, often hundreds, of contiguous spectral bands.
ICT4D	Information and communication technologies for development
Industry Foundation Classes (IFC)	An open, neutral data format for Building Information Modeling (BIM)
Imagery processing	Method of converting an image into digital form and analyzing it to enable interpretation
Implementation Consultant	Consulting company or consortium financed through KfW as part of the FC project that assists the PEA in implementing the FC project. The company or consortium is recruited through international tender.

[30] https://www.usgs.gov/centers/western-geographic-science-center/science/global-food-and-water-security-support-analysis

[31] https://www.un-redd.org/glossary/gross-primary-productivity-gpp

[32] https://modis.gsfc.nasa.gov/data/dataprod/mod17.php

Term	Definition
Indigenous peoples (IP)	Indigenous peoples — also referred to as First Peoples, First Nations, Aboriginal peoples, native peoples, indigenous natives, or autochthonous peoples — are culturally distinct ethnic groups whose members are directly descended from the earliest known inhabitants of a particular geographic region and who to some extent maintain the language and culture of those original peoples. In the context of the World Bank Environmental and Social Standards Communities, a people is considered ans IP if the following characteristics are all in evidence to some degree: (a) self-identification; (b) collective attachment to geographically distinct habitats, (c) customary cultural, economic, social, or political institutions that are distinct or separate from those of the mainstream society or culture; (d) distinct language or dialect.
Inductive-loop traffic detectors	Devices installed in pavement to detect vehicles passing or arriving at a certain point, such as when approaching a traffic light, or in motorway traffic.
Information and Communication Technologies (ICTs)	Devices, infrastructure and programs which process, save and transfer digital information.
Information Technology (IT)	Information technology is any computer, storage, networking or other physical device technology or infrastructure used to create, process, store, secure and exchange any form of electronic data.
Institutional approach to RMMV	Change in the project's institutional setup due to the introduction/use of RMMV. Actors with continued access to the region, such as national or local staff, national or local consultant staff, other institutions (e.g., Third-Party Monitoring Consultancy) and/or the target group itself collect information, thus substituting and/or complementing international or other national staff of KfW, the PEA and/or the consultant
Integrated Biodiversity Assessment Tool (IBAT)	The Integrated Biodiversity Assessment Tool (IBAT) is a data analysis tool that provides authoritative geographic information relevant to global biodiversity. The tool is underpinned by three of the world's most authoritative global biodiversity datasets: the IUCN Red List of Threatened Species, the World Database on Protected Areas (WDPA) and Key Biodiversity Areas (KBA). [32]
Interactive radio shows	A local radio station is asked to host a show about the project allowing citizens to call in and voice their opinion on the project. The host allows phone-ins from the listeners making the show interactive and interesting, as listeners give different views on the issue being discussed. Added value: Radio programs enjoy a wide variety of listeners and are easily accessed also by more disadvantaged parts of the target population. This approach can thus facilitate gathering feedback from a variety of target groups. Limitations: The approach only facilitates the gathering of the opinions of individuals and principally encourages individuals who have strong opinions to call in.
Interactive voice response	A technology allowing a computer to interact with humans through the use of voice and DTMF tone input via a keypad.
International Aid Transparency Initiative (IATI)	A global initiative for improved transparency of development and humanitarian resources and their results in addressing poverty and crises.
International Labour Organization (ILO)	The International Labour Organization is a United Nations agency whose mandate is to advance social and economic justice by establishing international labor standards. Founded in October 1919 under the League of Nations, it is the first and oldest specialized agency of the UN.
Internet–of-Things (IoT)	A system of interrelated computing devices (e.g. sensors), mechanical and digital machines, objects, animals or people that are provided with unique identifiers and the ability to transfer data over a network without requiring human-to-human or human-to-computer interaction.
IPC	Integrated Food Security Phase Classification (IPC) is an innovative multi-partner initiative for improving food security and for nutrition analysis and decision-making. Using the IPC classification and analytical approach, governments, UN agencies, NGOs, civil society organizations and other relevant actors work together to determine the severity and magnitude of acute and chronic food insecurity and acute malnutrition situations in a country, in accordance with internationally-recognized scientific standards.
IPEX	KfW IPEX-Bank is a wholly-owned subsidiary of KfW Group responsible for international project and export finance within the KfW Group.

[32] https://www.ibat-alliance.org/

Term	Definition
JavaScript	A high-level interpreted programming language used to make webpages interactive and provide online programs.
Keyhole Markup Language (KML)	An open file format (based on Extensible Markup Language (XML)) used to display geographic data in an Earth browser, such as Google Earth.
KfW	KfW is the development bank of the German government. Jointly owned by the German federal government (80%) and federal states (20%), KfW has been committed to improving economic, social and environmental living conditions across the globe on behalf of the German Government since 1948.
Light detection and ranging (Lidar)	A surveying method that measures the distance to a target by illuminating the target with pulsed laser light and measuring the reflected pulses via sensor.
Local data storage	When data are stored locally on a physical device, as opposed to being uploaded to the internet.
Linear Tape-Open (LTO)	An open standard computer storage tape format having a single spooled cartridge with half-inch tape.
Maintenance management software	Software used to organize and implement asset management strategies with the fundamental goal of preserving and extending the service life of infrastructure assets.
Maintenance Management System (MMS)	MMS is integrated software for managing a project's or operator's maintenance operations and optimizing the utilization and availability of equipment, infrastructure and/or maintenance staff. Such software is used in permanent infrastructure projects (schools, clinics, roads, power plants, etc.) in which a considerable number of assets with inventory are financed, including equipment, vehicles, machinery and spare parts). There are two types of MMS: highly sector-specific, proprietary systems and standard, basic asset management systems. Setting up an MMS is an ownership incentive for the Project Executing Agency or long-term operator to operate and maintain assets during and/or after the project in a sustainable manner. MMS offers many advantages, such as improved safety and uptime reliability as well as reduced downtime and paperwork.
Malware	Term used to refer to a variety of forms of hostile or intrusive software, including computer viruses, worms, Trojan horses, ransomware, spyware, adware, and scareware as well as other intentionally harmful programs.
Management Information System (MIS)	Software for collecting, processing, storing, administering, aggregating, analyzing, visualizing and disseminating information in support of managerial responsibilities.
Map polygon	Polygons on a map for describing geographic units of collected data.
Massive Open Online Course (MOOC)	Online course aimed at unlimited participation and open access via the web.
Message–Passing Interface (MPI)	A standardized and portable message-passing standard designed by a group of researchers from academia and industry to function on a wide variety of parallel computing architectures.
Metadata	A set of data that describes and gives information about other data.
Micro narrative	Collection and aggregation of a large number of anecdotes or short stories by citizens to gain insight into real-time issues and changes in society. Information collected via such narratives is interpreted by the narrative teller based on a set of criteria to yield quantitative data. The practice allows identification of broad trends and representative narratives. Added value: micro narratives generate real-time data from a potentially large number of citizens. This may help identify early warning signs for program implementation in the relevant communities. Limitations: The approach requires high initial investment in pattern detection software (proprietary software like sensemaker) and information campaigns to inform and motivate citizens.
Middleware	Software that serves as a bridge between an operating system or database and applications, especially on a network.
Milestone-based monitoring	Progress is monitored based on the attainment of simple visual milestones (e.g. foundation built, structure completed, roofing finished), allowing monitoring by staff without expert qualifications.
Mobile application	Application software designed to run on a mobile device, such as a smartphone or tablet computer. The most common smartphone and tablet operating systems are Android, iOS, and Windows.

Term	Definition
Mobile Data Collection (MDC)	Mobile Data Collection tools are used for collecting qualitative and quantitative information in the field via mobile devices such as a smartphones, tablets and GPS trackers.
Mobile network population information system	System that collects and evaluates behavioral and primarily movement data of phone users, who frequently are unaware of such. Mobile phone data are collected by mobile network operators and mobile phone app providers. Data includes unique identifiers of the device or user, GPS location data and data on mobile phone use (e.g. download volume, call history).
Multispectral camera	A camera that captures image data within specific wavelength ranges across the electromagnetic spectrum. Multispectral imaging measures light in a small number of spectral bands, typically 3 to 15.
Multispectral imagery	Imagery captured using a multispectral camera in which light from a small number of spectral bands is displayed, typically 3 to 15.
Multispectral instrument	An imaging sensor on the Sentinel-2 satellite which captures multispectral data.
Near zero energy (NZE)	A European Directive dating from 2010 requires all new buildings to be “nearly zero”-energy by 2021.A nearly zero-energy building must conform to the following two criteria: 1. the building must have a very high energy performance rating 2. the near-zero or very low amount of energy required should be supplied from renewable sources and generated either on-site or in the vicinity.
Network Attached Storage (NAS)	NAS is one of two main types of networked file storage enabling multiple users and client devices to retrieve data from centralized disk capacity. Every NAS unit resides on the LAN as an independent network node, defined by its own unique Internet Protocol (IP) address. NAS handles unstructured data such as audio, video, websites, text files and documents.
Nonprofit organization	Associations, charities, cooperatives, and other voluntary organizations formed to further cultural, educational, religious, professional, or public service objectives. These organizations are solely concerned with money inasmuch as necessary to keep the organization operating, rather than seeking profit.
Non-commercial (NC) licenses	Non-commercial (NC) licenses restrict the purposes for which data may be used.
NoDerivs (ND) licenses	NoDerivs (ND) licenses do not allow data to be modified, only to be downloaded and shared.
Normalized difference vegetation index (NDVI)	A simple graphical indicator that can be used to analyze remote sensing measurements and assess whether or not the target being observed contains live green vegetation.
United Nations Office for the Coordination of Humanitarian Affairs (OCHA)	With its partners, OCHA contributes to principled and effective humanitarian response through coordination, advocacy, policy, information management and humanitarian financing tools and services.
Offline	The condition of being capable of but currently not connected to a network of computers or other devices such as in particular the internet.
Off-the-shelf	A product which is available as a stock item and is not specially designed or custom-made.
Online	Connected by computer to one or more other computers or networks, via commercial electronic information service or the internet.
Open access	Online research outputs that are free of all access restrictions and many usage restrictions
Open license	A license that governs the non-commercial use, changing and mixing of digital goods, such as content, images, videos and software (e.g., Creative Commons License)
Open Geospatial Consortium (OGC)	OGC is a worldwide community representing over 500 businesses, government agencies, research organizations, and universities that is committed to making location information FAIR (= Findable, Accessible, Interoperable, and Reusable) by establishing free, publicly available geospatial standards enabling new technologies.
Open-source community	A community of people who create, maintain, and contribute to the development of open-source software.
Open-source software	Open-source software is software the original source code of which is made freely available. This source code may be modified or redistributed by anyone.
OSCAR	Common decision support system for health emergencies financed by KfW

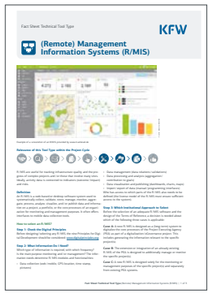
Term	Definition
Panchromatic imagery	A type of black-and-white imagery taken by cameras sensitive to all wavelengths of visible light.
Participatory Action Research (PAR)	An approach to action research emphasizing participation and action by members of communities affected by that research. PAR is about seeking to understand the world by trying to change it collaboratively and in a reflective manner. PAR emphasizes collective inquiry and experimentation grounded in experience and social history. Within a PAR process, "communities of inquiry and action evolve and address questions and issues that are significant for those who participate as co-researchers". PAR contrasts with mainstream research methods, which emphasize controlled experimentation, statistical analysis, and reproducibility of findings.
Participatory approaches	Approaches that enable ordinary people to play an active and influential part in decisions that affect their lives
Participatory rural appraisals (PRA)	Approach used in international development cooperation aimed at incorporating the knowledge and opinions of rural people into the planning and management of development projects and programs.
Participatory statistics	Set of methods that enable local populations to generate statistics for their own local-level planning, learning and reflection, but which can also be aggregated at wider levels and feed into national level policy processes.The idea behind the approach is to replicate participatory techniques (e.g., participatory mapping, matrix ranking etc.) with a large number of groups so as to produce robust quantitative data. Participatory statistics are particularly suitable for social and census mapping, household listing and scoring, wellbeing ranking, trend and change analysis, seasonal diagramming, preference ranking, causal-linkage analysis and problem trees. Participatory statistics have been used in the design, monitoring and evaluation, and impact assessment of policies, programs and projects in a number of developing countries. Added value: When carefully aggregated and triangulated, participatory statistics can produce more valid, reliable, and accurate data for M&E and can empower citizens through an M&E process that traditionally has been highly extractive and externally controlled. Limitations: participatory statistics can be time-consuming if citizens are asked to collect the necessary data.
Payload	The weight a drone or unmanned aerial vehicle (UAV) can carry. Typical payloads include cameras and/or other sensors.
Personal data	Any information relating to an identified or identifiable natural person.
Photogrammetry	The use of photography in surveying and mapping to measure distances between objects.
Plugin	A software component that adds a specific feature to an existing computer program.
PN	KfW Project Number (you can use this number to find project descriptions in the KfW Transparency Portal at > https://www.kfw-entwicklungsbank.de/International-financing/KfW-Development-Bank/Projekte/)
Post-processing	The processing and editing of imagery or data after it has been collected to improve quality and/or the ease of use.
Portfolio Manager (PM)	KfW employee who manages a number of Financial Cooperation projects
Portfolio Management Tool (PMT)	KfW’s internal FC project management system
Project-Affected Persons (PAPs)	Persons who potentially or actually affected by an FC project in negative ways
Project Executing Agency (PEA)	Entity mainly responsible for executing the FC project
Proprietary	Software the intellectual property rights to which, i.e. usually the copyright to the source code, are retained by the publisher. Such software is typically sold for profit. Sometimes the publisher retains patent rights over the source code. Proprietary software is sold under various pricing schemes having different licensing implications .
QGIS	QGIS is an open-source Geographic Information System application.
QR code	A Quick Response (QR) code is a pattern of black and white squares readable by smartphone that allows the phone user to obtain relevant information.
Quadcopter/Octocopter	A quadcopter is a multirotor helicopter that is lifted and propelled by four rotors. Similarly, an octocopter is a multirotor helicopter that is lifted and propelled by eight rotors.
RAID	A data storage virtualization technology that combines multiple physical disk drive components into one or more logical units for the purposes of data redundancy, performance improvement, or both.

Term	Definition
Real time	A system in which input data are processed within milliseconds so that it is immediately available virtually as feedback.
Reducing emissions from deforestation and forest degradation (REDD)	A set of actions and principles for financially incentivizing countries to protect their forests
REDD Early Mover (REM)	The REDD Early Movers (REM) program launched at the Rio+20 Conference in June 2012 is an innovative initiative of Germany's Official Development Assistance (ODA) for rewarding pioneers in forest protection and climate change mitigation. The program targets countries and regions that have already taken the initiative to protect forests.
Registered data access	Data which requires registration for password-protected access.
Remote Management	Remote Management denotes the overarching framework for developing and managing projects/portfolios based on information gathered through Remote Monitoring and verification (as well as potentially remote country office management). Remote Management refers to the management of development projects performed remotely, i.e. when the project managing entity is unable to be physically present where the activity is carried out. This includes Remote Site Supervision in projects involving infrastructure construction, and Remote Country Office Management where no international staff (including the office director) can enter the country.
Remote Management Information System (R/MIS)	An R/MIS is web-based or desktop software system used to systematically collect, validate, store, manage, monitor, aggregate, process, analyze, visualize, and/or publish data and information on a project, a portfolio, or the core processes of an organization for monitoring and management purposes. An R/MIS often offers interfaces to mobile data collection tools
Remote Monitoring	Task of monitoring project activities, outputs, outcomes and/or impacts partially or entirely through substitute actors (e.g. local instead of international Implementation Consultant staff) and/or technical tools (e.g. satellites and sensors). This is typically part of the project, and the task is typically the responsibility of the PEA and/or Implementation Consultant (as in regular project-based monitoring).
Remote country office management	Task of the management of a KfW country office in situations where no KfW international staff (including the country office director) are able to enter the country.
Remote sensing	The acquiring of information about an object or phenomenon without making physical contact with the object.
Remote site supervision	Task of the PEA and Implementation Consultant that is performed by local substitute staff and/or via technical tools where international or other expert national staff do not have (full) access to the project site/s.
Remote Verification	Core KfW task (as in the KfW monitoring business process) typically performed by KfW portfolio managers and technical experts during the project cycle: this includes conducting project appraisals, final reviews/inspections and ex–post evaluations remotely as well as during project execution; also remotely controlling progress, outputs, outcomes, impact, correct use of funds, compliance with KfW quality standards and verifying project monitoring reporting. "Remotely" in this regard means that the (prospective) project site/s have not (all) been personally inspected by the portfolio manager and the international technical expert in charge of the respective project during the above-mentioned project cycle milestone segments, or that the sample–size of physical inspections was reduced compared to a non-RMMV-supported sample size and instead a mix of RMMV institutional approaches and technical tool types was used to mitigate risks stemming from such limited site access.
Resettlement Action Plan (RAP)	A resettlement action plan is required if the project's land requirements lead to involuntary resettlement of or loss of livelihood by project affected persons. The plan addresses issues of eligibility, compensation, livelihood restoration and/or resettlement. The plan contains specific implementation measures for rendering compensation in accordance with applicable standards, outlining entitlements, communication with affected people, responsibilities, budget and monitoring requirements for tracking implementation and completion.
RMMV	Remote Management, Monitoring, and Verification

Term	Definition
RMMV approach	An approach for executing, managing, monitoring and verifying an FC project via a mix of RMMV institutional approaches and technical tools (an overview of institutional approaches and technical tools can be found in the > Section 2.5 RMMV Decision Matrix).
RMMV Decision Matrix	Overview of currently six institutional approaches and 13 technical tools (including data sources) with the objective to assist all project actors including the KfW PM and technical experts in determining the most appropriate mix of institutional approaches and technical tools for an individual FC project
RMMV (technical) tools	Technical tools for managing, monitoring, and verifying projects remotely, especially in environments where security risks are high and with limited or no access (these tools are mostly used in combination with a suitable–>institutional RMMV approach).
Satellite imagery	Images of Earth or other planets collected by imaging satellites operated by governments and businesses around the world. Satellite imaging companies sell images by licensing them to governments and map service providers.
SCADA	SCADA (supervisory control and data acquisition) is a category of software application program for process control, i.e. the gathering of data in real time from remote locations to control equipment and conditions.
Sensor	A device for detecting events or changes in its environment and sending corresponding information to other electronics, frequently a computer processor.
Sensor network	A group of spatially dispersed, dedicated sensors for monitoring and recording the physical conditions of an environment and organizing the collected data at a central location.
Server application	A software application with specific functionalities for a server system, such as a website. A server is a computer (hardware) and a computer program (software) that manages access to a centralized resource or service in a network. Servers provide functionality for other programs or devices, called "clients.
Shapefile	A popular geospatial vector data format for geographic information system (GIS) software.
Short message service (SMS)	A text messaging service supported by all mobile phones
Single audit principle	The United Nations system upholds what is referred to as the "single audit principle", whereby the United Nations Board of Auditors as the Organization's statutory external auditor retains the exclusive right to carry out external audits of the accounts and statements of United Nations organizations. Accordingly, audits of UN-agencies can only be conducted by its external and internal auditors —no third-party audits are permitted. In cases where a donor requires a special audit of its contributions, the Office of Audit and Investigations for internal UN audits may conduct a project audit of the project(s) funded by the donor, providing the donor with the audited financial statements of the project(s) and the Executive Summary of the audit report concerned.
Smart meter	A device that records utility usage data for an individual unit and automatically transfers this data to a central database where it can be used for active management (e.g. delivering a water bill) and information purposes (e.g. counting liters of water supplied).
Social Network Analysis (SNA)	SNA is the process of investigating social structures through the use of networks and graph theory. In SNA, networked structures (individual actors, people, or things within the network) are represented as nodes with ties, edges or links connecting the representing their inter-relationships or interactions.
Socioeconomic data platforms	Internet-based data platforms that provide statistical information on a country's overall development, on a sector, or on a population > Factsheet Data Sources
Spatial analysis	A process of examining the locations, attributes, and relationships of features in spatial data through overlay and other analytical techniques to address questions and gain useful knowledge.
Spectrum	The electromagnetic spectrum is the range of frequencies of electromagnetic radiation and their respective wavelengths and photon energies. The visible spectrum is the portion of the electromagnetic spectrum that is visible to the human eye which is the object of the sense of sight. Infrared is electromagnetic radiation with longer wavelengths than those of visible light, and is therefore invisible to the human eye. Thermal infrared is in the long-infrared range of the electromagnetic spectrum.

Term	Definition
STAT	The DHS Program > www.STATcompiler.com allows users to make custom tables based on thousands of demographic and health indicators across more than 90 countries over time.
Sustainable Development Goals (SDGs)	The Sustainable Development Goals or Global Goals are a collection of 17 interlinked global goals designed to be a "blueprint to achieve a better and more sustainable future for all.". The SDGs were formulated in 2015 by the United Nations General Assembly as objectives to be achieved by 2030, see > https://sdgs.un.org/goals
Technology-centered approach (now: tool type)	RMMV approach in which information and communication technology (ICT) is used to facilitate the collecting, transmitting, aggregating, structuring, analyzing and interpreting of information.
Terms of Reference (ToR)	Terms of Reference define the purpose and structures of a project in terms of committees, meetings, negotiations and any group of individuals who have agreed to work together to accomplish a shared goal. Terms of Reference are indicative of how the object in question is to be defined, developed, and verified.
Thermal infrared camera	A camera that detects radiation in the long-infrared range of the electromagnetic spectrum and produce images of such radiation. This allows observing variations in temperature and in the environment with or without visible illumination. Toolkit – A set of basic components for developing software.
Third-Party Monitoring (TPM)	Monitoring conducted by a consulting firm that is being contracted independently of PEA and the implementing consultant. The goal is to complement and/or verify monitoring information by PEA and/or Implementation Consultant to ensure that the project is executed in line with agreed procedures and towards the agreed objectives. TPM can both be part of Remote Monitoring or Remote Verification depending on its primary objective and institutional setup.
Third-Party Verification (TPV)	Verification of project progress, use of funds, outputs, outcomes and impacts conducted by a third party on behalf of KfW (similar to TPM).
Topic modeling	A type of statistical model for discovering the abstract "topics" that exist in a collection of documents. Topic modeling is a frequently used text-mining tool for discovering hidden semantic structures in a text body.
Triangulation	Comparing two or more data sources to check the results of one and the same subject.
Unmanned arial vehicles (UAV)	An aircraft without a human pilot aboard. These are more commonly known as drones.
Uniform resource locator (URL)	A reference to a web resource that specifies its location on a computer network and a mechanism for retrieving it. The address of a World Wide Web page.
User Interface	The means by which the user and a computer system interact, in particular the use of input devices and software (e.g. a website frontend visible in the browser).
Utility-owned usage information system	System for collecting, storing and managing utility information for the PEA.
Virtual reality (VR)	The computer-generated simulation of a three-dimensional image or environment that can be interacted with in a seemingly real or physical way by a person using special electronic equipment, such as a helmet with a screen inside or gloves fitted with sensors.
Voice over IP (VoIP)	Methodology and group of technologies for the delivery of voice communications and multimedia sessions over Internet Protocol (IP) networks, such as the internet.
Web platform	A complete web-based solution or server application for a project and its data.
XML (Extensible Markup Language)	A markup language that defines a set of rules for encoding documents in a format that is both human-readable and machine-readable.

Annex 2
Technical Tool Types and Data Sources Fact Sheets



2.1
(Remote) Management Information Systems (R/MIS)

2.2
Maintenance Management Systems (MMS)

2.3
Mobile Data Collection Tools

2.4
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2.5
Cameras (Terrestrial Observation)

2.6
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2.7
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Annex 3
KfW's Project Location Data Collection and Management Approach

Introduction

KfW's Open Project Location Model is a data model to systematically collect location-specific information in projects supported by international development cooperation in a structured way. It was developed by the KfW Development Bank, which is using and improving it together with their peers and partners. The model is currently provided in Excel format (xlsx) to be used in combination with a KML file. Data related to specific project locations should be collected according to this standard.

The project location model utilizes mostly predefined categories under the International Aid Transparency Initiative (IATI) standard and built-in selection methods facilitating clean data entry. A main difference to the IATI-standard is that the existing IATI list of location types has been expanded to cover all physical and immaterial location types required by international development cooperation standards. The IATI Standard is used by international development organizations and allows harmonization of development project location data across heterogenous projects. The data to be collected are subject to minimum requirements in the form of mandatory fields, and there are optional fields flexibly usable for collecting site-specific information.

In this Section we explain the open project location model according to which project location data should be collected as well as technical requirements for the data collection. The goal is to inform KfW staff, Project Executing Agencies (PEAs), consultants, and other external stakeholders responsible for data collection as to the types of location data to be collected and in what form.

Furthermore, projects are able to store single location points (e.g., the location of one power plant site) or a larger number of project sites and features (e.g., 300 locations of buildings in different sectors within the framework of a decentralization project). In addition, project sites with larger areas and more complex geometries (e.g., polygons of forest protection areas) are supported as well but have to be submitted in an additional KML file.

Please note, that KfW does not publish any exact coordinates of its project locations. Location data collection in fragile and conflict contexts should be treated with extra diligence.

When to collect project location information

KfW strongly encourages the PEA and/or consultant staff to collect geo-coordinates as early on as possible in the project cycle to increase the usage potential of such data throughout the entire project cycle. Ideally, data should be collected already during the project preparation phase, e.g., as part of the feasibility study.

If no exact locations can be determined at this stage, approximate location should be used and later be checked during the project appraisal and inception stages, including possible transformation from approximate to exact location information (see technical notes on the project location model for details). During project implementation, data should be updated at least annually in project progress reviews, and in order to reflect potential changes in the geographical allocation of funds, which are common in Financial Cooperation projects.

3.1 Technical Notes on Project Location Data Collection

Mandatory and Non-Mandatory Fields

When collecting data, there are certain mandatory fields that must be completed, as well as non-mandatory fields that can be used to gather additional site-specific information. It is important to check if there are any Terms of Reference (ToRs) for this project location data collection that specify additional required fields. If there are no ToRs available, please consult with your KfW counterpart to determine which non-mandatory fields should be filled out.

What is a project location?

A project location may comprise one or more features that are part of a financially supported activity where it is not feasible to make any further geographical distinctions regarding funding. For instance, a financially supported hospital in a specific location is an example of a single-feature project location. Another example of a project location with multiple features is a group of adjacent agricultural plots that are being financed under an irrigation plan that benefits all producers in that area. Additionally, a set of protected areas that are jointly financed from a fund is another example, provided that it is not possible to make any further geographical distinctions regarding the allocation of funds to specific areas. However, if discrimination is possible, data for multiple project locations (such as protected areas) and their financial allocation must be collected. KfW strongly encourages increasing the geographical discrimination of financial flows to specific project locations to the maximum extent possible, as this enhances aid transparency and financial accountability.

Exact[34] locations and how to collect them

A project location can be either exact or approximate. The exact location refers to the geographical endpoint of an international development assistance financial flow. If you already know the exact location coordinates, you may indicate them as "exact" locations. The Excel Template enables you to collect single location points, such as a power plant site, or a larger number of project sites and features, such as 300 locations of buildings in different sectors within the framework of a decentralization project using Latitude and Longitude Coordinates. Additionally, project sites with larger areas and more complex geometries, such as polygons of forest protection areas, or linear location types like roads or railways, are also supported but must be submitted in an extra file in KML format.

'Exact1 locations' can have three different geometry types:

1. **Point** geometries (e.g. a well or a hospital)
2. **Line** geometries (e.g. a road or transmission line)
3. **Polygon** geometries/shapes (e.g. a protected area or agricultural plots)

Regardless of the geometry type, all project locations should initially be collected as a point location in the Excel Template. This point can represent the location itself or a gateway to the project site, regardless of the actual feature geometry (i.e., also for lines and polygons). The gateway point could be, for example, the beginning of a road, a village adjacent to agricultural plots, or the administration building of a protected area. If there is a line or polygon geometry and no gateway/entry point can be defined, the geometrical center (centroid) may also be used.

All coordinates in Excel must be collected using WGS 84 (EPSG 4326) as the coordinate reference system[35]. WGS 84 is the standard for web mapping applications. Geo-coordinates have to be provided in the decimal place format 00.00000 in the "Latitude" and "Longitude" columns (using at least 5 digits after the separator).

[34] in the sense of the IATI- Standard

[35] World Geodetic System 1984, https://support.virtual-surveyor.com/en/support/solutions/articles/1000261351-what-is-wgs84-

If you have line or polygon geometries, you must use both the Excel template to store all relevant metadata for each location and an additional KML file to store the associated geometries for each location. The Excel file contains two columns that will enable us to link the geometries with the metadata in Excel. These columns are called "Filename of additional Geo-data submitted as KML[36]" and "Primary Key (As provided in the KML file)". The first column should contain the filename of the KML file that you send to KfW, for example "00345_Ouagadougou.kml". The second column should contain a "primary key" that must also be present in the attribute table of your KML file and links the geometry to the metadata in Excel. You must name the column "primary key" in KML as well. Use whole numbers (integers) to construct the primary key. In Excel, you may also provide a "gateway point". This point can help us verify whether the link between the information in KML and Excel is correct. You must submit all locations for your project in a single KML file. **KML files are also to be submitted using WGS 84 as the coordinate reference system.** The WGS 84[37] datum is also used by Open-StreetMaps and Google Maps. The complete specification for OGC KML can be found at https://www.ogc.org/standards/kml.

We highly encourage you to check the data before submission in GIS software, such as QGIS or Google Earth Pro. This will reduce the need to go back and forth between the responsible KfW counterparts and the project staff.

Approximate locations

The approximate location option[38] should be selected if one or more of the following circumstances apply:

1. **An exact project location has not (yet) been specified** or is not yet known (e.g., the exact project locations have not yet been determined) > then choose the option: *approximate (yet unknown)*.

2. **An exact project location is not to be collected or communicated due to security reasons** (e.g., in a conflict zone) > then choose the option: *approximate (security)*.

3. **The target location(s) is/are one or more administrative units**, such as a district, a province, or the entire country or group of countries (e.g., an entire country for a Policy-Based-Lending project or a number of districts in a country for a decentralization project) > then choose the option: *approximate (admin unit)*.

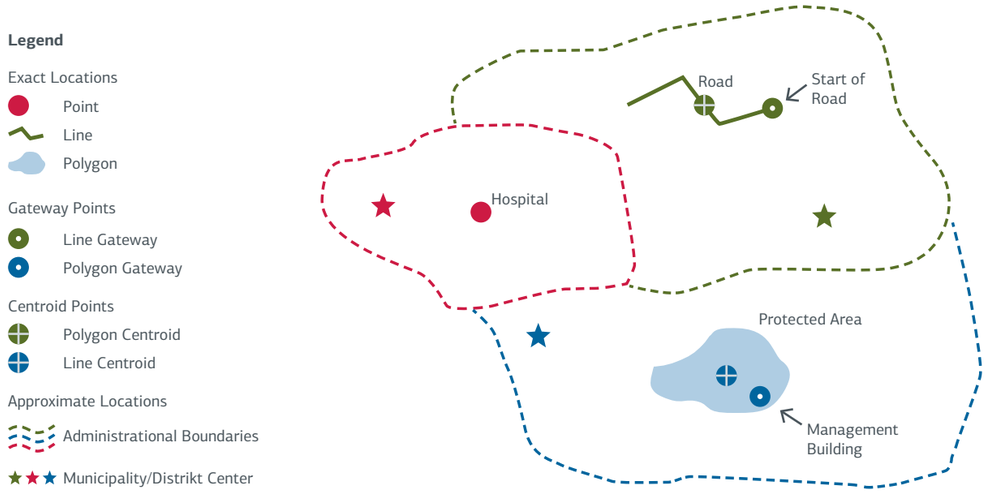
In the case of security risks (e.g., conflict zones), we strongly recommend only publishing approximate locations! Approximate locations can be given using either point or polygon data. You may use administrative areas from existing databases, for example.

[36] KML (KMZ) is an open XML Standard for Points, Lines and Shapes. It is maintained by the Open Geospatial Consortium, Inc. (OGC). Other Geoformats (e.g., Shapefiles or GeoJson) can usually be converted to KML in Standard GIS Software such as ArcGIS or QGIS.

[37] World Geodetic System 1984, https://support.virtual-surveyor.com/en/support/solutions/articles/1000261351-what-is-wgs84-

[38] in the sense of the IATI-Standard

Figure A3.1: Schematic Representation of Different Location Data categories



3.2 The Project Location Template

What is a Location Type?

This template closely follows the International Aid Transparency Initiative (IATI) standard, but we have created additional location types to cover all Financial Cooperation project types. This enables the aggregation of information among multiple location types. If you cannot find a specific location type, please use the most similar location type, such as "well" for an "extraction well". You can then add additional information on the location type, such as "extraction well", under "additional location types", if necessary.

Our new location type list includes the IATI location types that are useful for International Development, as well as additional location types for all sectors that were missing in the existing IATI list. We have created 197 new project location types, including "immaterial" ones like Capacity Development/Training or Voucher Schemes, that cannot be plotted according to any physical feature on a map but can be defined by the area covered by them. Therefore, we have also adapted the definition of "location type" as "project output- or intervention-related type of physical location or immaterial output- or intervention area".

Please refer to the list of Location Types in the Excel Template for more information. Definitions for the original IATI-based location types can be found here. A comprehensive list of all location types can be found in the Excel Template. After preselecting the KC Theme/Sub-Sector, please choose the most appropriate location type from the table sheet "Location Types". If there is no suitable option, please select "other physical" or "other immaterial" and fill out the next column "Alternative Location Type". If you need or want to mention two different location types (e.g., school and capacity development) at the same GPS coordinate, you may create two separate rows for these location types with different activity descriptions and DAC/CRS codes at the same GPS coordinates.

Please note that the preselection column "KC Theme/Sub-Sector" is only intended to help you quickly find the correct location type name. It will not be saved in the system and does not replace the DAC5 Purpose Classification/CRS-Code assignment below, which effectively assigns the correct subsector to each location.

DAC 5 Purpose Classification/CRS-Code

The one to four five-digit DAC 5 Purpose Codes for the entire project must be provided by your KfW counterpart (ideally in the project location data collection ToR, see samples here). If there is more than one code for the project, you must assign the correct code to each location. For example, in a decentralization project, the construction of primary school locations should be assigned to the respective Basic Education DAC 5-Code, while road rehabilitation sites within the same project should be assigned to the respective Transport DAC 5-Code.

If your project contains locations that contribute not only to one but two, three, or four DAC/CRS-Codes, please create two, three, or four separate rows with the same GPS coordinates but different DAC/CRS-Codes, and potentially different location types and activity descriptions. If all codes must be assigned to all locations, please create a new row for each location, with the only difference being the DAC 5 Purpose Classification. For the complete list of codes, please refer to the table sheet "DAC Purpose Codes" of the Excel Template.

Privacy, confidentiality, and publication

The Excel Template must be submitted without containing any personal data or any data that could be linked to individual persons, such as houses of private households. Please note that KfW does not publish any exact coordinates of its project locations. Location data collection in fragile and conflict contexts should be treated with extra diligence.

You can find the current version of the projection location data collection template here:
https://openkfw.github.io/open-geodata-model/tor/

For more details on the individual data fields and other information related to this open data model such as sample ToR and templates in multiple languages, please consult KfW's open project location data collection repository in GitHub.

Annex 3.1 The KfW Project Location Model

Annex 4
List of RMMV Literature

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Annex 4 List of RMMV Literature

Acknowledgements

We would like to thank all who supported us in the preparation of the RMMV *Guidebook* and previous version(s) of it. Our thanks go to all KfW staff who supported its development by attending workshops, giving their feedback and input on our drafts, and providing us with documents on their projects. They are Dr. Humayoon Alami, Dr. Frank Albert, Henning Baur, Florent Bédécarrats, Dr. Hajar Benelcadi, Roy Bergelt, Alexandra Boc, Katharina Braun Botao, Dr. Solveig Buhl, Patrick Dolle, Manyakhalé Diawara, Jonas Dylla, Denise Felix, Claudia Eckhardt, Vincent El Haidag, Yota Eilers, Christiane Feyerabend, Edgar Firmenich, Dörte Fischer, Johanna Flauaus, Armin Fleischer, Veronica Garcia Del Arco, Renate von Glischinski, Susanne Günther, Christof Griebenow, Franziska Grimm, Nele Grunau, Lukas Hamm, Hans-Christian Harde, Iris Harder, Miriam Hachelaf, Dr. Thilo Heiberger, Bastian Heil, Christoph Isenmann, Sebastian Jacobi, Ulrich Jahn, Dr. Fred Jendrzejewski, Daniel Jia-Jiun Liao, Bertold Liché, Dr. Nils Kemper, Isabel Kleitsch, Stephanie Kürsten-Camara, Aurelie Leucht, Dr. Marco Leidel, Gunnar Matsuno, Nils Meyer, Vivien Mohrland, Michael Nossek, Nina Otto, Paula Philipps, Falko Pfitzke, Dr. Philipp Rau, Patrick Rudolph, Sybille Reidenbach, Moritz Remé, Melani Reuter, Carl Richter, Tobias Richter, Meinhard Rögner, Thorsten Scherf, Dr. Yannick Scheid, Dr. Johannes Schielein, Boris Schinke, Bodo Schmülling, Dr. Andreas Schneider, Dr. Timo Schönfeld, Christian Schönhofen, Gerald Scholz, Lisa Steinacher, Emily Swyter, Matija Tadic, Vivien Tiryaki, Ulf Trautmann, Maren Verspohl, Anja Volk, Thorsten Waibel, Ahmad Yama Wali, Dr. Tanja Walter, Lorenz Weser, Jamil Zardarzada, and Maria Zettel.

We are equally grateful to the external experts assisting us in creating the present updated and expanded *Guidebook* version: the experts of the consulting firm Mainlevel Consulting AG on expanding the tool type *Fact Sheets*, Christian Kreutz of the consulting firm crisscrossed GmbH on geodata and providing an external perspective, Jule Jäger and Sebastian Pfaff of the consulting firm d-fine on data sources, the journalist Dr. Charlotte Schmitz as well as the legal experts from the international law firm Dentons on their substantial contributions to the legal and regulatory conditions and recommendations section, and last but not least, the layout designers of CUBE Agentur für Kommunikation.

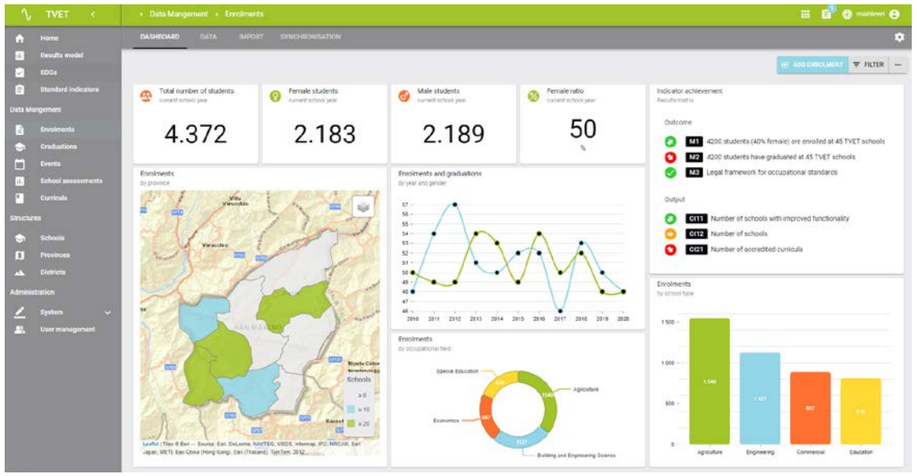
We also thank the main authors of the first version of the RMMV Toolbox: Markus Kaistra, Christina Kükenshöhner, and Martin Santa Maria of joyn-coop GbR as well as James Weeks of Development Monitors LLC.

In addition, we are grateful to all other interview partners, who shared with us their experience in developing, applying, and innovating RMMV approaches.

Last but not least, we would like to express our sincere gratitude to the German Federal Ministry for Economic Cooperation and Development (BMZ) for its continued support to KfW in developing its RMMV approaches as well as this *Guidebook*.

Editors Team: Maja Bott, Irina Eichenauer, Michael Gruber, Dr. Anja Hanisch, Clemens Kaune, Nadine Kuch, Tim Pfannmüller, Marlene Schild, and Cheryl Toksoz

(Remote) Management Information Systems (R/MIS)



Source: www.mainlevel.de

Example of a screenshot of an R/MIS provided by www.mainlevel.de

Relevance of this Tool Type within the Project Cycle

R/MIS are useful for tracking infrastructure quality and the progress of complex projects and/or those that involve many sites. Ideally, activity data is connected to indicators (outcome/impact) and risks.

Definition

An R/MIS is a web-based or desktop software system used to systematically collect, validate, store, manage, monitor, aggregate, process, analyze, visualize, and/or publish data and information on a project, a portfolio, or the core processes of an organization for monitoring and management purposes. It often offers interfaces to mobile data collection tools.

How to select an R/MIS?

Step 1: Check the Digital Principles

Before designing/selecting any R/MIS, the nine Principles for Digital Development should be considered: www.digitalprinciples.org

Step 2: What Information Do I Need?

Which type of information is required, with which frequency? Is the main purpose monitoring and/or management? The information needs determine R/MIS modules and functionalities:

- Data collection (web/mobile, GPS-location, time stamp, pictures)
- Data management (data relations/validations)
- Data processing and analysis (aggregation/contribution to goals)
- Data visualization and publishing (dashboards, charts, maps)
- Import/export of data (manual/programming interfaces)

Who has access to which parts of the R/MIS also needs to be defined (the license model of the R/MIS must ensure sufficient access to the system).

Step 3: Which Institutional Approach to Select

Before the selection of an adequate R/MIS software and the design of the Terms of Reference, a decision is needed about which of the following three cases is applicable:

Case A: A new R/MIS is designed as a (long-term) system to digitalize the core processes of the Project Executing Agency (PEA) as part of a digitalization/eGovernance project. This includes generating the information relevant to the specific project(s).

Case B: The extension or integration of an already existing R/MIS of the PEA is designed to additionally manage or monitor the specific project(s).

Case C: A new R/MIS is designed solely for the monitoring or management purposes of the specific project(s) and separately from existing PEA systems.

After selecting the institutional approach, you need to consider the following options and requirements:

Types of Hosting

- Hosting on the PEA/consultant's own server
- Cloud-based hosting of the R/MIS (Software-as-a-Service, SAAS)

Software cost structure model:

Is an initial, one-time payment with no/low ongoing (license) costs preferred? Can ongoing (license) costs be covered beyond the project period? Are customizations possible? It must be decided which software category is appropriate for the setup of the R/MIS. In all three categories, open-source and proprietary solutions are available. In general, **open-source solutions are preferable** > RMMV Guidebook Section 2.2.2.

a) Customized software

Tailor-made solutions meeting the specific needs and requirements of a project, portfolio, or organization.

+ Customized to reflect the exact needs, structures, and features
+ Suitable for complex project setups with a high number of users and access/approval levels
+ Connectors for exchange with other tools can be programmed
+ Usually lower or no licensing costs (none if open source)
– Usually higher costs for (initial) setup (compared to off-the-shelf tools)
– Setup requires IT expert resources
– Usually longer implementing period
– Ongoing costs for support and maintenance

Potentially suitable for Case B (if existing R/MIS is already customized or self-developed), Case C (if complex project, many users), Case A (if complex procedures, many users, AND no good sector-specific, off-the-shelf solutions exist).

b) Modifiable off-the-shelf software (MOTS)

Standard tools that can be modified on software source code level.

+ Fast setup as MOTS are based on available software solutions with existing modules
+ Customizations possible by the purchaser or by another party (if open source)
– Customizations possible only by the vendor (if proprietary)
– Setup and customizations require IT expert resources
– Ongoing costs for support and maintenance
– License costs based on time, user numbers, and support (if proprietary)

Potentially suitable for all cases if the project's/PEA's procedures being digitalized/established are not too complex and do not require too much customization.

c) Commercial off-the-shelf software (COTS)

Standard tools that can be used "as is" without the option to be modified on software source code level.

+ Available "out of the box" with basic functionality
+ Suitable for simple project setups that do not require customization
– Processes and procedures need to be compatible with tool design
– Usually setup and configuration by the purchaser (lower costs, but requires resources)
– Usually proprietary solutions with ongoing license costs per user
– Usually many clients on one (cloud) vendor server (data protection)

Potentially suitable for Case C (simple project, not too many users), Case B (if existing R/MIS is already COTS-based), Case A (if an excellent sector-specific COTS-solution exists).

Interoperability Requirements

In which formats and structures should data be stored in the R/MIS to allow for an exchange with others relevant to the project/organization? In general, the R/MIS must fit into the already existing IT architecture and with the existing IT knowledge of the PEA and country. The following data standards should be considered as part of the setup of any R/MIS:

- Consider (project-specific) required file formats (e.g., CSV, XLS, KML, JSON) or Application Programming Interfaces (API) for data import and export
- KfW requires the export of geo-referenced project data (in KML or XLS) according to a new template (> Links to Further Sources) as part of its regular reporting. This template also ensures compatibility of the reporting with the International Aid Transparency Initiative (IATI) Standard.
- The IATI standard is an XML-based set of rules and guidance for publishing data of development and humanitarian organizations to improve their coordination, accountability, and effectiveness and to increase the transparency of information on resources flowing into developing countries. All BMZ-funded projects must provide IATI-compatible data to KfW.
- Open Data Kit (ODK) is an XLS-based standard format for exchanging data between R/MIS, mobile data collection, and other compatible tools.
- Sector-specific open data standards also must be considered, if they are applicable (e.g., EPA standard for environmental data; www.epa.gov/data-standards).

Legal Aspects

Data Security: If a desktop software system is used, data security should be warranted by ensuring:

- that the data are protected against unauthorized or accidental destruction, accidental loss, technical defects, falsification, theft, unlawful use, unauthorized modification or duplication, and other forms of unauthorized access and use by technical means
- regular backup of data
- appropriate security of hardware

If the software is provided as web-based service (SaaS), the provider should be contractually obliged to take appropriate organizational and technical precautions to prevent disruptions to the availability, integrity, authenticity, and confidentiality of their IT systems, components, and processes essential to the functioning of the critical infrastructures they operate. The provider should implement data backup concepts, ensuring the protection of data against loss due to system-related failures.

Data protection: Wherever possible, the collection of personal data by the R/MIS-owner (data controller) should be avoided. If this is impossible, the main principles of data protection must be adhered to, that is, personal data shall:

- be processed lawfully, fairly, and in a transparent manner in relation to the person
- be used only for the legitimate purpose in relation to the project
- be limited to what is necessary in relation towthe purposes for the project
- be accurate and, where necessary, kept up to date
- not be kept longer than is necessary for the purposes of the project
- be securely stored, including protection against unauthorized or unlawful processing and against accidental loss

In case KfW (or persons acting on behalf of it) are (also) processing personal data, the privacy check in > RMMV Guidebook Section 2.3.1 must be followed.

If R/MIS tools allow **tracking of employees,** legal restrictions on the use of such tools may arise from applicable local laws. Some privacy laws will give discretion to employers as to how far they can go with their employee monitoring programs. In other cases, employers will have to inform employees who are likely to be monitored or even require employees to consent.

Project Examples/Use Cases

- In the project Fond d'Achat (FANiger; PN: 28336) in Niger, a Health-MIS (HMIS) was created to visualize, monitor and manage financial data and billing. The HMIS was based on the national system and additional data collected via tablet.
- In the Regional Infrastructure Fonds KhyberPakhtunkhwa (RIF-KP; PN: 30272), an RMIS was set up to get real time information on the implementation progress regarding physical completion of works and use of funds.
- In the Hydropower and Renewable Energy Project (HRE; PN: 27138) in Pakistan, an RMIS/Utility Information System (incl. power generation sensors & mobile revenue & maintenance data collection) was installed.

Links to Further Sources

- How to calculate total software cost: https://www.cio.com/article/242681/calculating-the-total-cost-of-ownership-for-enterprise-software.html
- Frequently used data analysis tools http://impacttrackertech.kopernik.info/data-analysis-tools
- About the International Aid Transparency Initiative (IATI) Standard: https://iatistandard.org/en/about/iati-standard/
- How to link offline data collection to an MIS: https://getodk.github.io/xforms-spec/
- KfW Terms of Reference for project geo data collection > RMMV Guidebook Annex 3
- Health management information system: https://openimis.org/
- KfW Digital Rights Check
- RMMV & D4D Tool Types on Github

Linkages to other tool types

Mobile Data Collection Tools

Cameras

Drones/UAV

Earth Observation via Satellites

Sensors/SmartMeters

Data Sources

Geospatial Tools

Further information on how to use this tool type in an RMMV context can be found here:

Fact Sheet Technical Tool Type (Remote) Management Information Systems (R/MIS): May 2024

Fact Sheet Technical Tool Type

Maintenance Management Systems (MMS)

Two techniciens discussing maintenance issues

Source: KfW Bankengruppe/Dawin Meckel

Relevance of this Tool Type within the Project Cycle

Definition

MMS is an integrated software to manage a project's or operator's maintenance operations and optimize the utilization and availability of equipment, infrastructure and/or maintenance staff. It is used by permanent infrastructure projects (such as schools, clinics, roads, power plants, etc.), financing a considerable number of assets with inventory, including equipment such as vehicles, machinery, and spare parts). It can be categorized in two types: highly sector-specific and proprietary or standard and simple asset management systems. Setting up an MMS is an ownership incentive for the Project Executing Agency (PEA) or long-term operator to operate and maintain assets during and/or after the end of the project in a sustainable manner.

MMS offers many advantages, such as safety improvement, uptime reliability, downtime, and paperwork reduction.

How to select an MMS?

Step 1: Check the Digital Principles

Before designing/selecting any MMS, the nine Principles for Digital Development should be considered: https://digitalprinciples.org/

Step 2: Which Types of Data to Consider?

MMS software gathers data giving a better sense of the project's operational and maintenance needs. The type and volume of data to be inserted into the MMS are based on the project's complexity and can range from a small farm (tractors, plows, tills, seeds, fertilizer, etc.) to a hospital complex (beds, wheelchairs, meals, light bulbs, drugs, masks, thermostats, blood bags, etc.).

Some MMS ready-to-use solutions are configured with all the necessary base files, processes, reports, and data visualization dashboards, work orders, inventory requisition, contracts, vendors, roles and responsibilities, technical restrictions, textual data and georeferences, external systems to interact, and so on. One important information need lies in the regular upkeep of data collection and the careful weighing of dis-/advantages between decentralized (by each technician) vs. centralized (by an administrative assistant) data entry.

The different components of an MMS include, but are not limited to:

- **Equipment data management:** equipment model number, serial number, equipment ID, purchase date, installation date, warranty, and spare parts information, such as part number, description, location, and pictures

- **Preventive maintenance:** cyclical maintenance scheduled on a regular basis to save on corrective maintenance, prolong the shelf-life of the device, and so on
- **Predictive maintenance:** occasional maintenance scheduled before a device is likely to fail, requiring a connection to sensors and increasingly using artificial intelligence (AI) to analyze the information. AI can also track deviations early on, which is particularly handy in case of remote monitoring, to send technicians timely information and avoid downtime.
- **Labor:** technician name, visits, date of repairs, and so on
- **Work order system:** required repairs are described and located for mobile teams to be sent out (e.g., scheduling/planning, vendor management, inventory control, purchasing, budgeting, and asset tracking)

In many cases, an MMS has touchpoints or even interlinkages with other key hard/software technologies of the project. For example, an MMS could be connected via an intranet to an infrastructure smart sensor that measures whether external conditions allow operations and alerts in case material degrades, or maintenance data can flow into **asset investment planning and management (AIPM)** solutions, which help asset-intensive organizations' management decide where and when to invest in their businesses to optimize performance and manage risk.

Step 3: What Information Do I Need?

Maintenance workers, quality engineers, customer service, manufacturers, and system administrators specifically rely on MMS to make inventory, effectively plan breakdown/preventive repairs, organize spare part storage management, support management's decision-making in cost allocation, and verify and keep track of regulatory compliance. Various sectors use MMS (manufacturing, fleet/facilities/utilities/properties management, hospitality, healthcare, agriculture, food service, municipalities, energy, national parks, warehouses, mobility, etc.).

MMS uses in the building sector

- Computer-Aided Facility Management (CAFM) systems for maintaining buildings such as hospitals or vocational training facilities

MMS uses in the water sector

- **Water supply/wastewater disposal:** Maintenance of treatment plants (drinking water treatment, desalination, wastewater treatment plants) via computer-based systems
- **Drinking water networks:** leakage repairs are made based on an MMS informing the repair teams via handheld systems (location of the repair, network details, etc.), data collection of all repairs to generate statistics and to generate the basis of rehabilitation measures in the network (time/type of maintenance, for example for valves, pipelines, and pumps).

MMS uses in the energy sector

- SCADA power monitoring and control systems

MMS uses in the mobility sector

- Road management systems
- Bus stop maintenance systems
- E-Mobility power charging systems

Step 4: Acquisition Options

Sector- and/or infrastructure-type specific software is usually proprietory. It is in the PEA's interest to plan MMS from the onset of the project and include its purchase and expertise to use it in the project suppliers' terms of reference.

What do I need to consider before acquiring MMS software?

- the **internal capacity** to channel and use the many data sources that may feed the MMS (sensors, spatial data, etc.)
- the **user adoption rate** (percentage of users sticking with an MMS app, number of work orders per technician, degree of autonomy between technician and supervisors).
- **cross-border dimension** with adaptations with regards to language, measurements, and time zone setup, among others.

Interoperability Requirements

MMS software is usually used in connection with Building Information Modeling (BIM) software, R/MIS and/or Geospatial Information Systems (GIS) > other Tool Types Fact Sheets. Thus, interoperability requirements are critical for smooth-running implementation. **Construction Operations Building information exchange** (COBie) is an international standard developed to improve the handover of facility data (BIM) and to support facility management systems.

Legal Aspects

Data Security: If a desktop software system is used, data security should be warranted by ensuring:

- that the data are protected against unauthorized or accidental destruction, accidental loss, technical defects, falsification, theft, unlawful use, unauthorized modification or duplication, and other forms of unauthorized access and use by appropriate technical means
- regular backup of data
- appropriate security of hardware

If the software is provided as a web-based service (SaaS), the provider should be contractually obliged to take appropriate organizational and technical precautions to prevent disruptions to the availability, integrity, authenticity and confidentiality of their information technology systems, components, and processes that are essential to the functioning of the critical infrastructures they operate. The provider should implement data backup concepts, thereby ensuring the protection of data against loss due to system-related faults.

Data protection: Wherever possible, the collection of personal data should be avoided. If this is impossible, the main principles of data protection must be adhered to, that is, personal data shall:

- be processed lawfully, fairly, and in a transparent manner
- only be used for a legitimate purpose in relation to the project
- be limited to what is necessary in relation to the purposes for the project
- be accurate and, where necessary, kept up-to-date
- not be kept longer than is necessary for the purposes of the project
- be securely stored, including protection against unauthorized or unlawful processing and against accidental loss

If KfW (or persons acting on behalf of it) are (also) processing personal data, the privacy check in
> RMMV Guidebook Section 2.3.1 must be followed.

Since MMS tools allow **tracking of employees,** legal restrictions on the use of such tools may arise from applicable local laws. Some privacy laws will give discretion to employers as to how far they can go with their employee monitoring programs. In other cases, employers will have to inform employees who are likely to be monitored or even require employees to consent.

Project Examples/Use Cases

- In the Greening Public Infrastructure Program in Montenegro (PN: 42455), an energy monitoring system for public buildings was set up to increase energy efficiency by remotely collecting, analyzing and managing energy and water consumption data.
- In the Water and Waste Water Program PAAC in Central America (PAAC; PN: 39602), a Water-MMS was created to monitor the maintenance of the newly built infrastructure
- In the infrastructure project PAPR in Togo (PAPR; PN: 35999), a Road Maintenance System was established to collect, store and utilize the data on the condition of rural roads for maintenance

Links to Further Sources

- List of Open Source MMS software: https://www.goodfirms.co/blog/the-7-best-free-and-open-source-cmms-software
- Interoperability Framework for BIM and MMS (pdf): https://www.researchgate.net/publication/326266381_Developing_an_Interoperability_Framework_for_Building_Information_Models_and_Facilities_Management_Systems
- KfW Digital Rights Check
- RMMV & D4D Tool Types on Github

Linkages to other tool types


(Remote) Management Information Systems


Geospatial Tools


Mobile Data Collection Tools


Sensors/SmartMeters


Cameras


Data Sources


Building Information Modeling

Further information on how to use this tool type in an RMMV context can be found here:

Fact Sheet Technical Tool Type

Mobile Data Collection Tools (MDC)

Source: istock/Alex Liew

Project monitoring staff recording a pest problem affecting a farmer's maize production using a smart phone

Relevance of this Tool Type within the Project Cycle

Definition

Mobile Data Collection (MDC) tools are used for collecting qualitative and quantitative information from the field via mobile devices such as a smartphones, tablets, or GPS trackers.

How to Select a Mobile Data Collection Tool or Platform?

Step 1: Check the Digital Principles

The Digital Principles provide guidance on how to choose an MDC platform. You may also check out: https://digitalprinciples.org and https://data.org/resources/how-to-choose-a-mobile-data-collection-platform/

Step 2: What Information Do I Need?

MDC tools can capture, organize, store, and transmit multiple media types that are collected in the field, including text, photos, audio, and video files together with corresponding (automatically generated) meta-data such as geo location, time stamp, validation status, and author. MDC can be used for:

- Questionnaires/surveys (quantitative and qualitative data)
- Narrative field visit/monitoring reports
- Photos and videos (geo-tagged)
- Geo tags and geo shapes (GPS-based)
- Digital signatures/fingerprints (e.g., on consent forms)

Step 3: Which Special Features Do I Need to Consider?

- Many MDC tools come with an offline functionality that enables users to collect data in environments with low bandwidth or no internet connection by storing data locally on the device and enabling the upload once the device is connected again (always highly recommended).
- Some tools allow users to define different roles with access to specific features or (web-based) reporting modules (useful for complex MDC procedures).
- Some tools can be used to transmit the collected information directly to the remote management information system (> Fact Sheet (Remote) Management Information Systems (R/MIS)) of the respective project or Project Executing Agency (PEA) for further processing. For this to work, both tools must be interoperable (highly recommended if a R/MIS exists or is planned).

Software Cost Structure Model:
Tools can be differentiated along the dimension open source vs. proprietary > RMMV Guidebook Section 2.2.2. While most Open Data Kit (ODK)-based solutions are open source, most customized tools, which are often an integral part of an overarching R/MIS system, are usually based on proprietary source code. The following three categories can be differentiated:

- Customized tools
- Modifiable off-the-shelf tools (MOTS)
- Commercial off-the-shelf tools (COTS)

For pros and cons of these three options, please go to the > Fact Sheet (Remote) Management Information Systems (R/MIS). In case no R/MIS exists (yet), an open-source-based tool (e.g., KoBo Toolbox) is recommended.

Interoperability Requirements

In which formats and structures should data be stored in mobile collection tools to allow for an exchange with other systems?

- ODK is a standard format for exchanging data between MDC tools and/or R/MIS. The standard is an XLS-based form description on which many compatible tools can be based.
- If they exist, sector-specific open data standards should be considered in addition.

Legal Aspects

Local legal requirements that restrict collecting project-related data by the R/MIS-owner (data controller) with MDC tools should always be complied with. For instance, some countries may prohibit photographing certain types of infrastructure. Where necessary, the PEA should request permission from authorities before commencing the collection of data.

Wherever possible, **the collection of personal data** should be avoided. Personal data includes any information relating to an identified or identifiable natural person. An identifiable natural person is one who can be identified, directly or indirectly, by reference to an identifier or a combination of identifiers such as a name, address, phone number or location data of that natural person. For instance, the geo-tagged picture or video of a person or a private premise can be considered personal data if the person can be identified from the geo-tagged location.

The project should look into technical solutions of avoiding the identification of individual persons, such as blurring their faces. Avoiding the collection of personal data can be further achieved, for example, by anonymizing the responses to questionnaires/surveys wherever possible or by the pseudonymization of data.

If the collection of personal data cannot be avoided, the project should make sure that the main principles of data protection are adhered to, that is, personal data must:

- ✓ be processed lawfully, fairly, and in a transparent manner in relation to the person
- ✓ only be used for legitimate purposes in relation to the project
- ✓ be limited to what is necessary in relation to the purposes of the project
- ✓ be accurate and, where necessary, kept up to date
- ✓ not be kept longer than is necessary for the purposes of the project
- ✓ be securely stored, including protection against unauthorized or unlawful processing and against accidental loss

In case KfW (or persons acting on its behalf) are (also) processing personal data, the privacy check in > RMMV Guidebook Section 2.3.1 must be followed.

In case of **copyright questions** or issues > RMMV Guidebook Section 2.3.4 (Rights of Use).

Project Examples/Use Cases

- In the small-scale irrigation project in Mali (IPRO; PN 33666) many small investments are remotely monitored using MDC among other tools.
- In an urban Water and Sanitation project in Mali (PAEPMA; PN: 32219), a smartphone app was used to collect information about water supply systems and wells.

Links to Further Sources

- Online catalog of data collection tools: http://impacttrackertech.kopernik.info/digital-data-platform
- Overview on MDC & MDC platforms: https://www.betterevaluation.org/en/evaluation-options/mobile_data_collection
- Evaluation Framework and Comparison of Mobile Survey Tools for Rural Water and Sanitation Monitoring https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5036673/
- Guide on how to do mobile data collection: https://school-of-data.github.io/mobile-data-collection/index.html
- How to link offline data collection to a MIS: https://getodk.github.io/xforms-spec/
- KfW Terms of Reference for project geo data collection > RMMV Guidebook Annex 3
- KfW Digital Rights Check
- RMMV & D4D Tool Types on Github

Linkages to other tool types

(Remote) Management Information Systems

Cameras

Geospatial Tools

Crowdsourcing Tools

Further information on how to use this tool type in an RMMV context can be found here:

Fact Sheet Technical Tool Type

Crowdsourcing Tools

Source: istock/visualspace

Young man giving anonymous feedback on a new city walkway he is using

Relevance of this Tool Type within the Project Cycle

Crowdsourcing can be used to quickly collect up-to-date information from many individuals (often anonymously) at relatively low cost, especially from (potential) target groups and Project Affected People (PAP).

Definition

Crowdsourcing is a process used to collect ideas, observations, opinions, votes, or feedback through a participatory approach from large groups of people who are not known to the project partners, that is, the crowd, assisted by technical tools. The crowd participates voluntarily in the collection of data via the internet or mobile phone (SMS, MMS, or an App), usually without prior training in data collection. In so-called "bounded" crowdsourcing, large but identified groups of people (e.g., staff members of a large organization) can be equipped and trained to use specific data collection tools (e.g., cameras, videos, etc.).

What is the Purpose of Crowdsourcing?

Crowdsourcing allows for the establishment of instant feedback loops with target groups and the engagement of beneficiary communities into problem-solving in projects. Crowdsourcing, therefore, enables the integration of local creative ideas and innovation into project design and implementation.

Step 1: Check the Principles!

Before designing/selecting any crowdsourcing tool, the nine *Principles for Digital Development* (https://digitalprinciples.org/) as well as the *Core Principles of Constituent Feedback* (https://feedbacklabs.org/about-us/guiding-principles/) should be considered.

Step 2: What are Our Objectives?

Potential crowdsourcing objectives include:

Tailoring project design to local needs

Crowdsourcing can be leveraged to engage communities living in a project area in the identification of problems as well as solutions (e.g., brainstorming with target groups). This can support situation and needs assessments and programming efforts while creating regular feedback loop mechanisms and trust between target groups and the Project Executing Agency.

Project monitoring and evaluation

Project teams can periodically ask target groups to participate in surveys to collect regular monitoring data or conduct specific progress assessments (e.g., target group observations, evaluations, or satisfaction levels). In combination with effective (Remote) Management Information Systems (R/MIS), such solutions have the potential to make regular monitoring tasks and data collection for specific project indicators that are directly related to the target groups more effective.

Accountability and complaint mechanisms

Beneficiaries are enabled to monitor the progress of infrastructure or other development projects by reporting problems. Similar reporting mechanisms can be used for incidents during elections and opinion polls or to gather information about the quality of public services.

Crowdsourcing simple tasks

Simple or automatically verifiable tasks (e.g., market research for value-chains or microfinance assessments, local language translation, user reviews, open-source programming, etc.) can be crowdsourced and are often paid via mobile-phone-based micropayments.

Step 3: What Types of Information and Tools Do I need?

Crowdsourcing can deliver information on any topic as long as the relevant information is directly accessible to the participating individuals. This information is mostly provided as text, numbers, or Interacive Voice Response (IVR, see below), but can sometimes contain photos, video imagery, or geo-tagged data, if offered by the chosen crowdsourcing software or platform. For market data observation or polling (opinions, votes, ideas), specific tools are available > Links to Further Sources.

Step 4: How to Make Collaborating with the Crowd Possible?

The effective application of crowdsourcing requires indepth local knowledge and clearly identified information needs to engage and empower the relevant crowd. As a minimum requirement, the crowd needs to have access to the required information and needs to be able to submit information as simply as possible. Crowds can be reached through open calls for participation via radio, TV, or online or direct engagement in bounded crowdsourcing. Further considerations when engaging crowds are:

Motivation

- Vision (clearly defined ideals and objectives, e.g., government accountability)
- Material incentives (e.g., micro-payments through mobile tools for accomplished tasks)

Skillsets

- Communication skills (e.g., local languages, digital literacy, [functional] literacy)
- Technical and professional skills (e.g., type of profession)

IT infrastructure

- Ownership of crowdsourcing devices (e.g., simple vs. smart phone users; ITU for country data > Links to Further Sources
- Access to relevant infrastructure (e.g., cost for and connectivity to the internet)

Lessons on Crowdsourcing

These considerations must be reflected against the background of the digital divide (access to IT) within communities to ensure an inclusive process. Survey structures for tools must consider using identifiers to ensure that all relevant groups (vulnerable groups, in particular) within a community participate.

Due to the digital divide, the **data sample** drawn from crowdsourcing based on unstructured self-selection is usually biased and not useful for impact assessments. Accompanying studies can be useful to draw conclusions on the context of crowdsourcing efforts.

Stakeholder engagement is a must to ensure government support and the support of local authorities, including traditional authorities.

Step 5: Selecting Crowdsourcing Tools

The selection of a crowdsourcing tool depends on both the information need and the characteristics of the crowd. For example, women sometimes do not possess their own phone, but share it. In general, user interfaces need to be as simple and engaging as possible to motivate participation.

- **Mobile-based systems:** Open-source, mobile-based systems provide customizable crowdsourcing solutions for any information need that allows for data collection via SMS, social media, and direct upload of data by the crowd. **SMS**-based systems offer the crowd a two-way communication to select relevant information or optional answers similar to surveys. Similarly, **Unstructured Supplementary Service Data (SSD)** solutions allow the crowd to select options in pre-designed protocols and the project to receive brief survey data. **IVR** allows the crowd to interact with an automated host system to provide data input via voice recognition. This is increasingly part of open-source systems and an advantage in contexts of low literacy (Exampe: Decentralisation Programme Togo). Translating and sharing the tools in local languages may be necessary, for which crowdsourcing can also be used. Besides open-source, mobile-based solutions, new tools can also be developed at high initial investment costs > Fact Sheet (Remote) Management Information Systems (R/MIS) "Customized Software".
- **Social media:** Popular social media services can either work as a channel to engage crowds via mobile-based applications or directly used to collect data and feedback. The advantage of using social media directly is the high degree of familiarity and frequent visits to social media platforms, which facilitates crowd participation.

Tools for Bounded crowdsourcing

- **Online surveys:** Questionnaires can be drafted and made accessible via links to online survey providers for regular monitoring activities, for example. These can be customized, and links shared via social media, e-mail, or SMS. An existing communication channel with the relevant crowd is required.

Lessons on Tools

Connectivity in rural areas may make offline data entry options for later upload at internet points advantageous. Support from local mobile networks is also necessary, particularly for SMS and IVR-based systems.

User friendliness of the tool is a must to engage and motivate a crowd to participate. Extensive testing of apps with prospective users is needed before their application.

Legal Aspects

Local laws may restrict collecting, processing, and exporting project-related data due to restrictions on the freedom of speech or restrictions on the use of crowdsourcing software.

Data protection issues can arise in connection to the content (e.g. name, picture, opinion relating to specific person) and/or to the technical process of the data transfer (e.g. telephone number). Only strictly relevant personal data should be collected and processed. If initial data minimization is not possible, data must be anonymized (by redaction or pixilation). In case KfW (or persons acting on its behalf) are (also) processing personal data, the privacy check in > RMMV Guidebook Section 2.3.1. must be followed.

A Tool must have adequate **security to protect collected personal data**, such as mobile phone numbers and names. Data leaks and security breaches threaten the viability of using crowdsourcing platforms, as participants must trust them. Flawed or inadequate data security to provide robust data protection puts the human rights of the participants at risk. This particularly applies in countries with limited freedom of opinion where crowdsourcing has the potential to put individuals at risk. In this situation, the privacy/anonymity of the participants should also be established in the Separate Agreement of the project > Section 3.1.4.2 Separate Agreement.

Data security requirements can also arise from local data protection regulations and/or the GDPR, which stipulate basic security requirements. Entities may be obliged under those rules to ensure the ongoing confidentiality, integrity, availability, and resilience of processing systems and services.

Controllers of personal data must also apply appropriate technical and organizational measures to satisfy data protection law. Business processes that handle personal data must be designed and implemented to meet security principles and to provide adequate safeguards to protect personal data > RMMV Guidebook Section 2.3.1.

In case **social media** are being used, the future deletion of the content, including any user data, after the end of the project should be explicitly planned and ensured so that this data cannot be misused later. This applies in particular to personal data but is not limited to it.

Project Examples/Use Cases

In the Decentralisation Programme in Togo (PAD; PN: 30205), the local population was involved using SMS/website for information sharing, participative community planning, and citizen feedback.

Links to Further Sources

- Success Factors in Crowdsourced Geographic Information Use http://documents1.worldbank.org/curated/en/387491563523294272/pdf/Identifying-Success-Factors-in-Crowdsourced-Geographic-Information-Use-in-Government.pdf
- The Role of Crowdsourcing for Better Governance in Fragile State Contexts (Closing the Feedback Loop, p. 107) https://openknowledge.worldbank.org/bitstream/handle/10986/18408/882680PUB0978100Box385205B00PUBLIC0.pdf?sequence=1
- World Press Freedom Index https://rsf.org/en/ranking
- International Telecommunication Union Guides and Statistics: https://www.itu.int/en/ITU-D/Pages/default.aspx
- NRC Digital Community Hubs: https://www.nrc.no/what-we-do/digital-community-hubs/
- Tools and recommendations on how to set up a feedback mechanism: https://feedbacklabs.org/
- KfW Digital Rights Check
- RMMV & D4D Tool Types on Github

Linkages to other tool types

Further information on how to use this tool type in an RMMV context can be found here:

Fact Sheet Technical Tool Type

Cameras (Terrestrial Observation)

Source: istock/MarioGuti

Image of smart phone camera showing potholes on a rural road

Relevance of this Tool Type within the Project Cycle

Definition

Cameras are manual or automatic optical instruments to capture static photos, omnidirectional (360˚) photos, virtual reality (VR) photos, or videos. Cameras can be carried by humans (separately or as part of smartphones) or mounted on static spots (e.g., buildings, mountains), drones or satellites > Fact Sheets Drones and Earth Observation via Satellites.

Step 1: Are Special Camera Features to be Considered?

- ✓ Most cameras and smartphones allow for storing and extracting **geographical information** along with the photos (highly recommended).
- ✓ Most allow for **streaming** captured photos/videos automatically to a server in a predefined **frequency** (useful for documenting progress on project sites with mounted cameras).
- ✓ Some allow for capturing **spherical** photos/videos (which can be used for creating a VR site visit). These photos require compatible players or head-mounted displays to be viewed.
- ✓ Some Mobile Data Collection (MDC) tools (> Fact Sheet Mobile Data Collection (MDC)) work by using the camera of the mobile device to directly link the captured images/videos with other collected information.

Manipulation:
Meta-data of images (such as location and time) can be manipulated and are not secure by default. Special software and hardware can be used to prevent fraud.

Quality:
The information purpose of images needs to be clear to depict the appropriate scene and angle. Pre-defined landmarks are helpful to analyze and locate the scene. Also, photo guidelines should be provided to avoid quality issues, for example blurred images > Links to Further Sources.

Step 2: What Information Do I Need?

Cameras can capture, store, and transmit multiple media types that are collected in the field together with the required corresponding meta-data, such as GPS coordinates of the imaging position, recorded direction of the photo (bearing), and the precise time stamp of the imaging (date, hour, minute), which is necessary for the usage of photos for verification purposes. Cameras can be used for various purposes:

- Baseline documentation (project start)
- Documentation of project progress on (construction) sites
- Endline documentation at final inspection and ex-post evaluation

- Surveillance of project sites in remote or hard-to-reach locations (e.g., robust solar-powered cameras)
- Surveillance of project sites during nighttime (e.g., thermal or infrared)
- "Live on tape" (video) impressions of physical site visits (e.g., livestream of visit with head-mounted camera)
- VR site visit (indoor/outdoor)

Step 3: What Do I Need to Consider When Acquiring Cameras?

The following criteria should be considered when procuring cameras:

- ✓ Is professional hardware equipment required or will smartphones, apps, and digital cameras satisfy the needs?
- ✓ If I need to use highly specialized cameras (e.g., VR), do I need to purchase them, or will they be provided by service agencies capturing photos/videos?
- ✓ Is special software needed for viewing 360°/VR photos and videos or can they be presented on standardized platforms (e.g., HTML5)?
- ✓ Is an adequate power supply available to operate the camera for the intended duration? Or are battery-packs/solar-panels required? Who could operate them?
- ✓ Is a mobile network available to stream photos/videos to a server? Or can the camera be reached to export data from the device?

Interoperability Requirements

- ✓ Photos should be stored in widely used data formats to allow for easy access and exchange with partners and other systems (e.g., JPEG, PNG)
- ✓ Meta-data should be stored in Exif (Exchangeable Image File Format)
- ✓ Prior to capturing 360°/VR photos and videos, target platforms and formats to view the media should be determined
- ✓ If a building information modeling (BIM) or R/MIS software is used, the compatibility of media formats should be considered to allow for imports.

Legal Aspects

Human rights: In countries with human rights issues or in conflict settings, images/videos could be used against the population or vulnerable parts thereof, such as minorities.
> RMMV Guidebook Section 2.3.3.

Carefully choose the scene of the photo or film so as to avoid depicting individuals. Avoid photographic imaging or filming of **individuals**, especially if photos/videos are captured automatically in a predefined frequency
> RMMV Guidebook Section 2.3.1.

Familiarize yourself with **National Laws** that can restrict using cameras in certain areas, such as critical infrastructure (e.g., markets in conflict areas, police and military installations, dams, power stations, airports)
> RMMV Guidebook Section 2.3.5.

Data protection & Copyright: cameras have the potential to violate privacy. For example, image and video recordings can contain personal data if individual persons are identifiable in them. Hence, individuals should be depicted rather as "accessories" to a scene—for example, in a landscape photo—and should not be the main focus of the picture. You can find a list of **country-specific consent requirements for taking a photograph of identifiable people** in the > Links to Further Sources.
Contextualizing imagery in reference to geographic locations can make an individual in an image distinguishable. Filming or regularly photographing in sequences a person leaving a house and geo-tagging the pictures allows for the identification of a person by location. In those instances, local data protection or copyright law can apply. Avoid the inadvertent collection of personal data (such as pictures of faces). Only personal data strictly relevant should be collected and processed. If data minimization is not possible, data has to be anonymized, for example by blurring or pixilation > RMMV Guidebook Section 2.3.1.

If cameras allow, even inadvertedly, the (constant) **surveillance of employees**, legal restrictions on the use of such tools may arise from applicable local laws. This might be the case where a project site is filmed or photographed in frequent sequences. Some privacy laws will give discretion to employers as to how far they can go with their employee monitoring programs. In other cases, employers will have to inform employees who are being monitored or even require employees to consent.

KfW requires proof of consent for any images or videos of individual persons to be published related to its projects, as per the regulations of the respective country. In case of copyright questions or issues > RMMV Guidebook Section 2.3.4. (Rights of Use).

If KfW (or persons acting on behalf of it) are (also) processing personal data, the privacy check in > RMMV Guidebook Section 2.3.1. must be followed.

Project Examples/Use Cases

- In the multi-country and multi-sectoral Crisis Prevention Project in the Lake Chad Region (TCD; PN: 42250) in West Africa, specific guidelines for pictures for reporting and verification of construction quality and progress were developed. These included certain quality standards, angles, and georeferencing.
- In the E-Waste Project in Ghana (E-WASTE; PN: 36594), permanently installed cameras are being used to continuous monitoring of operation of the electronic waste disposal.
- In the Regional Infrastructure Fonds Khyber Pakhtunkhwa (RIF-KP; PN: 30272) in Pakistan, pictures and videos of different stages of construction were uploaded into the R/MIS to monitor physical progress, completion of works, and use of funds.

Links to Further Sources

- Country-specific consent requirements for taking a photograph of identifiable people: https://commons.wikimedia.org/wiki/Commons:Country_specific_consent_requirements
- USAID example of a standard release agreement (to be translated and approved by the relevant mission/embassy): https://www.usaid.gov/branding/photo-guide/release
- 8 Ways to Make the Most of Construction Photos: https://constructionblog.autodesk.com/construction-photos/
- Comparison of 360° photo viewers https://360photo-to-video.com/360-photo-viewers-comparison.html
- Introduction to using Virtual and Augmented Reality https://www.dlr.de/en/sc/
- KfW Digital Rights Check
- RMMV & D4D Tool Types on Github

Linkages to other tool types

Further information on how to use this tool type in an RMMV context can be found here:

Fact Sheet Technical Tool Type

Drones / UAV (Airborne Observation)

Source: istock/AndreyPopov

Construction site supervising engineer watching live drone video on his tablet

Relevance of this Tool Type within the Project Cycle

Drones can be helpful in providing aerial imagery for monitoring agriculture, wildlife, the environment, and infrastructure (e.g., bridges, buildings, and roads).

Definition

A drone (also: Unmanned Aerial Vehicle; UAV) is an aircraft without a human pilot aboard. Drones can be equipped with sensors and cameras to analyze and monitor specific project locations (including, infrared, night vision, 3D-cameras, and video recording).

Step 1: Is It Allowed?

The operation of drones is subject to national laws and regulations > RMMV Guidebook Section 2.3 *Legal Aspects* for further details.

Step 2: What Information Do I Need?

Drones are collecting data to make accurate, two-dimensional maps, elevation models, and 3D models of terrain. Mapping is the most common and most popular drone application to date:

- Capturing aerial imagery and making base maps of small areas (<15 km²)
- Collecting optical imagery where cloud cover precludes the use of satellites and airplanes
- Operating in dense and fast-changing environments, such as urban areas and refugee camps
- Creating accurate elevation models needed for flood, avalanche, and debris flow modelling and rubble volume calculations
- Making 3D renderings of buildings and geographic features

Step 3: What to Consider When Acquiring Them

- ✓ Does a project stakeholder already use drones? Can they be employed for the project?
- ✓ If not, is a purchase of equipment (drones, cameras, sensors) needed or are full-service providers available? Operating drones and processing aquired data requires trained personnel see Drone Procurement Guide > Links to Further Sources.
- ✓ How do I obtain the permit from the local authorities?
- ✓ If the target area is populated, how do I prepare the local population for the deployment of drones?
- ✓ Are additional preparation steps needed, for example flight plans, detailed piloting instructions, and equipment operations?
- ✓ How will the collected data be extracted and processed, for example feature mapping, rendering of 2D images, or 3D models?
- ✓ Are specialists/experts needed to analyze the data?

Types of Drones

A wide variety of drones are already being used for mapping and monitoring purposes:

- **Fixed-wing drones** (like a plane) are used for long distance operations (larger mapping projects or surveillance) and typically stay in the air for several hours. Drawback: they require open space for landing and take-off.
- **Multi-rotor drones** (like a helicopter) are used for aerial photography or aerial video surveillance in short distances. Drawback: at present, most of the multi-rotor drones are capable of only 20 to 30 minutes of flying time (often with a minimal payload like a camera).
- **Single-rotor drones** (like a helicopter) are more efficient than multi-rotor versions. They have higher flying times and can even be powered by gas engines. They can be used for aerial laser scanning (LiDAR). Drawback: higher costs, complexity, and danger.
- **Hybrid drones** combine advantages of fixed-wing and multi-rotor drones but are highly complex to operate.
- **Kite drones** are used for aerial photography in low-resource environments.

Most drones are flown by human pilots stationed on the ground and within sight of the drone (up to 1 km in clear skies).

Types of Sensors

Optical instruments, or sensors, can be mounted on drones for monitoring and surveying purposes:

- **Cameras** are used for aerial photography and video recordings. Photos captured with drones can be used for generating digital elevation models of small areas (~ 5 ha).
- **LiDAR** (Light Detection and Ranging) sensors, which measure the reflection time of a pulsed laser beam, have a variety of uses, for example to generate accurate digital elevation models of bigger areas or in agriculture and forestry to analyze plant structures by height, density, or heterogeneity.
- **Electro-Optical Systems** (EOS) operate in visible and infrared spectral ranges and may be used for thermal imaging, for example building inspection or night vision. EOS equipped with multi- or hyper-spectral cameras provide additional data on features, for example the health of crops.

Risks and Alternatives

- **Danger of misuse** of drones for criminal and terrorist purposes, such as spying, smuggling, and (terrorist) attacks on people, vehicles, or buildings (combat drones).
- **Airplanes and helicopters** can also be used for airborne observations. They can capture very high-resolution imagery and highly accurate digital elevation models of large areas. Drawback: only a few providers are available, authorization is difficult, and costs are high.
- **Earth observation (EO, satellites)** is another source for aerial imagery and features mapping > Factsheet Earth Observation via Satellites. Compared to airborne observation, EO imagery can cover very large areas and provide retrospective analysis. Content is available from open and commercial sources and does not require additional authorization. Costs are dependent on the spatial and temporal resolution.

The RMMV Guidebook provides further details regarding the pros and cons of different airborne and space observation techniques. > RMMV Guidebook Section 2.5. Decision Matrix

Legal Aspects

National Laws are affecting the operation of drones and the enforcement of these laws vary by country. Restriction arise from national drone regulations, emissions regulations, and drone restrictions of certain areas, such as critical infrastructure or at certain times, for example during conflict. The United Nations International Civil Aviation Organization (ICAO) strives to provide a fundamental international regulatory framework through Standards and Recommended Practices > Links to Further Sources.

Human rights: In countries with human rights issues or in conflict settings, drone images can be used against the population or vulnerable parts thereof, such as minorities. Especially in areas where drones are not known or where combat drones have been operating, drones may create fear among the population and, hence, operators are required to inform the population before an operation starts > RMMV Guidebook Section 2.3.3.

Data protection: Drones equipped with cameras have the potential to violate privacy if individual persons are identifiable in the video recordings. Avoid the inadvertent collection of personal data by avoiding filming individuals in ways that could lead to their identification. Only strictly relevant personal data should be collected and processed. If data minimization is not possible, data has to be anonymized (e.g., by blurring or pixilation > RMMV Guidebook Section 2.3.1.

If KfW (or persons acting on behalf of it) are (also) processing personal data, the privacy check in > RMMV Guidebook Section 2.3.1 must be followed.

Liability: If persons are injured or property is damaged during a drone flight, the owner and/or the operator of the drone may be liable regardless of whether he or she is at fault in the specific case (i.e., intent or negligence). For this reason, many countries require third-party insurance even if you are operating a lighter drone (e.g., Article 14 (2) (d) of EU Regulation 2019/947). Local law requirements for insurance of drone operators should be checked.

Project Examples / Use Cases

- In the Biodiversity and Adaption to Climate Change Programme in Mongolia (BioDiv-III; PN: 43760), drones were used by the national park administration to manage the area.
- In an irrigation project in Mali (IRRIGAR-IIIa; PN 39888), drones were used to monitor constructed irrigation systems.
- In the Small-scale irrigation project PNIP in Mali (PNIP; PN: 31800), UAVs were used primarily to monitor project indicators like acreages and environmental protection in terrain difficult to access.

Links to Further Sources

- ICAO guidelines on UAV regulation: https://www.icao.int/safety/ua
- Drones in Humanitarian Action (Guide) https://reliefweb.int/sites/reliefweb.int/files/resources/Drones%20in%20Humanitarian%20Action.pdf
- Potential of Drones (World Bank brief) https://www.worldbank.org/en/topic/transport/brief/drones-for-development
- Drone Procurement Guide https://www.ictworks.org/wp-content/uploads/2018/10/usaid-UAV-buying-guide.pdf
- Code of Conduct for Use of Drones https://docs.google.com/document/d/1Uez75_qml-VMxY35OzqMd_HPzSf-Ey43IJ_mye-kEEpQ/edit
- Regulations database https://www.icao.int/safety/UA/UASToolkit/Pages/State-Regulations.aspx
- KfW Digital Rights Check
- RMMV & D4D Tool Types on Github

Linkages to other tool types

(Remote) Management Information Systems

Geospatial Tools

Cameras

Earth Observation via Satellites

Further information on how to use this tool type in an RMMV context can be found here:

Fact Sheet Technical Tool Type

Earth Observation via Satellites

Source: istock/aapsky

Satellite circling Earth and satellite image of an urban neighborhood

Relevance of this Tool Type within the Project Cycle

Definition

Earth Observation (EO) is a discipline that allows us to gather information about our planet. It often involves remote sensing sensors (usually onboard satellites). The data collected using satellites is designated as satellite or geospatial data. Optical (visible, near- and mid-infrared, and thermal infrared) ultraviolet and radar images (microwave) cover the full radiation spectrum beyond the optical domain.

Step 1: Which EO Applications Should I Consider?

- Land (all surface features, such as landscape topography, build-up, soil moisture, vegetation, inland waters, forestry, and agriculture)
- Ocean (e.g., topography and currents, salinity, and surface temperature)
- Atmosphere (e.g., aerosols, humidity, cloud particles, ozone, and trace gases)
- Snow and ice (e.g., sea ice cover and glaciers)

Step 2: What Information Do I Need?

Satellites provide an excellent means for tracking changes, that is, comparing baseline data with the actual status and drawing conclusions on the impact data for many sectors and types of projects. Depending on project type, they can also be used for progress monitoring. Since they do not require intermediaries, they are often used for remote verification, but they can be used by all stakeholders for decision making along the project cycle and during every step in the project cycle (e.g., planning and appraisal, implementation, progress monitoring and verification, impact monitoring, and evaluation). Some examples:

- **Feature mapping** (e.g., buildings, roads, landcover, and water extent)
- **Change Detection** (e.g., urban growth, deforestation, agricultural expansion, bio-diversity monitoring, climate vulnerability, and glacier melting)
- **Elevation or Digital Elevation Models** (DEM) (e.g., 3D terrain models for flood risk and 3D urban models)
- **Monitoring in fragile or disaster contexts** (refugee routes, drought and floods, locusts, etc.)

How Can I Get Access to Satellite Imagery? Is Open Data Available?

Step 3: What Should I Consider When Acquiring Satellite Imagery?

First, define and formulate your information need. Your need (e.g., detecting deforestation in the Amazon) will direct you to choose the type of satellite image suitable for your case and analysis. Your options:

- **Open and free-access satellite data:** this includes most of optical and radar satellites from public-funded satellite missions from the EU and the US (such as, Landsat, Sentinel or

ASTER). These data are available with high and low resolutions under free and open data policies and are accessible through several platforms (e.g., through the USGS, the Landsat mission, and Copernicus Access Hubs) > Links below

The Fact Sheets Geospatial Tools and Data Sources provide further information regarding free and open access to satellite imagery. KfW's evaluation department has initiated a **search engine for open geodata sets:** https://mapme.shinyapps.io/geodata

- **Commercial satellite data** (privately funded or sometimes publicly funded missions accessible for free under restricted terms (proposals, project context, research) or against a commercial fee): If the imagery requirements are much higher (e.g., very high resolution, near-real time, tight observation windows), the image data products will need to be purchased under commercial licenses from EO industry platforms directly (> Links to Further Sources below) or using image broker services.
- **Satellite Image data** from public or commercial sources **can be procured at various processing levels**, also saving several preprocessing steps and thus time and cost (the pre-pro-cessing levels include radiometric, atmospheric, geometric corrections and orthorectification using DEM). This will ensure the correct geolocalization of the images and the correct atmospheric effects.
- **Specialized image processing and GIS experts** might have to be recruited to process and interpret the data.

Types of Resolution to Consider:
The higher the resolution, the higher the probability that costs occur. A satellite image is geospatial raster data. This raster is formed from structured adjacent pixels. The arrangement of pixels describes the spatial structure of a satellite image. Every pixel contains a coded number that refers to the intensity of the reflected electromagnetic signal coming from the earth targets and recorded in the satellite sensor. Satellites are often characterized by several types of resolutions:

a) Spatial resolution
is equivalent to the level of detail the satellite sensor can distinguish on the ground. This spatial resolution is often similar to the pixel size (that only applies to optical data, for SAR-RADAR data due to the geometry of acquisition, the pixel size and the image spatial resolution are different). It specifies how detailed images need to be: Very high resolution (0.3 m – 5 m), high resolution (6 m – 30 m), or low-coarse resolution (>30 m).

See the link below to view imagery samples to help select the required resolution. For example, large roads can already be hardly distinguished at a 5-meter resolution
https://landscape.satsummit.io/capture/resolution-considerations.html

b) Temporal resolution
is the time period a satellite requires to revisit the same area (revisit time); for example, hours, days, months, or years.

Most satellites have a standard temporal resolution of about 1–14 days. But there are also satellites with very high temporal resolution, capable of acquiring images of the same area every few hours.

c) Spectral resolution
is the number of spectral bands (number of electromagnetic wavelength intervals) the sensor can record in. It results in a satellite image that contains several spectral bands –for example, multi-spectral (3–10 bands) or hyperspectral (hundreds of bands). Spectral bands contain information about the sensed objects on earth (for instance, leafy forest and healthy vegetation will reflect back to the sensor highly in the red edge band or near the infrared band, while sick vegetation will also reflect in other bands).

Sensors like the ones onboard the Landsat or ASTER public domain satellites have a spectral resolution of 7 bands (visible light [3], infrared light [3], and thermal radiation of the surface).

d) Radiometric resolution
is the ability of the sensor to distinguish different radiometric values. The finer the radiometric resolution of a sensor, the more sensitive it is to distinguish the emitted or reflected signal from Earth targets. Sensors feature 6–16 bit corresponding to approximately 64.000 gray-scale values and meaning there are 64.000 coded numeric values to represent/code the radiometric values of the satellite image (e.g., to better distinguish between different vegetation types).

Step 4: Which Types of Satellite Sensors Are Required (Remote Sensing)?

- **Optical imagery (passive remote sensing technique):** Uses the sunlight reflected by the Earth's surface and records the visible and near infra-red spectral range of the light spectrum. This requires further processing to derive *maps for vegetation types, crop vitality, or water quality, for example.*
- **Radar** (Radio Detection and Ranging, **active remote sensing technique):** This involves sending in the microwaves part of the light spectrum and recording independently from sunlight. The returned echos from the Earth targets to the satellite sensor are called backscatter. Besides the intensity of the backscatter (reflected microwave signals), the phase and polarization of the returned signal are stored as well in the image pixels. Microwaves are very sensitive to metal structures and soil moisture and can penetrate the Earth's surface to different depths according to their wavelength under certain conditions. RADAR images contain complementary information to optical imagery especially in atmospheric conditions of quasi-permanent cloud cover in some regions of the world. This type of imagery can be highly substituting or complementary. *Examples: detection of power poles, deforestation, geological structures, and buried wadi (river) courses.*
- **LiDAR** (Light Detection and Ranging, **active remote sensing technique**): also known as laser detection and ranging (LaDAR) or optical radar which uses electromagnetic radiation in the optical range (laser) to determine the distance between the object and the instrument. It can be onboard a plane, drone, or satellite. This technique primarily allows the estimation of the elevation of the Earth's surface and Earth targets

(e.g., the heights of buildings or trees and thus, indirectly, the trees' biomass). *Example: highly precise DEM Digital Elevation Model.*

Image Data Processing

Image processing is a set of mathematical methods and algorithms that allow the extraction of useful, so-called thematic information from images (e.g., processing of a satellite image to map land use and land cover, to identify built-up areas, to extract water bodies, or to estimate the crops yields or vegetation health, etc.). Usually, the image processing towards the derivation of the thematic product will follow steps. *Examples of a few processing steps are: geometric-correction, selection of optimal band combinations, contrast and spatial enhancement, and feature extraction and classifications (using machine learning algorithms) and visualization true and false color enhancement.*

Image processing tools are software applications (ESA SNAP, GRASS-GIS, ERDAS, or coding language libraries available for customized processing flows) that aid in the visual, semi-automatic interpretation or fully automated analysis of remote sensing data using complex algorithms. The goal is to produce additional derived information that is not necessarily visible or is badly visible to human eyes but is contained in the image radiometric information > Fact Sheet Geospatial tools/GIS.

Standards and Interoperability Requirements

- At KfW, a geo data project template is being developed that uses the International Aid Transparency Initiative location attributes, and the Open Geospatial Consortium (OGC) for feature classes > RMMV Guidebook Annex 3;
- Additional standards/definitions/requirements from established international initiatives should be considered depending on the sector, for example: the Multinational Geospatial Co-production Program (MGCP); for vegetation mapping: the Land Cover Classification System (LCCS) from the Food and Agriculture Organization (FAO); for land cover in a non-arid environment: Copernicus EAGLE; for forests: Reducing Emissions from Deforestation and Forest Degradation (REDD+, MRV following IPCC guidelines).
- File-formats for handling image (raster) and (vector) data are manifold. It is recommended in both cases to use industry standards for data exchange, such as GEOTIFF and SHP. Important is the preservation of any coordinate information, the meta-data, and keeping track of the pre-processing that the image has undergone to warrant full GIS operability.

Legal Aspects

National legislation is generally not applicable to imagery from space.

Human rights risks: In countries with human rights issues or in conflict settings, satellite images could be used against the population or vulnerable parts thereof, such as minorities, if they are used to identify individual households when combined with survey data or other sources of information. This information could be used for discriminatory policies, (state) terror attacks, and so on. Careful attention to data protection and data security (below) is required in order not to risk harming individuals or groups. > RMMV Guidebook Section 2.3.3.

Data protection: Very high-resolution images (finer than 0.31 m) or combined with other identifiers, such as address information, tracking of individuals, and groups and their movements ("patterns of life"), for example, through data mining can cause an invasion of personal privacy. Avoid this by choosing lower resolution images, blurring individuals visible in the images, and by avoiding triangulating the images with personal data. Only strictly relevant personal data should be collected and processed by the data controller. If initial data minimization is impossible, data must be anonymized (e.g., by blurring or pixilation) > RMMV Guidebook Section 2.3.1.

If KfW (or persons acting on its behalf) is (also) processing personal data, the privacy check in > RMMV Guidebook Section 2.3.1 must be followed.

Data security requirements can also arise from data protection regulations (local and/or GDPR), which stipulate basic security requirements for storing and processing satellite images. Entities may be required under those rules to ensure the ongoing confidentiality, integrity, availability, and resilience of storing and processing systems and services (technical and organizational measures) > RMMV Guidebook Section 2.3.2.

Project Examples / Use Cases

- In the Improving Energy Efficiency in Rural Areas in Vietnam Project (BMZ: 2009 66 663), impact was evaluated by measuring changes in nightlight on the satellite.
- In the city development project, Innercity Bypass in Lomé/Togo (BMZ: 2009 67 182), satellite images were used to evaluate increases in the numbers of trucks and upgraded buildings.
- In an irrigation project in Mali (PN: 39309), publicly available satellite data was used to supervise construction, verify and estimate crop yield, and maintain an alarm system of cultivated (rice) areas.

Links to Further Sources

- The KfW evaluation department's geodata locator list https://mapme.shinyapps.io/geodata/
- Earth Observation Handbook http://eohandbook.com/sdg/
- Remote Sensing Guide https://www.zfl.uni-bonn.de/resources-1/training-module-handbook
- Basics (guide) on resolution types https://landscape.satsummit.io/capture/resolution-considerations.html
- Database of agencies and missions http://database.eohandbook.com/measurements/overview.aspx
- Copernicus Open Access Hub https://scihub.copernicus.eu/
- In the satellite imagery platform UP42, credits are purchased to acquire VHR satellite imagery mainly from Airbus image provider (SPOT and Pléiades with Spatial resolution up to 0.3 m): https://up42.com/
- MAXAR platform: https://www.maxar.com
- Planet explorer platform: https://www.planet.com/explorer, access granted by the Norwegian government through the NICFI initiative to preserve tropical forests and support the climate agenda on the AFOLU sector, offering imagery with spatial resolution up to 4 m.
- KfW Digital Rights Check
- RMMV & D4D Tool Types on Github

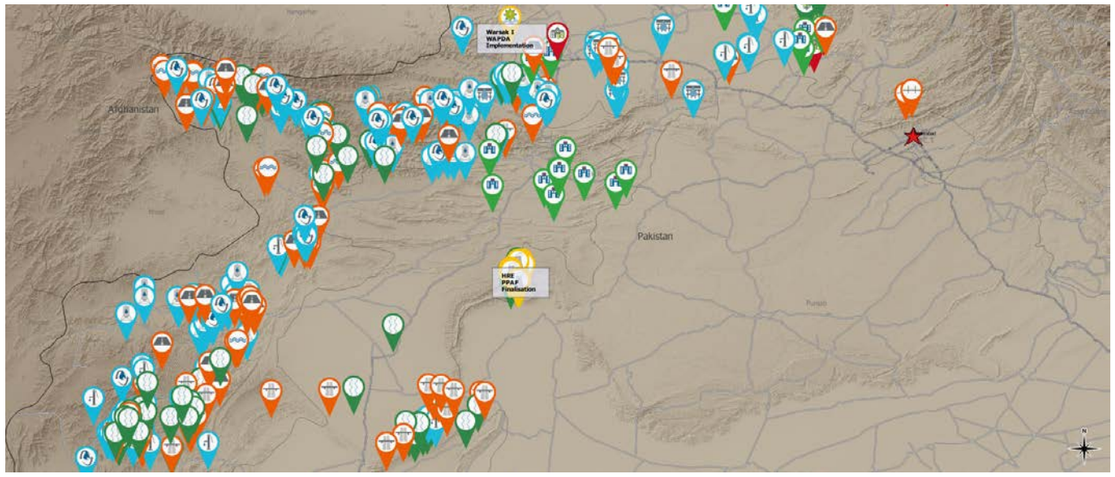
Linkages to other tool types

- Geospatial Tools
- (Remote) Management Information Systems
- Crowdsourcing Tools
- Drones / UAV
- Cameras
- Data Sources

Further information on how to use this tool type in an RMMV context can be found here:

Fact Sheet Technical Tool Type

Geospatial Tools / GIS



Source: www.gpls.org (Pakistan)

Overview of Financial Cooperation project locations in Pakistan

Relevance of this Tool Type within the Project Cycle

Geospatial tools facilitate the mapping of potential and actual project locations; the monitoring of implementation, usage, operation, and maintenance across all project sites; and the risks and impacts of natural or manmade occurrences. They are also useful for comparing internally collected project site information with external (open) geodata on a map.

Definition

For this fact sheet, geospatial tools encompass geographic information systems (GIS) as desktop and web-based (webmapping) software. GIS software is a specialized tool designed to collect, integrate, aggregate, store, edit, manipulate, analyze, manage, share, and present different types of geospatial data in layers of maps. Webmapping is the process of visualising and sharing maps on the internet. The delimitation between web maps and GIS is blurry: maps are often a presentation means in GIS but are increasingly gaining analytical capabilities.

Geospatial tools are particularly relevant for projects with a wide geographic radius because of scattered infrastructure investments in communities—either because of decentralization processes or for projects needing multilayered visualization and handling of specific location-based services.

Step 1: Check the Digital Principles

Before designing / selecting any geospatial tool or GIS, the *nine Principles for Digital Development* should be considered: https://digitalprinciples.org/

Step 2: What Types of Data Should I Consider?

GIS software can process any data that contains geocoordinates. These can be represented by two main types of geospatial data: vector (map) data or raster (image) data. This data can be visualized in a map and be referenced to images, sensor data, features, 3D models, and socio-economic and environmental data. Maps have shifted from manually made, one-off, static, paper-printed, and scanned images (in PNG, JPEG, TIFF, SVG, PDF, and SWF formats) towards web maps as more interactive and digital savvy alternatives of visualizing and manipulating data on the web. For example, dynamic and distributed maps are generated upon upload thanks to database sources distributed through different servers containing different map layers. Animated maps show changes over time (graphical or temporal variables) using multimedia formats and technologies such as: SVG, Java, Quicktime, etc.). Near real-time maps display a live phenomenon, using sensors. Customizable web maps (such as Open Layer Framework, Yahoo! Maps, or Google Maps) offer embedding in third-party webpages and/or map-based services (route planner, location marking, etc.)

Step 3: What Information Do I Need?

Geospatial tools process georeferenced geospatial data on sites, locations, attributes, and cross-sectoral information within a given geographical area through multidimensional layers that can be combined with project data or isolated according to analysis requirements, for example:

- **Assessment of risks**/vulnerability of populations to disasters, conflicts, or diseases
- **Planning of infrastructure** projects, for example, electricity grids, road construction layered with secluded homes, and hard-to-reach schools
- **Visualization** of wildlife, biodiversity, climate, and environmental issues, for example, deforestation and temperature changes
- **Forecasting analysis**, for example, crop exposition to flood-prone areas

For information visualization needs and monitoring purposes, geospatial tools make use of recent technological and webmapping developments and offer enhanced functionalities, such as animation; real-time feed; personalization via filtering, symbolization, and styling; and collaboration and can be combined with web-based cloud processing and analysis of geospatial data.

Step 4: What Should I Consider When Acquiring Geospatial Data and Software Tools?

Due to the variety and increasing importance of applications for geospatial data, a multitude of open, freely downloadable, geospatial data sources exists online that can be used for project-level analysis > Fact Sheet Data sources (incl. Open Data and Big Data).

Should data be collected first-hand to meet specific information needs, geospatial data collection can be incorporated into project monitoring via several tools presented in other > Fact Sheets (see below).

For the **processing and managing** of georeferenced geospatial data, several software solutions exist:

- open-source geospatial tools are available on the market, such as QGIS, GRASS GIS, ESA-SNAP, ILWIS, and gVSIG.
- Proprietary GIS tools are also available but require careful elabo-ration of licensing costs during and after project implementation (e.g., ESRI ARCGIS, ERDAS, and Ecognition).

For **collaboration, visualization, and presentation** purposes, geo-spatial tools such as OpenStreetMap, WikiMapia, and Google Earth may be of use.

The following **challenges** should be considered when using geo-spatial data for project planning, implementation, and monitoring or verification:

a) the availability of (updated) data
b) adequate data storage, hardware, and IT infrastructure
c) inter-institutional cooperation in terms of data exchange
d) access to the internet
e) adequate training of project implementers/monitors in the target regions to increase sustainability
f) access to appropriate software

Interoperability Requirements

The following standards/requirements should be considered as part of the setup of any geospatial tool:

- File formats for handling vector and raster data are manifold. Industry standards are recommended for georeferenced data exchange, such as KML, GeoTIFF, GeoJSON, SHP, GPX, GPKG, GIF, IMG, and JPEG.
- KfW will require the export of geo-referenced project data (in KML or XLS) according to a new template as part of its regular reporting. This template also ensures compatibility of the reporting with the International Aid Transparency Initiative (IATI) Standard and the Open Geospatial Consortium (OGC) for feature classes > RMMV Guidebook Annex 3
- Additional standards / definitions / requirements from established international initiatives, such as the Open Geospatial Consortium (OGC); feature classification of the Multinational Geospatial Co-production Program (MGCP); land cover classification and mapping of the Land Cover Classification System (LCCS) from the UN Food and Agriculture Organization (FAO), and Copernicus EAGLE. For forests: Reducing Emissions from Deforestation and Forest Degradation (REDD) can be used to further disaggregate georeferenced data types.

Legal Aspects

Human rights risks: In countries with human rights issues or in conflict settings, project location data containing exact GPS coordinates could be used against the population or vulnerable parts thereof, such as minorities. This information could be misused for targeting them via discriminatory policies, (state) terror attacks, and so on. The funding of a specific infrastructure or location by an international donor could increase such a risk. Careful attention to data protection and data security (below) is required so as not to risk harming individuals or groups.

Intellectual property rights for using the GIS information must be secured, thereby avoiding liability for infringement on such rights, whether intended or not. Such infringements could include failure to control access to geo-data or tools, resulting in the illegal use of the data or tools by others. Users must familiarize themselves with the terms of use of the respective GIS tool.

If commercial services, such as **Google Maps and Google Earth**, for example, are employed, any use has to comply with their general Terms of Services and their Additional Terms of Services for Maps and/or Satellite Services. Those terms prohibit certain conduct, including copying the content or "mass downloading" content (even content from projects that was mass-uploaded before).

Data Protection: Combining descriptive data with precise location data is the cornerstone of many types of spatial analyses. But when locations are easily linked to identities of individuals, households or farms, there is potential for violating personal privacy. Avoid the inadvertent collection of personal data. Only strictly relevant personal data should be collected and processed in line with the recommendations in the > Fact Sheet Earth Observation via Satellites. If initial data minimization is impossible, personal data must be anonymized (e.g., by redaction or pixilation).

Data security requirements can also arise from applicable data protection regulations (local and/or GDPR) or the above-mentioned human rights risks, which stipulate basic security requirements for storing and processing of exact GPS coordinates. Entities may be required under those rules and/or conditions to ensure the ongoing confidentiality, integrity, availability, and resilience of storing and processing systems and services (technical and organizational measures).

More information on legal aspects can be found here:
> RMMV Guidebook Section 2.3.

Project Examples/Use Cases

- In the crop production project PABSO (PN: 27495) in Burkina Faso, geospatial analysis was used to analyze vegetation and road networks.
- In the water and sanitation program RANC-EE (PN: 30343) in Central America, a GIS was used to map networks and conditions to reduce water loss.
- In "REDD Early Mover" project (PN: 29763) in Ecuador, a GIS, Satellite Imagery and Third-Party Monitoring are used to enable the Ministry of Environment to monitor forest degradation and carbon emissions.

Links to Further Sources

- KfW Terms of Reference for project geo data collection: > RMMV Guidebook Annex 3
- Geospatial is not GIS (GIS vs geospatial definitions): https://www.forbes.com/sites/forbestechcouncil/2019/03/21/geospatial-is-not-gis/
- List of Limitations or Challenges of GIS: https://grindgis.com/remote-sensing/limitations-or-challenges-of-gis
- List of open-source GIS applications https://www.gislounge.com/open-source-gis-applications/
- KfW Digital Rights Check
- RMMV & D4D Tool Types on Github

Linkages to other tool types

- (Remote) Management Information Systems
- Mobile Data Collection Tools
- Crowdsourcing Tools
- Cameras
- Drones / UAV
- Earth Observation via Satellites
- Sensors / SmartMeters
- Data Sources

Further information on how to use this tool type in an RMMV context can be found here:

Fact Sheet Technical Tool Type

Sensors / SmartMeters (Internet of Things)

Source: istock/B4LLS

Photo of a tablet showing an overview of data generated by a sensor network

Relevance of this Tool Type within the Project Cycle

Definition

A sensor is a device that monitors changes by converting signals (input) continuously and automatically from analog objects into a digital interface (output). Technological developments have empowered sensor connectivity through cloud/remote access, forming a global infrastructure of physical and virtual, internet-connected objects called the **Internet of Things (IoT)**. A smart sensor measures and combines signal conditioning and signal processing within one device. For example: a *SmartMeter* monitors electric energy consumption in (near) real-time, communicates with a central system or smart grid, and shares usage data with consumers and providers for billing, data analytics, customer targeting, and rate recommendations. Similarly, a *Smart Water Meter* provides high-resolution readings, demand forecasting, scarcity prevention and leak notification.

Step 1: Check the Legal Framework

Depending on usage and connectivity, sensors may require some regulation to ensure explicit consent and hedge privacy breaches given the growing concerns around fine-grained information collected by smart meters exposing individual behavior (private activity, daily routine, etc.) which need to be proactively accounted for with built-in controls masking personal behavior patterns.

Step 2: What Information Do I Need?

A wide array of sensors and SmartMeters can be used for project management, (remote) monitoring, and verification. Their selection depends on the project's information needs and is mostly sector-specific:

Energy sector

- **Power plants:** remote monitoring (input/output parameter), steering of energy generation, and controling:
  - Sensors measure parameters such as oil, air,and device temperatures, the speed of turning parts (turbine, motors), the physical characteristics and chemical composition of fuels, and gases and exhaust emissions.
  - Sensors measure optical and acoustic parameters, among others, to remotely control power plants that have limited or no operation personnel at the power plant site.
  - SmartMeter data can be used by the energy plant itself to detect/reconfigure and reroute in case of power loss, reducing maintenance costs.
- **Electricity (Smart) Grid:** sensors for measuring conditions in the electricity transmission and distribution grid (e.g., voltage, frequency, temperature, etc.)
- **Energy efficiency and reliability:**
  - Sensors applied to various energy captors/processors (electric/gas generators, water turbines, windwheels, solar panels/street lighting, etc.) measure, monitor, and steer energy sources.
  - Power suppliers use sensors to gather insights and offer incentives to users to use energy at non-peak times to reduce the costs of building greater capacities.

Water sector

- **Wastewater and drinking water treatment plants:** sensors measure water quality and flow to remotely monitor and steer treatment, inlet- and outlet water quality, and support operations.
- **Water and wastewater networks:** sensors are used to monitor network conditions (flow metering and pressure sensors) and steering (via valves, pumps).
- **Meterological and hydrological networks:**
  - Sensors measure hydrological situations (precipitation, evaporation, temperature, river runoff, sunshine hours, etc.).
  - Sensors measure water quality and quantity (levels of groundwater and surface waters in reservoirs and water quality parameters).
  - Remote data transfer (mobile cards, internet), remote control, analysis of the meterological, and hydrological data in computer-based systems.

Mobility sector

- **Network capacity:** sensors monitor load in interconnected charging stations for e-vehicles.
- **Traffic:** sensors can help in incident reporting and response, traffic directions, and parking management. They can also measure air pollution.

Biodiversity/Environment sector

- **Forest and ocean protection:** sensors may be used to stop illegal deforestation, protect endangered species, and track waste dumping.
- **Smart farming:** sensors measure methane levels, air temperature, rainfall, soil moisture, soil pH, etc.

Step 3: What Do I Need to Consider When Acquiring Sensors?

There are many platforms available on/offline for purchase-by-unit. Users may choose sensors based on:

- ✓ **size** (nano, micro, 2D, 3D, etc.)
- ✓ type of **connection**: wired/wireless
- ✓ **functional** requirements (offline usage and range, solarpower, calibration resolution, repeatability, interferences, environmental conditions, maintenance, etc.)
- ✓ **non-functional** attributes (e.g., longevity, interoperability, scalability, wireless protocols, compliance with safety standards, etc.)
- ✓ **costs** (can be mitigated by industry collaboration)
- ✓ **accuracy** as precision requirements often drive up costs exponentially. Sensors often require frequent calibration to assure correct measurements, so you need to check if calibration services are available locally.
- ✓ **disponsability.** Sensors may offer many advantages: low-cost, easy-to-use, short-term or rapid single-point measurements, reliable information and digital connectivity for availability to users and centralized/decentralized facilities.

Procurement of Sensor Data

Sensor datasets are siloed, often proprietary, and treated as the exclusive preserve of the organizations collecting them. However, traffic and meterological data is often available for free (universities/cities).

If the application of sensors is not possible and no publicly available datasets exist or are accessible, the use of tools modeling synthetic datasets can be explored (meaning generated by a computer simulation that approximates real data but is fully algorithmetically generated). Example: https://dweet.io/

Risks and challenges to keep in mind:

- Need for high-quality products to avoid technology distrust and bypassing
- Maintenance processes are dependent on supply chain disruption when replacing spare parts
- Data quality requires expertise to ensure interlinking with multiple data sources.
- Data control requires expertise to avoid security breaches or data leaks in case of unproven encryption methods.

Legal Aspects

Data protection: Smart meters provide insights into the consumption patterns of private households and are thus sensitive in terms of data privacy. Data transmission is only permitted for the applications required for utility industry operations. The use of personal data for other purposes will, depending on the applicable law, require consent from consumers > RMMV Guidebook Section 2.3.1.

In addition, **data security requirements** also arise from national data protection regulations, which stipulate basic security requirements to protect the collected personal data, such as consumption, address, and names. Entities may be required under those rules to ensure the ongoing confidentiality, integrity, availability, and resilience of processing systems and services (technical and organizational measures). They need to ensure that the IT security measures are adequate to withstand attacks from hackers or cyber warfare directed at critical infrastructure > RMMV Guidebook Section 2.3.2.

Project Examples / Use Cases

- In the energy project, Green Energy Corridors in India (GEC; PN: 30420), sensors are used to record data, like voltage or power, which are transmitted to the control system SCADA.
- In the Hydropower and Renewable Energy project in Pakistan (HRE; PN: 27138), sensors are used to monitor offgrid mini-hydropower plants. The open source-based power monitoring software was developed in a GIZ-project.
- In the Hydromet Project in Jordan (Hydromet; PN: 29452), new measuring stations for the collection of hydrological and meteorological data were installed and commissioned. The measuring stations transmit the data via mobile data networks to a control and server room.
- In the Water and Climate Monitoring project II in Sambia (PN: 30888), existing hydrological and meteorological stations were rehabilitated, groundwater boreholes for measuring groundwater were drilled and an Integrated Water Resource Management Information System was established.

Links to Further Sources

- Regulation Framework on Sensor Technologies
  https://link.springer.com/chapter/10.1007/978-1-4302-6014-1_6
- Sensors as new Data Source in DC
  https://merltech.org
- Infrastructure sensing
  https://www.researchgate.net/publication/304065637_Infrastructure_sensing
- Smart metering market trend analysis
  https://www.fortunebusinessinsights.com/smart-meter-market-102666
- Biodiversity applications:
  https://www.techrepublic.com/resource-library/downloads/the-internet-of-wild-things-technology-and-the-battle-against-biodiversity-loss-and-climate-change-cover-story-pdf/
- Disposable sensors:
  https://onlinelibrary.wiley.com/doi/full/10.1002/adma.201806739
- Open sensor datasets
  https://data.world/datasets/sensors
- Commercial use of data sets
  https://datarade.ai/data-categories/iot-data
- KfW Digital Rights Check
- RMMV & D4D Tool Types on Github

Linkages to other tool types

- Building Information Modeling
- Maintenance Management Systems
- (Remote) Management Information Systems
- Geospatial Tools
- Drones / UAV
- Cameras
- Earth Observation via Satellites
- Data Sources

Further information on how to use this tool type in an RMMV context can be found here:

Building Information Modeling (BIM)

Source: istock/Laurence Dutton / istock/fizkes

BIM manager verifying CAD solar panel design

Relevance of this Tool Type within the Project Cycle

Definition

Building information modeling (BIM) is a cutting-edge method for integrated design, construction, and operation of infrastructure projects, increasingly adopted in engineering, construction, and facility management (whether industrial or public civil work/structures). It is used to collaborate on a coherent set of digital representations of an asset's characteristics. It forms the basis for the consistent generation and management of information and data relevant to an asset's lifecycle. In essence, BIM software is a set of integrated computer-added files that can be extracted, exchanged, and amended to support decision-making regarding a built asset from its planning to its dismantling.
The goal is improved building performance combined with transparent communication. Among many advantages, BIM affords a better overview and meeting remotely in the asset's "data space," thus visualizing the links in 3D between design, costs, and the time schedule.

How BIM Works

BIM software is jointly used by architects, engineers, planners, suppliers and contractors, builders, operators, owners/clients, and financing partners, such as KfW. It follows a lifecycle approach, within which the following modules are included:

- ✓ Programming
- ✓ Conceptual and detailed design
- ✓ Analysis
- ✓ Documentation
- ✓ Fabrication
- ✓ Construction and its logistics
- ✓ Operations and maintenance, followed sometimes by demolition
- ✓ Renovation

... and going back to programming.

Step 1: Select Data Solution Level

BIM can also be categorized according to their level of complexity (described by the number of dimensions "D" covered):

- **3D design and planning:** includes 3D laser scanning, computer-aided design modeling, visualization, clash detection, and 3D printing.
- **4D scheduling:** includes project phasing for the simulation/scheduling/planning of resources and payment scheduling.
- **5D estimating:** includes quantity extraction to support detailed cost estimates, multi-phased cost estimation, value analysis, and change management.
- **6D sustainability:** includes conceptual and detailed energy analysis, sustainable element tracking, and LEED tracking.
- **7D facility management:** incudes life cycle BIM strategies, BIM as built, BIM embedded manuals, cost estimation, value analysis, and change management.

Step 2: What Information Do I Need?

BIM software can provide various functionality and information:

- **view** information (see details of a building, show and hide parts, observe a 360 degree model, for example to be used for cost estimation)
- **edit** information (smart revision management, warnings, revision comparison)
- perform **comparisons** (merging, model checking, fusion, check for clashes)
- **plan** ahead by identifying and solving issues in the design phase
- support **functionalities,** such as a **carbon** assessment by informing designers on the **impact** of their decisions throughout the building's lifecycle or a robot simulation module, constraint-solver
- **design real-life objects** (structure, mechanical, electrical, plumbing, etc.) of any size using 3D and 2D annotations, for example
- **prepare construction site inspections** and fire safety assessments
- **document designs** (complex shape types)
- **export** the Industrial Foundation Class (IFC) files as ifcXML and ifcZIP files > Interoperability Requirements

Step 3: What Do I Need to Consider When Acquiring a BIM?

The inclusion of BIM at project planning is a key to success and mandatory in a growing number of countries. KfW has already gained substantial expertise internally. Lessons from past experience underlined that priorietary vs. open-source BIM software is not a key factor as it should be integrated into Terms of Reference as a requirement along with the suppliers' expertise to properly use it. For remote monitoring purposes, KfW estimates that viewing rights are sufficient and can be granted more access through the process, if necessary.

In cases requiring acquisition, there is usually a distinction between large-scale, complex infrastructure projects mainly using sector-specific, proprietary BIM-software and smaller actors who use open-source BIM more frequently > RMMV Guidebook Section 2.2.2.

Interoperability Requirements

BIM information is only useful if it can be shared between all the relevant stakeholders involved in the project, hence interoperability is crucial in the industry:

- **Planning and construction phase:** buildingSMART is an international organization aiming to improve information exchange in the building construction industry by establishing IFCs as global open data standard formats (ISO 16739: 2013) for BIM.
- **Operation and maintenance:** the Construction Operations Building information exchange (COBie) is an international standard for asset management (equipment capture and record lists, product data sheets, warranties, spare parts lists, and preventive maintenance schedules). It is used once a built asset is in service.

Legal Aspects

Use of BIM must be reflected in the project's construction and engineering **contracts**. Since the BIM tool is used by all engineers involved in the project, the respective responsibilities of the parties must be carefully defined. In bigger projects, contracts should define the role of a BIM manager. Further, since all engineers use BIM, effective intellectual property rights management is necessary > RMMV Guidebook Section 2.3.4.

The BIM tool must have adequate **security to protect the collected data** and to ensure that it is kept **confidential**. Data leaks and security breaches threaten the viability of using BIM software. All participating entities are required to ensure the ongoing confidentiality, integrity, availability, and resilience of processing systems and services. They need to ensure that their individual and collective IT security measures are adequate to whithstand **cyber-crime** attacks.
> RMMV Guidebook Section 2.3.2

If KfW (or persons acting on behalf of it) are (also) processing personal data, the privacy check in
> RMMV Guidebook Section 2.3.1 must be followed.

Project Examples/Use Cases

- In the Harpo Hydropower Project in Gilgit-Baltistan, Pakistan (HHP; PN: 24692), BIM is used for part of the construction planning of the hydropower plant (34.5 MW).

Links to Further Sources

- Review on BIM interoperability: https://www.sciencedirect.com/science/article/pii/S2405896319311309
- Overview of BIM software https://www.g2.com/search?utf8=%E2%9C%93&query=Building+Information+Modeling&filters%5Bcategory_ids%5D%5B%5D=292
- buildingSMART/ IFC https://technical.buildingsmart.org/standards/ifc/
- Construction Operations Building Information Exchange (COBie) https://www.bimpedia.eu/-/1390-cobie
- KfW Digital Rights Check
- RMMV & D4D Tool Types on Github

Linkages to other tool types

Maintenance Management Systems

Geospatial Tools

Cameras

(Remote) Management Information Systems

Sensors/SmartMeters

Further information on how to use this tool type in an RMMV context can be found here:

Fact Sheet Technical Tool Type

Collaboration Tools

Source: istock/FG Trade

Local monitoring agents using web-conferencing tool to discuss next mission

Relevance of this Tool Type within the Project Cycle

Definition

Collaboration tools (or groupware) are software applications designed to optimize the interactions or "group processes" for people working on a common task. Their objectives are to increase teamwork efficiency, allow multitasking, reduce miscommunication, increase search capabilities, and reduce paperwork, among others.

Levels of Collaboration

Collaboration tools can support one or a combination of the following categories:

- **Communication** and **interaction** (including phone and video calls), instant group or one-on-one messaging and conferencing, voting, brainstorming and digital whiteboarding:
- **File sharing/document management**
- **Collaboration** for complex interdependent work > Fact Sheet Building Information Modeling (BIM)

Tool Types and Features

- **Videoconferencing software** communicate through video and audio and share screens, documents, whiteboards or other collaboration tools
- **Electronic calendars** (or time management software) schedule events and automatically notify and remind group members
- **Project management systems** schedule, track, and chart the steps in a project
- **Online proofing systems** share, review, approve, and reject web proofs, artwork, photos, or videos between designers, customers, and clients either in real-time, where multiple users engage in live, simultaneous and reversible editing, or in version control mode in which users make parallel edits, preserving every saved edit by every user as multiple files (that are variants of the original file)
- **Workflow systems** support task/document management within a knowledge-based business process
- **Knowledge management systems** collect, organize, manage, and share various forms of information
- **Blockchain Technology**: Project Monitoring and Managment including tracking of financial flows by using TruBudget
- **Client portals** interact and share information with clients in a private online environment

Depending on project needs, some of these collaborative platforms can be upgraded with plugins or mobile offline features and therefore become hybrids offering the basic functionalities of an R/MIS, for example > Fact Sheet (Remote) Management Information Systems (R/MIS).

Acquisition Options

KfW is already equipped with several collaboration tools to support decision-making on the best fitting one(s) for project needs. For specific cases in which tools need to be procured, there are three main options to consider:

- Software-as-a-Service (SaaS) is a subscription-based licensing model in which access to the collaboration tool is provided via the internet, as it is located on the service provider's servers. Users typically access the tool through a web browser (of any internet-connected device) using a username and password instead of installing the software. Advantages are access from anywhere to sophisticated apps without deployment, interoperability development and maintenance costs (per device), and pay-per-usage.
- Self-hosting is a more hands-on approach that keeps the application on one's own (virtual) private server (VPS). A large majority of SaaS web applications can't be self-hosted, however, so innovative open-source alternatives have been developed. Advantages are data ownership and security with end-to-end encryption, centralization of all collaboration tools on one server, and competitive features. An open-source collaboration software is available to everyone, in some cases for free; its code can be changed and distributed to anyone, meaning it has limited warranty. The advantage lies in its limitless customization possibilities and low-cost distribution and responsive support thanks to a committed community.
- Proprietary software cannot be owned since its code is kept closed-source by providers and distribution or modification is prohibited. However, its usage can be rented and is limited by an agreement. The advantage lies in the reliability and compatibility of its features, but the user can be dependent on the provider's willingness to upgrade, develop, and maintain the software. Proprietary software is a good fit for projects in need of instant deployment of collaboration tools and typical productivity needs.

Interoperability

Certain collaboration tools do not operate together (for example, video conferencing systems and file sharing apps), meaning that users are forced to migrate to unknown collaboration tools with the same functionality of the ones they are already using. They can make up for it via integration (indirect connection—via a "middleware" third party— so that data from one system can be accessed by the other one). It means that actions in certain applications can trigger functionalities in others.

Device experience interoperability fares better due to a hardware-dominated market, which translates into vendors providing for multidevice connections (adding sometimes multi-feature possibilities) to collaboration tools.

The surge in collaboration tools usage generated by conditions during the COVID-19 pandemic may be the nudge ending the siloed multiplatform reality. Lacking interoperability decreases collaboration efficiency and increases end-user frustration and shadow IT (the use of hardware/software unapproved by the employer's IT unit: for example, using Skype chat when only MS Teams is cleared or bringing one's private USB-drive to share files), which, in turn, may bring security issues (such as outdated technology, tools protection, etc.)

Legal Aspects

Data Security:

- Collaboration tools must have adequate **security to protect the data.** Data leaks and security breaches threaten the viability of using the tool.
- Operators of collaboration tools must ensure confidentiality, integrity, availability, and resilience of processing systems and services.

Video transmissions should be made with end-to-end encryption. To keep unwanted participants out, access restrictions (such as password entry or consent of the moderator when guests participate) must be set up > RMMV Guidebook Section 2.3.2.

Data protection:

- Only personal data strictly relevant for the collaboration should be collected and processed in the tool.
- Controllers of personal data must also apply appropriate technical and organizational measures to satisfy data protection laws. Business processes that handle personal data must be designed and implemented to meet security principles and to provide adequate safeguards to protect personal data > RMMV Guidebook Section 2.3.1.
- In most cases, the **ownership of the data** (including images, audio, video files of virtual meeting participants) remains with the users and is not shared with the provider of the collaboration software/platform. Attention should be paid to the issue of whether the service contract for using the collaboration tool confirms the entity's ownership of their data located on the vendor's servers, as well as the right to retrieve and delete the data at the end of the project. The service contract for using the tool should further rule out any disclosure of the stored information to third parties without prior consent.
- If KfW (or persons acting on behalf of it) are (also) processing personal data, the privacy check in > RMMV Guidebook Section 2.3.1 must be followed.

Project Examples / Use Cases

- In several countries, for example in Tunisia, KfW's Open-Source software TruBudget is used as the main monitoring and management tool for the governments of receiving countries. Blockchain technology is used to track the workflow of projects and therefore minimize the risk of corruption.
- KfW has established special RMMV rooms in its offices that offer additional possibilities for collaboration, that can be used for remote appraisals and progress reviews, virtual site inspections, etc. > RMMV Guidebook Section 2.4.1 (RMMV Rooms).

Links to Further Sources

- A list of collaboration tools accessible to KfW staff is available on the KfW Intranet.
- Reviews and ratings of 2021 collaboration tools by a market-leading company specializing in technology research: https://www.gartner.com/reviews/market/workplace-social-software
- KfW Digital Rights Check
- RMMV & D4D Tool Types on Github

Examples of Tools

Communication

Slack, Signal, Skype, Zoom, Webex, GoToMeeting, Miro, etc.
Currently available at KfW: Jabber, Webex

File-Sharing

NextCloud, Dropbox, GoogleDrive, SharePoint, etc.
Currently available at KfW: Sharepoint, One-Note, IBM Filenet

Collaboration

Trello, Jira, Monday, Mural, etc.
Currently available at KfW: Conceptboard, Jira, Confluence, Azure DevOps

Blockchain Technology

TruBudget

Linkages to other tool types


Cameras


(Remote) Management Information Systems


Maintenance Management Systems


Mobile Data Collection Tools


Earth Observation via Satellites


Geospatial Tools


Building Information Modeling


eLearning Tools

Further information on how to use this tool type in an RMMV context can be found here:

Fact Sheet Technical Tool Type

eLearning Tools

Source: istock/Zinkevych

PEA project manager with laptop and learning material preparing for her first training on RMMV in English

Relevance of this Tool Type within the Project Cycle

eLearning tools assist in the remote implementation of tailored trainings and workshops throughout the project lifecycle. They can include trainings for Project Executing Agency (PEA) staff and other project participants on how to conduct remote project management and monitoring.

Definition

eLearning tools are primarily web-based software for the PEA, implementation-consultant, or eLearning providers to deliver training and content across a variety of electronic devices, including desktop and laptop computers, tablets, and smartphones. eLearning can be conducted either in individual training sessions or in refresher courses as an instrument of continuous learning. It is especially advantageous in scenarios where beneficiaries or partners:

- ✓ are in different locations
- ✓ face mobility challenges
- ✓ request short training sessions
- ✓ have reliable connectivity
- ✓ want to learn at their own pace

Types of eLearning Approaches

Usually, remote eLearning interventions incorporate both of the following types of eLearning (blended learning):

Face-to-face workshops: eLearning tools are used to facilitate in-person and live capacity building sessions.

Virtual learning: eLearning tools enable users to study individually and/or participate in communities of practice.

Step 1: Integrate eLearning into Remote Monitoring and Evaluation (M&E) Systems

A clear definition of the learning objective needs to be elaborated to integrate eLearning into M&E systems, including relevant indicators on every impact level. This will allow for evaluation of the eLearning intervention in surveys with learners.

Step 2: Assess Needs and Feasibility

Before eLearning tools are applied, the need for training and suitable content must be determined in dialogue with the learners and the PEA. Further, the feasibility of eLearning interventions based on the targeted learners' ecosystem must be assessed, including:

- ✓ Availability of IT devices
- ✓ Access to and costs for sufficient internet connection
- ✓ Reliable electricity provision
- ✓ Digital divide in access to IT resources based on local inequalities
- ✓ Familiarity of learners with eLearning and digital literacy
- ✓ Experience with learning in groups and social dynamics
- ✓ Language requirements, literacy
- ✓ Availability of learners during specific times of the day

Step 3: What Kind of eLearning Tool Should I Choose?

The choice of an adequate tool is based on both the characteristics of the learners identified and the preferred eLearning approach.

Potential tools used in eLearning are:

Collaboration tools

Collaboration tools for conferencing (> Fact Sheet Collaboration Tools) can be used to organize live and in-person online trainings. Commercial providers of such tools often also offer a related webinar product to handle large numbers of learners. The most commonly used communications tools, like Signal or WhatsApp for instant messaging, can be used to establish links between learners and create communities of practice. File-sharing tools may also contribute to sharing content with and between learners.

Learning Management Systems (LMS)

LMS are online software that can be customized to create courses for learners to study at their own pace and attend live courses. Among the most common functionalities are the creation of digital courses, file sharing for course content, discussion forums for communities of practice and learner teacher communication, test automation, and assignment grading. Most solutions include a mobile application. Several open-source options exist (e.g., Moodle, Opigno).

Massive Open Online Courses (MOOCs)

MOOCs are courses that are made available online to a large audience. Course material and lectures are usually provided at no additional costs and cover a range of topics. Costs may be incurred however for course certification. Popular MOOCs with a large course catalogue include EdX, Coursera, Futurelearn, and so on. The German Ministry for Economic Cooperation and Development also offers the free eLearning platform Atingi for all kinds of trainings for end users in the Global South, including certified vocational trainings. Atingi can be used to create courses from scratch as well, and offers methodological support and evaluations for remote M&E purposes. MOOCs with a specific focus on RMMV-related content include NASA ARSET (Satellites, Sensors), Copernicus MOOC (Satellites), and SERVIR Global (Satellite, GIS). Further RMMV learning content is available for free from reputable research institutions on Edx, Coursera, MIT OpenCourseWare (GIS), and OPEN.ED@PSU (GIS).

Mixed eLearning approaches

To create the necessary preconditions for successful learning in ecosystems with low availability of IT infrastructure, internet access, and insufficient learning environments, using a physical teaching facility as a learning hub for learners can be beneficial. Learners can then access the web-based eLearning tools described above in such facilities. Sustainable strategies for this type of mixed eLearning would be to connect local institutions and internationally operating schools to avoid additional local competition and ensure continued funding in sustainable business models to cover recurring costs as well as personnel costs.

Lessons for Face-to-Face Workshops Via eLearning Tools:

Planning ahead and clear communications: Provide a clear schedule for training ahead of time and consider time differences. Communicate objectives and topical integration into the trainings at the beginning.

Connectivity: Test connectivity with participants beforehand, opt for low bandwith options and record sessions for later sharing.

Engage participants: Plan for practical exercises during the trainings and interactive homework assignments. Allow for questions and ask participants to prepare questions.

IT support: Ensure that regular and ad-hoc support for your eLearning tool is available to help instructors and learners with technical difficulties.

Legal Aspects

The chosen **license model** of the eLearning tool must ensure sufficient access to the eLearning tool (ideally open-source). The license must also ensure that students may reasonably use the learning materials for private study. The PEA has to warrant that constraints of the respective license agreement are complied with—for example, that inadmissable copying of material is prevented > RMMV Guidebook Section 2.2.2.

Data protection: the personal data of the students must only be collected and processed to the extent necessary for the training purpose.

The eLearning tool must have adequate **security to protect the collected personal data** of the students, such as their names and addresses. Flawed or inadequate data security puts the rights of participants at risk, who should enjoy robust data protection allowing them to freelyl use the eLearning tool without fear of negative personal consequences > RMMV Guidebook Section 2.3.1.

Project Examples/Use Cases

Global eLearning platform for end users Atingi,
www.atingi.org

The digital learning center TUMO in Berlin
https://www.kfw.de/stories/society/education/tumo-berlin/

In the educational project Activate! in South Africa (Activate; PN: 34017), a digital learning platform was built to enable technical and vocational training for teachers.

Links to Further Sources

- Open Source eLearning Tools": https://elearningindustry.com/open-source-tools-to-boost-digital-learning
- BMZ Toolkit Digitalisierung https://www.bmz-digital.global/en/topics/education/
- KfW eLearning platform **Sustainability Training** to support our partners in the financial sector and beyond on environmental social governance topics and environmental & social risk management: https://kfwdeg.sustainability.training/
- KfW Digital Rights Check
- RMMV & D4D Tool Types on Github

Linkages to other tool types

- Collaboration Tools
- (Remote) Management Information Systems
- Maintenance Management Systems
- Mobile Data Collection Tools
- Crowdsourcing Tools
- Cameras
- Drones/UAV
- Earth Observation via Satellites
- Geospatial Tools
- Sensors/SmartMeters
- Building Information Modeling
- Data Sources

Further information on how to use this tool type in an RMMV context can be found here:

Fact Sheet Technical Tool Type

Data Sources (incl. Open Data and Big Data)

Source: istock/Laurence Dutton

Consultant comparing baseline data from various sources on a screen for a feasibility study

Relevance of this Tool Type within the Project Cycle

Data sources can be helpful to acquire and analyze existing data on a project's target population and areas at low cost. This opportunity is frequently overlooked during feasibility studies that often solely focus on conducting assessments while comparable data already exists.

Open data are of particular interest as it is usually available online at no cost of acquisition. This can lower costs considerably and afford stakeholders rapid assessment, instead of having to rely on time-consuming and costly primary data collection on the ground.

Big data (i.e. data sets that are too large or complex to be dealt with by traditional data-processing application software) have gained importance with the increasing use of smart devices, sensors, the Internet of Things, Artificial Intelligence (AI) and social media platforms, which constantly produce data without their users necessarily being aware of it. This is useful in cases where large amounts of individual user data collected by network providers – such as on user movements, communication, and payment activities – are needed. This can help to quickly identify crisis situations based on the movements and messages of large numbers of people.

Definition

Data sources can be proprietory (collected and owned by a private entity with no availability to the public), public (collected and owned by a governmental institution with limited access and editing options), or open. Open-data sources are publicly available datasets on all sectors and geographical areas – some of them without restrictions on their use and sharing, some of them restricting commercial use. For open data licensing types > Legal aspects.

Step 1: Check the Digital Principles

Before selecting adequate data sources and designing access to and use of these, the nine Principles for Digital Development should be considered: www.digitalprinciples.org

Step 2: What Information Do I Need?

Given the wide range of existing data that can be obtained, various project tasks can be supported by secondary open data:

- ✓ Input to country and sector strategies
- ✓ Project targeting strategies
- ✓ Feasibility studies
- ✓ Socio-economic, peace and conflict,do-no-harm, environmental assessments
- ✓ Remote monitoring (e.g., comparison of project outcomes with government survey data)
- ✓ Outcome and impact assessments

a) Structured open datasets

Structured open datasets refer to organized data with clear relationships between data points that often come in the form of tables. Datasets are available on any topic, for instance demographic data, socio-economic data, geographical data, environmental data, and governance data—for example electoral data and polling data.

Step 3: Where Do I Find Structured Open-Data Sources?

✓ **Metasearch for datasets:** Google offers a free keyword search for datasets on any topic from a range of public and open sources online that allows setting filters according to the latest update, file type, user rights, subject, and acquisition costs.

✓ **Direct download from institutions:** International organizations and academic and government institutions publish their datasets online and allow free downloading. Examples for different types of data include:

✓ **Platforms for open datasets:** Another way to receive a curated overview of reliable data sources is through platforms agglomerating research and social impact data > Links to further sources

Demographic data

- World Pop by University of Southhampton (Spatial demographic data)

Socio-economic data

- Multiple Indicator Household Cluster Surveys on women and children by UNICEF
- Living Standards Measurement Study by World Bank (Household survey data)
- World Development Indicators by World Bank
- Joint Monitoring Programme by WHO and UNICEF (WASH data)

Geographical data

- ASTER Global Digital Elevation Model by NASA and Government of Japan (Elevation data)
- EarthExplorer by U.S. Geological Survey (Satellite imagery)
- ESA Sentinel Hub

Environmental data

- FAOSTAT by FAO (Agricultural and environmental data)
- EarthData by NASA (Geographical and atmosphere data)

Governance data

- Global Barometer (public opinion surveys) by academic and not-for-profit organizations
- Worldwide Governance Indicators by World Bank (Index and data on good governance)

b) Structured microdatasets

Microdata refers to individual responses to surveys by national authorities, research institutions, or nongovernmental organizations (NGO) and can give detailed information on a target population. It contains sensitive personal data and is therefore not openly available, butprovided as aggregated data for publishing.

Where Do I Find Microdatasets?

To obtain full microdatasets an application is necessary, including a description of the designated use. Access is usually granted under certain restrictions on sharing and disaggregation of information. For example, if the data is spatially aggregated up to the municipality level, further disaggregation in other dimensions, for example, gender, may be prohibited. Access to microdata can be requested from the World Bank, IPUMS International, or directly via the respective national statistical bureau. Further, **online platforms** that allow for individual evaluations based on microda-ta without accessing full datasets are also available, for example, STATcompiler.

c) Unstructured datasets (including big data)

Unstructured datasets refer to either unorganized and/or large volume datasets that need specialized software for analysis. The two main sources of big data for projects are:

- **Social data:** user data from social media platforms and the global system for mobile communication (GSM).
- **Machine data:** produced by scanning textfiles from archives or using industrial equipment, sensors, and smart meters (Internet of Things).

Where Do I Find Unstructured Data/Big Data Sources?

Social data from social media can be procured from social media providers. This data can provide more accurate data on the actual number of inhabitants of a refugee camp and their needs and problems. **GSM** data needs to be acquired through mobile network providers. The GSM Association offers some open-source insights for all world regions. Few openly accessible sources for **sensor data** within cities and universities exist > Fact Sheet Sensors.

Step 4: Which Tools and Methods can I use for data processing?

Processing of big data and unstructured datasets requires programming expertise and knowledge of methods to make use of relevant information:

- **Data mining, machine learning and artificial intelligence** are used to find and summarize relevant information that may be unknown or hidden in large datasets. Data mining techniques can be conducted using the open-source programming languages R or Python.
- **Data visualization tools** can help to understand and structure data. Data analysis can be programmed using Python, but most tools are commercial, for example, Tableau or Power BI.
- **Social network analysis and visualization** is helpful to examine the relationships and structure among individuals, groups, and organizations within a specified network for a project. Data for this approach can be collected via surveys and from social media. Open-source tools for the visualization of connections within a given population include Cytoscape, Gephi, and Visone.

Interoperability requirements

Most available structured data sources and microdatasets provide valuable insights alone and can be downloaded or are provided in several data types, including common formats such as CSV/XLSX and XML/JSON files. These can be analyzed in every analytical software, including Excel, SPSS, STATA, R, or any database or programming environment. In cases where a combination of multiple sources and/or a comparison with project data is necessary—to evaluate the impact of a certain project—the importing of both datasets (or more) into the same tool is required and facilitated by using compatible data file types (see above). Sometimes the data requires some adjustments like the unification of categories (m/f/d vs. male/female/diverse). For unstructured and big data, interoperability is less of a concern since no direct relationship to project data exists in most use cases. If this is necessary, expertise in methods to standardize data formats and the use of specialized software as mentioned before is required.

Complexity of Use Cases for External Data Sources

The various data source use cases possess four levels of complexity:

1. Basic information based on **easily consumable data**
2. More complex information based on **moderately processed data**
3. Complex evaluations and application **of statistical/AI models**
4. **Advanced AI models** and data pipelines

While the higher levels usually offer the more impressive results, the lower levels are comparably easy to apply and provide benefits within a short period of time. The first group addresses average practitioners capable of using standard office software. They may benefit from information directly provided as XSLX or CSV tables or that is displayed in intuitively designed dashboards. The second group encompasses data that is provided in more complex formats (XML, JSON, APIs, query-languages, geodata) or that requires further processing (transformation or computation of statistical figures, e.g., performed in Python, R, STATA, SPSS, or QGIS). Although the skill profile of designated users is a bit more restrictive, required experience usually exists within KfW. Hence, data use cases from the first two categories may be carried out by practitioners without the explicit need for external support. Moreover, they may be integrated into terms of reference for consultants.

Complexity level three includes tasks like classification of a topic (security, health, etc.) or sentiment (positive, negative) of Twitter messages based on natural language processing methods or the evaluation of cellular connections (mobile communications), and requires pertinent skills concerning the use of Python/R and general knowledge of common data science techniques. The use cases may be carried out as (internal) projects by data scientists within KfW or be given to specialized consultancies. The development of complex AI models (e.g., for the classification of objects based on satellite imagery) or the integration of big data require very profound knowledge of special methods and usually a large amount of labor. This special expertise must be acquired externally.

Legal Aspects

Data protection: The data sources must be managed in a manner that is in line with the principles of data minimization and proportionality. Any data (structured or unstructured) may contain or reveal personal information of individuals and hence harm their privacy rights if not managed adequately. No individual data should be collected without prior consent and no data should be published to outsiders without a level of aggregation that allows for anonymization of the provided information. An agreement about usage and publication rights should be always obtained with the data providers. Thus, only personal data strictly relevant for the project should be collected and processed. If initial data minimization is not possible, data must be anonymized (e.g., by redaction or pixelation). The collected data must be **securely stored and protected**. Flawed and inadequate data security puts the rights of individuals to enjoy robust data protection at risk. > RMMV Guidebook, section 2.3.3.

Data security requirements can also arise from data protection regulations like the GDPR, which stipulate basic security requirements. Controllers of personal data must also have **appropriate technical and organizational measures** in place to satisfy data protection law. Business processes that handle personal data must be designed and implemented to meet security principles and provide adequate safeguards to protect personal data. Entities may be required under those rules to ensure the ongoing confidentiality, integrity, availability, and resilience of processing systems and services > RMMV Guidebook, Section 2.3.

In case KfW (or persons acting on behalf of it) are (also) processing personal data, the privacy check in > RMMV Guidebook Section 2.3.1 must be followed.

Before (re-)publishing information based on open data, you need to check its respective **licence type:** https://opendatacommons.org/

Project Examples / Use Cases

- In the Investment Program Renewable Energies Eletrobras (BMZ: 2000 66 324) in Brazil, open data on annual discharge values of a small hydropower plant was used to evaluate the project.
- In the off-grid electrification program Green People's Energy for Africa (PN: 43770) in Mozambique, Open Data (e.g. on educational and health facilities) was used to identify potential mini-grid sites.

Links to Further Sources

- KfW Digital rights check on AI: https://digitalrights-check.bmz-digital.global/kfw
- Google metasearch of datasets: https://datasetsearch.research.google.com/
- List of national statistical offices: https://unstats.un.org/home/nso_sites/
- UN Datamarts: http://data.un.org/Explorer.aspx
- Harvard Dataverse: https://dataverse.harvard.edu/
- Open Data Impact Map: https://opendataimpactmap.org/
- List of free satellite imagery sources: https://eos.com/blog/free-satellite-imagery-sources/
- World Bank Open Data: https://data.worldbank.org/
- Open data for Africa by AfDB: https://dataportal.opendataforafrica.org/
- ASEANstats: https://www.aseanstats.org/
- World Bank Microdata: https://microdata.worldbank.org/
- International Household Survey Network: https://www.ihsn.org/
- Integrated Public Use Microdata Series: https://ipums.org/
- STATcompiler by DHS Programme: https://www.statcompiler.com/en/index.html
- GSMA: https://www.gsma.com/
- DEEP – a collaborative platform for effective aid response: https://thedeep.io/

Linkages to other tool types

- (Remote) Management Information Systems
- Maintenance Management Systems
- Mobile Data Collection Tools
- Crowdsourcing Tools
- Cameras
- Drones / UAV
- Earth Observation via Satellites
- Geospatial Tools
- Sensors / SmartMeters
- eLearning Tools

Further information on how to use this tool type in an RMMV context can be found here:

An Online Version of this RMMV Guidebook:

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As of March 2025

Supported by the

Federal Ministry
for Economic Cooperation
and Development