FOR PARTICIPANTS ONLY
14 March 2017
ENGLISH ONLY

UNITED NATIONS
CENTRE FOR REGIONAL DEVELOPMENT

In collaboration with

Ministry of Public Works and Transport, Lao People's Democratic Republic
Ministry of the Environment (MOE), Japan
Partnership on Sustainable, Low Carbon Transport
United Nations Economic and Social Commission for Asia and the Pacific, and
United Nations Office for Sustainable Development

INTERGOVERNMENTAL TENTH REGIONAL ENVIRONMENTALLY SUSTAINABLE TRANSPORT (EST) FORUM IN ASIA,
14-16 MARCH 2017, VIENTIANE, LAO PDR

Policy Framework to Improve Rural Transport Connectivity to Wider Local, National and Regional Transport Networks

(Background Paper for EST Plenary Session 4)

Final Draft

This background paper has been prepared by Sabrina Engel, Peter O'Neill, and Madan B. Regmi for the Tenth Regional EST Forum in Asia. The views expressed herein are those of the authors only and do not necessarily reflect the views of the United Nations.

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Intergovernmental 10th Regional Environmentally Sustainable Transport Forum in Asia

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Policy Framework to Improve Rural Transport Connectivity to Wider Local, National and Regional Transport Networks

Draft background paper for the plenary Session 4:
Introducing Vientiane Declaration on Sustainable Rural Transport towards Achieving the 2030 Agenda for Sustainable Development

This draft paper is issued without formal editing and is prepared by Sabrina Engel, Peter O'Neill, and Madan B. Regmi, Transport Division, ESCAP for discussion at the 10th Regional EST Forum. The views expressed in this background paper are those of authors and do not necessarily reflect the views of the United Nations.

1. Introduction

Asian economies are growing. Still, not everyone benefits from this development to the same degree. Particularly people living in rural areas of lesser developed countries have little opportunity to participate in wider economic activities. This is mainly a result of the physical isolation of rural villages from a wider transportation network. Because road construction in remote areas is costly and the average number of direct beneficiaries per kilometer of road is comparatively low, governments are typically reluctant to invest into the extension of rural road networks. Consequently, on an aggregate level 700 million people in Asia are negatively impacted by this geographic isolation (United Nations ESCAP, 2015). In the affected areas, access to basic social institutions like schools or hospitals is very limited. As a result, the rural citizens' quality of life of suffers tremendously and their potential for economic empowerment remains low (Bird et al., 2010).

Reliable access to a wider transportation network has been recognized as a major enabler of economic and social development. Still, large demographic groups in rural Asia remain isolated within their communities, where poverty shapes people's everyday lives. The obstacles for substantial extensions of rural road networks on nationwide bases are evident. They range from financing, lack of know-how and proper engineering and maintenance, a misalignment of national and regional priorities and the unsustainable use of resources. The purpose of this paper is to provide policy makers and practitioner with a policy framework to improve rural connectivity. The proposed policy framework would incorporate these critical points. It would build on the insights from best practices, lessons from less successful cases as well as recommendations from research and publications. The major goal is to facilitate economic and social development in rural communities in the Asia Pacific region by highlighting the opportunities for sustainable transport solutions though implementing innovative funding, sourcing and management methods in a coordinated and collaborative way.

Rather than relying on conventional cost-benefit analyses, the framework will build on the value-for-money approach, which goes beyond a mere financial assessment of individual projects. It takes the perspective that in development initiatives effectiveness, efficiency and economy need to be balanced in order to reach the best possible outcome, which in the case of rural connectivity would be the achievement of maximum road coverage. This means that in the planning and implementation of large-scale rural infrastructure initiatives, the active search for smarter, cheaper and more local solutions can systematically lower the cost of all sub-projects so that access can be provided to a greater total number of communities. Policy makers and practitioners are encouraged to use the It is hoped that insights presented in this paper and policy framework would supplement other national and regional planning frameworks, available technical guidelines, quality control and monitoring mechanism in place in countries and communities to derive situation-appropriate plans and decisions.

Following this introduction, the goals and principles of developing policy framework is presented. Section 3 outlines strategic context of rural access and the policy framework is elaborated in section 4 that includes institutions, planning and preparation, implementation and performance management.

2. Framework Goals and Principles

Following the adoption of the 2030 Sustainable Development Agenda including 17 SDGs, every policies, programmes and projects should be analyzed through sustainability lenses. The provision and improvement of rural access – be it a policy or plan or decision has to be reviewed with regards to its potential to induce sustainable development in these isolated communities.

Firstly, long-term **economic** development should be targeted with each decision. This means that the measure should have the potential to strengthen the local economy, creating the environment for local people to rise above subsistence farming, by making the region attractive for firms, generating employment opportunities, and consequently raising incomes and prosperity. Secondly, and in connection with point number one, any measure should have the potential to have positive long-term **social** outcomes. Economic progress has to benefit not only businesses, but should specifically contribute to making the lives of those better, who have to sustain on the lowest incomes. The most disadvantaged demographic groups are often (ethnic) women and children. Progress means that they get access to better health care, education and economic opportunity. Thirdly, development has to be **environmentally** sustainable, meaning that any infrastructure-related intervention in the region has to be analyzed with respect to its impact on the respective eco-systems and wildlife. The integrity of local ecological networks has to be preserved, while biodiversity and geodiversity need to be maintained. Wherever natural resources are extracted for road construction, this has to be done in the most effective and efficient manner. Minerals are finite, so it is vital to preserve them and only extract them if their use will lead to the long-term success of the project.

Sustainable development on all of those three dimensions also means that planners are required to meet the challenges of climate change and all of its consequences. These include changes in the weather patterns of the specific region, coastal change and an increase in the likelihood of extreme events and flooding.

3. Strategic Context

Providing road access can be an effective response to the needs of inhabitants of rural and isolated communities, and responding to the specific local conditions, connectivity can be an appropriate solution for prevailing economic and social problems (van de Walle, 2002). The following paragraphs discuss rural agricultural, social and economic context and importance of connectivity.

3.1. Agriculture

It has been argued that rural road access is an effective economic policy measure because of its positive impact on agricultural productivity. According to this perspective, farmers do not have an economic incentive to move beyond subsistence farming unless they have access to markets. Connecting them to a bigger transport network works as an enabler to increase their agricultural production and market their surpluses. With additional incomes a virtuous circle will be initiated. Farmers will be able to afford more expensive high-value crops, and trade between rural communities as well as with urban areas will increase (Starkey & Hine, 2014).

The positive outcomes of such an endeavor do not only affect each rural village but rather, they contribute to the stability and resilience of the entire economy. On the one hand, food spoilage and post-harvest losses will be reduced as farmers do not necessarily need to dispose of storage facilities but can transport their surpluses elsewhere. Moreover, when agricultural productivity increases in the wider region, farmers will seize opportunities for trade, which will further increase the variety of products available to rural residents. For each village participating in trade, food security would be enhanced. On the other hand, also urban food prices could be stabilized due to stabilized supply (Partnership on Sustainable Low Carbon Transport, n.d.).

3.2. Social Institutions

On a more direct level, reliable road access has the potential to decrease human suffering through a significant cut in travel times to key social institutions, such as health care facilities and educational establishments. Long and tedious journeys aggravate the problems of infant mortality, maternal mortality, as well as the lack of emergency care. In Papua New Guinea 94.3 per cent of the country's poor are located in rural areas. There, a study has unveiled that shortening the travel time to the nearest main road link to 2 – 3 hours leads to a significant reduction in the headcount index of over 5 per cent (Gibson & Rozelle, 2003). Similarly, it has been found that in Thailand, despite the provision of universal financial health protection, beneficiaries are less likely to actually make use of state-provided health services the farther such establishments are located from their homes. In Viet Nam, this negative effect of distance on the probability of visiting a health care facility held true for the lowest income households but not for higher income ones. This observation emphasizes the notion that physical isolation and poverty need to be addressed jointly (Kirdruang, 2011).

Education is one of the key indicators for breaking the circle of poverty. When children in rural villages have the chance to commute on a reliable and safe road to and from school, it has strong positive outcomes on the health and prosperity of the entire community. Without all-season road access, attendance can be prohibited, as protracted travel times lessen pupils' time to be productively engaged. Still, facilitating school attendance will result in higher literacy and people's higher capacity to process information. Among other benefits, they will be able to apply contemporary farming technologies more effectively and efficiently and learn how to participate in market activities more successfully. The same study from Papua New Guinea highlights this relationship. If all household heads could be made literate, incidents of poverty would drop by 17 per cent. At the time of the study average schooling in rural Papua New Guinea was three years, and according to the results, raising it to a minimum elementary (middle) school level would result in a 10 per cent (20 per cent) reduction in poverty (Gibson & Rozelle, 2003). The outcomes of these studies are robust, and they provide solid evidence that bringing infrastructure networks closer to rural villages is likely to reduce poverty through better access to key social services.

3.3. Overall Economic Activity

In the medium to long run, it is expected that economic activity will be induced as an indirect effect of rising incomes and employment from farming activities. Moreover, reliable all-season and well maintained road access can contribute to the wider economic activity of the region by attracting firms and by, consequently, creating sustainable employment opportunities through a shift away from agricultural jobs (Gertler, Gonzales-Navarro, Gracner, & Rothenberg, 2014).

Connecting isolated villages to a wider transportation network also lowers many market entry barriers for outside producers of diverse merchandise. As a result, on an aggregate level very large new consumer segments could be reached. This does not only have a positive outcome on the national GDP but also ensures that people in remote areas have access to important products that enhance their quality of life.

4. Proposed policy frame work

Governments are typically aware of the potential benefits of investing in and implementing rural infrastructure projects. However, particularly in developing economies, policy makers might have different priorities for the development of their countries, and they allocate their scarce financial resources accordingly. In direct comparison with other infrastructure projects, rural connectivity is likely to be seen as less efficient than, for example, urban ones, because fewer people are served per kilometer of road. This fundamental imbalance leaves rural infrastructure chronically underfunded.

The policy planning cannot stop at the financial level where projects are weighed against each other. Rather, it will need to explore alternative measures and approaches to infrastructure policy that allows the connection of rural communities to wider transportation networks on a long-term basis. The key idea of the following policy framework is to think beyond the standard model of public funded, executed and managed solutions and to make use of more effective and efficient practices.

The goal of transport policy should not be an increase in the absolute value of investment in rural connectivity, but to invest in line with national policy, local circumstances and case-specific requirements in the most efficient, effective and economic way possible.

Not every action will have the same impact in different regions or communities and under different circumstances (Asian Development Bank, 2006). Consequently, for the long-term success of any policy intervention in rural areas, it is absolutely crucial to understand the processes through which development is achieved and to select plans that are appropriate for the specific connectivity issue that the target area is facing. Evidence-based techniques should be employed accordingly. Otherwise, inappropriate and non-targeted spending will result in loss of money without realizing the intended outcomes. Since usually the success of previous projects serves as a guideline for future investment, mistakes in the selection of case-specific measures can have substantial negative effects on governments' pursuit of achieving rural connectivity. In other words, if money is spent wastefully and without a well thought-through plan, people living in rural areas will remain isolated, because practice has "proven" that such investment are ineffective.

This is why, in the following section present a sequential policy framework that starts with establishing and defining institutions, planning and preparation of rural access programmes and projects, implementation, and performance management. The policies, plans, programmes and projects should take into account local context and situations. Ultimately, it should assist in the formulation of strategic rural master plans that enable the long-term success of national rural connectivity efforts. In the future, ad hoc decision making should be avoided so that the overall life-time costs of a transport network are minimized.

For ease of reference the proposed policy framework is graphically presented in Annex –I and salient points of the framework are summarized.

4.1 Institutional Authority and Responsibility

One of the major success factors for the implementation of a large scale infrastructure endeavor, particularly in rural regions is the assignment of clear and binding roles and responsibilities in planning, implementation as well as management. Losses of resources occur where authority and responsibilities are not clearly assigned. The results of such misalignment are a quick deterioration of established roads or an inflated coordination effort where regional governments are not sufficiently involved in the entire process. Because local communities are the main stakeholders and users of rural transport networks, they should be involved in every stage of the process. On the one hand, they know the local circumstances and needs best, on the other, they should develop a sense of ownership and responsibility over the newly established road links. The positive outcomes of such an engagement have been widely recognized (World Bank, 2001). Together, a close collaboration between national and local authorities should to bring down the system-wide costs while attaining the required quality.

4.1.1 Central Agency for Rural Infrastructure Development

For a coordinated and sustainably successful national initiative on rural connectivity, it is advised to establish a central institution with the task to coordinate and monitor planning, funding, implementation and maintenance. Money is one of the main hurdles when initiating specific road construction projects. In the following section the potential of alternative funding measures will be highlighted, but it is very difficult for local officials to implement such strategies by themselves. Even if financing is not affected directly through the national government, at least coordination of nationwide efforts in rural road connectivity should be in hands of the central planning agency. Success can never be guaranteed. However, authority can foster consistency and help develop much-needed expertise (European Commission, 2013). What is more, there is a general need for public awareness for rural roads projects, and it cannot be in the responsibility of overburdened small communities or local governments.

Still, money is often only one constraint. Lacking knowledge about design, materials and maintenance usually drive up life-time cost and cause major disturbances in the quality and usability of the finished networks. Such an institution could be regarded as a knowledge base, providing necessary training and technical assistance to local contractors, engineers and regional authorities. This way, best practices can be developed centrally and expertise can be leveraged in the most efficient way. Local communities are not left alone but benefit from previously generated Know-How. It can also have the responsibility for connecting all parties including communities, development banks and other funders (Asian Development Bank, 2013). To further strengthen the capabilities of this central agency, the institutions in the region are encouraged to collaborate across borders and share their individual expertise. It is expected that synergies will be created, thus accelerating progress in rural connectivity considerably. This national central body should also enforce national standards on road safety, quality and social, economic and environmental sustainability.

4.1.2 Decentralization and Participation

A strong orientation towards decentralization can also drive down total life-time costs while ensuring long-term sustainable success. By creating mechanisms through which local communities contribute to the necessary tasks in a participatory way, efficiencies and value-for-money can be enhanced. Common problems of information failures can be counterbalanced. Whereas central governments are unable to know the necessary details about local circumstances, decentralizing certain activities can strengthen governments' knowledge of their citizens' lives (World Bank, 2013). Further positive externalities are a generally enhanced level of social cohesion in the community and the establishment of a platform for other activities (World Bank, 2006), higher speed and lower cost than serving each rural community via a nationwide contractor or monitoring all activities via governmental supervision. Ideally, this participation should not only be effective in operational activities, including implementation and supervision but also in the planning process. If communities have the opportunity to voice their opinions about their very own needs and contribute their local knowledge, a sense of ownership and identification with respective road initiatives can be achieved. Such an engagement has great positive outcomes on the long-term sustainability of the undertaking.

Particularly in countries where poverty alleviation is the main priority, practice has proven that decentralized resource allocation can lead to more effective targeting of poor households. For example, under the Trabajar 2 program in Argentina the central government allocated their budget for socially useful projects in poor areas to the provinces according to their demand. Within the provinces, regional governments then allocated these funds according to their best knowledge of the local needs. An evaluation of the program unveiled that the self-targeting approach worked in favor of the poorest households, who were effectively reached (Ravallion, 2000 and Jalan and Ravallion, 2003; cited in World Bank, 2013).

4.2 Planning and Preparation

4.2.1 Status Quo Analysis

Policy makers need to know exactly what the major challenges are in each region and each community to reach the optimum combination of whole-life cost and quality (fitness of purpose). Therefore, a status quo analysis of the target areas should be conducted that tells planners where they currently are. Economic, social but also topographic and geographic differences are very likely to be encountered within each country. Evidently, heterogeneity in circumstances will lead to heterogeneity in the encountered degree of difficulty. Some communities might be greatly disadvantaged in terms of location and the resulting complexity of the project (Flyvbjerg, 2005). These differences have to be identified first (World Bank, 2001), because providing road access has a different impact depending on the nature of the specific community, including the prevalent level of poverty and the economic potential (Asian Development Bank, 2006). In the appendix a catalogue of questions can be found that will help in identifying key points and issues for the analysis of the current situation.

Some of the questions can be answered using standard government data, such as geographic and climate maps, seasonal rainfalls and population figures. For others, more detailed questions about the quality of the local transportation network additional data might need to be collected via a low-cost inventory and condition survey including roads, tracks, paths, footbridges and waterways. A map should be produced, showing the nationwide or regional rural transport networks in conjunction with geographic, economic and social indicators (World Bank, 2001). Areas with similar characteristics should be identified, as this allows targeting groups of areas with similar policies at the minimum risk, cost and overall need for coordination. At the same time it enables planners to test the effectiveness of specific measures under comparable conditions.

Again, local authorities should be participating in the collection of data to highlight local needs and enable effective decision making. Particularly when the main goal of the infrastructure initiative is to target poor households, local knowledge has to be leveraged. Planners should be pragmatic about the types of indices to use, as data might not be available in the desired quality and quantity (van de Walle, 2002).

4.2.2 Network Planning

Budgets are limited. As a result, infrastructure planners are required to prioritize among all the possible projects using available indices and data. For that purpose, a variety of tools can be used. Depending on the specific policy goals, priority can be given to the poorest communities, those that are the easiest (cheapest) to serve, areas with the potential for some degree of industrialization or with the prerequisites for increasing food security on a bigger scale. In general, however, three main criteria can be employed when evaluating new rural road development projects, which are the technical feasibility, the economic justification and social considerations (Johannessen, 2008).

Common methods are multi-criteria analysis, cost-effectiveness analysis and cost-benefit analysis. This stage of the planning process is likely to be one of the most delicate ones, as it requires the quantification of costs, returns as well as social impacts of any intervention. A review of large-scale infrastructure projects has unveiled that a systematic error exists when it comes to the estimation of costs and benefits, which transcends cultures, continents and is stable over time. Costs for road construction are strategically underestimated by an average of 20.4 per cent, while 50 per cent of road traffic forecasts are wrong by 20 per cent, because planners and promoters have economic incentives to push projects towards their realization (Flyvbjerg, 2005). Furthermore, long-term operation and maintenance costs must not be

neglected at this stage (Asian Development Bank, 2006). Decision makers have to make sure that project estimations are as realistic as possible.

All construction projects should be screened and those that do not fit the minimum criteria should be dropped. A ranking of the remaining possibilities can serve as a guideline for further action. The produced priority ranking can be translated into an integrated master plan for rural connectivity with short-term, medium and long-term goals for the attainment of maximum road coverage (World Bank, 2001).

In the network planning stage, the total scope and consequently the need for investment can be reduced significantly by eliminating low-priority links of the network. This means that for each community only one link would be constructed or upgraded to an all-season road, for example the shortest one. In India this strategy accomplished to reduce the road network considered for interventions from initially 5,000 km to 3,000 km per district (World Bank, 2001).

Every road leads somewhere. Policy makers have to make well-founded decisions about the type of rural development they intend to push. The previously conducted status quo analysis should be the foundation thereof. On the one hand, rural communities might become vital partners of other (urban or rural) markets. Another possibility is to establish new markets in wider regions that have been lagging behind economically and socially.

In general there are certain success factors for rural road projects. Firstly, the economic potential of the targeted community should be sufficient. For example, to realize the agricultural potential, farmland per capita should be high, water supply sufficient and the climate suitable for certain cash crops. Such ideal areas are expected to attract seasonal labor also for surrounding areas. By strategically placing a new road in such a community, planners can boost economic activity, employability and prosperity in the wider area without having to physically access every single village (Asian Development Bank, 2006). Untapped economic potential can also take the form of the presence of valuable natural resources. If such materials can be used for manufacturing, private businesses will be attracted if all-season high quality road access is provided. In a similar fashion, this would increase labor demand in the wider region at a high level of efficiency.

4.2.3 Creating New Markets

In regions, that may not have the best conditions for attracting private investors from outside or that do not have the capabilities to produce and trade certain products on a commercial scale, road investment should still not be discarded as a measure for development. Evidence from northern Viet Nam and Yunnan suggests that simply upgrading isolated rural roads does not serve as a poverty reduction measure in poorly-endowed mountainous areas (Asian Development Bank, 2006).

An alternative for targeting such a region can be the connection of individual isolated communities within a wider geographic region. This strategy can lead to a number of benefits. Through agglomeration new markets are supposed to evolve where an increase and diversification of economic and social activities can take place (Mu & van de Walle, 2009). Studies have shown that in such scenarios the local economy can largely switch from agricultural to non-agricultural employment on a long-term basis, mostly to service-based activities. Education is also expected to improve, as isolation is decreased and people are sharing ideas and knowledge on a common meeting place. Even though evidence suggests that poorer communities benefit to a larger extent from the establishment of new road links, simply because of their larger potential for improvement, some characteristics of isolated villages strongly curb that effect. For example, a high level of adult literacy usually lessens the impact of road investments, because there will be less positive network effects through mutual learning and exchange (Mu & van de Walle, 2009).

Consequently, policy makers should consider pairing strategic infrastructure investments with educational programs in order to trigger development in the areas that are most disadvantaged. It has to be emphasized that education is one of the most effective factors in reducing poverty, so linking education and road access could induce the desired progress that each of them cannot in isolation.

Furthermore, this approach is less recommended in very sparsely populated areas, because agglomeration is less likely to occur. Similarly, regions that are divided by culture and language are unlikely to experience the benefits of exchange. In such cases there might be other, more effective and economic measures than investments into rural connectivity.

4.3 Implementation

In the following sections the implementation of policies, plans, programmes and projects will be further discussed with respect to financing, construction and maintenance.

4.3.1 Funding Possibilities

Despite the traditional reliance on government funds, there are innovative ways of financing rural infrastructure combining public and private resources. Subsidized interest, private collective investments, public private partnerships and staged construction approaches have the potential to increase the total number of sustainably successful rural road projects.

Traditionally, investments in public goods have been funded via public finance sources, including domestic tax money and government bonds. This is supplemented by external funding provided through international finance institutions like the Asian Development Bank, World Bank or regional infrastructure funds. To attract private sector funding for rural connectivity is vital in providing significant coverage. Firstly, hardly any usage-based cash flows can be derived from rural road investments, because the users are among the poorest people in the region. Imposing fees on them would result in a low usage rate that does not serve the purpose of the initial investment. Secondly, costs are stable and high. Thirdly, rural infrastructure projects have to compete for these budgets on a national level with all other public investments. For these reasons, new decentralized forms of financing have to be considered that can have realistically successful outcomes and low risks of failure.

Private Collective Investments

Even though a usage-based fee is not recommended, there are other ways to engage locals in the financing part. Certain rural communities have a high agricultural potential, but they are lacking the money to directly pay for a road link upfront. The Asian Development Bank (2006) has reported numerous instances in Viet Nam and China, where individuals or village leaders borrowed (sometimes on behalf of a bigger group of beneficiaries) loans for the investment village infrastructure. In one village in Yunnan, China the construction of a dirt road was financed by an individual in agreement with local farmers and a sugarcane processing firm. Repayment was effected via annual fees from revenues of sugarcane sales. These cases have shown that if the investment promises the benefits of access to markets and higher productivity, local farmers are willing to collectively take out long-term loans. Future cash flows should be used to repay loans in the long-run. In such a model, government funds can be used as facilitators of investment by private financial institutions, speeding up the development process considerably. The state can provide small grants to subsidize interest, with the benefit of a low overall investment amount per

kilometer or road. Furthermore, compared to direct government loans, farmers are more incentivized to repay instalments to a commercial investor (Asian Development Bank, 2006).

It should be noted that the coordination and assessment of economic potential should be the responsibility of the central infrastructure agency. On the one hand, it has to connect private financial institutions with communities. On the other hand, it has to realistically assess the success likelihood per road project. If the agency is reluctant at this stage and encourages investment in communities with little capability to repay the debt (despite the intention to do so), commercial investors will lose trust in the initiative and refrain from further engagement.

Risks lie in the long-term commitment of many individuals. The purpose of constructing a rural road is that it will be used by villagers. Therefore, the road is a non-excludable good and it imposes the challenge how to avoid free riding and ensure accountability of payment, especially if the obligation transcends generations. Again, locals have to be able to participate at each stage of the project to ensure sustainable success. For the administration of such a jointly funded infrastructure good, economic insights from the sphere of common goods can be derived. The communities themselves have to set up social rules, develop a system for monitoring and sanctioning violations, build responsibility and means for ensuring accountability. Through participation, farmers and villagers should develop a sense of ownership and act accordingly. For the sake of the sustainability of the effort, it is crucial that the participants cooperate rather than having rules imposed on them (Ostrom, 2000).

Public Private Partnerships

Engaging the private sector can be done by setting up Public Private Partnerships (PPP). Such agreements can take a multitude of forms, whereas the balance between public and private participation need to be carefully chosen in order to match the specific project requirements and objectives. Public Private Partnerships should enhance the overall public benefit, which requires a careful assessment of the total cost and benefits (European Commission, 2003). In this regard, overly complicated PPP structures should be avoided if it cannot be guaranteed that the country can provide the necessary capabilities and attention (European Commission, 2013).

It has to be argued how appropriate PPP structures are for small scale rural infrastructure investments, as daily road usage might be comparatively low. For example, Build-Operate-Transfer (BOT) Toll models, under which the private partner has the right to collect usage fees, are not recommended where the expected traffic will be low or where the toll would reduce the usage. If, however, road access enables some bigger commercial manufacturing or the extraction of primary resources, tolls could be levied on those transports. Generally, new ways of tailoring PPPs to small-scale infrastructure projects should be explored in order to reach maximum efficiency.

Cost Sharing via Staged Construction Approach

Local communities typically know their own needs better than outside agencies. In some instances a mismatch between needs and centrally provided solutions requires communities to take the initiative in providing adequate solutions. The Rural Road Gravel Assessment Programme identified two provinces which immediately overlaid donor-sponsored gravel surfaces at their own expense due to its inadequateness in the local conditions. The insights from this case suggest the possibility of a staged construction approach. Problematic areas could be effectively served by splitting the construction process into multiple parts, like the preparation of the subgrade, the gravel and the weather-proof sealing. While the state could, finance the construction of the unsealed surface, local communities could arrange the

appropriate overlay. To be technically feasible the phases has to be coordinated accordingly and executed quickly (Department for International Development, 2006).

In accordance with the previous model of private collective investments, comparable models can enable rural villages' access to a wider transport network. Under a simple cost-benefit analysis these villages are relatively likely to be discarded prematurely but through sharing the financial risk, it becomes feasible to enter suboptimal regions.

4.3.2 Construction

In the construction process new road surface techniques need to be explored, as gravel has proven to be unsuitable for many climates, topographies and traffic intensities. Through the use of labor-based construction techniques new situation-appropriate solutions can be put into practice. In this regard, a shift towards local businesses and local labor is a promising strategy of combining social and economic development goals with road construction, by providing rural people with skills, some ownership of rural roads as well as additional incomes. After construction the importance of appropriate and timely maintenance cannot be overemphasized. It is one of the main success factors in the effort of connecting communities to a wider transportation network, as deterioration is oftentimes fast and there is a well-documented lack of awareness for maintenance activities as opposed to more visible new construction projects.

One of the most effective ways to bring down total life-time cost and the need for costly renovations is to fundamentally change the established way of constructing rural roads. There are many emerging local technology, construction techniques and materials that are more environmentally, economically and socially sustainable than conventional approach. Designers and practitioners should be encouraged to explore such options while planning, designing and constructing rural roads.

Road Surfaces

Conventionally, rural roads have been constructed using natural gravel and laterite surfaces. Even though the obvious advantages of these materials are their low initial cost and simplicity of use, particularly gravel has serious drawbacks in the medium and long run. First and foremost, gravel is a "wasting surface", meaning that it gets lost at a high rate under a variety of conditions. These include traffic itself, rainfall, poor gravel quality, dust problems in the dry season, a weak or soaked subgrade and longitudinal gradients. Other cost drivers are long haul distances and the need for routine reshaping and periodic regravelling. This list alone demonstrates that gravel is only the most economical solution in few ideal cases (Department for International Development, 2006).

For the biggest share of roads, there are proven alternatives to gravel, which are more sustainable, have similar initial costs, lower lifetime costs and a lower need for maintenance. The status quo analysis should be used to determine the specific requirements of the road section in question. The question is what types of vehicles will be using the road and in which frequency. As mostly no heavy goods traffic is to be expected in rural regions, on many soils a simple engineered earth road will be sufficient. Stone, bitumen, concrete and brick are other materials that should be considered and evaluated thoroughly. In general, indigenous materials are more resistant towards local weather conditions and should, therefore, be used to avoid quick deterioration. At the same time delivery costs are reduced and the dependence on external materials with fluctuating prices minimized (Department for International Development in cooperation with World Bank and Asian Development Bank, 2006).

In terms of the quality of used materials and drainage systems, it has to be emphasized that they must be adequate for all-weather usage throughout all seasons. A study conducted in the South East Asian state of Timor-Leste from 2016 found robust evidence that rural villagers had significantly higher levels of well-being if their community road was accessible at all times (Chongvilaivan et al., 2016). This reflects the fact that limited seasonal access is asociated with high levels of insecurity and dependence from outside, because people cannot be certain that they will have access to schools, hospitals and markets. For planners, this means that not only the quantity but also the quality of new road projects has to be emphasized, particularly in areas prone to extreme weather events.

Type and Scope of Intervention

Pragmatic solutions for areas with different geographic and climatic requirements are the key to increasing efficiency while maintaining effectiveness. More precisely, this means that overinvestment has to be avoided where a simple and cheap solution is feasible, while other sections will need more attention. In many areas it will not be necessary to build an entirely new road, as some types of path or corridors may exist already. Through upgrading these established routes, a more reliable and safe road access can be provided. The total investment amount can also be minimized by using spot improvement techniques. Gravel material loss is highly variable with a median of surveyed sites of 26 mm per year and a rage from 2 mm to 200 mm per year. Accordingly, different road sections require different levels of attention. After one year of operation, usually 80 per cent – 90 per cent of the road is in fair to good condition. However, 10 per cent – 20 per cent of the length is in poor condition. This implies that, while a simple unsealed road might be appropriate for the biggest part of the road few spots might require more advanced weather-proof materials and drainages. Where degradation is expected to be strong and fast, this composite construction approach suggests that investing in higher quality construction materials can have significant positive impacts on the longevity of the road and lower total lifetime costs (Department for International Development, 2006).

Local Businesses and Labor

The decision about who will be responsible for the actual construction activities has substantial impact on the cost of each individual project as well as on the feasibility of a nationwide infrastructure initiative. Policy makers should shift to local contractors, possibly in the form of SMEs, to keep costs low, create employment opportunities and make best use of local knowledge.

These companies can provide more cost efficient solutions than big contractors, because they have low mobilization costs and they have the capabilities to build, improve or upgrade many types of roads with affordable and simple equipment alone. The combination of local SMEs and alternative paving techniques and materials is very likely to be a successful strategy, if the right overall framework is provided (Department for International Development, 2006).

Firstly, governments should reduce barriers for the establishment of local SMEs. This comprises decreasing bureaucracy and red tape in the tendering process for small rural road construction projects, particular in terms of documentation and pre-qualification. Instead, the central agency should provide the necessary training in simple management tasks and provide technical assistance to those entrepreneurs. With the new skills local SMEs can serve a wider region or perform a variety of construction jobs besides roads (Department for International Development, 2006).

Localizing labor also means that members of the target communities or those of the wider region can contribute their personal workforce in the construction and maintenance of the road. The International Labour Organization (ILO) describes labor-based technologies as “the construction technology which,

while maintaining cost competitiveness and acceptable engineering quality standards, maximizes opportunities for the employment of labour (skilled and unskilled) together with the support of light equipment and with the utilization of locally available materials and other resources" (Johannessen, 2008, p. 36). Such an approach has the potential to address multiple goals simultaneously. Infrastructure can be provided at competitive cost while rural people are provided with employment opportunities and supplementary cash incomes (Johannessen, 2008). Rural staff needs to be properly trained, equipped and their work should orientate towards the goal of economic rural infrastructure solutions.

Under the guidance of the United Nations Development Programme and the International Labour Organization, the Kingdom of Cambodia has started to implement the *Labour-based infrastructure rehabilitation project* in the early 1990's, through which capacity was built among provincial authorities to manage and execute labor-based infrastructure projects effectively, including roads and irrigation works. Workforce was recruited among socially and economically disadvantaged people, with a focus on women. Under the project, local staff was trained in planning, organizing and implementing the necessary works and labor-based appropriate technology was promoted on a national scale. The integrated plan involved local private contractor as well as educational facilities and consequently accomplished the creation of valuable human capital, management and engineering expertise in the country. After five years and 2.7 million work days of direct employment, maintenance systems for around 560 kilometers or rural roads and 96 kilometers of secondary irrigation canals have been constructed, rehabilitated and established. External evaluators contested that the construction costs under this labor-based project have been considerably lower than equivalent construction employing heavier equipment. At the same time the road quality was good at increased traffic levels (Sakko, 1999). In fact, the ILO concluded that these labor-based methods, as opposed to equipment-based ones, should be the standard for all rural road rehabilitation and maintenance works, as the evidence suggests no negative effects on efficiency, cost effectiveness or quality of the management of the rural road sector whatsoever (Munters, 2003).

4.3.3 Maintenance

The final step of the establishment of rural infrastructure networks will determine the long-term success of the undertaking. All the economic and social accomplishments through road access cannot be sustained without adequate road maintenance. In many cases it happens that the effort of accessing villages is destroyed within years or even months after completion due to neglect in maintenance (Asian Development Bank, 2013). In fact it has been reported that 75 per cent of surveyed roads in South East Asia have not received any effective maintenance since construction. Planning authorities need to account for the need of coherent designs, required skills and resources for effective operations and maintenance (Department for International Development, 2006).

Road deterioration has strong detrimental effects on road safety, the economic activity in the surrounding area and long-term costs. One effective way to counteract this process is regular inspection and timely reporting, because repairing small imperfections is much cheaper than fixing more advanced damages. Ideally, a prevention focus should be taken altogether and awareness for the importance of maintenance needs to be enhanced substantially. Priority is frequently given to the construction of new road links, even though the highest returns on road investment are, in fact, achieved by maintenance activities (40 per cent), followed by rehabilitation (20 per cent) and lastly road construction (10 per cent) (Sieber & Allen, 2016).

According to the Asian Development Bank (2013), lack of funding and the inadequacy of maintenance efforts are the top two issues for road deterioration. As for funding, the ADB argues that specific sources need to be dedicated to maintenance in order to ensure liquidity. In general, even in cases where funds have been established funding was ineffective, as they have never been properly capitalized.

Consequently, effective mechanisms need to be put in place linking funds to road use and ensuring the best Value-for-Money usage thereof. This is by far not the standard of current practice in most countries under review by the Asian Development Bank, in which large parts of dedicated money went into the financing of public sector overhead costs and not the necessary direct maintenance activities. Moreover, out of a specific road fund, only 38 per cent went into prioritized road projects, whereas other lower priority activities, including roadside cleaning and beautification, took up 25 per cent – 35 per cent. In some areas it might be suitable to impose fuel levies, bridge and road tolls, fines for overload trucks or even provincial road maintenance fees.

Involving local villagers in this activity is one of the most immediate ways to accomplish that. Labor-based methods of road maintenance have the potential to create job opportunities in rural regions, where big contractors might not even be willing to work. Through the employment of local people, the goals of poverty reduction and adequate and sustainable road management can be combined. Pilot projects in Western Yunnan, China well as in rural Viet Nam have explored the capabilities of local women's unions in performing community-based road maintenance works (International Finance Corporation, 2011; Asian Development Bank, 2013). In both projects, the focus was put on women below the poverty line as well as women from ethnic minorities, who were trained in routine works, such as the removal of landslides, road surface or road shoulder repairs. As significant improvement in road quality could be achieved while rural households received a steady income for their labor. In the pilot project in Viet Nam, ethnic women were also trained in engineering and road-building practices. The advantages of such an endeavor are the strong ties between local people and their communities. They have a strong intrinsic motivation to promote the quality of their roads and to limit corruption. If authorities decide to employ similar labor-based strategies in the most efficient way, they have to make sure that regional governments receive the necessary supervision and support from a specialized government institution, as the management and coordination of many small local subcontractors can drive costs on a national level. This holds true in any decentralized system, regardless of whether local people or small SMEs are performing the tasks.

Lastly, decentralized maintenance approaches could be coupled with the ongoing task of conducting road condition surveys, which are vital for a sustainable road management system.

4.4 Performance Management

Governments with the goal of alleviating poverty in rural regions of their respective countries are advised to reap the full benefits of both central coordination and decentralization of important tasks, by establishing binding areas of responsibility that still allow for close collaboration. Assessing the current state of their country's rural road network, as well as collecting reliable and comparable social and economic indicators for each region is vital before planning any further action. An appropriate evaluation scheme needs to be chosen for the assessment of all competing projects. This evaluation should contain relevant social and economic factors, as well as cost and efficiency measures. Rural road organizations and researchers are, furthermore, encouraged to collaborate, develop cases on basis of their own geographic, socio-cultural and economic circumstances and use those insights for evidence-based decision making.

4.4.1 Measure

Part of an integrated plan for rural connectivity has to be the performance measurement of the road quality, as well as of relevant social and economic factors, after all the actions have been taken. These indicators need to be assessed using low cost survey techniques similar to those of the initial status quo analysis. It should be affected in a timely manner and consistently across all regions of the country in

order to ensure comparability. Again, the local communities should be involved in that process, as they are constantly interacting with the people, the local markets and the road network.

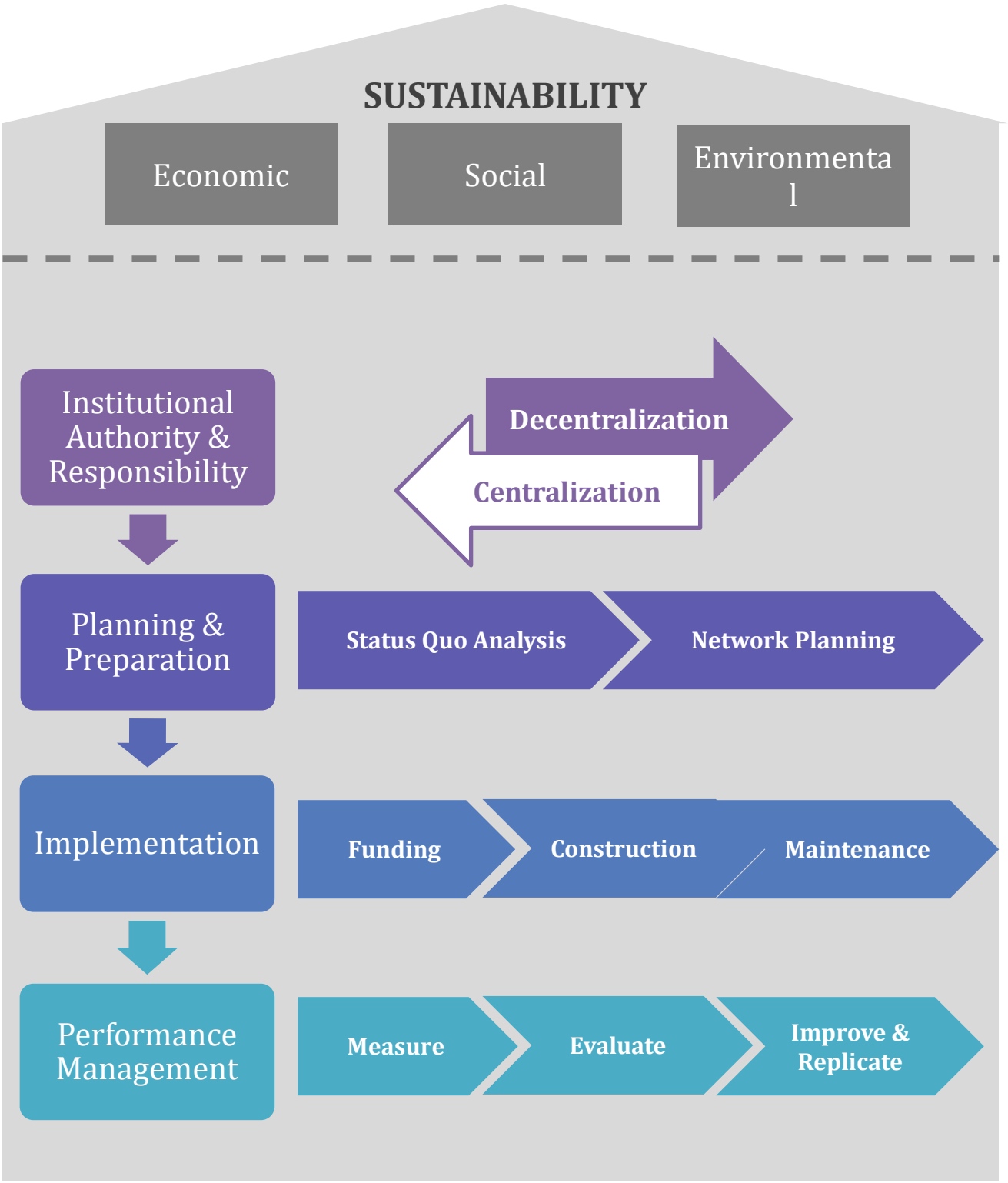
4.4.2 Evaluate

After the action plan has been implemented in the targeted areas and the targeted outcomes have been measured, planners have the opportunity to derive key learnings by identifying which activities are successful in which context and which need to be refined. A prerequisite for an evaluation is the previous formulation of quantifiable and realistic social, economic and road quality related goals, e.g. "reduction of households suffering from hunger in the community from 20 per cent to 13 per cent within the first year after road completion, and to 10 per cent after five years of completion". With the data at hand, planners should evaluate the effectiveness, efficiency and economy of the employed financing approaches, choices of road surfaces and contractors as well as maintenance for future projects. They need to answer the question "With the chosen action plan, to what extent have our goals been reached?" A collection of sample questions for different types of evaluation are presented in Annex-II.

4.4.3 Improve and Replicate

It has to be acknowledged that governments have a considerable financial burden in trying to substantially expand their nationwide rural road networks. Therefore, the outlined performance management activities should be regarded as risk-reducing strategies with the aim of continuously increasing rural road coverage within a country. Via systematic measurement and evaluation, planners can build a strong basis for the development of more refined projects, which are based less on assumptions and more on solid evidence for groups of regions that have similar demands for rural policy interventions. The initial status quo analysis is a valuable tool for identifying such communities with comparable economic, social and geographic characteristics. This knowledge should be leveraged in a sense that the programs are improved and adapted so that, ultimately, identified inefficiencies can be diminished and successes will be replicated.

Annex I: Policy Framework to improve Rural Connectivity



Implementation

Funding

- Explore alternative financing sources in addition to government funds
- Consider private collective investments for communities with high agricultural potential, in which government funds are used as facilitators of investments by private financial institutions
- Encourage the establishment of appropriate Private Public Partnership forms for in the rural road sector

Construction

- Explore opportunities for staged construction approaches, where the government and local communities are responsible for different parts of the construction process
- Use gravel only in situations where the circumstances allow it. Else, use more sustainable alternatives with lower life-time cost, such as stone, bitumen or concrete
- Use indigenous materials with higher likelihood of withstanding local weather conditions to reduce overall cost and avoid wasteful uses of scarce resources
- Implement appropriate drainage systems
- Avoid overinvestment in projects for which simple and cheaper solutions suffice
- Use spot improvement techniques that account for different levels of degradation on different sections of the same road
- Invest in more advanced weather-proof materials and drainages where degradation is likely to occur faster and stronger
- Engage local contractors, engineers and labor in the construction and maintenance of the rural road network, and employ labor-based technologies
- Recruit workforce from socially and economically disadvantaged people, as well as marginalized women
- Reduce barriers for the establishment of local SMEs
- Decrease bureaucracy in the tendering process for small rural road construction projects

Maintenance

- Increase public awareness for the crucial role of road maintenance
- Ensure regular road inspection and timely reporting

communities with high agricultural potential

- Conduct a status quo analysis featuring a map of the currently available road links, as well as economic, social and geographic data
- Systematically prioritize all possible rural road projects using appropriate screening criteria, such as the technical feasibility, economic justification and social considerations
- Develop an integrated master plan for rural connectivity
- Create employment opportunities in the wider geographic region via strategic investment in communities with high agricultural potential

Annex II: Sample questions for evaluation

A. Economic Evaluation

Does the area have the potential to move from subsistence farming to commercial farming?
How much farming land per capita is available in the area?
Are communities self-sufficient?
Do the local people have access to affordable food products? What is the price level?
In which areas are strong urban-rural dependencies?
Are there markets within the wider rural area, serving multiple communities?
Which natural resources can be found in the region?
Do these resources have any commercial potential?
Would the region be attractive for private investors and business or is the cost of conducting business too high?

B. Infrastructure Evaluation

Do roads already exist?
Are the roads paved/ all-weather – paved/ sometimes impassable?
In what shape and condition are existing roads?
How far from the village is the nearest major transport way (road or waterway)?
Are there opportunities for intermodal transport?
Are there areas where many traffic accidents are happening?
Do the communities have access to motorized/ non-motorized transport?
Which type of traffic is currently prevalent (animal carts, motorbikes, minibuses, bicycles) and is it expected to change after having acquired road access?
Which Know How exists on the country and regional level with regards to planning and execution of rural infrastructure initiatives?
Are there partnerships with neighboring countries?

C. Geographic Evaluation

Can the country be divided into geographic climate zones?
Do geographic climate regions differ with respect to the development of their transport networks?
Within each of those climate zones, is the transport infrastructure uniformly developed?
In each of the climate zones, how high is the likelihood of extreme weather events?
What is the nature of the local ecological networks and wild life?
Is the region subject to extreme seasonal weather changes?

D. Sociodemographic Evaluation

How long are the travel times from the village to the nearest school?
How high is illiteracy?
What is the actual school leaving age in each area?
What is the per capita area of farmland?
How accessible is basic health care in the region?
What is the rate of infant mortality?
What is the rate of malnutrition?
How many incidents of hungry households are in the village?
How high is the population density in each area?
Is there an agglomeration of ethnic minorities?
Within a region, are the rural communities culturally, linguistically or custom-wise distinct from one another?

E. Institutional Evaluation

Which agency is currently responsible for (rural) transport?
Which agency is currently responsible for (rural) development?
Are there any overlapping authorities between agencies of the same hierarchy level? (e.g.

ministry of transport and ministry of development)
Are there any overlapping authorities between agencies on the national, regional and local level?
Which agency has experience with nationwide infrastructure projects?
Is there a need to create institutional capacity or are there unused resources that can be leveraged?
How is the coordination and communication between national regional and local entities?
Which institutions currently dispose of valuable knowledge in the field of rural infrastructure?

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