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A MODEL FOR COMMUNITY DRIVEN RURAL ROAD MAINTENANCE IN SMART VILLAGES IN INDIA

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Abstract

Poor road maintenance especially in developing economies is one of the key reasons that remote communities are disjointed from mainstream activities. While governments' initiatives for upgrading rural roads through capital programs show immediate benefits, lack of appropriate maintenance regimes during the post construction phase often results in roads becoming non-functional over the medium to long term. In India the poor state of some 'paved' rural roads often fail to fulfil their basic functionality. Whilst there are numerous reasons for this non-functionality, lack of periodic maintenance is often cited as a common cause across many developing countries; this is often attributed to governmental and funding issues. The purpose of this research is to explore alternative governance options for maintaining rural roads. Based upon a comprehensive review of community based road maintenance programs across the world, a generic conceptual model for maintenance funding and delivery, to empower the local community, was developed. Taking into consideration the current governance structure in the state of Assam, India, the model was then applied to derive a specific solution for the funding and delivery aspects of maintaining rural roads and

empowering local communities through proactive involvement in the decision making process. The model is expected to bring significant insights for maintaining rural roads within a community without indefinitely needing to rely upon public agencies.

Keywords: rural roads, road maintenance, community based initiatives, road funds, devolution.

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1 Introduction

The provision of rural infrastructure in emerging economies such as India has received considerable attention from governments. In such economies, vibrant, rapidly modernising urban centres are coupled with more slowly developing rural areas, with consequent increases in inequality. Unless this issue of equity between areas is addressed, efforts to alleviate poverty in rural areas will be hampered. Roads are crucial for economic activity in rural areas. An issue, increasingly evident in the literature, is programmes for the provision of infrastructure being undermined by poor maintenance. In the case of rural roads, this results in a breakdown of connectivity of communities from towns, and from each other. This impedes rural access to markets and government services, which in turn hinders the alleviation of poverty. The success of any programmes on rural development significantly relies on accessible roads and adequate connectivity. Thus functionality of the rural roads are at the core of the smart villages' initiatives and underlying development programmes [4]. Research based solutions for up keeping the rural roads and without overreliance on public agencies are crucial issues within the Smart Villages project which is being developed within Assam as a joint venture between the University of Melbourne, the Assam Engineering College, Guwahati, the Indian Institute of Technology Guwahati, and the Assamese Government.

Based on global project experience and a rigorous elicitation process, the research is conducted based on two underlying propositions:

1. Existing assumptions, attitudes and methods in relation to the rural road maintenance are inadequate to cope with the scale, nature and complexity of projects, which inevitably results in inconsistency and under-performance in rural development programs.
2. To improve the efficiencies in rural road maintenance practices, the governance structure and funding allocation provisions need 'rethinking' or 're-engineer' within the smart villages initiatives.

In order to address the above propositions, two interrelated concepts, 'rural roads' and 'smart villages' have been investigated together. Thus, focusing on rural road maintenance in the context of smart village, the research puts forward a conceptual model highlighting an alternative governance structure for rural road maintenance. It begins by discussing why rural road maintenance in emerging and developing countries is essential to the functioning of their economies and social provision. It then describes why road maintenance is usually

poor in the rural areas of those countries. Three key problems are highlighted: bottlenecking, the effects of distance, and funding leakage. The paper then flags how, drawing upon the academic and industry literature, others have overcome these problems, and derives a conceptual model for rural road maintenance from these precedents. Finally, an elicitation process within the context of a case study from the state of Assam, India is applied into the conceptual model and derived a customised model for practical application. Whilst the model is contextualised with a specific case study, the solution, having been derived from as strong a globally grounded base as is possible, has global applicability.

In sourcing literature for this paper and project the authors have had to some degree rely, as have many of the handful of academic papers dealing with this topic, on material from the public realm or produced by donor agencies. Conference papers are also well represented often by a core number of authors. This means that the balance between peer reviewed academic papers and other sources of information is not as the authors would have wished, but it is in line with other peer reviewed academic articles in the field [11, 12, 20, 24]. The reasons for this are understandable. Firstly entities like USAID, The World Bank, and the Asian Development Bank, do not need to undertake rigorous peer review in the production of their material, yet they are producing numerous ‘best practice’ guides from the field based upon their empirical and ethnographic findings, combined with an analysis of the outcomes and issues associated with their donated funds [9, 10, 17, 22]. In addition the standard of review required for conference papers is often below that required for academic journals; again reference sources may be allowed to rely on more publically available information. Perhaps the most obvious reason for the lack of peer reviewed empirical evidence on the topics to be discussed relate to the issue of corruption and inefficiency in the public sector. Both Bowen et al.(2012) *and* the Victorian Auditor General (2015) called for higher ethical standards for public servants in terms of a multiplicity of things – taking bribes, manipulating tenders, putting pressure on external advisors to tow the government line, or simply failing to report malpractice or dubious data – but, both note the potential damages to career and indeed in the case of Bowen et al (2012) in South Africa, personal safety. It is therefore unsurprising that a large body of empirically sound, peer reviewed academic material does not exist to examine the topics in question.

While rural development is a well published area, the specificity of the rural roads and its importance in the context of the smart villages is not widespread. Thus, the significance of the current research for devising solutions on rural roads with the smart villages’ initiatives is

crucial for contextualising the body of knowledge in rural development. The remainder of the paper comprises two sections highlights the smart villages' initiatives in the context of an Indian state, Assam, followed by development, application, findings and discussions of the conceptual model.

2 The Assam Smart Villages initiative

The Indian Smart Village concept aims to empower 'off grid' rural communities in rural areas. While the term 'off grid' originally meant disconnected from national grid, in a broader context, the smart village model is aimed at making villages remote from hubs of local, sustainable economic activity, able to support a higher quality of life, without moving to the city [3]. The Government of Assam has commissioned the University of Melbourne to undertake research on a suitable model for empowering over 26,000 poor villages through the Smart Villages initiatives in Assam [4]. While 40% global population is rural, in the state of Assam with a population of 35 million, over 86% lives in villages where basic road access and connectivity is far from adequate. In an attempt to address numerous issues including accessibility associated with such a large rural population, the University has established a Smart Villages Lab [SVL] in the Faculty of Architecture, Building and Planning. The goal of the project is to raise the quality of life in Assamese villages through improved housing and village infrastructure so as to support the State Government of Assam's Smart Village initiative [5]. SVL is collaborating with the Assam Engineering College, Guwahati, the Indian Institute of Technology Guwahati, and government and private agencies, and has established a study site on the island of Majuli.

The research effort aims to conceptualise Smart Villages in Assam by empowering both the rural community and local planning agencies, with better policies, tools and technologies. A Smart Village as defined within the context of the project will: empower villages to envision and build better futures; create tools for government to better understand and meet rural needs and, help train a cohort of professionals to improve rural life. The project also will create a platform, extendable over time, to include health, education, livelihoods, governance, and other areas needed to ensure rural economic and social well-being [6] [7]. Access is a critical feature of any Smart Village.

3 Accessibility: a crucial component of the Smart Village

Rural roads are a lifeline for villages in developing countries [8]. There is a link between transport access and poverty [9] with roads playing an important role in development and helping to lessen poverty [10]. In much of the developing world roads are gravel or earth, often impassable in the rainy season. The traffic mix is usually varied, encompassing animal drawn carts, bicycles, people on foot, rickshaws, and some motorised traffic including, in India, auto rickshaws, motorcycles, and the occasional lorry or car. Often roads that access the main highways are less than twenty kilometres long with traffic levels being often less than fifty motorised vehicles per day, the non-motorised trips usually being of a significantly higher order than this [11]. Access to villages on rural roads is important for both economic and social reasons. Metschies [12] and Orabourne [13] term rural roads in developing countries as ‘village to market’ roads. Due to the difficulty of reaching markets to sell agricultural produce and other goods in the rainy season, and the inability to import products and foodstuff, rural people can be locked into subsistence farming. Buyers cannot reach the village. Cash crops cannot be exchanged for money and crops are wasted (in India, 40% of food production is wasted [14]).

The impassability of rural access roads also hampers the provision of basic social services such as health, education and information. Pinard et al [15] state that broken down rural roads are one of the key hurdles the poor in rural communities have to overcome in accessing educational facilities. O’Donnell [16] states that in rural areas of developing countries, distances to health care facilities, combined with the poor condition of rural roads, can significantly lessen the ability of remote populations to access health care.

4 The rural roads maintenance challenge

To realise their potential contribution to an economy and social services, however, roads need to be properly maintained [10]. Pinard et al [15] speak of a ‘rural roads maintenance challenge’ in developing countries, describing a lifecycle, where a road is built and allowed to fall into neglect. Following its construction a road requires frequent preventative maintenance, at moderate cost, to maintain it as fit for purpose [17]. If this preventative maintenance is not done, then over time the road decays; potholes develop which are worsened in heavy rains. Eventually the condition of the road deteriorates to the point where a significant refurbishment is necessary to restore the road to full functionality. This is

invariably not done, and eventually, there is no choice other than to completely rebuild a road. The Asian Development Bank [10] suggests that such a cycle is acceptable to many politicians due to capital bias. Politicians want to build new roads as ‘ribbon cutting’ wins more votes than keeping roads in good condition. Rioja [18] describes with a bias towards building new infrastructure to the neglect of existing assets. Pinard et al [15] discuss the apparent lack of a preventative maintenance culture in many countries.

There are three major causes of the problem of poor road maintenance in developing countries, which impede funding arrangements and institutional frameworks [19] [20]. These are: procurement and funding bottlenecks; funds leakage, and; the distance of decision making diminishing effectiveness.

4.1 Procurement and funding bottlenecks

The Asian Development Bank [10] describes how in many member countries, the main reason for the poor standard of road maintenance is inadequate funds. While this is the case, what makes the problem more acute in developing countries is the issue of the degree of *bottlenecking* taking place - the process whereby funds or decisions are impeded by layers of bureaucracy. Banerjee et al [21] believes that implementation bottlenecks constrain the effectiveness of social programs the world over, but the problem is especially acute in the developing world. USAID [22] examined ‘public sector procurement bottlenecks’ in developing countries, and concluded that common reasons for funds not being released for a project were that those responsible in government delayed, diverted or withheld them.

The analysis of funding and logistical bottlenecks is not widely discussed in the academic literature; a handful of references dealing with the topic explicitly are largely geared around the dissemination of funds for health programmes not infrastructure maintenance. Gill et al. [23] in discussing inoculations for children across resource-poor settings discuss how bottlenecks at government level impede the flow of funds and act as a barrier to progress. They examined how the supply chain in rural Bangladesh, for rehydration solutions and vaccines is impeded by not only physical but institutional bottlenecks. In a similar vein, within purely the Indian context, in Gujarat, Rupani et al.[24] undertook a bottleneck analysis exercise to gauge how childhood diarrhea management was being affected by governmental and logistical impediments. Their bottleneck analysis pertained to fund availability and timely dissemination, infrastructure management, human resources management, supply

chain management, capacity building and identification of training load, supportive supervision for facilities. Baker et al. [25] in examining implementation bottlenecks for effective coverage of screening for antenatal care in rural Tanzania and Uganda, explored the underlying determinants and perceived solutions, and concluded that a lack of integration of funding and support at local level significantly impacted the quality of antenatal care programs. Coovadia and Hadingham [26] note how bottlenecks in the distribution and usage of funds are major reasons for the ineffectiveness of global healthcare interventions in developing countries. The Abdul Latief Jameel Poverty Action Lab [27] suggests government social programmes in India are plagued with public service delivery failures.

4.2 *Funds leakage*

Funds leakage describes monetary resources being diverted away from their original purpose. Reinikka and Svensson [28] describe the leakage of public funds as occurring when intended beneficiaries do not receive in resources and services, what was allocated to them, because funds were diverted or captured for private gain. According to Purohit and Purohit taxes raised at the state level may well be allocated to capital programmes, but the delegation model often does not see them manifesting themselves at the community level [29]. Leakage is common throughout countries with relatively weak governance. For example, Hubbard [30] describes how in Uganda, in 1996, only 12.6% of the centrally allocated funds for rural schools, reached the local level.

Kaiser and Streatfield [31] focus on the flow of public road maintenance funds in developing countries, funds from the point of extraction through to disbursement, with specific attention to 'leakages' in that overall system. Their approach unpacks the process of road maintenance to identify leakages in the overall road maintenance system, thus enabling development partners to focus on institutional root causes beyond a singular focus on insufficient funds. Other academic references allude to similar issues identified by Kaiser and Streatfield. Bowen et al. [1] make reference to persistent corruption within the South African civil service dealing with the construction industry including the taking of bribes and tender manipulation, leading to loss of public funds. Sohail and Cavill [32] note that the American Society of Civil Engineers claims that corruption accounts for an estimated \$340 billion of worldwide construction costs each year.

Studies into corruption document how a lean administrative structure with clear delegation of tasks is essential in guarding against malfeasance [33]. An example is the Government of Indonesia's PNPM Mandiri program, in which village development funds are sent directly from the Ministry of Home Affairs to the local villages, without passing through the intervening provinces, districts or sub districts [34].

4.3 *Distance diminishing effectiveness*

In traditional government structures, funds for infrastructure construction and maintenance pass from a Finance Ministry to a Department for Public Works, responsible for infrastructure maintenance, who in turn procures contractors to undertake the work. In addition to the bottlenecks and leakage issues already mentioned, a further flaw to this model is the sizeable distance between those responsible for the work and the community needs raising the 'don't see, don't care' risk described by Zietlow and Bull [19] who argue the case that those who use the roads should have direct control over how they are maintained. Donnages et al [9] state that when a community is involved in the process of road maintenance, the outcome is more assured.

Robinson [35] in unpacking the dynamic of roading agencies in developing countries, notes a bias towards centralisation in decision making in the road sector both in developed and developing nations. Fukubayashi and Kimura [11] focus on developing an approach to promote the concept of community involvement in repairing rural access roads and to enable the members of communities to improve the conditions of the roads by themselves at a low cost. This is not a problem unique to the roading sector. In other sectors Nilvarangkul et al [36] examine the removal of health policy from remote communities in Thailand. Reisman [37] examines agricultural policy in an Indian state and cites the need for self-reliance among rural communities. Teare et al [38] note the need to engage the rural communities of Sri Lanka in sustainable tourism.

In trying to overcome the problem of distance by devolving work to the community, a further problem may manifest itself: a lack of technical capacity at the local level. Even the most basic road maintenance endeavours require some technical and managerial competence, as well as the ability to procure and delegate work to others. Those responsible need to inspect roads, prioritise funding, plan maintenance, respond to emergency maintenance needs, procure materials, hire and supervise labour, and show how funds have been spent. Often

these skills are lacking at a village level, an argument which according to Donnges et al [20] is often used by centralised agencies as a *justification* for retaining responsibility for activities in their sector.

The remainder of the paper focuses on developing a concept model for facilitating a smart solution for rural road maintenance in smart villages. How might rural road maintenance be made *smart* in the context of Smart Villages? ‘Smart’ in this instance does not denote a model that is overly sophisticated, quite the contrary. Smartness here means close-coupling end user with authority and accountability, to ensure access roads are not an impediment to broader economic aims.

5 Derivation of a conceptual model

The conceptual model for rural road maintenance in developing countries described in this section is derived from the literature, from both empirical and theoretical sources. Whilst rural roads may have varieties of configurations in terms of materials, composition, functional requirements, connectivity and access, the focus of the research is on paved or semi paved roads which usually connect rural villages with main through roads. In essence, the authors aimed to draw upon the examples of what have worked elsewhere and how it may be applied in the context of Assam and possibly other Indian states.

The model is derived through a two stage process. Firstly, to overcome the problems of bottlenecking, leakage and distance, a conceptual maintenance model will be derived. This will be validated with a case study within the context of the state of Assam, India.

5.1 Overcoming procurement and funding bottlenecks through community driven development (CDD)

Devolution and direct funding are the essence of the proposed model, both being examples of focussed interventions, as described in Kaiser and Streatfield [31]. Devolution entails passing responsibility of actions to the community level; direct funding means passing funds directly from central government to the community—into a dedicated road fund—bypassing the Public Works Department. The road fund may be seen as the repository for maintenance financing sitting at the community level.

The International Labour Organisation [39] advises that funding for rural maintenance *should* be directed to and controlled at the community level as they are the party expected to manage and supervise works. The World Bank [40] has used Community Driven Development (CDD) to implement models that give local communities full control over investment resources and project implementation. Within CDD projects the community members are involved in identifying needs, selecting subprojects, and the provision of labour and technical services. CDD projects require specific procedures for financial management and disbursement, to maximise accountability and transparency. By making communities responsible for project development and delivery, and through direct grants to road funds from donors and state government, the potential for procurement bottlenecking and funds leakage is by deleting intervening bureaucratic layers and making local implementers directly visible and accountable to local communities.

The community grant is crucial to the CDD concept. A block grant to a party is a non-commercial transaction awarded following the receipt of a proposal. Grants are usually awarded by government bodies or donors directly to not for profit entities. This removes the need for complex state procurement procedures to access funds. Another advantage of the grant is that they are not for profit recipients – charities, community entities, or non-governmental agencies (NGOs), what Donou-Adonsou and Sylvester [41] term micro-financed institutions - so at the community level work packages can be awarded to the community without tendering. In making this system work it is essential that the application procedure for grants is not made excessively bureaucratic or onerous for a rural village community.

The use of an NGO road fund as a receptacle for direct grant funding from domestic sources has procurement and procedure advantages, and can be an effective model provided the NGO does not engage in political activities and lessen the chances of future finds. Fortunately service delivery or educational NGOs are generally apolitical [42][43] [44].

As an example where the CDD process has been successfully implemented, the Asian Development Bank [45] describe four Indonesian provinces which were provided with support for two cycles of village infrastructure upgrading, through block grants. These included provisions for community facilitation, mobilisation, and rural infrastructure support. The project not only funded the village level initiatives but also improved the local capacity to design, implement and monitor solutions. Also in Indonesia, The World Bank [34]

describes how a region's villages were provided with block grants and support for community development activities designed to reduce poverty.

To circumvent layers of bureaucracy e-commerce has been used in India to great effect. In the state of Bihar the establishment of a National Electronic Fund Management System (NEFMS) has allowed reimbursement for actual expenditure at village level to go straight from the state to workers [27]. This system does require all parties to have a bank account, but it is effective, not only in terms of leakages but managing the bottlenecking of funds passing through the bureaucracy. The automated process facilitated fund-flow, cut out administrative tiers, and switched the basis of transfer amounts from forecasts to documented expenditures. As a consequence, the number of fake households on payrolls fell as did local program officials self-reported median personal asset values [21]. Twenty-one Indian states have now adapted the new finance system.

The provision of funds from government can be termed 'traditional funding'. The setting up of a local road fund allows for other sources of non-traditional funding to be developed over time. Select user charges could be deployed for some categories of vehicles provided this did not breach issues of social equity. Another source could be diaspora contributions as described in VSO [46].

5.2 *Tackling funds leakage*

To minimise and manage funds leakage the model should utilise a separation of duties approach. The separation of duties principle is a well-established financial management tool, a way of applying checks and balances to a system, where the extra cost of doing so is outweighed by the benefits of reduced fraud risk and error. The California Department of General Services [47] describes separation of duties as a key element in a system of internal control. In the debt reduction management strategy for governments developed by Magnusson et al [48], for the World Bank, segregation of duties played a key role in risk management. For the rural road maintenance model different parties will be tasked with funding, dividing up the responsibility for the allocation and apportionment of funds, the management and disbursement of funds, and the technical implementation.

As a receptacle for funding for the direct funds provided by a funding entity, a local road maintenance fund should be established, managed by a local, legally established, body [8]; [49]. Traditional funds from government should be channelled directly into the entity's bank

account ; the Asian Development Bank [8] advocates two or three accounts with different banks to manage the risk of default. The primary source of funding should continue to be the state (traditional funding) with a fixed allocation for maintenance to each unit/area to ensure, as a base requirement, that a core level of maintenance is funded per annum. The approach for lump sum funding for rural roads is supported in the literature. Heggie [50] describes models of road maintenance funding where the trunk road maintenance fund is established by user charging, with a percentage of the revenue collected going to rural roads. Zietlow [51] explains how for road funds in Latin America, rural areas, where the percentage of revenue raised by charges is low, are cross subsidised by parts of the network where traffic flows are high. Metschies [10] advocates road user charging for major roads and cross subsidy for the rural roads where the users can't afford to pay charges.

Community contributions are to be encouraged to help manage lumpy cash flow requirements when maintaining rural roads, and to overcome government failure where it manifests itself. The Department for International Development [52] believes it *is* possible for convince a rural community to contribute to local maintenance programmes, provided there is a locally trusted organisation to hold and distribute funds. Mahajan et al [53] state that when discussing community financing states it is a misconception that the poor cannot or will not pay for infrastructure services.

5.3 *Devolution of the maintenance task to the community—community based contracting*

Empowering the local community to undertake rural road maintenance in their own jurisdiction is a key theme in the literature. This is an example of community based contracting (CBC) a method of procurement increasingly favoured by the World Bank [54]. Therefore within the conceptual model developed the responsibility for the management and delivery of the maintenance task, should be taken from the state and placed with the community. Fukubayashi and Kimura [9] believe the aim of such a model is to enable locals to repair the roads using simple technologies with locally available materials and sourced labour. Such delegation of works to the community through grant funded social programmes should also have the added benefit of providing local employment and reducing poverty [55]. Figure 1 taken from the Asian Development Bank [15] shows the nature of the maintenance process at community level. Central to the success of the model is a local implementation agency, working with the community, to oversee the delivery process. This agency brings

parties together, develops local maintenance plans, commissions work from the community and is responsible for overall oversight at works level. As Figure 1 demonstrates many of the activities at community level are about getting local people to ‘buy in’ to the concept of them taking control of their access road’s maintenance, seeing it as something for the village to fix, not the responsibility of a remote third party.

Both the International Labour Organisation [39] and Asian Development Bank [15] offer a range of tasks that a community maintenance implementation unit is typically accountable for. These cover: taking an inventory of the road network under their jurisdiction; inspecting the roads and recording their conditions; determining the maintenance need and specifying remedial action; estimating resources to undertake maintenance; scheduling work; mobilising labour; convening community meetings; skills development; and assisting with financial transparency. A key success factor for devolving road maintenance activities to the communities will be either skills development or the capacity to source technical skills from nearby private or public sources. Engineering and costing exercise could be provided by local technical colleges as described in The World Bank [6].

Formation steps of community-based rural maintenance model

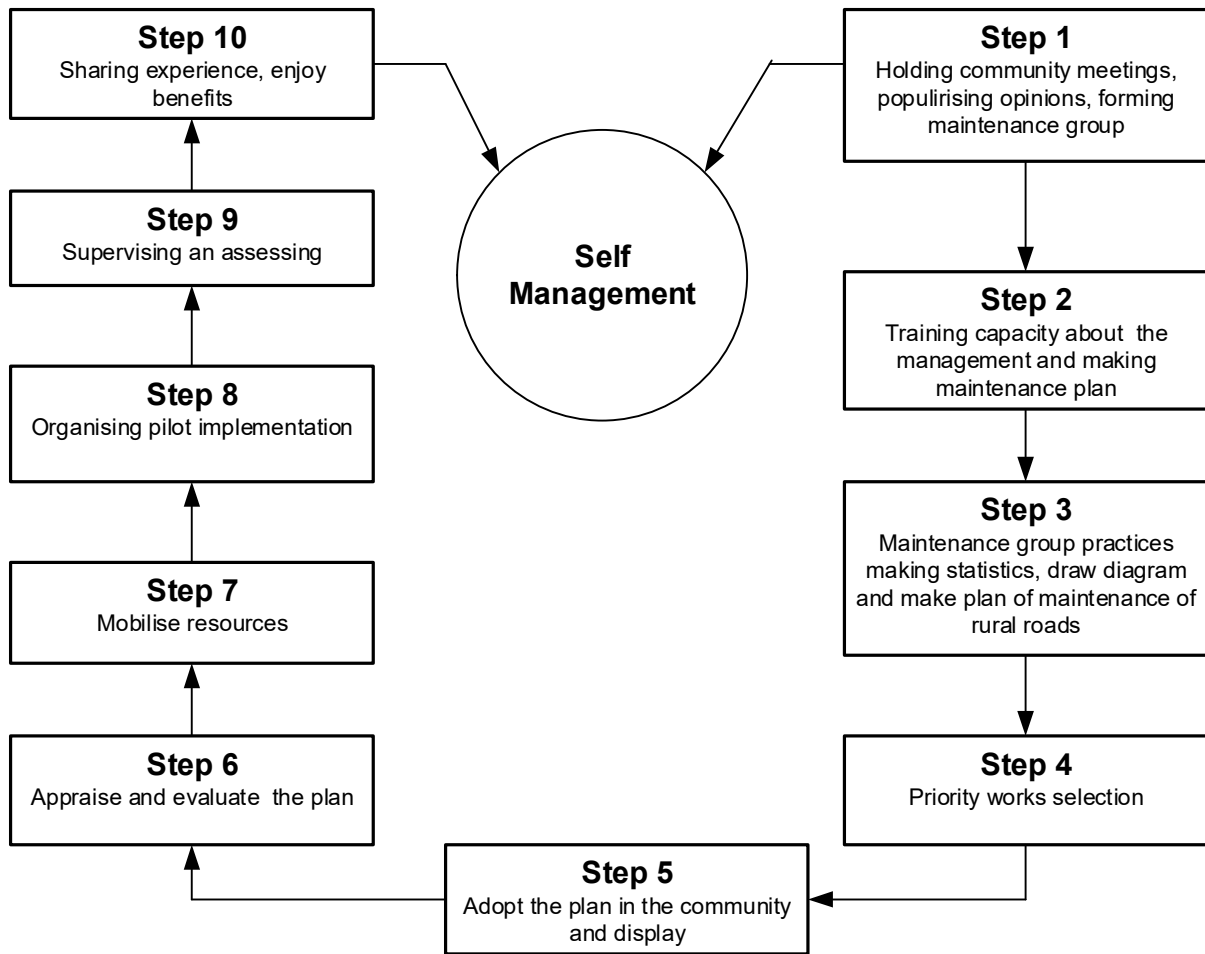


Figure 1 – An example of a rural road maintenance process at community level (adopted from the Asian Development Bank [15])

It is important that at community level, if the devolved model is to be workable, it should be easily understood and based on a handful of simple pieces of evidence. Where a community entity is only being responsible for a single earth track of a few kilometres, sophisticated cost allocation models to different stretches of road (such as that described in Odoki and Odongo [56]) should be avoided. As much as possible, forms should be kept to a minimum and evidence should be picture based, for example photographs, and drawing (as shown in Figure 2).

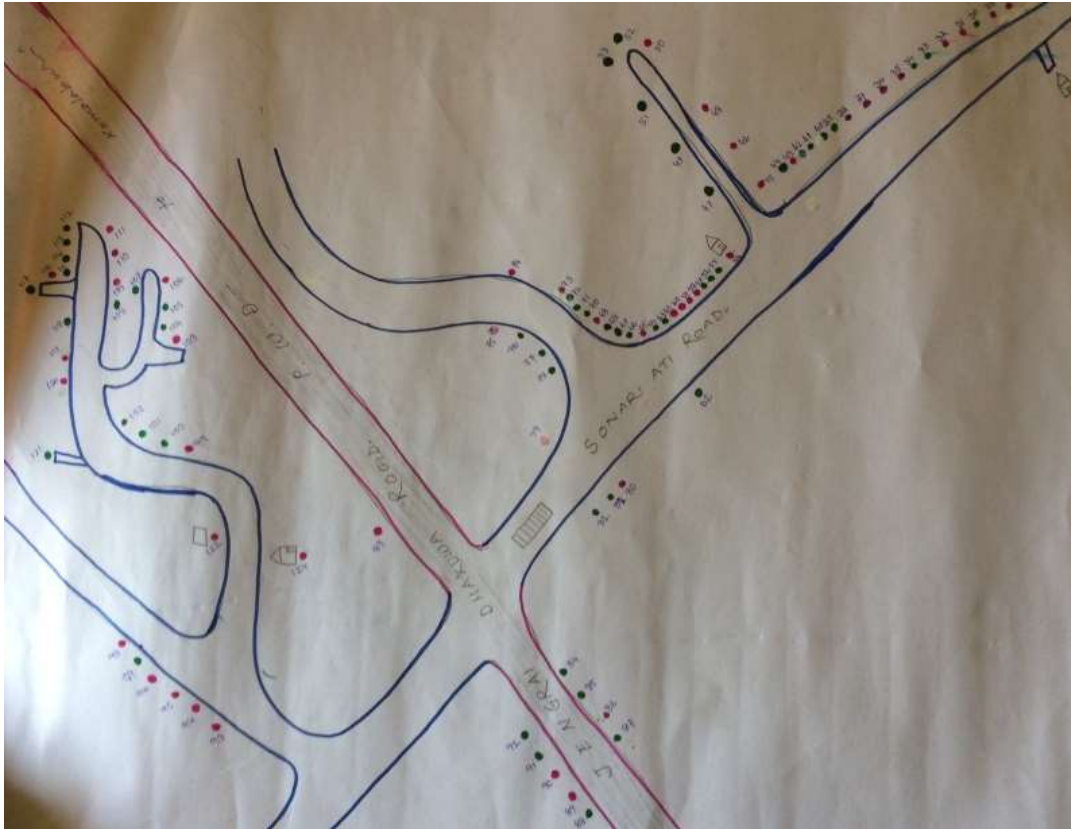


Figure 2 – A sample maintenance plan for rural roads in Assam

The approach of devolving road maintenance works to the local community has been successful in Nepal. The World Bank [57] state that:

Bank funded roads projects have also pioneered an innovative program in the form of Road Maintenance Groups (RMG) - collectives of around 5-6 workers from local communities who are mobilized by the District Technical Offices to help maintain the local road network. The workers – mostly women from poor and marginalized communities – carry out the routine maintenance of the road, benefit from livelihood opportunities, and ensure community ownership of rural roads. The program employs 1,850 such workers in 36 districts across Nepal to maintain about 3300 km of the local road network.

5.4 Fostering of transparency and accountability

According to USAID [22], system transparency relating to corruption and access to funds is best achieved through civil society. The use of the press – print media, radio and television – is a potent tool to disseminate information to the public and hold decision makers

accountable. Hubbard [30] stresses the criticality of information dissemination to ensure funds reach their intended recipients. Reinikka and Svenson [28] describe how information disseminated directly to the public can play a critical role in improving spending outcomes. Reinikka and Svenson [28] and Collier [58] describe a case study from the Ugandan education sector where the central government posted the monthly transfers of public funds to districts in newspapers, and broadcast them on radio. It also required primary schools to post notices on all inflows of funds. Instead of about 20 percent in 1995, over 90 percent of the intended capitation grants reached the schools in 1999.

5.5 *The prototype model*

Drawing from the best practice literature on the community based road maintenance models internationally; a new prototype model for rural road maintenance has been developed. The key proposes of the new prototype model include the following:

- Devolution of responsibility to the community
- The establishment of a road fund to be operated at community level
- Separation of duties—funding, allocation, finance and implementation
- Direct block grant funding to a community NGO with carriage of the road fund (termed the primary, traditional, source of funding)
- The ability for the road fund to source revenue over time from other non-traditional sources: levies, road user charges to select vehicles, contributions, diaspora funds
- Delegation of the technical task to the community level drawing upon local skills, suppliers and labour
- The use of public information channels to foster accountability

The roles of each of the parties identified – termed funding entity, allocation entity, finance entity and implementation entity - are shown in Figure 3. It should be noted that in some cases these roles already exist; this is a concept model, yet in some cases, the reality may be partially reflected on the ground. In these instances less customisation of the model to fit the local context may be required. In addition the authors wish to stress that another method of undertaking this exercise, and perhaps more applicable globally, is to review the local circumstances, and derive a customised model. This has not been done in this instance – the theoretical development has preceded the application – but the authors acknowledge the case study could have preceded the model.

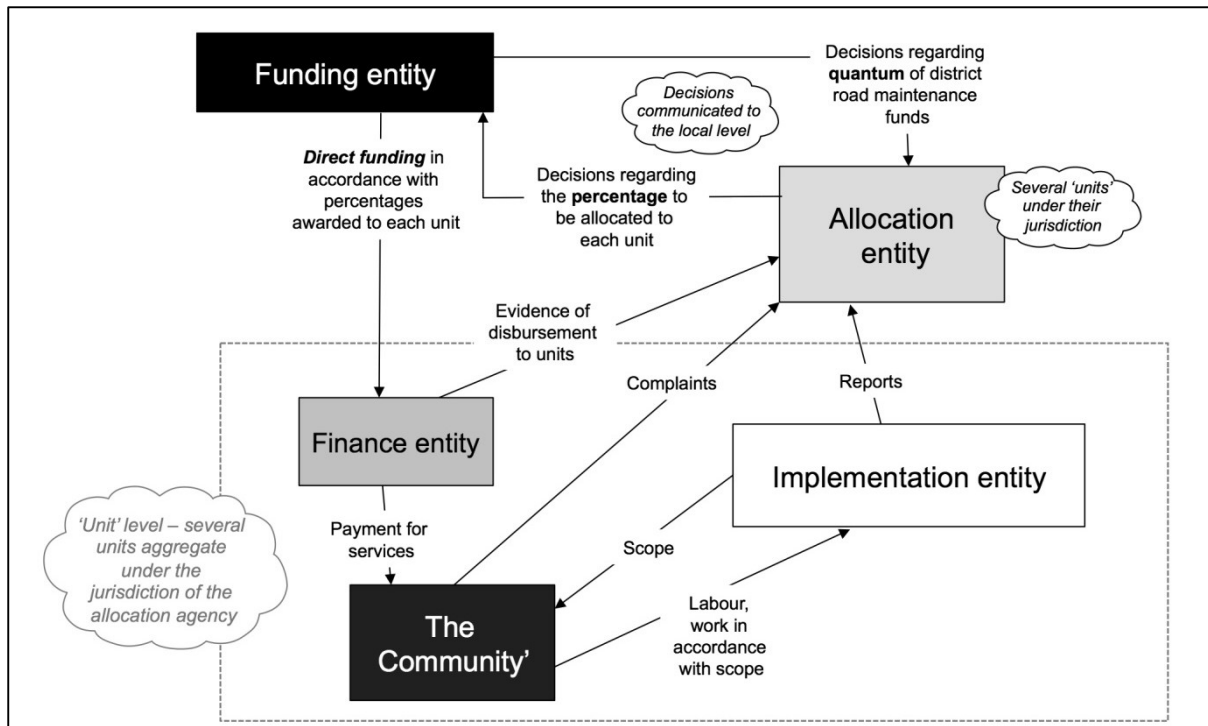


Figure 3 – A separation of duties model utilising direct funding to the community, to support rural road maintenance in developing countries

The tasks for each key entity in the model are described below.

5.5.1 The funding entity

As the primary source of funding communities are funded via block grants from the funding entity to direct to a community NGO, charity or trust to removes the bottlenecking risk [45]. The allocation will be a fixed sum as per as described by Odoki and Odongo [56]; this can be termed ‘traditional funding’. Electronic transfers into community financial entity’s bank accounts are desirable as detailed in Banerjee et al [21].

The funding entity should be at high governmental, ministry, level. The process for the release of funds per annum is thus: the funding entity as part of the budgeting cycle, informs an allocation entity as to the funds for the year for the units under the allocation entity’s jurisdiction; the allocation entity then (after deciding the *percentage* of the funds to be allocated to the villages under its jurisdiction) notifies the funding entity how much should be transferred directly to financial entity for each unit. As a part of fund allocation and to ensure transparency, the funding entity is made aware of the justification for the percentages forwarded by the allocation agency, and all these sums, and to whom they are going, are

published in local media and on noticeboards at village level. The funding entity then pays the funding directly to each unit's finance entity's bank account, all parties are informed, and again, information is published.

Once the funds have been transferred the funding entity plays a minor role. It receives confirmation that the work it has funded has been done via the reports for each unit, forwarded to it by the allocation entity (who will have been passed these material by the implementation agency). The funding entity also receives regular summary reports from implementation and finance entities on the progress of work against documented plans.

5.5.2 The allocation entity

Odoki and Odongo [56] opine that within the rural roads context, the fixed allocation should be spent as felt appropriate by an overseeing agency. This would be the allocation entity; typically there will be several units (usually villages) under its jurisdiction. The allocation agency does not handle money, but decides how the total funds are to be allocated based upon a direct assessment of needs [59]. The allocation agency also acts as a distribution hub for reports, and plays a key role in accountability and transparency, being the receptacle of complaints of misconduct from the community level.

Annually, each unit presents to the allocation agency, in a collective meeting or forum, the funds it is requesting for rural road maintenance. These requests should be placed within a written plan, justifying the proposed spend. Photos should be provided by the community as supporting evidence. The allocation entity then reviews all the requests and decides, equitably, transparently, based on rules and need, what *percentage* of the total fund is to be allocated to each unit. Using a needs based percentage removes the requirement for detailed bottom up costing. Each unit, now be aware of the quantum of funds it will be receiving, is able to re-scope and submit their maintenance plan. These plans, and the magnitude of funds to be distributed to each unit, are then made public via information channels. Each unit's finance and implementation agencies are also formally notified. The allocation entity will also inform the funding entity of the planned scope of works as a whole.

From this point, until the following year's budget allocation cycle, the allocation entity's role shifts to that of a collator of progress reports and complaints. It investigates complaints from each community regarding potential mismatches of funds and works, and allegations of mismanagement. It is also the consolidator of information from the units: financial reports

and accounts from the finance entity, and maintenance reports from the implementation entity.

An ongoing role of the allocation entity will be to examine the potential for developing other sources of road maintenance funding over time. These would not pass to the allocation agency, but the financial entity, and could consist of levies, user charges for the more affluent market segments provided no social equity issues are breached, and charitable donations. Again, the magnitude of these alternative revenue streams should be made public via noticeboards and articles in the media to foster accountability.

5.5.3 The implementation entity

The implementation agency, staffed by elected officers, operates at unit level, and is distinct from the finance entity in that it does not handle funds, and has solely a technical delivery remit, being responsible of road maintenance at the community level. The implementation agency needs to be non-governmental to enable it to award work directly to the community without a requirement for tendering. The implementation agency's staff are paid a fixed allowance as agreed by the allocation agency; this is disbursed by the finance entity.

The implementation entity is responsible for a range of technical tasks (many of which are described in International Labour Organisation [39] and Asian Development Bank [15]). It delegates work packages to the community, orders and accepts materials from suppliers, brings in technical expertise as needed, informs the finance entity as to payments required for community and subcontracted labour, and monitors work undertaken by the community. A crucial ongoing annual task for the implementation agency is to present to the allocation agency the unit's maintenance request, as part of the annual funding forum.

5.5.4 The finance entity

The finance entity is a trusted local level party who is responsible for receiving grant money and disbursing it to the community and subcontractors as advised by the implementation agency. The finance agency plays a crucial role in the transparency process as it is mandated, along with the allocation agency, of making public the sums awarded to each unit and how they have been allocated and paid. In this regard it fulfils the public information requirements as described by Reinikka and Svensson [28].

The finance entity is the recipient of direct funding from the funding agency, in accordance with the percentages ordained by the allocation agency. It also receives other revenue streams as they are established so needs a bank account. The finance entity is also responsible for payments to the community for work conducted as per the instructions of the implementation agency. In addition, the finance entity makes payments to suppliers and subcontracted labour, as well as payment of allowance to the implementation agency staff.

Finally to ensure transparency, the finance entity works with the allocation entity to disseminate information across the villages on the funds awarded and how they are to be spent. The channels to be utilised should be as broad as possible and may include reports to the funding entity, audits, bulletin boards, newspaper articles, and a complaints hotline.

5.5.5 The community

The community, the ultimate beneficiary of the road maintenance programme, provides labour to the implementation agency to deliver stipulated works plans. Workers and suppliers are paid directly by the finance entity. The community is managed by the implementation agency. It is anticipated that the level of skills required from the community to provide maintenance services for rural roads will be relatively low level. Some technical expertise is required but in the main, as far as is possible, maintenance should be undertaken using local materials and labour intensive techniques. Imported labour should be avoided as much as possible as the principle is for the community to be self-reliant.

The community has several tasks. It undertakes road maintenance works as directed by the scope described in the work packages supplied by the implementation entity; has its work inspected by the implementation entity; offers complaints directly to the allocation entity; and provides feedback as to work requirements on the ground to the implementation agency. Technical expertise should, wherever possible, be sourced from the community, for example local technical colleges and suppliers of materials.

Section 5.5 has described how the model will work at a conceptual level. Each location it is to be applied, however, brings its own issues to be overcome, governance structure and geographical characteristics. The model will need to be tailored to each location. The next section offers a description of the customised model to be presented to the Assamese Government for use in the Smart Village project.

6 Case study to customise the model for Smart Villages in Assam

6.1 Method of customisation

The research team for the Assamese Smart Villages initiative at the University of Melbourne [4]; [5] has identified low levels of rural road maintenance as a barrier to delivering sustainable housing within their study area. As the Assamese Smart Villages project has a strong focus on housing construction, the rural road network will need to support the transporting of building materials from the main highway. The level of service of the access roads will be crucial to the ongoing success of the project; a village cannot really be claimed to be ‘smart’ if it is unreachable, and goods cannot flow in or out. As such the Smart Village represents an excellent case study for the piloting the conceptual model, once it has been customised.

The model was presented to three experienced members of the research team who had had reasonable understanding about the Indian bureaucratic processes in relation to capital projects. Among the three team members, two each have over 20 years consulting and advisory experience of transport and rural development projects in developing countries. The third is a senior academic and researcher with a native background of rural living in India, who has experienced first-hand issues of rural road maintenance and governance in India. Drawing from the current governance structure in Assam, a structured forum was organised to discuss how the model could be adapted to work in Assam: which parties would be best placed to fill the roles identified, what the trade-offs between the customised and theoretical model would need to be; and where the key project risks lay. This elicitation methodology can be seen as operating at the interface between a case study and quasi-soft system methodologies [60].

6.2 Justification of the use of the model in the case study area

The Smart Villages site lies in the river district of Majuli, which has a population of 167,000 people spread across 1,250 square kilometres. Majuli has recently been granted the status of the first river island district in India, the thirty-fifth district in Assam [61]. Majuli’s villages are linked to state highways via rural access roads, badly weathered, often unsurfaced. Being a river district, the area floods during the monsoon season placing communications under strain, eroding the surface of the roads, and deepening potholes. This impacts the local economy greatly during the rainy season.

Assam's governance model is typical of most Indian states, and is shown in Figure 4. The vast majority of high level issues come under the jurisdiction of the State. Local government is organised under an elected district with smaller Panchayats being responsible for individual village matters. Tax revenue is collected at district level by a district collector. Districts are divided into development blocks for tax administration purposes, a block being an aggregation of several villages (Gram Panchayats). Majuli district, an elected body, comes under the jurisdiction of Upper Assam an aggregation of nine districts; Upper Assam is administered from Jorhat by a divisional commissioner. Whilst in Figure 4 villages and wards are shown in same level in a graphical context, the hierarchy of the blocks and the municipalities within the governance structure is functionally different. While both the entities come under the district administration, the responsibilities of blocks lie within the rural settings but functionality of the wards is confined to the semi-urban or urban settings. There is a clear operational distinctions between wards and blocks in the Indian governance structure.

At state level, roads are the responsibility of the Department of Public Works; the Panchayat Department will also have jurisdiction as to events occurring at the village and district level. Under the current system, funds for road maintenance would be allocated by the State Finance Ministry and passed to the Department of Public Works (DPW), based in the state capital Guwahati. The DPW is then responsible for setting work programmes and hiring contractors across the state. The condition of the village roads, the centralisation of the decision making remotely from Majuli, and the complex layers of government involved, mean that there is a strong likelihood of the identified problems of bottlenecking, leakage, and distance, being present. Road maintenance funds may be being allocated at the top of the system but they are no manifesting themselves at the local level. Corruption at the Panchayat level is has been described by the Times of India [62] as something which slows down rural development in India.

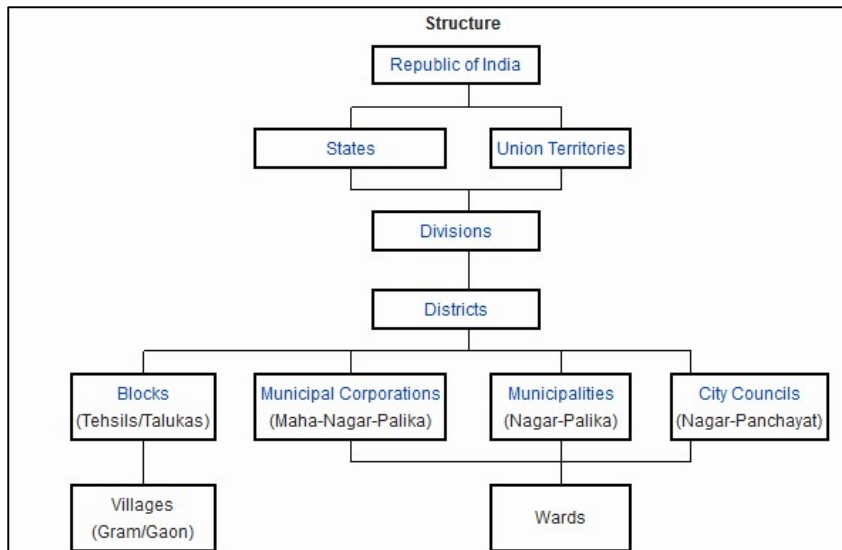


Figure 4 – The Indian Governance Structure [63]

There is thus a seemingly solid argument for the establishment of independent local road funds across the district, with the unit being the block. These should be established as NGOs and funded directly by a block grant each year. Utilising the NGO concept to solve problems associated with government failure has a long tradition in India; the Civil Society concept is well established as a way of overcoming the problems associated with the over-loaded public sector [64]. In keeping with the model, work for road maintenance should be delegated to the community, via community based contracting, to eliminate the distance problem; this will involve capacity building at the district level. The transparency and integrity of the system will be maintained through the dissemination of information as to what has been allocated, to whom, and why, at the local level. Segregation of duties to separate finance, allocation, implementation and funding roles is a fundamental aspect of the model.

6.3 Roles allocated to tasks

Figures 5 and 6 depict the elicitation process by which the conceptual model is applied, to allocate roles to central and state governments, as well as the community. By applying the prototype model developed the elicitation process offers significant possibilities for the government of Assam to implement alternative flows of resources and a stronger segregation of duties.

Using a quasi-soft system methodology, - a raw mapping of the tasks in question to each of the parties through a brainstorming process – an applied model was developed. Figure 5 offers the static processes identified; Figure 6 goes further to show the flow of funds to and

from the various entities. For sake of brevity, diagram of the raw mapping have been excluded from the manuscript.

As stated Figure 6 demonstrates the key linkages and roles mapped to each of the parties within the Assamese context. Figure 6 is in effect a more fluid version of Figure 5, showing the clear establishment of lines of demarcation between roles, as well as the separation of duties and the establishment of a roads trust.

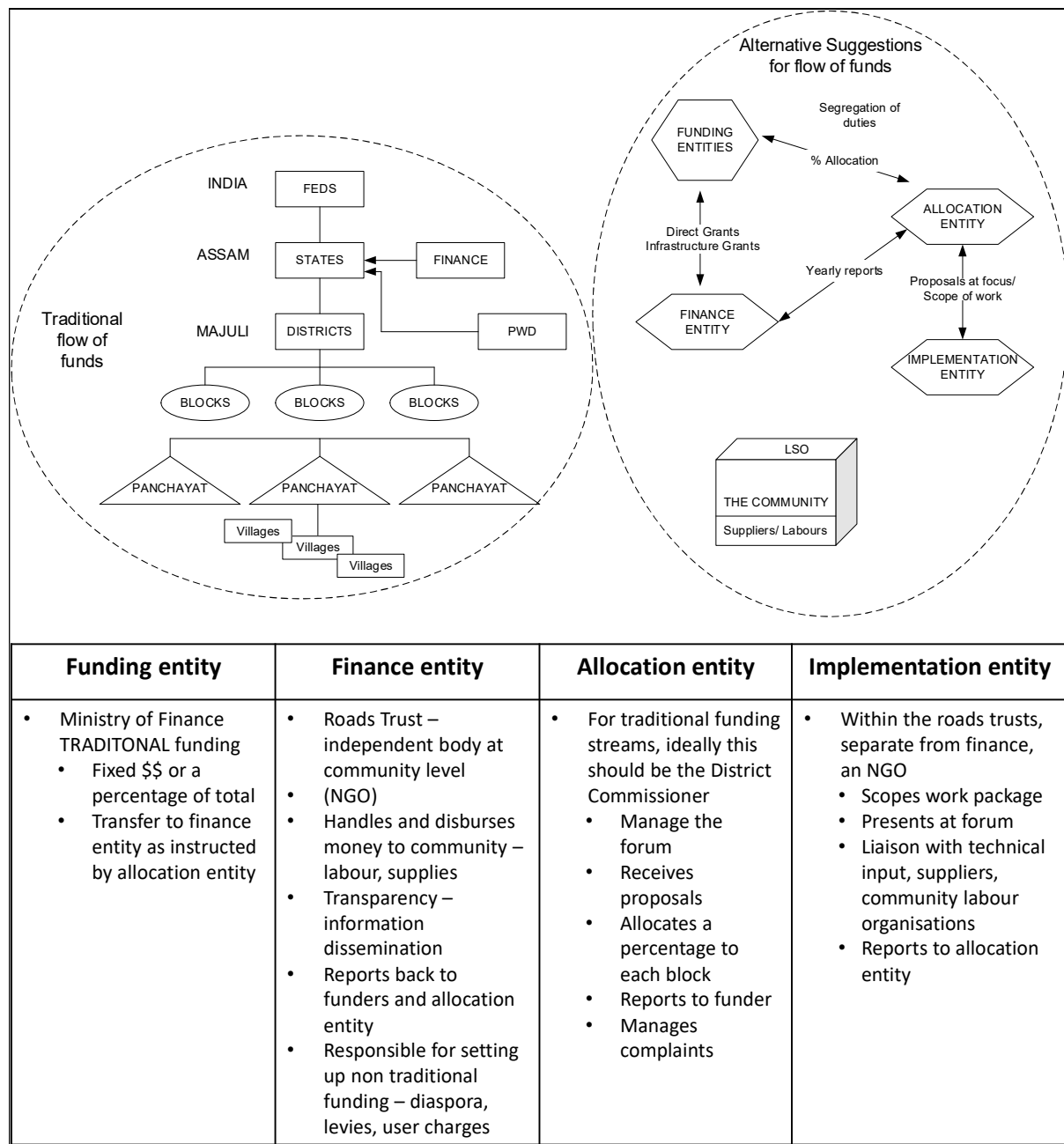


Figure 5: roles of the parties mapped to each task - formalised output.

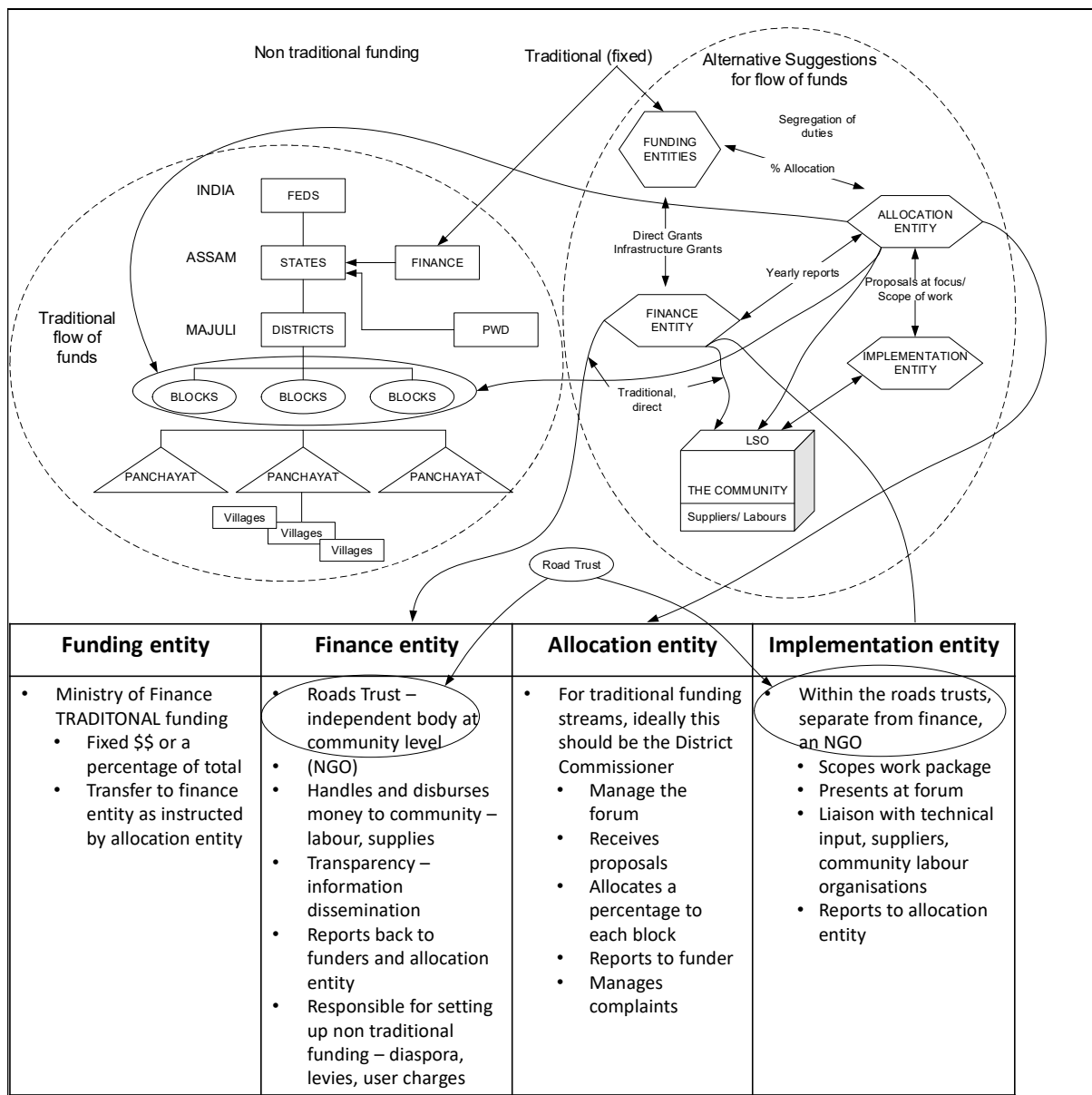


Figure 6 – Applying the conceptual model, a rich picture derived from the elicitation process

Our mapping of the conceptual model to the Assam case, via the elicitation process, identified the following:

- For each revenue block, a road user fund is to be established within n NGO with two distinct and separate arms: an implementation entity and a finance entity.
- The traditional funding entity should be the Ministry of Finance, transferring a fixed sum, as decided by the allocation entity, to each community road fund.
 - For traditional funding a bottom up process takes place whereby each block’s road fund presents their district level maintenance needs at an annual forum (presenting to the allocation entity).

- The allocation entity decides on the percentage funding for each block, and instructs the finance ministry to release funds to the individual block road funds.
- The finance entity is responsible for: generating additional funds from non-traditional sources – diaspora funding, levies, road user charges for selected vehicles; system transparency through the provision of information on money released at the community level; and the disbursement of wages and payments to the community.
- The implementation entity within the NGO: scopes the work packages to present to the allocation entity; tasks the community with individual work packages; liaises with suppliers and technical expertise; and instructs the finance entity regarding payments at the community level.

Table 1 shows the terms of reference for each of the entities within Assam.

Role and stipulated entity	Terms of reference	Comments
Funding entity (traditional)	<ul style="list-style-type: none"> ● Finance Ministry. ● Informs the allocation entity as the annual funds available for rural road maintenance. ● Disburses a fixed annual budget to each block level road fund, upon instruction from the district commissioner (allocation entity). ● Receives reports from the community level as to the work completed. 	Only for traditional funding.
Allocation entity (for traditional funding)	<ul style="list-style-type: none"> ● District level (District Commissioner) ● Transfers hypothecated funds from the Finance Ministry to the Road Fund (traditional funding). 	Only for traditional funding.

Role and stipulated entity	Terms of reference	Comments
Finance entity (at block level)	<ul style="list-style-type: none"> • Runs the annual allocation forum, where each block’s road fund NGO presents their case for funding. • Decided upon the funding percentage to be allocated to each finance entity; informs the primary funding entity to disburse to the finance entity; handles the transfer. • Handles complaints from the district level. • Within the community NGO operating at block level. • Manages the NGO’s road fund. • Receives traditional funds as disbursed by the Funding Entity via the Allocation Entity. • Responsible for system transparency – posting notices on public boards – work to be done, funds transferred from whom. • Disburses wages to the community CSOs once instructed by the implementation entity. • Pays supplier invoices once signed off by the implementation entity. • Develops and receives non-traditional funding sources – diaspora contributions, levies, select road user charges. 	<p>Within the same block level NGO as the Implementation Entity but separately functioning entities</p>

Role and stipulated entity	Terms of reference	Comments
Implementation entity (at block level)	<ul style="list-style-type: none"> • Within the community NGO operating at block level. • Responsible for the delivery of the rural road maintenance. • Presents annual budget request to Funding Entity – surveys the roads, scopes the individual projects, and liaises with technical experts on costing. • Scopes work to fit with available resources. • Manages informal community contracts at local level. • Negotiates materials and supplies. • Hires labour from the CSOs. • Inspects work undertaken. • Instructs finance entity as to payment disbursement. 	

Table 1 – Terms of reference for the entities within the Majuli, Assam, Smart Villages rural road maintenance funding model

It should be stressed that the road fund, the receptacle for finance sitting at the community level, is a flexible repository, capable of being filled by both traditional and non-traditional sources. The government should continue to provide funds at a high level for a road’s maintenance; the transparency and direct funding mechanisms of the model should ensure that this reaches the community level. The custodians of the trust hosting the road fund, however, are free to embellish these traditional sources of funding with other more innovative revenue streams. These could include leveraging from the Assamese diaspora, negotiating levies for certain products, donor funding from international NGOs, and road user charges for the more affluent market segments of traffic with full consideration of social equity.

7 Conclusions and further research

Rural roads are a lifeline for many communities in the developing world but they are often not maintained leading to them not being fit for purpose. This is generally due to inefficiencies in governance model and inadequate methods and approaches for administering the interventions programs targeting rural developments. Among numerous factors, funding bottlenecks and leakage, and remote decision making, supported by poor system transparency and accountability are found to be highly critical. This paper has demonstrated that several villages, across Asia, have been able to overcome these problems using a model that combines devolution, separation of duties, passing the implementation of the task to the community, and direct grant funding to local NGOs. Whilst retaining the traditional government funding route with more accountability is not a new concept, the model presented here does offer specific measures by which accountability may be fostered. This, to our understanding, is a first in the field of rural road maintenance. In placing this model within the peer reviewed academic body of literature it arguably offers a guide for others, not only within India, but other nations, as to how to tackle similar issues.

For Assam the conceptual model for rural road maintenance has great potential if it is adapted for use in the local context by means of a local road fund. This would include retaining the traditional government funding route, but making it more accountable, by means of a direct grant from the finance ministry to the district level, which is then passed onto the community. The community would also be responsible for undertaking the maintenance task, and sourcing and paying for local technical expertise. Crucially the community will also be granted freedom to generate funds for road maintenance to supplement government funds; this can be from diaspora contribution, levies, NGO donations, and road user charging.

The next phase of the research will be to present and apply the developed model in Assam. When political approval has been given to the model, community consultation may take place to strengthen it. If applied successfully within the context of the Smart Village construction programme, then the model can be rolled out, across the state, other Indian jurisdictions, and even globally, provided it is customised appropriately; this will foster significant social benefit.

Going forward, a crucial first step to the implementation of the model is to find sponsorship at community level, a village willing to put itself forward to trial the concept in a pilot. This

would be an overseeing district to take the role of the allocation agency. The next step would be to take the model to the political body responsible for *funding* road maintenance (as distinct from traditionally delivering public works). It is likely this would be the finance ministry who may be able to offer an indication of the quantum of funds available for the units under the allocation entity's jurisdiction. Ideally entities that have previously bottlenecked funds should be avoided.

Assuming the funding entity is willing to support the initiative through a block grant then some form of approval will need to be granted to allow the legal establishment of the allocation entity. This should not at this stage be an act; existing enabling legislation should be used to ensure speedy approvals. Following this, systems will need to be established to allow mobilisation of the pilot at community level. The allocation entity will need to recruit a suitable group of villages, who in turn will appoint implementation and finance agencies.

Following this, each unit's implementation entity, having scoped their initial work packages, will table, at a district annual forum, their proposed maintenance projects for the coming year – major, preventative and emergency contingency (rainy season). The allocation agency will agree percentage allocation of the total funds available for each village, based on need, and work packages will be re-scoped to fit with the allocated sums. Once appointed, the finance entity for each unit will set up the fund bank account, establish transparency/information channels to post decisions, and define payment channels to supplier and the community workers.

Projects will then be mobilised. The allocation will alert the finance entity to release the funds to each village's finance agency, making the transfer of funds public through the approved channels, and the maintenance process will begin. The implementation unit will recruit labour, both skilled and unskilled to deliver the scope of work, monitor projects, and approve payment for workers and subcontractors, paid for by the finance entity. Complaints from the community should be sent to the allocation agency. The finance entity should explore the possibilities for non-traditional funding routes. The pilot will conclude with a report provided to the allocation entity and the high level involved entities – ministries - that will then gauge the success of the initiative and make decisions as to whether or not to expand or continue the pilot.

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