



► EIP Technical Brief

July 2020

Using digital technologies in employment-intensive works

Summary

- This technical brief presents examples of the Employment-Intensive Investment Programme's (EIIP) use of digital technologies during the planning, implementation, monitoring and closure/evaluation phases of a project cycle. For more general information about EIIP, please visit: <http://ilo.org/eiip>

Introduction

Digital technologies are transforming our world of work at an unprecedented speed. While these technological shifts pose challenges for those who need to transition from an old job to new ones¹, the application and integration of new technologies into our daily work routines can also enhance effectiveness and productivity. The ILO's Employment-Intensive Investment Programme (EIIP) has witnessed the rapidly changing world of technology since its set up in the 1970's. Throughout its history, the Programme has adjusted its intervention modalities to accommodate innovative technologies in its operations to enhance the effectiveness and impacts of its interventions. The COVID-19 crisis in 2020 has posed new challenges for the EIIP and the world, and new working modalities with digital tools have become necessary.

Digital technologies have been largely integrated into EIIP projects throughout the project cycle to facilitate the collection and processing of necessary data to plan, implement and monitor, as well as to close and evaluate a project.

To ensure that EIIP programmes and projects are well managed and achieve their employment and asset creation

objectives, the **planning and programming phase** of the project is crucial. New technologies, including those such as GIS and smartphones increasingly facilitate the process of project planning and assessment as they enable more systematic and dynamic collection and processing of data that influence investment needs, priorities and intervention modalities.

Collected and processed evidence/data then inform project managers of necessary actions to be taken in a project. At the **implementation phase**, EIIP projects involve the management of employment and infrastructure-related data to target vulnerable people in need and critical infrastructure assets to enhance people's livelihoods. Data management often takes the form of information and computer technology (ICT) platforms, compiling information relevant to infrastructure conditions and employment status. These platforms can also be used for various digital transactions, including electronic payments.

Monitoring implementation activities is based on key indicators set out in the planning and budgeting phase of the project cycle. It is also crucial to secure decent working conditions and address emerging needs and grievances that may arise at the work place. Alternative means of

¹ ILO. 2016. "Employment Policy Brief. New Automation Technologies and Job Creation and Destruction Dynamics". Pp 7

monitoring, such as through mobile applications which most people currently have access to, create an environment where workflow data are more transparent and accessible to both workers and employers.

► **Figure 1. EIIP project cycle (simplified) and examples of digital technologies used in each phase**



Just as crucially, successful closure of a project and evaluation of its results require analysis of data at the **closure and evaluation phase**. Ensuring project sustainability after the successful closure of a project, however, is not only about evaluating project impact through analysis of data, but also leveraging the generated data for future use in partner countries. This final phase of an EIIP project therefore involves both extensive analysis of employment and infrastructure-related data, while ensuring that the data and the methods to manage data are transferred to the partner countries through IT skills training.

As such, the EIIP projects and the impact of their intervention are often strengthened when digital technologies are used in the project cycle, in order to collect, process and use the employment and infrastructure-related data. This note introduces the EIIP's experiences with several concrete examples from different countries in leveraging digital technologies to deliver results more effectively and efficiently. The examples in this note explore each phase of a typical employment-intensive project management cycle; namely, 1) planning and budgeting, 2) implementation of activities, 3) monitoring

activities; and 4) project closure, evaluation, and ensuring project sustainability. By way of introducing the successful examples of using innovative technologies in EIIP projects at each phase, this note encourages employment-intensive investment projects to explore innovative solutions that can enhance the impacts of EIIP interventions in specific country contexts.

► **Figure 2. EIIP and its 6 product lines and 5 cross-cutting core values**

EIIP
 Employment Intensive Investment Programme

Six key areas of EIIP interventions:

- Employment Impact Assessments
- Public Employment Programmes (PEPs)
- Public and Private Sector Development
- Community and Local Resource-Based (LRB) approaches
- Green Works
- Emergency Employment

Crosscutting core values:

- Gender equality
- Reaching vulnerable groups
- Working conditions
- Environmental considerations and climate change adaptation
- Social dialogue

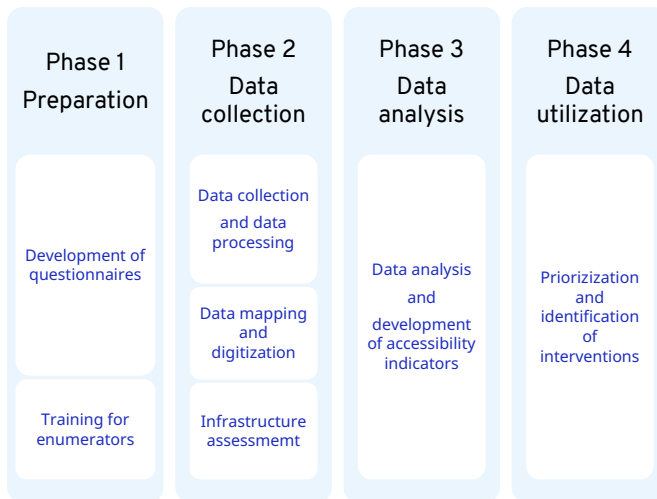
► Identifying and planning local investment priorities

Assessment of project location and community needs through Integrated Rural Accessibility Planning (IRAP)

The earliest example of the use of digital technologies in EIIP projects can be found in rural infrastructure investment planning using a tool called the Integrated Rural Accessibility Planning (IRAP). This tool is a product of a continuous methodological and technological development by the ILO throughout its application in several countries since the end of the 1980s.

IRAP is a local-level planning tool that starts from the notion that rural communities lack of access to goods and services is one of the fundamental constraints to their socio-economic development. IRAP therefore seeks to identify investment priorities to improve this access. The IRAP tool is capable of existing as a stand-alone intervention, which formulates necessary project proposals for communities in need.

► **Figure 3. IRAP process**



Phase 1: Preparation

The IRAP process starts with the preparation of survey instruments necessary for collecting required data,

including agreement on the questions to be asked. Based on this, enumerators are trained so that they are able to complete the survey questionnaires in each community.

Phase 2: Data Collection

At this stage, primary data are collected at the local level. The data collected through community surveys pertain to the rural households where they are situated in relation to the location of basic goods and services. By using the GPS (Global Positioning System) spatial information is also included in primary data collection. Collected primary data are then processed to create maps, visualizing the location of communities and their distance to goods and services. This visualization helps to identify the priorities for improving local access. The IRAP mapping exercise has developed as a “user-friendly” process. When the use of technology is not feasible throughout the process, IRAP allows for some of the mapping and prioritization to be done by hand.



Mapping exercise during IRAP process

Phase 3: Data analysis and priority setting

The accessibility analysis is based on Accessibility Indicators (AIs)² that define profiles in the targeted area. The AIs are calculated at two levels: at the local community level and the local government level. The AIs for these two levels are produced for different sectors, such as education, health, market access, and transportation.

In the water sector at the local community level, for example, a drinking water indicator is calculated from the relevant data such as village size, type of wells available, source of drinking water, number of months of water shortage, one way travel time to fetch water in a wet season and the ratio between household and well. At the local governmental level, on the other hand, most disadvantaged

² Accessibility indicators (AI) are calculated with the size of the demand from households and the degree of the transport burden in a given area. AIs can be shown as: $AI_{TT} = TT \cdot HH$ where TT stands for travel/transport time an average household spends to access a facility or service, and HH is the number of households residing in a given village/area

local communities are identified in relation to the required goods, services and facilities. Accessibility Maps are produced at both local community and governmental levels. GIS is used at local government level to visualize access needs and priorities.

Phase 4: Identification of intervention needs

The AIs are then taken back to the communities during participatory meetings and play a key role in the bottom-up planning process. This can be facilitated with the use of visual Accessibility Maps developed during Phase 3. Once the process is completed, investment priorities are presented at resource mobilization meetings with line ministries and donor organizations to solicit their support for improving accessibility that is now based on evidence, consensus and is visible on the map.

Over time, manual mapping exercises have largely been replaced by digital technologies such as GIS (Geographic Information System) softwares that allow more effective data mapping and data saving, wherever the technology is feasible. In some IRAP projects such as in Laos, Cambodia and Indonesia, the mapping process has become completely computerized. A GIS software package with map information helps produce digitized maps showing boundaries, villages and infrastructure as well as the calculation of these AIs. The GIS integrates and analyses spatial location, and organizes layers of collected data into thematic maps for different types of access to the different sectors. GIS reveals deeper insights into data, such as patterns, relationships, and situations. However, the manual IRAP mapping process is still relevant for many local communities who do not have enough access to advanced technologies. The physical mapping process helps them understand their surrounding infrastructure accessibility issues and priorities.

Rural road condition assessment using GIS data for national and sub-national planning in Timor-Leste

When investing in rural infrastructure development, reliable and quality data of people's accessibility plays a key role, as explored in the previous section on the application of IRAP. In Timor-Leste, the ILO took this further and integrated this into a management system for the road/transportation sector. Here the ILO has supported the Government in planning the Road for Development (R4D) programme that has been implemented since 2012.

Stage 1: Data collection and reviews

The ILO's support for the national R4D started from collecting, compiling, and reviewing existing secondary data on road conditions. The dataset was collected and captured in a computerized GIS to generate a digitized initial working map. National and local stakeholders gathered for a series of workshops around the working map to create a list of existing rural roads with the potential to provide larger access for people in rural areas. The roads with 'high potential', considered as "core rural road candidates," would then be subject to a field survey.

Stage 2: Field survey

A field survey is carried out - pictures are taken and videos recorded at a particular location every 200 meters, and tagged using GPS. This survey helps identify: 1) road locations and structures; 2) road conditions; 3) what landmarks and social facilities are near to the local people; 4) location of gravel pits and quarries (i.e. local construction materials), and local industries; and 5) traffic levels and priority areas of intervention. The survey directly engages communities through interviews to identify their needs, similar to the data collection and validation process of IRAP.

Stage 3: Developing indicators

The collected survey data are then processed again in GIS, generating a new map with more detailed qualitative and quantitative information. On the digitized map, each road was classified into three different classes: 1) National or municipal roads that are defined by the Government's Basic Law on Road Transport; 2) Core rural roads that serve over 500 people within a 2km radius; 3) Non-Core Rural Roads which serve less than 500 people within 2km. This classification of roads and people's accessibility enables the estimation of the Rural Access Index (RAI)³. RAI is an indicator generated through survey data collected on road networks, road conditions, and population. It is defined as "the proportion of the rural population who live within 2 km of an all-season road" and it is recognized as an official SDG Indicator (Indicator 9.1.14).

Stage 4 - Application of RAI

RAI signals the extent to which roads and transport services are accessible by the rural population. RAI, therefore, allows governments to set road policy targets to improve rural accessibility with concrete numbers in percentage change within an established timeframe. In the case of Timor-Leste, the government has set its targets to achieve 90% by the year 2030 (i.e. 90% of the rural population with an access of within 2 kilometers), nearly double that of 2015. This policy target enables the planning of road development and management strategies, and the

³ Faheem Eqbali, Bas Athmer, Augustus Asare (2017). "Rural Access Index (RAI): The Case of Timor-Leste."

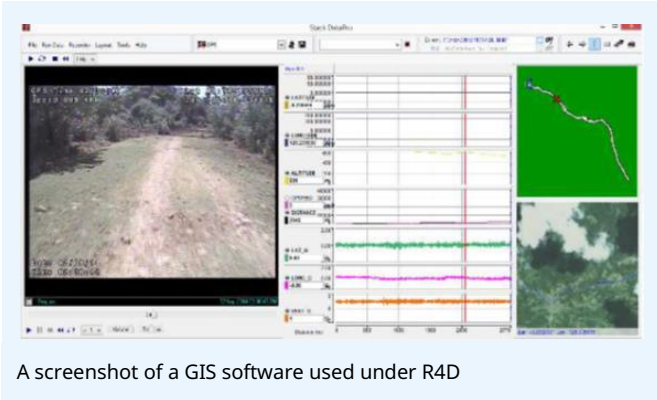
⁴ World Bank Group (2016). "Measuring rural access : using new technologies (English). Washington, D.C."

<http://documents.worldbank.org/curated/en/367391472117815229/Measuring-ruralaccess-using-new-technologies>

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calculation of the budget required to achieve the objective. RAI is used for monitoring the progress of such policy targets and strategies through its continuous updates.

condition surveys with drones, security concerns need to be cleared and discussed with communities and governments. Once these concerns are addressed and objectives are clear, drones make for an innovative tool.



A screenshot of a GIS software used under R4D

► Implementation of activities

Centralized information platform for effective employment data management in Greece

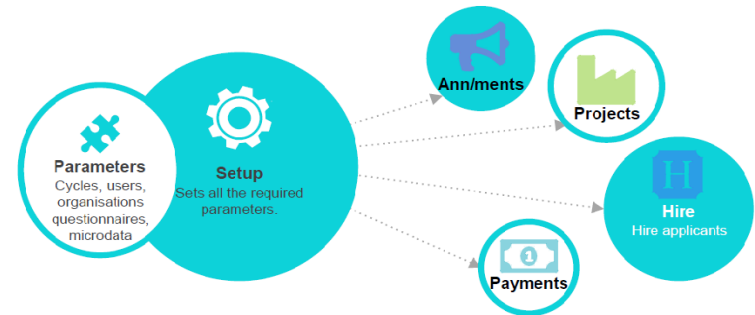
Land survey with drones in Mauritania



The use of drones in the construction sector allows for condition surveys to be conducted from a certain distance to present a broader picture. Drones provide construction site planners with accurate and precise spatial data from the sky, which can be processed and analyzed on a computer. Construction site data collection is usually carried out on foot or in some cases by manned aircrafts, but some EIIP projects have been piloting the use of drones to develop intervention designs.

In Mauritania, the “*chantier école*” approach of theoretical and practical training on construction works has seen a significant expansion throughout the country. The EIIP in Mauritania has conducted a survey on people’s mobility around the *chantier école* construction site in order to inform the project manager of potential rural roads to be rehabilitated or upgraded, in accordance with the volume and frequency of the movement of people as well as their accessibility. The EIIP in Mauritania has been implementing these *chantier école* projects in Bassikounou, a rural area with a refugee settlement. In this area drones were similarly used to identify the most effective use of land and space, while capturing surrounding environmental challenges that need to be taken into consideration when developing infrastructure.

The use of drones to support planning have only been explored in some pilot projects. In order to implement



The Kinofelis Public Works Program (PWP) was developed by the Greek Ministry of Labour (MOL) in response to the recent economic and financial crisis. At the invitation of the Ministry, the ILO provided technical support to improve various aspects of the programme. The Program offers eight months of employment to participants with wage costs covered by the MOL. Based on the MOL targets, local municipalities develop projects that contribute to public goods within their areas of jurisdiction. Through the public employment services agency (OAED), a call for employment is then made for applicants with the skills required for implementation of the projects. A points system is used to select the most vulnerable people who apply for the positions. For instance, this includes targeting older workers who do not have many alternative options.

As part of the ILO’s technical support, a web-based electronic platform was introduced as part of the Management Information System (MIS) to operationalize such a workflow. This makes the data management simpler, efficient and more accessible. The platform has multiple modules:

- 1) project submission and registration, where local municipalities log in and submit projects;
- 2) worker recruitment and registration, where the OAED matches possible candidates with projects submitted by local municipalities; and
- 3) payment for workers.

In the initial set-up, the MOL sets up the scope of its intervention and registers and administers organizations

(i.e. local municipalities) that participate in the PWP. Registered organizations can create and submit projects in the system, where the MOL can review and approve them electronically. Once projects are submitted and cleared, the MOL imports the OAED's applicant evaluation results in the system for the participating organizations to verify their skills requirements and vulnerability parameters. Once the project is running, a Payments List is generated every month with inputs on beneficiaries' workdays from the participating organizations. The MOL imports the list to prepare the wage payments of beneficiaries. This information management system with real time data has made the management of the public employment programme and its reporting more effective.

In addition to the online platform, three online training tools were also developed through the project: the first explaining the concept of Kinofelis; the second on the project selection procedures; and the third on the rights and responsibilities of programme participants.

Digitalization of the apprenticeship program management in Tunisia

The ILO has been advancing a pilot EIIP project on integrated local development (*Initiative Pilote pour un développement Local Intégré*, or *IPDLI*) in Tunisia, implemented in 5 governorates (Jandouba, Nabeul, Gafsa, Kasserine, and Tatouine). The project aims to support the decentralization measures promoted by the government.

As the demands for EIIP intervention continued to increase, the ILO Office faced a need to systematize the information flow gathered from different governorates to monitor project status as well as to provide information on subsequent intervention designs. For this purpose, an information management system was developed to register and categorize information in sequence for project management: different infrastructure assets that need to be constructed/rehabilitated in different governorates by their type/category, and the potential scope for labour-based works that correspond to the categorized infrastructure assets. It also includes relevant information such as labour intensity, assessment of how feasible it is to use labour-based methods, SMEs engagement potential, economic profitability, and so on.

Through such a sequential information system of potential labour-based works, the rapid identification of relevant vocational training institutions in Tunisia also becomes more easily available. The database contains various types of information that automate the training process for the identified infrastructure works, namely, 1) necessary labour-based apprenticeship curriculum for the whole period of implementation, which is submitted through the system and requires validation and certification by the central vocational training authority, 2) profile of the participants in training, including their skills,

responsibilities, wage scales, and work attendance records, 3) performance evaluation by the project participants' supervisors in relation to their mastery of different operations, and 4) apprenticeship validation test information.

With the systematized information flow that combines the infrastructure types and their technical data, together with necessary training and institutional arrangements for the infrastructure works, a larger programme portfolio can be managed more effectively.

Timely and safe payment with e-payment system in the Central African region

In the Central African region, most of the projects are implemented in the context of rampant poverty and conflict, which seriously hampers the implementation of labour-based initiatives and, above all, the prospects for innovation. However, some projects are innovative in these difficult settings, particularly in the use of new communication technologies. The main areas of innovation have emerged through (i) the use of mobile phones for the identification of workers; and (ii) electronic payments to workers. Before the advent of these innovations led by smartphones, registering workers and making payments to them during employment-intensive work was a real challenge. This was especially evident when copies of workers' identity documents had to be made in remote rural areas where access to photocopiers on construction sites is limited.

With the spread of smartphones in the 2000s, most employment-intensive projects such as the Kumba/Mamfe Project and the National Participatory Development Programme (PNDP) in Cameroon, as well as the Londo Project in Central African Republic (CAR) used smartphones to take photos of workers' IDs on the construction site. This method had the advantage of speeding up the registration process and providing the administration with complete and reliable data. In addition, it also made it possible to directly create a database of the profiles of the workers on the construction sites.

However, even when a worker is registered with a photo, payment transactions remain difficult in rural areas. Since the works are located in areas without local banking services, the administrators would often have to travel to urban areas to collect money in cities and return to the worksite to make payments. This exposed them to theft, delays in making payments and significant stress.

As a solution, under the PNDP and other initiatives in partnership with the Ministry of Economy, Planning and Land Management (MINEPAT) in Cameroon, the EIIP projects offered the possibility for workers to opt for electronic payment through the use of smartphones. When workers are registered, they are required to provide a telephone number through which payments can be made.

If they agree and do not have a telephone, the project provides them with a telephone for the sole purpose of payment transactions. Although few workers chose this electronic payment option initially, it made the payment mechanisms more secure. In fact, after about 18 months of making e-payments almost half of the workers opted for this form of electronic payment. It reduced payment delays, improved security, and ensured a transparent payment process. As the electronic payment system is linked to a micro-finance system, it allowed workers to save part of their income directly for future investments.



A young EIIP project site foreman consolidating his data on a database at the end of a day's work on a MINEPAT programme in Cameroon.

and addressing grievances in Nepal and India

Rural Transport Information Management System (RuTIM) in Nepal

Construction site monitoring

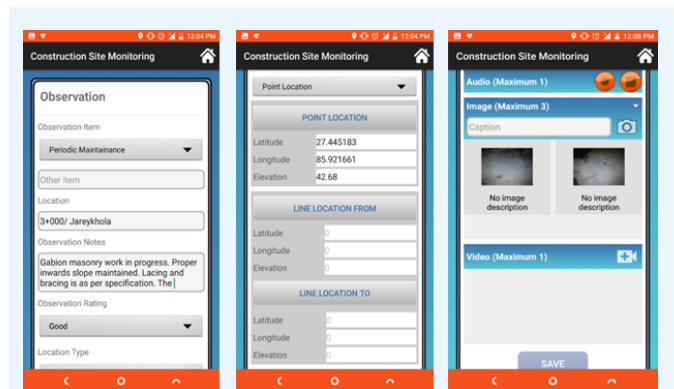
The ILO has provided technical assistance to the Government of Nepal under the Strengthening the National Rural Transport Programme (SNRTP), which is financially supported by the World Bank and the Government of Nepal. The objective of EIIP's support to the Programme is to improve the capacity of beneficiaries for the provision and maintenance of rural infrastructure, thus contributing to the Government's efforts to alleviate poverty in rural areas of the country. In this context, an information management system called "the Rural Transport Information Management System (RuTIM)" linked with mobile phone-based applications was systematically incorporated in the implementation and monitoring, enhancing the efficiency and effectiveness of its operations. RuTIM is an online platform for planning and monitoring rural roads and transportation infrastructure.

The mobile-based monitoring application has been particularly useful for tracking progress and monitoring the quality of works conducted on site. Any android device with the function of an in-built GPS receiver and location recorder can use the application to monitor the construction sites. The information gathered through these devices feeds into RuTIM.

Other data processed through RuTIM includes road structures and different technical details. Information relevant to all stages of a contract, from the bidding process through to implementation, is managed online: GIS-based road maps, implementation progress, financial status, payment certificates, variation orders, and other vital information are kept up-to-date on this online platform, supported by the mobile apps.

► Worksite monitoring

Mobile application and ICT software for work site monitoring



Screenshots of construction site monitoring mobile application under the SNRTP

This bottom-up data flow, with the centrally managed information system backed by the mobile-based monitoring application combined, enables the contracting agency to quickly access reliable information. In the field information on work progress is indispensable to process payments to workers. It also allows the contracting agencies to review the payment status in order to avoid any delay in the payment to workers that could lead to grievances.

Grievance redressal mechanism

SNRTP also replaced the traditional method of a physical “complaint box” with an electronic grievance redressal mechanism. The traditional “complaint box” system did not turn out to be a very effective tool to address grievances due to the government’s hierarchical structure taking too much time to process each complaint. A web-based platform is set up to allow any of the project beneficiaries or stakeholders to submit complaints or report fraudulent activities. The platform can also be used to make suggestions for improving the program. Project staff are obliged to respond to the reports within an established timeline and this too can be monitored electronically. The system has greatly improved the ability of the program to respond to grievances and constructive suggestions from workers.

Mobile application for effective road surveys and contracting in India



Narendra Tomar, Minister for Rural Development and Deborah Greenfield, DDG, ILO launch a mobile app for maintenance of rural roads

In 2017, the Government of India and the ILO launched a mobile application “Aarambh” for effective road maintenance planning and monitoring in the country. This mobile phone-based app for performance-based

maintenance contracting and community contracting aims to introduce an efficient use of GIS mapping systems for creating road inventories, conducting condition surveys, and producing cost estimates and other relevant data. The data retrieved from the handy application are used for the preparation and monitoring of annual road maintenance plans. The application helps to enhance the service delivery of the state-level institutions in planning, implementing and monitoring performance-based rural road maintenance contracts.

► Project closure and ensuring sustainability

Capacity building for ICT on labour-based road building in Indonesia

After the devastating tsunami in 2004 and the major earthquake in 2005, the ILO initiated a project on capacity building for Local Resource-Based (LRB) road works in Aceh and Nias, Indonesia. The rehabilitation and improvement of rural road networks were the main objectives. In its Phase III (2011-2012) in which two Aceh districts (Pidie and Bireuen) were targeted, the project centered on building capacity for road investment planning and management of public works by the local governments. It included a series of training on data system management as part of the project’s exit strategy⁶. The data system was comprehensively developed throughout different project phases to be sustainably incorporated into the administration of public works. The system that was transferred to the local authorities features GIS data that combine layered maps with detailed information on road locations, classifications and conditions, as well as other administrative information such as contract costs.

In Bireuen, the database was expanded to include more information on socio-economic infrastructures previously not covered (see the section on IRAP for basic socio-economic infrastructures that are normally covered for accessibility planning). Staff members who manage the public works on infrastructure acquired skills on data collection with GPS handsets, data entries on the GIS system, as well as output reporting and information maintenance. This training contributed not only to the development of the data system but also to the development of master plans for transport infrastructure in Bireun and Pidie.

⁶ ILO (2012). “Capacity Building for Local Resource-Based Road Works in Selected Districts in Aceh and Nias. Final Evaluation Report.”



A workshop with local stakeholders on data management systems in Indonesia

Conclusion

As explored in the various country examples, digital technology is enhancing the impact and efficiency of EIIP project planning, implementation, and monitoring, while ensuring the sustainability as projects complete. These examples clearly demonstrate the coexistence of rapidly changing digital technologies and employment-intensive works, contrary to the often perceived image of employment-intensive works being reluctant to adopt advanced technologies. In fact, the EIIP has always explored potential windows for new technologies to implement employment-intensive works whenever technically feasible and economically viable to improve program management and enhance the impact on beneficiaries. Its innovations are evident throughout each phase of a project cycle, as demonstrated in this note.

For instance, IRAP was a pioneering method that was applied in a number of countries, gradually incorporating digital mapping tools to visualize the rural accessibility data to present access problems and investment gaps. In some countries, such data that used to be assembled and read manually on a paper map, became digitally registered through GIS. This allowed to more effectively feed into the national planning of infrastructure development to present multiple layers of information, as can be seen from the example of R4D. R4D is an initiative specialized in transportation and road accessibility information. The use of GIS allows for the categorization of road classes and rural accessibility, which form core elements of the RAI, one of the official indicators to measure SDG targets. In recent years, the use of drones has been introduced in some projects to conduct surveys on infrastructure conditions as well as land and surrounding environmental challenges.

Data collection and management for the implementation of activities can also be facilitated using digital platforms in areas other than the road sector, as can be seen in Greece. The Kinofelis programme has introduced a centralized data management platform to effectively recruit and place its target group, i.e., the long-term unemployed, on projects that match their skills. Data management technologies can be used even in remote areas where seemingly digital technologies are not available. In the Central African Region, the registration of workers was made simple with mobile phones and payment transactions were made quick and secure through e-payment systems. E-payment contributes not only to effective project management, but also to the increased access of project participants to micro-finance institutions.

Such central information platforms, together with handy mobile applications, are enhancing the effectiveness of project monitoring. As seen in India and Nepal, data flows are streamlined within the national programmes to respond to the infrastructure needs and workers' grievances, ensuring timely payment to workers and safeguarding decent working conditions. In other cases, such as in Tunisia, the data flow was streamlined for apprenticeship programme management. The newly introduced system in Tunisia consistently processes different layers of information such as infrastructure conditions, corresponding vocational training institutions, and project participants willing to take part in training to develop infrastructure assets.

The skills for using digital technologies, including information management systems, can and should ideally be transferred to partner countries and local communities through training for them to take ownership of the new digital technologies, as was done in Indonesia.

The EIIP has continued to innovate and adopt new technologies into its approaches, tailoring its intervention modalities in accordance with country-specific situations and needs. As shown in this brief, there are multiplier benefits of incorporating digital technologies into the management of employment-intensive works. Employment-intensive projects should therefore continue to make innovative use of digital innovations to enhance their intervention impact, effectiveness and efficiency. In addition to the clear benefits, demand for digital innovation is increasing rapidly, particularly in the aftermath of the COVID-19 crisis, where alternative solutions to traditional means of work, communication, and socio-economic structures need to be re-explored. The EIIP is ready for this growing demand as demonstrated through its experiences outlined in this brief.

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