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Asset Management in Infrastructure

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FEATURES

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Editor's Message

Begin a discussion on Indonesia's infrastructure, and you will hear a wide variety of comments. Some people may point out the need to make improvements to existing facilities. Others may note the challenges of implementing new policies. Still others may share their experiences as users of roads, bridges, and water and sanitation facilities. In every case, the underlying assumption is likely to be that "more and bigger" is better. But the problem, as can be seen by experiences in other countries, is that building more and bigger does not necessarily guarantee the delivery of better quality.

Often times, failure to deliver occurs when budgeting, planning, and investing decisions are taken without consideration for managing existing assets. The articles in this issue of ***Prakarsa*** examine the challenges of proper asset management and propose workable recommendations.

In the transport sector, authors Les Carter and Tom Elliot address how the quality and performance of Jakarta's busway can be improved. They offer steps to support Transjakarta management to overcome cross-ownership challenges that include operational and maintenance concerns in page 8. In order for the Government of Indonesia to reach its targets for economic growth, improving the performance of existing roads is increasingly urgent. Edward 'Ted' James explores ways to transition from the use of directly employed public sector maintenance teams *(swakelola*) and build the capacity of private contractors in page 19. The importance of strengthening public participation and monitoring to ensure program implementation on urgent road priorities, including maintenance, is also highlighted in this edition. Steven Schmidt describes an initiative by the Nusa Tenggara Barat government in page 14 to better engage the public through utilising communications platforms, including social media.

In the water and sanitation sector, Joel Friedman and Andrew McLernon in page 4 emphasise the crucial role that Local Government could play to bring asset management to the forefront in better service delivery, public accountability, and value for money. Jim Coucouvinis and Ai-Lien Tran-Cong in page 24 provides a reality check on what it will take for Indonesia to reach an adequate level of investment and sustain its assets in order to fulfil its goal of universal access to safe water and sanitation by 2019.

In the end, what matters is how stakeholders – whether from the government, private sector, or the public – can complement one another to highlight the importance of asset management in infrastructure dialogue, decisions, and practices. Asset management has been overlooked for a long while. This edition of ***Prakarsa*** is about encouraging all parties to share knowledge and practices that will strengthen asset management and contribute to infrastructure development in Indonesia. •MR

Infrastructure by the Numbers

Rp 313 Trillion
Indonesia's infrastructure budget for 2016.

53
Indonesia's rank among 160 countries surveyed for the Logistics Performance Index (2014) published by the World Bank.

Rp 100,000
Average cost to repair damaged roads per square meter in Jakarta.

Rp 10 Million
Average cost of a piped water connection per home.

Rp 115 Billion
Total funding from the state budget (APBN) in the form of 42 units of assets transferred to local governments for making improvements in sanitation and drinking water services.

14,262
Number of targeted villages to have drinking water supply systems constructed during the period 2015-2019.

Local Governments and Management of Infrastructure Assets

Infrastructure asset management in Indonesia is often perceived as a technical issue. For strengthening the overall management of Local Governments, developing and applying sound, strategic frameworks for asset management is important.• Joel Friedman • Andrew McLernon

The Government of Indonesia (GoI) recognises the importance of investing in infrastructure to improve the delivery of public services and foster economic development. Key GoI agencies, such as the Ministry of Public Works and Housing (MPWH), are investing considerable sums in the development of new infrastructure. The current decentralised environment means that due to limited GoI funding, the majority of investment must come from Local Governments (LGs).

While LGs provide funding for the construction or purchase of infrastructure assets necessary to deliver public services, many are less cognizant of the need to properly maintain and utilise these assets. Some are also confronted by difficult administrative processes necessary to do so. It is estimated that at least 75 percent of the sludge treatment plants in LGs are poorly maintained or not used at all. Funding provided by GoI sometimes results in assets which do not address local needs and priorities and for which allocation of local funds for ongoing operations and maintenance (O&M) is administratively difficult. With MDGs (Millennium Development Goals) and SDGs (Sustainable Development Goals) and the increased attention to public service delivery, LGs are under pressure to improve their management of infrastructure assets leading to better and more efficient delivery of services and greater accountability to the public. However, there are still significant issues regarding how LGs manage assets.

The Australian Government-supported Indonesia Infrastructure Initiative (IndII) supports GoI investment on new infrastructure through grants programs which develop and operate water and wastewater systems. One of these is the Australia-Indonesia Grants for Sanitation Program **(**sAIIG**)** wastewater program, which stimulates LG investment in wastewater facilities and in ongoing O&M through a program of output-based funding.

Problems and Issues of Assets Management in Infrastructure

Assets such as sludge treatment facilities, wastewater treatment plants, or pipe systems that are funded by LG budgets (APBD) are required to be recorded on each LG's asset register.

The estimated value of the asset is also registered. Each LG maintains a centralised register which, by regulation, is to be updated regularly. The LG work unit (SKPD), which funds the construction or purchase of the asset, maintains its own register. An SKPD can only allocate funds for ongoing O&M of an asset if the asset is recorded on its register. By regulation, this should be reflected in the composite register maintained by each LG.

In cases where one SKPD is responsible for the construction of an asset that is to be operated and maintained by a second unit, the asset must be formally transferred to the second unit. In cases where an asset is funded by the central government, such as with many sludge or wastewater treatment plants and sewer networks, the central government must formally transfer the asset to the LG. The process of asset management is overseen by the Directorate General of Regional Finances, Ministry of Home Affairs (MoHA) at the central government level. At the LG level, the Revenues and Management Unit Department of Finances and Regional Assets maintains the centralised register.

The experiences of LGs with respect to management of infrastructure assets vary widely. However, anecdotal evidence suggests that some are experiencing problems in complying with the management system in place and that this is influencing their ability to properly operate and maintain the assets. This in turn results in an inefficient use of public funds and difficulties in delivering public services. Many assets are simply not entered in an LG's asset register at all. This occurs both with assets funded by APBD where complicated administrative procedures make registration a problem, and also when the central government has funded an asset but not followed through with transferring "ownership" to the LG.

In many LGs, the Public Works SKPD serves as the construction arm of the LG. Following construction, the Public Works SKPD should transfer the asset to the unit charged with operating and maintaining it. If this is not done, the asset is often poorly maintained and underutilised. This can happen, for example, when a sludge treatment plant is constructed by the Public Works SKPD but is never transferred to the unit, such as the

Cleanliness Unit (*Dinas Kebersihan*), that will use the asset and be responsible for O&M. In some cases, assets funded by the central government do not reflect local priorities and use technologies which are beyond the skills and funding available at the local level. Because the central government does not provide funding for O&M, the LGs find themselves responsible for assets of uncertain value and face the choice of budgeting for something that is not their priority or which is not affordable, or (as is often the case) not maintaining it at all. In some cases, LGs experience problems in allocating O&M if a single facility has infrastructure "owned" by two or more SKPDs. This can be the case, for example, when a solid waste disposal site is registered as "owned" by one SKPD but uses compacting machines registered by another SKPD.

Poor management of assets, or simply the lack of knowledge of what assets exist, complicates planning and budgeting and blurs the accountability of LGs to their citizens. Without knowing which assets are owned by which SKPD, and without knowing their real value and their condition, LGs are unable to plan properly for future asset acquisition and utilisation. And LGs that are not properly allocating funding for O&M for assets that were purchased or built by them are not meeting their fiduciary responsibilities to their citizens to properly account for their use of funds.

As noted, the estimated value of an asset is also recorded. Updating of the asset register should also result in new value estimates. However, there are indications that many LGs do not do this. This becomes a problem if, for example, the LG wishes to become involved in a Public Private Partnership (PPP) effort. These cannot be properly structured unless the proper value of the LG asset is known. There are plans for LGs to move towards accrual accounting in the future (although these plans appear to have been delayed), but this is not possible if the real value of all LG assets is not known.

The outcome of these situations in many LGs is that many infrastructure assets are poorly maintained, or not maintained at all. This has been a problem for a considerable length of time and numerous donors, including the Australian Government, have devoted funds to try to strengthen asset management. However, many of these systems have focused on technical solutions such as computerisation or early warning systems. As stressed in the next sections, the problems are more managerial and administrative in nature, with a basic lack of recognition of the importance of good asset management.

Strengthening Asset Management

A fully functioning integrated asset management system requires an immense amount of work by the LG. To build this system, important aspects include an automated asset register and asset tracking system, a regular valuation and updating system, GIS, a transaction tracking system, and more. Such systems also require significant expenditures and staff with high level skills. More importantly however, the value of such systems is not yet fully recognised in Indonesia, and government officials are not always committed to service delivery or open and transparent in their transactions.

In spite of these problems, there are a number of steps that can be taken to improve management of infrastructure assets by LGs. First, LGs should follow more closely the procedures established in Government Regulation (PP) no. 27/2014 and the MoHA Ministerial Decree (Permendagri) no. 17/2007. MoHA is currently working on a new decree but this has not yet been completed. Many LGs have not been thorough in recording assets when they are procured or built. In some cases the assets never appear on either the central registry or those of the individual SKPDs. In other cases they are recorded on the central one but never entered on the SKPD register that uses them. As has been noted, this makes it difficult for the SKPD to allocate funds for O&M.

Second, once an asset is recorded on an SKPD's register the SKPD must ensure that funds are allocated for O&M. Experience has shown that some LGs are reluctant to do this because it requires them to commit scarce budgetary funds to maintain the asset. Third, SKPDs must ensure that when an asset is transferred between SKPDs, such as when Public Works SKPD builds something and then transfers it to a second SKPD for service delivery, the transfer is acknowledged by the regent or mayor through a formal letter. Fourth, assets funded through the GoI budget (APBN) must similarly be transferred to the LG. Finally, valuations of assets should be updated on a regular basis as specified in PP no. 27/2014.

Benefits of Better Asset Management

Better assets management will gradually lead to more accountability of the LG to its citizens, better delivery of services and value for money in protecting investments in infrastructure.

With assets properly registered on the user SKPD's register, the SKPD is able to allocate funds for future O&M. While the allocation of additional funds for O&M (i.e. over and above the cost of building or purchasing the infrastructure asset) is often avoided by SKPD's in an attempt to save money (or because the asset is not on their register), investments in O&M in the long run save money. Infrastructure lasts longer if there is routine funding for maintenance. By avoiding the often encountered cycle of "build a unit of infrastructure, allow it to run down, build a new unit", investments in infrastructure are protected leading to a situation of more value for money.

With more knowledge of which SKPD manages which infrastructure assets, and of their expected life and value, LGs will be better able to rationally plan and budget for ongoing investments in infrastructure. Such investments will increasingly be made on the basis of need and on longer term plans for

infrastructure development. Rational allocation of funds and a reduction in funds for superfluous infrastructure or infrastructure not responsive to local needs will increase the value added of infrastructure investment. Knowledge of an asset's real value will assist in the structuring of PPP ventures and, when it happens, the transition to accrual accounting.

Ultimately, improved asset management means LGs will be more accountable to their citizens. Use of existing infrastructure for longer periods and ensuring that new infrastructure that is built is a product of better planning and budgeting and more responsive to community needs and priorities will lead to better, more cost efficient service delivery and strengthen the links between LGs and the community. Rational planning and budgeting, value for money in infrastructure investments and transparency in how investment decisions are made are all factors that increase LG accountability.

Of course, these results will not occur simply because of better asset management. Many other factors influence the accountability of an LG towards its constituents: commitment on the part of politicians towards serving their community, transparent plans and budgets, a properly functioning bureaucracy, and demands by the community for increased accountability. An LG's progress in these areas offers the opportunity for better asset management to contribute to improvements in overall accountability.

Key to the strengthening of asset management is the need for a champion who sees the benefits of such a system, who is determined to make the system a success, and who has the resources to deliver the system. The champion also has the important role of communicating the benefits of the system in the most effective ways, so that users learn that the information is assisting them in their work. And since this system must be based on accurate information, the champion must ensure that those operating the system understand their accountability to maintain its accuracy. If not, the classic "garbage in, garbage out" situation will quickly arise. It is important that these factors be considered as LGs work to strengthen their asset management.

Australia-Indonesia Grants for Sanitation and Asset Management

The sAIIG wastewater management program is addressing the challenges of LG asset management. The program funds small-scale communal wastewater collection and treatment systems in approximately 40 LGs. Operating since mid-2012, sAIIG will conclude when the entire IndII facility ends in January 2017. Although managed at the central level with a Central Project Management Unit based at the MPWH and with funding channelled through the Ministry of Finance (MoF), the program is undertaken at the local level. Participation in sAIIG requires each LG to use its APBD to design and fund construction of a system consisting of piping, a treatment plant, and in some cases pumps. Following completion of construction and verification that local residents have connected to the system, a percentage of the funds expended by the LG is reimbursed by the Australian Government through MoF.

Because the construction of the systems was funded from the local budget, they are owned by the LG. The IndII Preparation, Appraisal, and Oversight (PAO) consultants are working with the LGs to ensure that the systems are properly entered in the locality's asset register. In a number of cases the systems have been or are being built by the Public Works SKPD. However, ongoing O&M responsibilities and planning for future systems will rest with another SKPD such as the Cleanliness Unit or Environmental Unit (*Badan Lingkungan Hidup*). In such cases, the PAO will work with the LG to ensure that the systems are formally transferred from the builder to the operator of the systems.

A programmatic requirement of sAIIG is that the LGs must allocate funds for ongoing O&M. This will ensure that the assets are properly operated and maintained. Because the systems will be listed in the operator's asset register, the SKPD will be able to allocate the required funds. The PAO assists the LGs in determining in advance the funding needs for O&M. In the past many LGs have not based their budgetary allocations for O&M on real costs. The PAO, however, is developing a simple spreadsheet to estimate necessary O&M budgets based on length of pipes,

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numbers of household connections, and calculated O&M costs for the treatment plants.

Finally, the operator will be responsible for planning and developing future systems. With accurate data on construction and O&M costs, the operator will be better able to plan and budget for these future systems. As IndII and the PAO have worked with the sAIIG LGs, many officials have increasingly recognised the importance of good asset management and are taking, or will take, the necessary steps to ensure that the wastewater systems they have are properly managed.

This article has stressed the importance of LG asset management in delivering key public services such as the management of wastewater as well as the factors that have inhibited this. Progress is being made as pressures to better deliver services increase and officials recognise the importance of better asset management. In particular, officials in many of the sAIIG LGs are taking steps to properly implement the wastewater management systems funded by the program. It is hoped that such champions can stimulate improved asset management, not only for wastewater management systems but for all LG assets. ■

Key points:

Poor management of assets (or simply the lack of knowledge of what assets exist) complicates planning and budgeting and blurs the accountability of Local Governments (LGs) to their citizens. Without knowing which assets are owned by which LG work unit (SKPD), and without knowing their real value and condition, LGs are unable to plan properly for future asset acquisition and utilisation.

A fully functioning integrated asset management system will require an immense amount of work by LGs at this point. To build this system, important aspects include an automated asset register and asset tracking system, a regular valuation and updating system, GIS, a transaction tracking system, and more. Such systems also require significant expenditures and staff with high level skills. More importantly however, the value of such systems is not yet fully recognised in Indonesia. The public does not recognise the importance of asset management systems and government officials are not always committed to service delivery or open and transparent in their transactions.

However, there are a number of steps that can be taken to improve management of infrastructure assets by LGs. First, LGs should follow more closely the procedures established in Government Regulation (PP) no. 27/2014 and in the Ministry of Home Affairs Regulation (Permendagri) no. 17/2007. Second, once an asset is recorded on an SKPD's register, the SKPD must ensure that funds are allocated for operations and maintenance (O&M). Experience has shown that some LGs are reluctant to do this because it requires them to commit scarce budgetary funds to maintain the asset. Third, SKPDs must ensure that when an asset is transferred between SKPDs, such as when Public Works SKPD builds something and then transfers it to a second SKPD for service delivery, the transfer is acknowledged by the regent or mayor through a formal letter. Fourth, assets funded through the Government of Indonesia budget (APBN) must similarly be transferred to the LG. Finally, valuations of assets should be updated on a regular basis as specified in PP no. 27/2014.

Better assets management will gradually lead to more accountability of the LG to its citizens, better delivery of services and value for money in protecting investments in infrastructure:

- With assets properly registered on the user SKPD's register, the SKPD is able to allocate funds for future O&M.
- With more knowledge of which SKPD manages which infrastructure assets, their expected life and value, LGs will be better able to rationally plan and budget for ongoing investments in infrastructure.
- Improved asset management means LGs will be more accountable to their citizens.

Many other factors influence the accountability of LGs towards their constituents: commitment on the part of politicians towards serving their community, transparent plans and budgets, a properly functioning bureaucracy, and demands by the community for increased accountability. The important role of a champion who sees the benefits of such a system, who is determined to make the system a success, and who has the resources to deliver the system is also key to strengthening asset management.

Case Study: Asset Management and Jakarta's Busway

The asset management of the Jakarta's Bus Rapid Transit system is executed by a newly appointed company, PT Transportasi Jakarta (Transjakarta), and three existing government agencies. This case study explores how cross-ownership affects the complex operational and maintenance challenges. • Les Carter • Tom Elliott

The issue of asset ownership of public transport infrastructure historically has always been a barrier to achieving operational improvements. This also applies to Transjakarta and the management of Jakarta's Bus Rapid Transit (BRT) system – known locally as the busway. First launched in 2004, the busway at that time represented Asia's first full BRT system. The objective of the busway is to reduce traffic congestion in the city by providing a viable alternative to private car use.

Until 2014, there were three DKI Jakarta (Special Capital City District of Jakarta) agencies responsible for various aspects of the busway: the Jakarta Transportation Agency (*Dinas Perhubungan* or Dishub) for transport-related infrastructure, Bina Marga for roads, and the Landscape Gardening Agency (*Dinas Pertamanan*). Then in January 2015, a new company, PT Transportasi Jakarta (which will be referred to hereafter as Transjakarta), was formed to take over the operations of the busway and to improve services. With the transition from a Dishub business unit to a DKI-owned company, Transjakarta also seeks to better address the challenges of developing and maintaining the busway's infrastructure in this multi-ownership environment. A Governor Decree no. 1006/2015 was later launched which allows Transjakarta to use certain assets including nominated depots, shelters, and the busway lanes.

There is, however, a recognition that some assets need to be transferred to Transjakarta and a revaluation process is currently underway which will clarify asset ownership so that Transjakarta will own buses (except those owned and operated by other bodies), all bus stations or shelters, footbridges connecting shelters, four bus depots, office buildings and equipment, and several busway terminals.

The current regulatory environment does nevertheless still maintain that existing agencies continue in their ownership role of key assets: Dishub for most footbridges, footpaths and intersection traffic signalisation of the busway; Bina Marga for busway lanes, barriers and busway intersects on roads and bridges; and Dinas Pertamanan for median strips and other landscaped areas around shelters and pedestrian access to the busway.

Transjakarta's Business Strategy and Asset Management

The draft Transjakarta Business Plan 2014–2018 incorporated a business strategy that includes capital investment in busway infrastructure and an underpinning assumption that all the assets listed above would be either owned or at least controlled by Transjakarta. This was because effective control of the busway is one of the primary factors in improving busway performance. Therefore, the development of asset management capabilities for the company has become one of the more important areas of focus since March 2014.

The first asset management plan (*Transjakarta Draft Asset Management Plan 2014–2018*) conveyed the need for asset management systems to continually improve the quality and performance of Transjakarta's busway assets valued in 2013 at Rp 1.7 trillion. A simple asset management model was articulated in order to improve understanding (Figure 1). The role of executive management in asset planning, establishing programs that guide where funds are spent, and setting standards (for asset design and maintenance), was highlighted. The front line service delivery role was articulated in terms of identification of issues, maintenance, repairs, monitoring, and security.

In this plan, 14 separate standards relating to the six Key Result Areas from the Minimum Service Standards, namely reliability/ regularity, security, safety, affordability, comfort, and equity were included in the plan to underline the importance of standards. These included passenger access and egress, traffic signs on busways, shelter ventilation, bus priority seating, and wheelchair spaces. The need for systems independent of those of finance and procurement was also highlighted in the plan with the statement "establish and maintain accurate records that clearly define what the assets are, where they are located, and what condition they are in". This initial plan then went on to provide guidance about how Transjakarta might commence this process with the identification of a small project team to source and create an asset database with an identified list of functions (Figure 2).

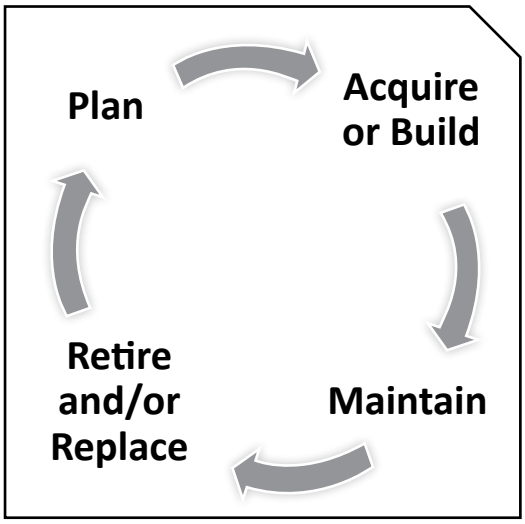
An implementation time frame was recommended as well as the primary elements of the data which needed to be gathered and inputted to the database. As with most planning documents

developed at the time, the approach was practical and operationally focused.

Asset Management Framework Development

The new Board of Directors for Transjakarta was appointed in mid-2014 but did not begin its management roles until January 2015. After six months of ongoing consultation about the need for capital investment in infrastructure and how this would underpin future busway performance, a new program of work was commenced. This program focuses on redesigning and upgrading a section of the busway in order to demonstrate how capital infrastructure should be designed to meet the required Minimum Service Standards, and how better infrastructure would result in improved busway capacity and performance. The need to develop asset management capabilities was an integral part of this program. By August 2015, these two important asset management developments were underway.

Figure 1: Asset Management Model



Transjakarta had also commenced implementing new corporate and operational technology platforms based on the MRCagney Information, Communication, and Technology (ICT) Plan from 2013. A new enterprise resource planning system had been designed and procured that incorporated finance, human resources, and other corporate functions. The finance module in significant ways incorporated financial accountability on assets but did not incorporate all the necessary asset management functionality. The current plan is to specify and procure an asset management system in 2016 and a budget has been allocated for this purpose.

Work had also commenced on building a better understanding of asset management, and how it is important to Transjakarta in financial and operational terms. An important consideration in the process of developing this capability was to recognise that not all the relevant busway assets were “owned” by Transjakarta as there had been disagreements about the merits of transferring large amounts of capital to the company. So a cross-agency team was formed to provide clarity and advice on assets and knowledge transfer including asset management. This team included representatives from Transjakarta, Dishub, Bina Marga, and Dinas Pertamanan.

Figure 2: Transjakarta Asset Management Plan 2014–2018

Year	2014	2015	2016	2017	2018
Activity					
Capability					
People (professional staff)					
People (support staff)					
Data					
Corridors					
Depots					
Fleet					
Office and Administrative					
Programs					
Investment					
Maintenance					
Operations					
Commercial					
Systems					
Built Infrastructure					
Bus Fleet					
Control, Monitoring & Security	Determined By Timing of Control Centre Implementation				
Practices & Procedures					
Administrative					
Technical (standards)					
Monitoring and Reporting					

Part of the initial familiarisation process was to help the team appreciate that:

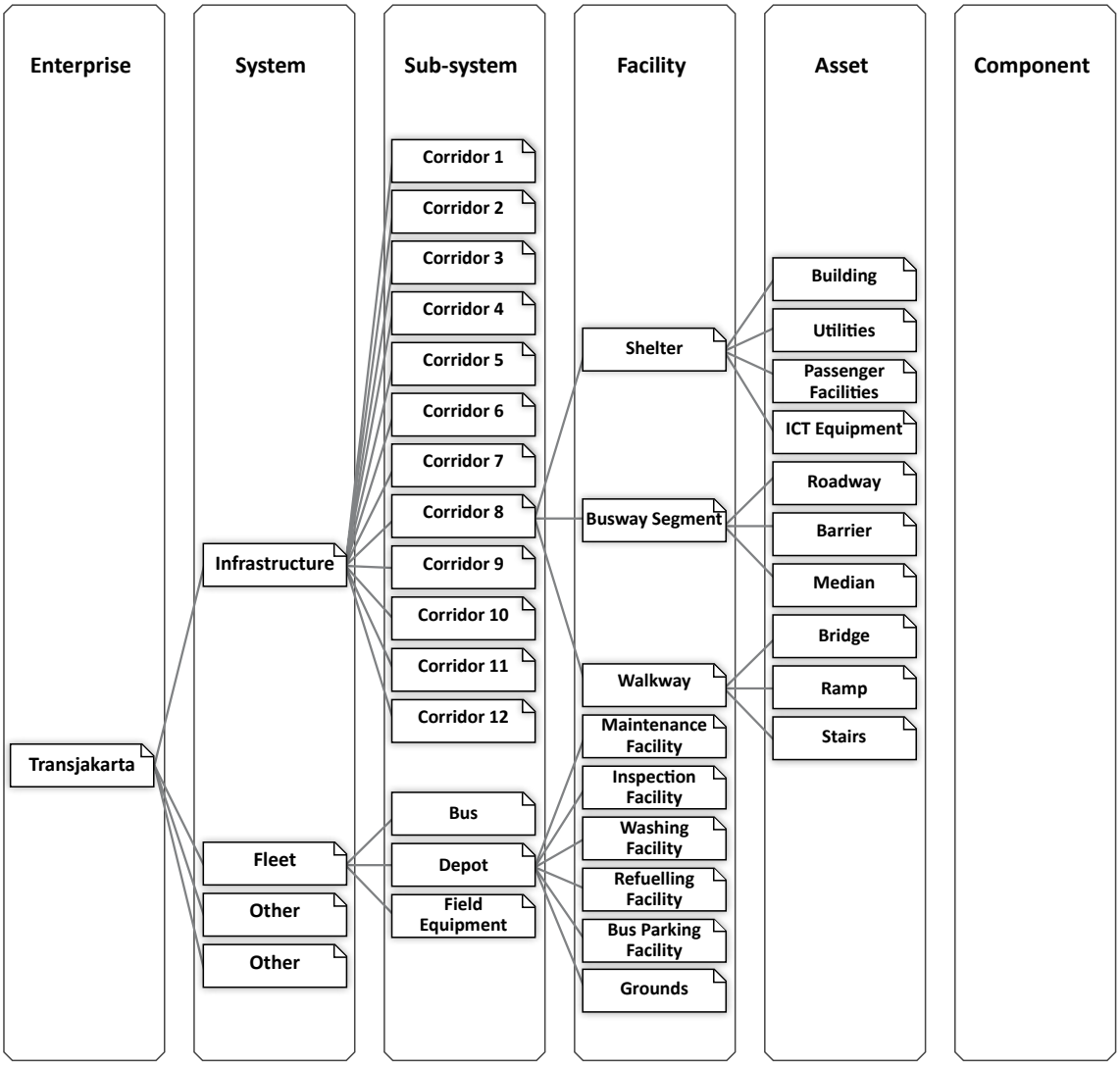
> "Transjakarta is a significant user of built infrastructure. The Jakarta busway network has over 250 kilometres of roadway, 200 plus passenger shelters, and associated pedestrian walkways and footbridges. They also have bus depots and a bus fleet. They do not however have access to any formal asset management systems (data, software programs and/or monitoring tools) that would assist them in the day to day management of the busway infrastructure"(*TransJakarta Improvement Program Asset Audit and Condition Report Executive Summary*, page iv, August 2015).

In order to ensure that the cross-agency team had a complete understanding of the complexity and detail required to build a useable asset management system, a trial audit was undertaken of a small section of the busway. As part of the preparation for the trial audit, multi-agency agreement was reached on an asset management framework that included an asset hierarchy, categorisation, and condition rating methodologies.

The hierarchy has six levels and in previous page example (Figure 3), individual components have not been incorporated and only a small section of assets are represented. This simplicity was used to build understanding and undertake the subsequent audit with the team.

The concept of asset categorisation and its use in a system (to link together similar assets across multiple facilities) was one of the more difficult notions to convey to the team. The following asset categorisation data (Figure 4) was used to develop understanding about the need and benefit of linking similar components particularly in relation to budgeting for capital

Figure 3: Asset Hierarchy in Transjakarta



infrastructure development, infrastructure maintenance and system reporting, and performance management.

Figure 4: Asset Categorisation and Description in Transjakarta

Code	Category Heading	Category Description
1	Roads and Bridges	Pavements, footpaths, line markings, retaining walls, barriers, kerbs, traffic signage
2	Underground Utilities	Drainage, sewer, water, conduits
3	Buildings	Building structure; floors, walls, doors, glass, roofs, gutters
4	Electrical & Mechanical	All wired equipment; electrical cabinets, cabling, lighting, fans, automatic doors, gensets, UPS
5	Furniture & Fittings	Bins, seats, fences, signage (information), toilets
6	Landscaping	Trees, gardens, fountains, monuments, statues
7	ICT	All IT, communications and ticketing equipment; data cabinets, servers, smart card readers, PCs, CCTV
8	Other	Anything that does not fall into the above categories

Finally, a condition rating methodology was developed with and agreed by the team. Figure 5 summarises this agreed rating methodology.

Figure 5: Rating Methodology in Transjakarta

Code	Rating	Remaining Life	Remarks
1/5	Unsafe or unserviceable	No remaining life	Direct impact on the well-being of bus users, community and staff
2/5	Poor	0–30%	May impact on continuity of operations; needs to be fixed at earliest available time
3/5	Fair	30–60%	May deteriorate further if not attended to
4/5	Good	60–90%	Maintenance needs to be considered over time
5/5	Excellent	90–100%	No maintenance required

The trial audit was undertaken with Transjakarta staff and a local engineering firm whose future role potentially would be to assist Transjakarta with the huge task of auditing its assets. Learnings from the audit process were documented and shared with the broader cross-agency team. The time and detail required was far more lengthy that expected, and the process tested the veracity of the framework at several points which ultimately would make it more useable and robust. In December 2015, the trial data was inputted to a temporary asset management system and demonstrated in a quasi-online environment to show how the linkages between assets and asset components could assist better operations and financial management. This demonstration also provided information how a properly specified asset management system could help improve asset performance and maintenance.

Initial Asset Management Implementation and Progress

The Australian Government-supported Indonesia Infrastructure Initiative (IndII) has been supporting the improvement of BRT services across Jakarta since 2012. After an assessment of Transjakarta's capability to manage the busway, IndII recommended a three part reform program to improve the long-term performance of Transjakarta and the BRT system. This included:

- An Institutional Framework
- A five-year Business Planning Framework
- A short-term Operational Improvement Framework

The focus of the Institutional Framework was to form a government-owned and operated company (*Badan Usaha Milik Daerah* or BUMD) to provide stable, long-term management direction of busway operations and also to oversee a much needed capital investment program in systems technology, fleet and busway infrastructure. The draft regulations that underpinned this change were approved in December 2013. Important regulatory inclusions were the adoption of Minimum Service Standards for services and infrastructure, and the proposed transfer of relevant assets (bus stations, shelters, buses, buildings, and equipment) as equity in the new company.

The Business Planning Framework completed in March 2014 included documentation of a Business Plan and nine supporting plans including an Asset Management Plan and a Capital Investment Plan.

The Operational Improvement Framework was a series of small step operational improvements aimed at developing capabilities that would assist longer-term development. Some of the systems and processes that were institutionalised, such as the interim incident management system in the control centre, remain in use.

Later in December 2015, Transjakarta also announced it had secured new budget funding to implement an asset management system in 2016. After some discussions, it was decided to

cease further work on auditing and framework development, and concentrate on writing a system functional specification. In January 2016, the functional specification for a new asset management system was developed. Transjakarta will now use this draft document to guide further inter-agency discussion, refinement, and ultimately inclusion in a procurement strategy that will deliver a viable asset management system by the end of 2016.

The functional specification describes the requirements of each type of user (from executive management through to technical and field staff); the scope of the assets that make up the busway; an asset hierarchy as well as categorisation and rating methodologies; financial and operational functionality; analytical and reporting functionality; and overall system architecture and interfacing considerations. In 2016, IndII is supporting Transjakarta with the development of new infrastructure designs for BRT Corridor 6 shelters, walkways, footbridges, and the Ragunan terminal. There will also be a need to revisit asset audit training late in 2016 as part of the new system implementation including a long-term asset audit strategy to populate the new system with relevant data.

The ongoing issues concerning which DKI agency owns which busway assets will be tested through a revaluation process (currently underway) of some of Transjakarta 's assets, as well as through revisiting Transjakarta 's underlying capital investment strategy in order to secure funding for the new infrastructure.

These processes will assist the development of Transjakarta's asset management capability which will ultimately provide better financial planning and monitoring capability, as well as an ability to redevelop and maintain assets into the future. The inclusion of other agencies in the process also has the benefit of expanding the systems to other DKI agencies. Bina Marga is the most likely candidate for this given its ongoing interest and huge volume of road and bridge assets in DKI Jakarta under its management control.

As the public's attention to and demand for improved busway services continues, it is important to pay close attention to the implications of these asset management activities to overall city planning. In February 2016, several news media in Jakarta reported that DKI was concerned that city development projects were constantly impeded by a lack of data about land ownership in DKI Jakarta. This underlines an inherent issue with city planning in a developing urban environment. Practical asset management capability development such as that developed by IndII and its consultants together with Transjakarta may provide a model for other DKI areas in the future. ■

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- **Les Carter** is the Managing Director of MRCagney and a member of the Transjakarta consulting team since 2013, providing technical advice about buses and bus maintenance, operational systems, depot development and the busway control centre and supporting technologies. Les is the Principal Consultant on asset management for TransJakarta.
- **Tom Elliott** of MRCagney, is the Program Manager for the IndII Transjakarta Improvement Program providing stakeholder management and program coordination, strategic and regulatory advice, with oversight of technical infrastructure and technical inputs to the program.

MRCagney is a Brisbane-based transport consulting company specialising in public transport. In November 2012, MRCagney was engaged through IndII to provide Transjakarta with technical assistance in revitalising and improving Jakarta's BRT system.

Key points:

The management shift of the Jakarta Bus Rapid Transit (BRT) system, locally known as the busway, to the new company Transportasi Jakarta (Transjakarta) in 2015 carries over a demand for better coordination on busway asset management with existing government agencies. A Governor Decree no. 1006/2015 was later launched which allowed Transjakarta to use certain assets including nominated depots, shelters, and the busway lanes. At the same time, the current regulatory environment also endorses existing agencies continuing to exercise an ownership role related to the assets: Jakarta Transportation Agency (*Dinas Perhubungan* or Dishub) for most footbridges, footpaths and intersection traffic signalisation of the busway; Bina Marga for busway lanes, barriers and busway intersects on roads and bridges; and the Landscape Gardening Agency (*Dinas Pertamanan*) for median strips and other landscaped areas around shelters and pedestrian access to the busway.

This cross-ownership management to some extent presents operational challenges with asset management, capital development of busway infrastructure, and maintenance. A revaluation process of some of Transjakarta's assets is currently underway to address the issues of ownership of busway assets, as well as make an effort to revisit Transjakarta's underlying capital investment strategy to secure funding for new infrastructure. This case study shares the steps taken to develop asset management capabilities for the company as an important focus since March 2014.

First, a program to redesign and upgrade a busway section to fulfil Minimum Service Standards for capital infrastructure and improve busway capacity and performance was implemented. By August 2015, two important asset management developments integral to this program were underway. Second, based on the MRCagney ICT Plan from 2013, Transjakarta had also commenced implementing new corporate and operational technology platforms. A new enterprise resource planning system had been designed and procured that incorporated finance, human resources and other corporate functions. Third, a cross-agency team was formed to provide clarity and advice on asset and knowledge transfer including asset management. A trial audit was undertaken on a small section of the busway to ensure the cross-agency team had a complete understanding of the complexity and detail required to build a useable asset management system. As part of the preparation for the trial audit, multi-agency agreement was reached on an asset management framework that included an asset hierarchy, categorisation, and condition rating methodologies.

The Australian Government-supported Indonesia Infrastructure Initiative (IndII) has been supporting the improvement of BRT services across Jakarta since 2012. After an assessment of Transjakarta's capability to manage the busway, a three part reform program was recommended to improve the long-term performance of Transjakarta and the BRT system. This included:

- An Institutional Framework
- A five-year Business Planning Framework
- A short-term Operational Improvement Framework

Transjakarta has also taken steps to develop functional system specification for a new asset management system. The new system is currently being discussed for refinement and inclusion in a procurement strategy. Other works, with IndII support, are currently in progress with the development of new infrastructure design for BRT Corridor 6, the Ragunan terminal, and a revisit of asset audit training.

Lessons From nusa Tenggara Barat - Improving Road Maintenance Performance Through Public Engagement

Nusa Tenggara Barat's Provincial Government is leading the way in strengthening its Road Traffic and Transport Forum and widening public participation to improve road maintenance performance. • Steven Schmidt

Public awareness and participation is widely considered to be one of the key factors in ensuring the success of development projects. The World Bank (2004)[1] reports that successful community awareness and participation depends on the extent to which community members are involved in the various phases of a project's life cycle, including planning, design, construction, and evaluation. The Government of Indonesia (GoI) has made significant efforts to ensure public awareness and participation in development works through the introduction of Law no. 25/2004 which provides the right for members of the public to participate in the Planning and Development Consensus (known as *Musrenbang*).

The role of Musrenbang is to arrange the priority of development activities and allocate funds through consensus which takes into consideration the aspirations and needs of the public.

However, in reality, the priorities arising from Musrenbang are often subject to interventions and changes, because there is often a mismatch between the development priorities of (i) the community, private businesses and industry, and (ii) the vision and objectives of national and regional government bodies.

Partly to address the shortcomings of the Musrenbang process, GoI further strengthened public participation in the road sector through the introduction of the Road Traffic and Transport Forum (RTTF), which was launched through Law no. 22/2009 and subsequent Government Regulation (PP) no. 37/2011. GoI's vision for RTTFs was that they would represent the entire spectrum of Indonesian society from grassroots to ministerial level. The membership of the RTTF should therefore comprise leaders/coaches, organisers, academics, business leaders and community members.

One of the key intended roles of the RTTF is to strengthen public participation and monitoring to ensure that funds are allocated effectively to the most urgent road and traffic priorities including, where appropriate, routine road maintenance which is widely neglected across Indonesia. Social capital needs to be strengthened to ensure this occurs by not only providing the opportunity to participate in consensus, but also establishing a system to monitor implementation of the consensus and ensure that "what is planned is what is built", and "what is built is built and maintained well."

This article provides a brief overview of the current status of RTTF development in Nusa Tenggara Barat (NTB), and the recent initiatives to increase public participation and foster closer public scrutiny of road maintenance planning, programming, and implementation.

Establishing RTTF – Lessons From Nusa Tenggara Barat

The RTTF in NTB was established under the authority of the Decree of NTB Governor no. 634/2010. The forum was virtually dormant from 2010–2013 when it was included as a development component of the Provincial Roads Improvement and Maintenance Project (PRIM) funded under the Australian Government-supported Indonesia Infrastructure Initiative (IndII). A key element of the PRIM pilot project in NTB has been a focus on strengthening the composition and capability of the local RTTF, to enable them to carry out improved provincial road management and maintenance and to ensure that these improvements are implemented effectively through PRIM.

There are many reasons identified by IndII for the forum not becoming sufficiently active across Indonesia, notably:

- Forum members were almost all drawn from the public sector and saw participation as an extension of their public role; there was almost no representation from the community and private sector.
- The forum consisted of an unmanageable 49 members[2].
- There was poor identification of champions, and a general lack of direction, and therefore no incentive to perform.
- There was a lack of funds for operation with no established office or ability to cover administration costs.
- There was no portfolio of issues to debate and resolve, leading to a preoccupation with unimportant issues such as the wording of the forum's Standard Operating Procedures (SOPs).

RTTF culture during that phase was one of lack of focus and direction, which in turn exhausted members' energy and did little to boost motivation. Under these circumstances it also lacked any form of public engagement. In 2015, IndII supported a more action-oriented approach to enhance the operation of the RTTF. Several changes were introduced such as revised SOPs, creation of an RTTF working group[3] and rearrangement of membership. During 2015, RTTF members participated in several activities related to inter-agency coordination on road transport and traffic issues, and held several meetings. That year was a year of change with a significant increase of activities compared to previous years. Now that interest and commitment have been established it is expected that 2016 will be a defining year for NTB's RTTF as all its various components become further activated.

Further changes[4] to include more representatives from the community and private sector in RTTF membership are currently being organised. Initial RTTF kick-off meetings for 2016 have already taken place. Monthly meetings are mandated and both roadworks planning and implementation will be monitored.

Improved Engagement for Provincial Roads Asset Management

A number of RTTF improvements are planned for 2016 to improve engagement with the wider community and therefore increase public scrutiny of roadworks and road maintenance performance. These initiatives primarily focus on improving access to information and the ability to engage. The various RTTF mechanisms and activities for public outreach are described in the next pages:

1. **An Established RTTF Secretariat.** This secretariat will perform administrative and management functions on behalf of RTTF, as busy members with full-time jobs and civic duties do not have time to dedicate to RTTF duties. The secretariat will have various roles including acting as moderator on public inputs (complaints and issues), organising regular RTTF newsletters and website updates, maintaining a social media presence (through Facebook), record-keeping and organising, and recording RTTF meetings and events.

2. **Improved Coordination With Musrenbang.** The Musrenbang is the annual development coordination consensus workshop which is held at all levels of government to prioritise and agree on annual activities and funding priorities. Musrenbang are convened under a number of different themes, one being the Provincial Transport Musrenbang. The RTTF will provide provincial roads maintenance priorities as inputs to the 2016 and all future Provincial Transport Musrenbang.

3. **RTTF Website Development**. The RTTF has developed a website where the public can access information including annual roads maintenance programs, progress on roads maintenance contracts and RTTF activities. The site is currently under construction but is being increasingly populated (http://forumllaj-provntb.com). Members of the public will soon be able to download the PRIM mobile app, formally register as an "RTTF follower" and submit complaints through the website directly from their phones.

4. **RTTF Network of Followers**. Any member of the public who wishes to become an RTTF follower can register on the website to receive RTTF update notifications. RTTF is currently in the process of finalising its "Followers Registration System" and establishing a mechanism to maintain and update its followers. RTTF followers can be any members of the public with private or business interests in the performance of roads in their area.

5. **Bulk SMS Messaging**. This system is already available, and is used to send important messages to members of the public and especially RTTF followers. Not everyone has internet access, and therefore developing a text-based engagement tool is necessary to allow all users to receive updates. This system allows users in remote areas with poor internet access to stay in touch with RTTF. SMS messages are used to inform followers when important postings have been made on the website and

to issue other notifications. All mobile phones can receive SMS messages, even where network coverage is poor.

6. **RTTF Mobile App.** This is currently in development. The mobile app is planned as a simple mobile phone tool to facilitate public monitoring of roadworks. The mobile app will provide a simple interface to enable digital photographs to be automatically uploaded to the system. The app will offer choices to users to upload positive encouragement or negative complaints and photographs. Initially the app will geocode photos to verify that they are indeed linked to their stated location. Although the current PRIM focus is on NTB, this system is being developed so that it can eventually be applied nationally.

7. **Grievance Management System.** RTTF has established a system through which community inputs are recorded, registered, verified, clarified and, if possible, resolved. The Grievance Management System is an important mechanism for generating and encouraging increased community participation in closer scrutiny of road maintenance. Through this system anyone in the community can access the RTTF through SMS, email, telephone or even a visit to the RTTF office to register complaints or simply participate in RTTF activities. Any community member can now have his or her say in relation to road maintenance planning and implementation.

8. **Facebook.** In January 2016, the RTTF established a Facebook page "Forum Lalulintas Angkutan Jalan FLLAJ NTB". In the short time it has been operating it has attracted 371 members (as of 27 February 2016). The Facebook page is designed for individual Facebook users to discuss common interests or topics. However, it is a platform for discussion only; it does not officially represent any organisation. The RTTF Facebook Group has started to discuss issues relating to roads and traffic, including road safety and infrastructure provision. It is also used as a platform to get messages out to the general public about the existence and role of the RTTF.

9. **WhatsApp Group.** WhatsApp is used to coordinate the activities of a number of PRIM working groups. The first PRIM WhatsApp group, "PRIM NTB", was very successful in keeping group members up to date with PRIM developments and activities in real time. This success led to the establishment of a specific RTTF-based WhatsApp group "FLLAJ@NTB" which is being utilised successfully to keep RTTF members informed of issues and activities on a daily basis. Members can upload information in the form of photos, text, and video through the WhatsApp interface, and this is shared immediately with all group members. Group members are already using WhatsApp to draw attention to trouble spots on the road network such as flooded carriageways, so it is already operating as a useful safety alert tool. WhatsApp groups will also be formed for each Balai Pemeliharaan Jalan (the regional arms of the Department of Public Works across NTB) to coordinate and monitor the performance of public sector local road maintenance teams (*swakelola*).

10. **Provincial Roads Management System (PRMS)**. The centerpiece of the PRIM pilot project is a new management system, PRMS, tailored and customised specifically for the management of local roads. The system assists the local road authority (sub dinas Bina Marga) in making logical decisions about road maintenance priorities based upon an assessment of traffic levels and road condition. This replaces the previous ad hoc method of road maintenance planning which was subject to political influence and based upon poor information. PRMS outputs the first draft of the annual provincial roads maintenance program, which is then made available to the RTTF which has a role in commenting on and approving the final roadworks program.

The combination of these 10 RTTF engagement initiatives provides a wide range of possibilities for accessing information for any member of the public regardless of location or economic status. The minimum basic tool required to participate is a simple mobile phone. Broad-based engagement with the RTTF is essential to encourage greater public scrutiny of roads maintenance planning and implementation, and eventually to influence road maintenance performance. There were significant advances in participation levels during late 2015 and early 2016.

RTTF members together with IndII will manage several further activities in 2016 to increase awareness about RTTF. Activities will include radio talk shows involving RTTF members, and news stories in the local media. Billboards with RTTF contact information will be erected in five strategic locations such as ferry ports around NTB. Members of RTTF will run a community outreach campaign to engage communities in more remote locations (Community Advocacy for Road Safety Campaign and Road User Training). Basic information on the RTTF will also be included in publicly available documentation related to road maintenance works.

What's Next for NTB's RTTF

The RTTF is a relatively new initiative that was established nationwide between 2009 and 2011, but until now there has been very little useful RTTF activity across Indonesia, with limited public participation. NTB is now leading the way in introducing significant reforms and improvements to the RTTF process, and we are already seeing the benefits of this new approach with increasing RTTF member motivation and commitment and much wider public engagement. As the initiatives described above become further established during 2016, greater community involvement is expected, and therefore increased public pressure to plan and deliver road maintenance more effectively. If NTB continues on its current improvement trajectory, its RTTF will soon be recognised as a model for others to follow across Indonesia. ■

Key points:

The Government of Indonesia (GoI) has made significant efforts to ensure public awareness and participation in development works through the introduction of Law no. 25/2004, which provides the right for members of the public to participate in the Planning and Development Consensus (known as *Musrenbang*). Partly to address the shortcomings of the Musrenbang process, GoI further strengthened public participation in the road sector through the introduction of Road Traffic and Transport Forums (RTTF), which were launched through Law no. 22/2009 and subsequent Government Regulation (PP) no. 37/2011. GoI's vision for RTTFs was that they would represent the entire spectrum of Indonesian society from grassroots to ministerial level. The membership of the RTTF should therefore comprise leaders/coaches, organisers, academics, business leaders and community members. One of the key intended roles of the RTTF is to strengthen public participation and monitoring to ensure that funds are allocated effectively to the most urgent road and traffic priorities including, where appropriate, routine road maintenance which is widely neglected across Indonesia.

The RTTF in NTB was established in 2010 but was virtually dormant until 2013 when it was included as a development component of the Provincial Roads Improvement and Maintenance Project (PRIM), a project funded under the Australian Government-supported Indonesia Infrastructure Initiative (IndII). In 2015, IndII supported a more action-oriented approach to enhance the operation of the RTTF. Several changes were introduced, such as revised Standard Operating Procedures, creation of an RTTF working group[5] and rearrangement of membership. During 2015, RTTF members participated in several activities related to inter-agency coordination on road transport and traffic issues, and held several meetings. A number of RTTF improvements are planned for 2016 to improve engagement with the wider community and therefore increase public scrutiny of roadworks and road maintenance performance. These initiatives primarily focus on improving access to information and the ability to engage. The various RTTF mechanisms and activities for public outreach are listed below:

- An established RTTF secretariat
- Improved coordination with Musrenbang
- RTTF website development
- RTTF network of followers
- Bulk SMS messaging
- RTTF mobile app
- Grievance Management System
- Facebook
- WhatsApp group
- Provincial Roads Management System (PRMS)

The combination of these 10 RTTF engagement initiatives provides a wide range of possibilities for accessing information for any member of the public regardless of location or economic status. The minimum basic tool required to participate is a simple mobile phone. Broad-based engagement with the RTTF is essential to encourage greater public scrutiny of roads maintenance planning and implementation, and eventually to influence road maintenance performance.

NOTES

1. World Bank (2004). World Development Report: Making Services Work for Poor People. Washington DC: World Bank.
2. Apart from the obvious difficulties of getting 49 members all together in one place at the same time, there was also the challenge of working with members who were almost all government officials with busy agendas. Between 2013 and 2015 the RTTF was able to arrange only two meetings.
3. The working group consists of 12 active members including the Chairman, based on Governor of Nusa Tenggara Barat Decree No. 552.1.1 of 2015.
4. These further changes include a membership overhaul with 50 percent of RTTF members drawn from public institutions in NTB and 50 percent from the private sector/civil society.
5. The working group consists of 12 active members including the Chairman, based on Governor of Nusa Tenggara Barat Decree No. 552.1.1 of 2015.

About the author:

Steven Schmidt is the current PRIM Transition Manager based in NTB. He is a generalist Capacity Building and Human Development consultant with more than 20 years of extensive experience working in Indonesia on capacity building activities including stakeholder engagement, community driven infrastructure, rural roads development and roads management information systems. During his time in Indonesia, Steven has completed both research and development assignments for several Indonesian agencies and private sector organisations including Ministry of Education and Culture, Ministry of Underdeveloped Regions, Ministry of Public Works and Housing, Ministry of Agriculture, Ministry of Home Affairs, Ministry of Forestry and private organisations such as Newmont Mining. He has also held strategic and consulting positions on projects funded by donors including the World Bank, ADB, JBIC, JICA, Australian Aid, DFAT, UN organisations and the Millennium Challenge Corporation.

Improving Indonesia's National Road Assets Maintenance Outcomes

Indonesia's national road system suffers from poor maintenance despite an adequate annual maintenance expenditure level of Rp 20 trillion[1] for the 47,000 km network. Two recent initiatives by the Directorate General of Highways (DGH) and IndII respectively: Long Section Maintenance Contracts (LSM) and the introduction of a new Road Asset Management System (RAMS) will significantly improve Indonesia's national roads maintenance outcomes. • Edward (Ted) James

Improving road performance across Indonesia is essential if the Government's latest targets for economic growth are to be met. Upgrading the performance of existing roads is an important part of that task.

Performance-Based Maintenance Contracts or PBMC (see Box 1) have become a popular means to privatise road rehabilitation and transfer risk to the contractor. In a PBMC, the maintenance treatment choices are chosen by the contractor. However, improvement of the design elements may be problematic if left to the contractor's discretion. Pilot contracts in Indonesia have highlighted significant issues related to the PBMC contract form, not least of which is that design elements other than the pavement structure tend to be overlooked. Much of the national road system needs modernisation: elements such as design speed, widening, drainage, walkways, shoulders, property access, junctions and side friction often need to be addressed in parallel with major pavement rehabilitation. The award-winning Eastern Indonesia Road Improvement Project (EINRIP) provided design element improvements successfully through a conventional contract mechanism[2].

Box 1: What is a PBMC Contract

The ultimate privatised delivery model for road maintenance is often considered to be the Performance-Based Maintenance Contract. The Contractor is responsible for developing and delivering a road maintenance strategy over a large section of the road network covering both major maintenance and routine maintenance works. Reimbursement through regular lump sum payments is subject to adjustments in accordance with performance against defined performance indicators (KPIs). The KPIs are designed to ensure the contractor achieves the outcomes required by the owner and road users For example, these may include: ride quality, emergency response time, lane availability, condition of safety features (lines, markings, lighting, etc.), landscape condition, and remaining life. PBMCs have longer contract periods, typically 10 years, to encourage contractor engagement in the maintenance process, and to drive value for money of asset management. Treatment design is the contractor's responsibility.

Trial projects in Indonesia have demonstrated difficulties associated with this contract type including:

- The highly variable condition of the existing road network transfers unpredictable risk to the contractor.
- Current regulations prohibit price escalation for lump sum contracts, clearly an unacceptable limitation for a 10-year period contract.
- A lack of understanding within contracting organisations of the use of asset management systems to develop maintenance programs.
- Adoption of overly conservative pavement reconstruction designs to reduce risk and contract period maintenance costs, but which increase the owner's costs.
- Failure to hold contractors to account for unsatisfactory performance outcomes, thus negating the benefits of performance-based payments.

Increasing Pavement Design Life

Poor quality design and construction, ineffective maintenance, climatic influences, poor drainage, and truck overloading all contribute to rapid deterioration of Indonesia's road pavements. The first step to break this cycle has been to introduce longer pavement design lives.

The design life of a pavement refers to the length of time a total road pavement structure can withstand traffic loading before failure. Before an asphalt pavement has reached the end of its useful design life, the exposed surface will suffer deterioration and require an overlay. This period of surface deterioration to the point of requiring an overlay is referred to as the asphalt surfacing life. It is an important factor in pavement maintenance strategies.

From the 1980s until recently, a 10-year design life strategy was used for national roads across Indonesia for the design of new pavements. A 20-year design life for flexible asphaltic pavement and 40-year design life for rigid concrete pavement was introduced in 2013[3] in line with international practice.

The 10-year design life strategy in place prior to 2013, typically resulted in an asphalt surfacing life of around 5 years[4]. Temperate climate countries generally achieve surfacing lives of 12 - 15 years and 20 years or more for light traffic[5]. Up to 30-year asphalt surfacing life is possible on rigid concrete pavement[6] bases in temperate climate countries.

Indonesia's tropical climate and heavily overloaded commercial vehicles demand more frequent treatments. An asphalt surfacing life of 8 - 10 years generally and 14 - 15 years for light traffic is achievable[7] in Indonesia. The change in pavement design standards will result in much longer pavement intervention cycles (both structural and surface interventions) and, if comprehensively implemented, will yield significant savings.

Introducing the Long Segment Maintenance Contract

DGH introduced Long Segment Maintenance Contracts (LSM) in 2015 as a means to improve maintenance standards and to replace the direct labour based *swakelola*[8]. approach used previously. These contracts include the outcome compensation element that is fundamental to the PBMC approach but are of shorter duration. Some of the difficulties associated with the PBMC contract form are therefore avoided.

Beginning in 2017, it is expected that LSM contracts will be extended from the current one year to three years' duration and will cover the entire national network. LSM contracts are intended to be about 200 km in length.

Box 2: Controlling Overload - Another Pavement Deterioration Priority

Truck overloading is a significant contributor to early pavement deterioration. Maximum truck axle weights in Indonesia are controlled by the Minister of Transportation Decree no. 74/1990 Article 9. Overloading of 50 percent or more relative to legal loads is commonplace. That level of overload conservatively increases the rate of asphalt pavement deterioration by a factor of four. The latest 2013 pavement design standards require consideration of actual axle weights derived from surveys, rather than legal loading, as input to the pavement design. DGH has committed to achieving commercial vehicle overload control by 2020, although the strategy to achieve this is not yet defined.

The contractor is required to undertake all necessary routine and major maintenance. The major maintenance works, which typically consist of sections of pavement reconstruction, resurfacing or widening, together with needed design element improvements, are specified by the employer in the contract.

One of the difficulties in switching routine maintenance delivery to the private sector over a short period of time is the lack of capacity in the road contracting sector to deal with this new workload. To assist contractors to take over routine maintenance duties, the LSM has initially been designed to reduce risk and financial exposure for contractors by:

- Limiting the contract term to one to three years.
- Major treatments and improvement works defined by DGH.
- Adopting a low-risk pricing structure with a combination of lump sum with KPI adjusted payments for routine maintenance (similar to PBMC) and a schedule of rates based payments for the major maintenance works.

It is critically important that LSM and PBMC treatments and improvement works are well designed. This may not have been achieved for LSMs effected in 2016 due to the limited time available for preparation and procurement.

DGH is considering replacing LSMs with PBMCs once the network is stable. The question of how long it will take to stabilise the network under an LSM maintenance regime will therefore be considered.

Road Asset Management Systems

IndII has developed a bespoke Road Asset Management System (RAMS) in association with software developer, Lonrix. This system, which is built on the JunoViewer Web framework (see Figure 1), is designed to identify optimal regional (Balai) network

level maintenance treatment strategies. A project level module is also planned. RAMS differs from many other asset management software including Integrated Road Management Systems (IRMS)in several ways, with two key differentiators being that it is fully web-enabled, and it is fully integrated with a GPS-aware offline field inspection system.

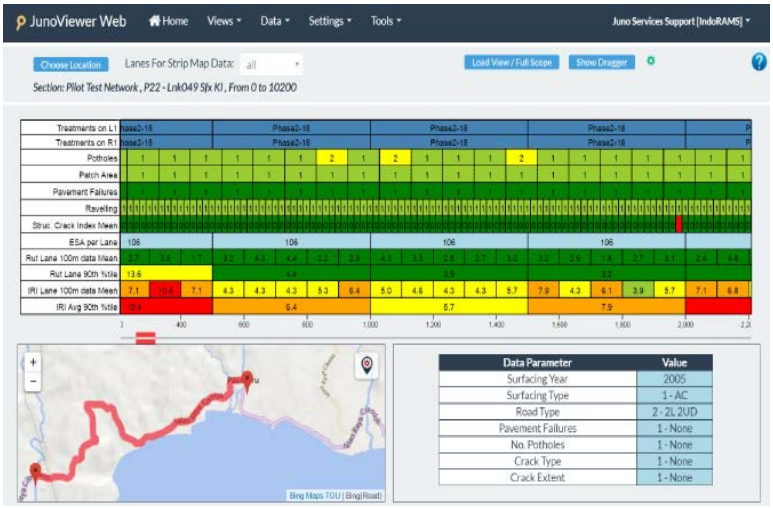
In RAMS, identification of a broad range of treatment strategies is achieved through use of surface condition and deflection analysis. RAMS analysis operates at two levels: network and project, thereby reducing the need for expensive deflection data at the network level. RAMS will introduce innovative and cost effective maintenance treatements such as structural mill and inlay (see main photo).

Many asset management systems use a deterioration modelling approach to identify pavement treatment strategies. Deterioration models must be calibrated for local conditions. In Indonesia, high remaining life variability increases the difficulty of the calibration task. The DGH policy to collect asset condition data annually reduces the importance of accurate deterioration models as does the 3-year rolling works program and historical data review approach used by RAMS.

At network level, RAMS assists regional planning by providing project grouping, prioritisation, and constrained budget optimisation tools. At project level, including for long contract period Performance-Based Contracts, it will identify all treatments and their timing. A Windows Tablet based Field Inspection Tool (FIT) is used to validate treatments assigned by RAMS in the field, thereby ensuring that RAMS-generated treatments are optimal for field conditions.

Figure 1: RAMS Provides GPS Mapping and Retrieval of all Pavement Condition and Treatment Segments, Field Notes and Photos.

Courtesy of Junoviewer



Using RAMS as Input to Maintenance Contracts

It is important that the timing of major maintenance treatments be optimised from the owner's perspective. Major treatment design, when managed by PBMC contractors does not necessarily achieve this objective. Other highway agencies (Malaysia, New Zealand, and Australia in particular) now use a collaborative approach between the owner and the contractor to manage major treatment design and timing. RAMS can provide guidance for selection of the most cost effective treatment solutions and therefore provides a basis for assigning treatments to LSM and PBMC contracts. Several strategies are possible to optimise maintenance programs derived from RAMS:

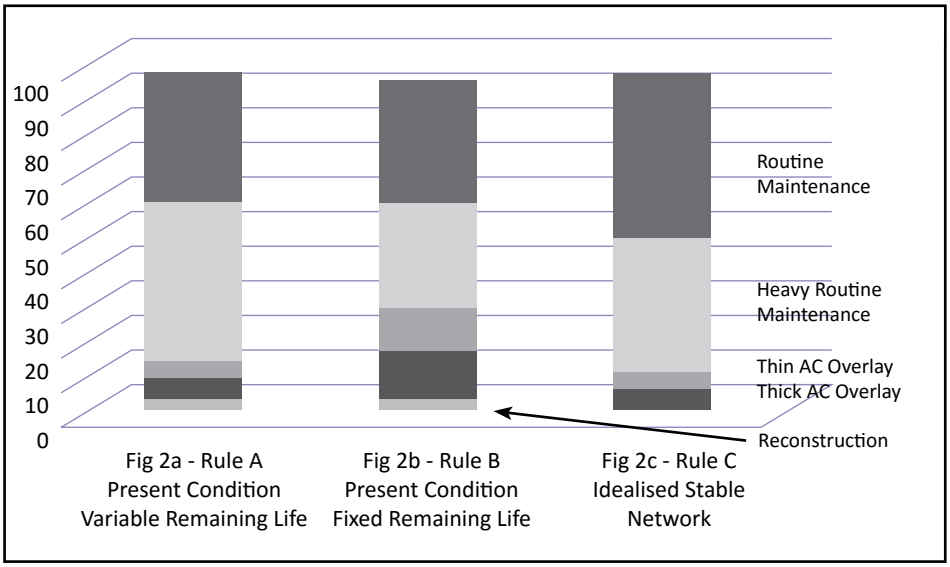


Figure 2: Treatments Distribution From RAMS Analysis for Central Java Rule A (Variable Life) Compared with Rule B (Fixed Life) and Rule C (an Idealised Steady State PBMC Distribution)

Table 1. Distribution of Remaining Lives, Variable Remaining Life Approach
Central Java RAMS Analysis, Year 3 of an LSM Contract (Rule A)

Major treatment within 3-year work cycle	Percentage lane length for each major treatment 3-year cycle	Remaining pavement surfacing life at end of LSM contract period	Remaining structural life of pavement	Risk level for next maintenance contract
Sections only receiving routine or heavy routine maintenance[9]	62%	0 – 7	1 – 7	high
Thin asphalt overlay	16.5%	6 – 10	5 – 10	low
Thick asphalt overlay	18.9%		12 – 15	low
Full reconstruction	3%		17 – 40	low

Rule A: Variable Remaining Life Approach

This strategy identifies timely and cost-effective maintenance treatments but permits variable remaining pavement life at the end of the contract period of between 1 - 15 years (Fig. 2a). This can be the most cost effective long term approach if used responsibly.

Rule B: Fixed Remaining Life Approach

This strategy requires a uniform remaining pavement life at the end of the LSM contract. Risk is reduced for a future PBMC as the contractor will be starting with a known pavement life (Fig. 2b). The strategy clearly increases the cost of initial contracts.

A RAMS analysis for Central Java undertaken by Balai staff with IndII support, indicated an optimum distribution of needed treatments for each of the next three years when Rule A was applied (as indicated by Fig. 2a). Remaining lives would then be as indicated by Table 1. Had Rule B been adopted the treatment set would be as indicated by Fig. 2b. The cost of the Rule B treatment is 70 percent more than Rule A, and is therefore likely to exceed available funds. The question as to whether additional funds should be sought to adopt Rule B must be answered by a return on investment analysis. In general, Rule A minimises the owner's long term costs (17 percent less than Rule B over 10 years) while maintaining a stable network (which should be the ultimate goal) while Rule B minimises future performance-based contractors risk.

Table 1 indicates that it will likely require several LSM contract cycles using the minimum treatment approach (Rule A) to fully stabilise existing pavements. Fig. 2c shows a typical annual work plan for a stable network that is ideal for PBMCs. This illustrates the expected transition of treatment types over time if LSM maintenance contracts utilise RAMS treatment solutions. The proportion of major structural treatments will gradually reduce, eventually being replaced mainly by non-structural overlays.

Previous maintenance strategies in Indonesia have failed to produce this positive outcome. As this transition occurs, purely Performance-Based Maintenance Contracts may become more viable.

In the short term LSM contracts using RAMS designed treatments and a mixture of performance-based and schedule of rates payment mechanisms are expected to provide the most efficient method of asset maintenance delivery.

Conclusion

Introducing the shorter term one-year and then three-year LSMs will assist the private contracting sector to gradually build capacity. In time, well implemented cycles of LSM contracts may pave the way for the introduction of PBMCs through:

- Gradually bringing the network up to a stable condition with each section of road having a uniform defined pavement life, thus reducing risk for an incoming PBMC contractor - this could take six or more years of successive LSM contracts using the Rule A approach, or could be accelerated at additional cost, by adopting Rule B.
- Allowing time to make the necessary regulatory changes to introduce price escalation into 10-year contracts.
- Encouraging contractor access to RAMS to support optimum treatment decisions.
- Access to ongoing training in new pavement design standards throughout Indonesia's private and public sector.
- Educating contractors and supervisors on the strict link between KPI performance and payments on a smaller scale before applying the principles to larger PBMC contracts.
- Allowing contractors to build up equipment and human resources before committing to longer-term PBMC contracts.

The variable remaining life RAMS analysis approach with timely and cost-effective treatments (Rule A) minimises life cycle costs for DGH so it should be adopted for LSM contracts. ■

NOTES

1. RENSTRA 2015-2019.
2. FIDIC (English translation: International Federation of Consulting Engineers) supervised contracts.
3. Pavement Design Manual.
4. The former DGH periodic maintenance strategy.
5. Source Vicroads. Technical Bulletin 50, Guide to Surface Condition Rating.
6. Warringah expressway NSW Australia, RMS records.
7. For example the very heavily trafficked Lohbener to Jatibarang Pantura road built on soft soil, opened 2006 and overlaid 2015 and therefore it has a surfacing life of nine years.
8. Translation: directly-employed public sector maintenance teams.
9. Heavy Routine Maintenance includes the following treatment types defined by the DGH: routine maintenance condition and preservation.

Acknowledgement

Support from the Directorate General of Highways, Directorate of Preservation and Planning (particularly the Data Analysis and System Development [ADPS, *Analisa Data dan Pengembangan Sistem*] subdirectorate), Balai IV and V, Road Planning and Monitoring (P2JN, *Perencanaan dan Pengawasan Jalan*) and working unit (*satker*) staff for the valuable discussion, the provision of asset data, participation in joint field inspections and for trialing RAMS analysis, are gratefully acknowledged.

About the authors:

Edward (Ted) James is the Co-Team Leader of IndII's National Roads Delivery project. He was Design Team Leader and Team Leader respectively of the Australian Aid funded Eastern Indonesia Road Improvement Project (EINRIP) and the Technical and Financial Audit Project (TFAC) and the author of the Pavement Design Manual 2013. Ted is a Civil Engineer with 46 years of road sector experience spanning government, industry, contracting and consulting. His specialties include asphalt technology, Indonesian natural asphalt, pavement design, road asset management and design and construction quality management. Ted's association with Indonesia spans 30 years in the consulting and industry sectors.

Key points:

Long Section Maintenance (LSM), which contracts maintenance services to private contractors, were introduced in 2015 by DGH to address the underperformance of *swakelola* in the maintenance of national roads. From 2017, it is expected that LSM contracts will be extended to three years' duration from the current one-year format and will cover the entire national network.

IndII has also developed a bespoke Road Asset Management System (RAMS) in association with software developer Lonrix, designed to identify optimal regional network and project level maintenance treatment strategies. Identification of a broad range of treatment strategies is achieved through use of surface condition and deflection analysis. The system provides optimum treatment strategies for both LSM and PBMC.

There has been significant interest in introducing Performance-Based Maintenance Contracts (PBMC) to the national road network. Pilot projects have highlighted major associated risks both to the project owner and to contractors. There has also been interest to reduce PBMC contract risk by applying a fixed remaining life strategy to preceding contracts. Early RAMS data has shown that this strategy while effective, will increase DGH costs.

LSM contracts, coupled with the use of RAMS, offer an excellent transition solution from the current use of swakelola units. LSM contracts permit outcome-based incentive payment similar to PBMC contracts but with more manageable risk and more scope to incorporate fully designed improvement works.

Universal Coverage for Water by 2019: How Achievable and Sustainable Is It?

The Government of Indonesia has pledged to reach the universal coverage target of 100 percent access to safe water and sanitation by 2019. However, the question remains about how much investment is required and the capacity of relevant stakeholders to sustain it. • Jim Coucouvinis • Ai-Lien Tran-Cong

The Government of Indonesia (GoI) has adopted the universal coverage target of 100 percent access to safe water and sanitation as defined by WHO and UNDP. In this article we examine two issues; first, how much investment is required and how to provide it, and second, once that investment is made, are the local water companies (PDAMs) able to sustain the assets in operation.

Although GoI has responsibility for setting the policy and providing technical oversight of the water sector, local government (LG) is by law responsible for delivering water services to the public. The most recent revision of the Law on Regional Autonomy allows for concurrent funding of some LG functions where this is in the best interest of the public and where LG does not have the capacity to meet the investment needs on its own[1]. As we try to make sense of the investment requirements we will focus our attention on the PDAMs. These are owned by LGs, operate as corporate entities, are audited annually, and have data in the public domain.

Having set the policy objective of universal coverage, the Directorate General of Human Settlements (DGHS) has decided to meet this objective by providing piped water for 80 and 40 percent of the urban and rural population respectively. Non-piped safe sources will provide the balance of the urban and rural targets. Based on this, Table 1 describes the overall GoI target for piped water in urban and rural areas.

Table 1: Piped Water Coverage Data

	Households (millions)	
	Urban	Rural
Projected total number of households by 2019	34.2	32.5
Target households served by piped water in 2019	27.3	12.7
Existing households served by piped water[2]	9	6.1
Incremental households to be connected 2015–19	18.3	6.6

This article will focus on the requirement for piped water to urban households which is the responsibility of the PDAMs. From Table 1 we see that PDAMs need to increase their urban customer base from 9 to 27.3 million in the 2015–2019 period, which represents an additional 18.3 million connections. This requires approximately Rp 108 trillion of capital investment, or approximately A$ 12 billion. We shall see that the PDAMs and indeed LGs cannot do this on their own, so responsibility for financing the investment must be shared between levels of government, or else the date for achieving the target must be pushed further ahead.

Overview of Investment Requirements in the Water Sector

The first thing to be aware of is the scale of the water sector in Indonesia. PDAMs are one of the few local state-owned enterprises that make money, and they make large amounts of it. Using the data from State Finance and Development Supervisory Board (BPKP) audited reports, it can be seen that in 2013, 363 PDAMs received a total of Rp 11.3 trillion (A$ 1.2 billion) from the sale of water to 8.5 million customers. Although the PDAMs reported a net profit of only Rp 550 billion, they were able to apply significantly more funds for investment in new assets. From the same BPKP audited reports, 119 PDAMs which had complete data during the period 2009–2013 were focused on. This analysis showed that these 119 PDAMs invested Rp 3.7 trillion into new physical assets over that five-year period, resulting in an increase of connections from 1.9 million in 2009 to 2.6 million in 2013[3]. These 119 PDAMs depreciated existing fixed assets by Rp 1.6 trillion and used these funds to acquire new assets. We have not been able to calculate funds invested by the remaining 244 PDAMs but it is probable that they accounted for about 1.5 times the equivalent investment of the 119 PDAMs, say Rp 5.5 trillion. With the combined investment of PDAMs thus estimated at Rp 9.2 trillion it seems unlikely that the PDAMs will be able to contribute significantly to the Rp 108 trillion target required for universal coverage.

How Much Can PDAMs Invest by 2019?

In the analysis explained above, the funds for investment came exclusively from the PDAMs' sale of water. The only way PDAMs

can increase funds available for investment is to increase tariffs. We can reasonably estimate the increase of surplus funds available from a 10 percent increase in tariff using the same BPKP data. To do this we need to assume that costs of production would not rise because of a tariff increase, and that consumption would not fall significantly. Separate studies by the Australian Government-supported Indonesia Infrastructure Initiative (IndII) show that the demand for water is quite inelastic (Box 2), meaning that people will not reduce consumption (or only slightly so) for moderate price increases – so those assumptions would seem to be reasonable. Analysing the data shows that a modest 10 percent increase in the price of water sold will almost double the surplus of the PDAM. However since the bulk of the funds for investment come from the depreciation provision, the total increase in funds available for investment will only increase by approximately 20 percent.

Box 1: Average Unit Cost of a Household Connection

This analysis determines an average unit cost for an additional connection as Rp 6 million, which correlates closely with the planning figure used by the Directorate General of Human Settlements (DGHS) in the National Medium-Term Development Plan (RPJMN) projections, and the figure used by IndII to design the Phase1 Water Hibah. It also corresponds to the figure derived from the review of the implementation of the IndII Phase1 Water Hibah, Activity W267.05[4].

Importantly also, in the five-year period 2015–19, the PDAMs will be starting with a larger customer base, 9 million in 2015 compared to 6.8 million in 2009. As that customer base grows it will have a greater impact on the investment capacity and ultimate achievement of new connections by the end of 2019. Therefore assuming a modest tariff increase and combining that with the larger customer base in 2015, we estimate that total available funds for investment by the PDAMs will be of the order of Rp 20 trillion during 2015–2019. However, this analysis has a significant caveat: we are assuming that all capital investment by the PDAMs results in net new assets. In other words we assume that in the short term the PDAMs do not lose any of their current productive assets. This is equivalent to assuming that the PDAMs provide sufficient maintenance expenditure to retain the operational integrity of existing assets before declaring surplus funds. We know this is not the case but we do not know by how much asset maintenance is underprovided. This is the subject of the second half of the article.

Nevertheless, the above analysis is accurate enough to demonstrate that even with a tariff increase, the surplus funds of the PDAMs are not enough to make a sizeable contribution to the investment requirements for universal coverage. Therefore more investment is required. There are only three possible sources: loans for PDAMs, equity or grant from LGs, and contributions from GoI. We will make only a passing reference to loans because this is a subject that would require a separate analysis[5].

Local Government Funds

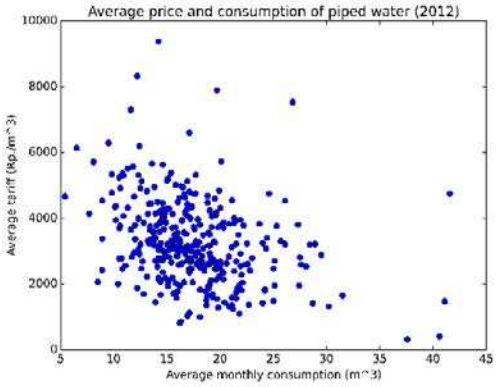
The size of the LG 2016 budget (APBD) is approximately Rp 940 trillion. If LGs pledged 1.25 percent of this amount as equity investment to the PDAMs it would add up to Rp 58 trillion over five years (to 2019). LGs could also spend that money in the form of infrastructure projects for the water sector and transfer the assets to the PDAM. Many LGs favour this option because it gives them more direct control over the spending process, but equity investment has the better governance outcomes in the long term. LGs, as a result of their exposure to the Water Hibah, are now more willing to provide direct equity or a grant to the PDAM, especially if the grant is conditional on output.

Government Interventions

GoI has pledged up to Rp 10 trillion during 2015–19 for the APBN-funded Water Hibah. This program uses the IndII-DFAT Water Hibah design which means that Rp 10 trillion will result in approximately 3.3 million connections. GoI can secure greater leverage of LG funds by modifying the design to require equity of Rp 3 million from LG for a grant of Rp 2 million per connection. This would add Rp 5 trillion to the Rp 10 trillion APBN funding and would finance up to 5 million connections[6]. We should remember that Rp 3 million equity to the PDAM per connection still requires on average a further Rp 3 million contribution from the PDAM to make one connection, so that the limiting criterion for the APBN Water Hibah may be the capacity of the PDAMs to absorb the hibah.

GoI has also sharply increased transfers to LGs through Specific Purpose Grants (DAK) and the new Village Grants program. These increases have not come at the cost of key ministry budgets, therefore the Ministry of Public Works and Housing still has a healthy budget for water and sanitation under DGHS. Altogether the consolidation of these funds can provide the investment needs of the sector. The question remains: is it sustainable? There is a nagging belief amongst GoI officials that existing water supply assets have been paid for more than once. Poor maintenance by PDAMs has led to rapid deterioration of assets and their untimely replacement, often by GoI. In the remaining part of this article, we will see that good asset management makes good economic sense. The prerequisite for that is ownership of the assets.

Box 2: Elasticity of Water Demand



Up to 70 percent of local water companies (PDAMs) sell water at a price that does not allow them to provide investment for new assets or maintaining existing assets.

Increasing the tariff should provide more revenue if we can be sure that customers do not decrease their consumption by a greater amount. How the demand for water changes with price is the elasticity of demand which is what we try to determine in this analysis.

To address this issue, we examine how much water people consume at different prices. We observe this variation in price and quantity of water consumed over different districts in Indonesia. In particular, we observe the average domestic consumption of water in m^3/month and average tariff in Rp/m^3 for each district. Other factors which determine how much water is consumed at a certain price are average income and whether the district is rural or urban. This data is drawn from the Water Supply System Development Support Agency (BPPSPAM) data on annual PDAM performance for 345 districts across Indonesia in 2012, combined with data from the Central Agency on Statistics (BPS) on district characteristics such as population and GDP. In this dataset, the average district has a population of 585,969 people with an average of 22,892 water connections in the district. The resulting estimate for elasticity of demand for water is -0.3, meaning that demand for water is highly inelastic with increases in price leading to only small decreases in the amount of water consumed (1 percent increase in the price of water leads to 0.3 percent reduction in quantity of water consumed).

As an example, take the average district in the dataset, which sells water at Rp 3,263/m^3 and where households consume on average 17m^3 of water a month. For this district, average revenue per household is Rp 55,470/month. Using the estimated elasticity, an increase in the water tariff of Rp 1,000/m^3 would result in a decrease of consumption to 15.5 m^3/month and an increase in total average revenue to Rp 66,000/month/household. These results are a first indication that we can rule out the possibility of tariff increases leading to large decreases in the quantity of water consumed and suggest that there is scope for tariff increases to increase revenues for PDAMs.

Table 2: Investment to Achieve Universal Coverage by 2019

Source	Annual Funds Available (trillion Rupiah)	Five-Year Contribution to Water Infrastructure	% of Annual Availability
APBD	940	58	1.25
DAK[7]	50	10	4
PDAM	20	18	90
APBN Hibah	2	10	100
DGHS	6.2	22	70
Total		**108**	

Asset Management at PDAMs – Overcoming Bad Habits

In the review of investment requirements for new infrastructure, we have assumed that $ 1 invested in infrastructure means a $ 1 increase in infrastructure assets. In effect that means the PDAMs are maintaining their existing assets to keep them close to their original condition. We assume that these costs have been provided, and that surplus funds are used to acquire new assets, not replace existing ones. In reality PDAM asset management varies greatly and the assumptions above are only practiced by a few PDAMs. This part of the paper examines the economic returns of planned asset management by applying a simple asset deterioration model to different asset management regimes.

Unfortunately many PDAMs, especially the smaller ones, only provide minimal maintenance and allow the assets to deteriorate over time. Underlying this practice is the reluctance of the PDAMs to take responsibility for management of assets that they do not own. There is little incentive for the PDAM to maintain assets which are owned by someone else, especially if the expectation from past experience is that the assets will be replaced when they fail.

Asset Management – Book Value Versus Productive Value

If we look at PDAM accounts we will see a depreciation expense for fixed assets. The PDAM is allowed to depreciate its assets

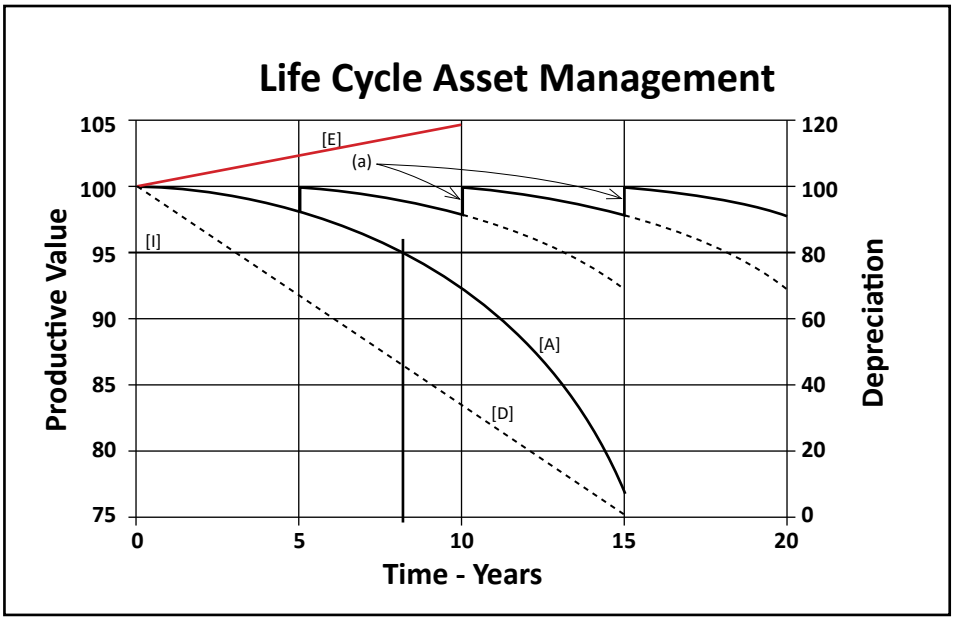


Figure 1: Simulation of Asset Deterioration and Productivity Loss

according to a schedule issued by the Ministry of Finance which gives guidelines for each class of asset[8]. The depreciation allowance is applied as a linear deduction of the book value of the asset over the specified nominal life of the asset. As a result the PDAM depreciates the aggregate book value of its fixed assets at approximately 6.7 percent per year which is equivalent to a life of 15 years. It is important to realise that depreciation is a tax deductible expense to defray the cost of the capital invested. It is not related to the actual loss of productive value of the asset. Asset management and asset maintenance is what determines the productive value of the assets. The objective of asset management is to maintain the productive capacity of assets.

Maintenance of Productive Assets

The productive capacity of a water system depends on the interaction of its many components. Small components are generally maintained on service schedules as recommended by the manufacturer. However, the maintenance regime of large components such as production units, clarifiers, filters, pipelines and the like requires monitoring of performance and planning. The impact of prudent asset management is best demonstrated by a simple asset management model used to simulate the deterioration and loss of productivity of assets. Figure 1 depicts the main elements of the model.

The deterioration of physical assets is not linear. The best model is one which predicts the future loss of productive value based on the current productivity. In other words, the rate of future deterioration depends on how far the asset has already degraded. This is depicted as curve 'A' which shows an initial slow loss of value but rapidly increasing as the asset gets less productive and more degraded. Note for comparison that the depreciation allowance which is a tax deductible expense is shown by line 'D'. The simple mathematical model for deterioration is:

$$Q_t = Q_0 - ke^{rt}$$

where 'Qt' is the productive value at time 't', and 'k' and 'r' are constants related to the particular asset. The important thing to take in is that assets lose productive value faster the longer they are not maintained. For example, pipelines accumulate deposits which affect flow capacity, slowly at first but with greater impact as time goes on and deposits accumulate. Filer media lose their optimum grading, slowly at first and more rapidly with time. Pump impellers get small cavitation imperfections at first which grow faster as they accumulate.

The asset manager's job is to monitor the performance of assets and apply maintenance actions at key times. The model shows such maintenance action being taken at 5, 10, and 15 years. This is akin to scheduled maintenance. For larger assets, the maintenance is more likely to be carried out when the productive life reaches a predetermined intervention limit. If that is set at 95 percent (line 'I'), the first maintenance action in the model occurs at eight years.

Economic Benefits of Asset Management

The model shows an intervention 'a' at the end of five years which recovers the working capacity of the asset. In practice if the asset has lost a nominal percent of its productive value it would require more than that nominal percent to restore it. Even then it would not be restored to its original new asset quality. This would mean that the asset would degrade slightly faster

Table 3: Comparison of Planned Maintenance Versus 'Do Nothing' and Refurbishment

#	Description	Start	Year 5	Year 10	Year 15
a	Value of asset	100			
b	Value if "do nothing"	100	97.9	92.2	76.7
c	Maintenance on schedule		2.1	2.1	2.1
d	Adjusted maintenance		3.1	3.1	3.1
e	Cumulative adjusted maintenance		3.1	6.2	9.3
f	Value after maintenance	100	100	100	100
g	Refurbishing after "do nothing"				23.3
h	Adjusted refurbishing after "do nothing"				28
i	Value of asset with escalation	100	109	119	130
j	Adjusted maintenance escalated		3.5	3.7	4.1
k	Cumulative adjusted (escalated) maintenance		3.5	7.2	11.3
l	Cost of refurbishing adjusted (escalated) "do nothing"				37

after the first intervention. Despite this we can use this asset model to demonstrate the effectiveness of asset maintenance by comparing the three interventions at 5, 10, and 15 years to the scenario of doing nothing for 15 years followed by refurbishing.

From Figure 1 and Table 3, we see that three interventions in the first 15 years total 6.3 units of the value of the asset and return the value of the asset to its original condition (row 'c' in Table 3). As stated earlier, it will usually cost more to recover lost value so this should be adjusted by a factor. In this case, the model applies a 50 percent loading to the cost of the intervention (row 'd').

Then the cost of asset maintenance of 9.3 units at pre-set intervention points compares favourably with a loss of 28 units from the "do nothing" option (rows 'e' and 'h'). The model allocates a lower adjustment factor to the refurbishing costs of 20 percent on the assumption that economies of scale apply (row 'h'). Note also the very rapid drop of value in the "do nothing" option. In fact on this model the value goes to zero by year 23.

So far we have left out the revaluation of the asset. Generally the PDAM has little incentive in revaluing its assets because revaluation is treated as income and incurs a tax. Instead, the PDAM gets maximum tax write-off advantage by depreciating the original book value of the asset. However, the model shows a revalued asset (Figure 1, line 'E') and Table 3 shows the impact of escalation which is the level of analysis necessary to have a prudent plan for management and maintenance of assets. Under the escalation scenario the maintenance intervention "costs" 11.3 units of the value of the asset, while the refurbishing in an escalated scenario after doing nothing "costs" 37 units.

Clearly, a planned asset management program pays economic dividends. Unfortunately it is only being applied in a few PDAMs and even in those PDAMs there is scope for greater economies through optimisation. Other PDAMs allow assets to deteriorate to a point requiring refurbishment or replacement. Often replacement comes from the provider and owner of the asset, GoI. Therefore, if investments are to be sustainable, the PDAM must cover the full cost of maintenance of existing assets and include that cost in its tariff structure. Otherwise, the net impact of new investments is reduced through loss of productivity of existing assets.

Capital Investment and Sustainability

We have seen that it is possible to provide sufficient funds to achieve universal coverage for water as defined by DGHS. However these funds cannot come from the PDAMs alone. GoI and the LGs have to contribute to the investment. Both GoI and LG have a responsibility to ensure that public funds so invested are not wasted and that the assets which have been put into public service remain productive under the proper care of the PDAMs. To ensure this, the PDAMs should own the assets that they operate. Once PDAMs own all of their assets, they are more likely to develop an asset management program and provide funds for the maintenance of their assets. LGs should therefore invest equity rather than build infrastructure for the PDAM, while GoI should transfer funds for local infrastructure and not build infrastructure that it owns but does not operate.

Significant progress has been achieved in the last five years to strengthen the foundation of regional government autonomy and accountability. It is ultimately the right path to achieving universal coverage not only for water but also for other public services. ■

NOTES

1. Law no. 23/2014 on Regional Autonomy.
2. Data from DGHS.
3. Australian Government-supported Indonesia Infrastructure Initiative (IndII) study under Activity W267.09 Mainstreaming Water and Sanitation Hibah.
4. IndII study W267.05 Implementation Review of Watsan Hibah Program.
5. More recently, GoI has initiated a write-off of all existing non-performing loans of PDAMs including principal, arrears on interest payments and penalties. At the same time GoI is pressing ahead with a revision of the previous Presidential Regulation (Perpres) no. 29/2009. PDAMs have also been paying down loans rather than taking on debt.
6. The present IndII design provides for a grant of Rp 2 million per connection for the first 1,000 connections, going up to Rp 3 million per connection after that. Greater leverage of LGs would require equity of Rp 3 million for a fixed grant of Rp 2 million per connection.
7. The DAK is applied to non-PDAM infrastructure – therefore not included in the total for Rp 108 trillion.
8. Law no. 36/2008 Taxation – clause 10.

About the authors:

Jim Coucouvinis is IndII's Technical Director for Water and Sanitation. Prior to his affiliation with IndII, Jim Coucouvinis was an independent consultant working with the World Bank and Australian Aid on water and wastewater sector programs. Previously, he was Vice President, Louis Berger Group for water and environmental services in South East Asia and the People's Republic of China. Before that he was Resident Manager of Montgomery Watson, Indonesia. In Australia, he worked for the Canberra Water and Power Authority on the design and construction of major sewerage works; and with the Australian Murray-Darling Basin Authority on the management of water quality in the Murray-Darling system and reservoirs. Jim holds a Master's of Engineering degree from the University of New South Wales, and Bachelor's degrees in Science and Civil Engineering from the University of Queensland.

Ai-Lien Tran-Cong's role at IndII involves the design and implementation of impact evaluation studies to measure the impact of IndII's programs. Her interests lie in development economics, particularly in the use of econometric methods to measure and understand the effects of policy interventions. Ai-Lien has a Masters of Applied Statistics and Bachelor of Economics (Hons) from the Australian National University.

Key points:

This article examines the investment required to meet the Directorate General of Human Settlements (DGHS) objective for universal coverage for water supply as it applies to local water companies (PDAMs). The policy is for 80 percent piped water coverage for urban centres by 2019.

The article shows the level of investment achievable by PDAMs and estimates the impact of tariff increases. It discusses analysis of data held by the Australian Government-supported Indonesia Infrastructure Initiative (IndII) to assess net investment by PDAMs for fixed assets, and examines evidence of moderately inelastic demand for water.

The article stresses the need for sustainability in the management of existing assets so that new investment results in a net increase of new assets and illustrates this with a simple asset management model which demonstrates the economic returns of asset management.

Finally, it concludes that there are better outcomes for asset management if the owner of the assets is the operator.

Outcomes:

Bandung Government Receives an Award for Improving Sanitation for Citizens

After successfully establishing 3,100 household sewerage connections, the Bandung Government, represented by Mayor M. Ridwan Kamil (Kang Emil) received the "Best Performing Sanitation Grant Program in 2015" from the Australian Government. The award was presented to the Mayor by Minister Counsellor for Economic, Infrastructure and Governance (Development Cooperation) Australian Embassy, Steven Barraclough, in Bandung on 15 March 2016. Apart from appreciation for the Bandung Government's achievement in ensuring adequate sanitation for its people, the award also acknowledged the excellent leadership of Kang Emil.

After receiving the award, Kang Emil expressed his gratitude. "Thanks to the Government of Australia for the grant and the knowledge transfer, and for the award to celebrate the success of the sanitation management in Bandung", he said.

The success of the program has encouraged the Local Government (LG) to implement an additional 2,500 sewerage connections this year.

More than 40 participants attended the awards ceremony, including representatives of the Directorate General of Human Settlements (DGHS), Ministry of Public Works and Housing; staff of LGs (LG Secretary Office, Local Planning Agency, Dinas PU); PDAMs' staff; private sector representatives; consultants of PDAM Bandung; and journalists from various media (television, print, and online).

Easier Accessibility for Disabled Users with Low Floor Buses

Jakarta Governor Basuki Tjahaja Purnama (also known as Ahok) and Head of DKI Jakarta Transport Agency, Andri Yansyah, inspected a new low-floor bus which features disabled-friendly facilities and conduct a trial on March 11, 2016. The new bus, built by United Tractors/Scania, incorporates IndII's specifications for disabled users that increase accessibility and safety as they travel in public buses.

Two members of IndII's Advocacy Working Group for Accessibility, Hernawati and Trian Airlangga, participated in the bus trial with the Governor. The purpose of their participation was to give first hand evaluation and recommendations on the accessibility, safety, and comfort level of the new bus, directly to the Governor and other transportation stakeholders. Both of them appreciated the facilities provided to ease their travel, including the vehicle floor-lowering system and built-in ramp.

Trian, who is visually impaired, pointed out the importance of setting up an audio-visual information board which gives announcements at each bus stop. "I hope the government will launch this type of bus, the sooner the better. Hopefully this new bus will not only be available in Jakarta but also in the Greater Jakarta area. It will certainly help people with disability. The amount of money I paid for travelling by taxi all these years could actually buy me a house; I would definitely travel with this bus when it's available," said Hernawati, a wheelchair user.

The specifications for the low-floor bus prototype have been submitted to the Goods and Services Procurement Agency for a further procurement process. Manufactures are also pursuing the registration process within the Ministry of Transport to ensure that the design has met road worthiness and applicable safety standards. Once the operator for the pilot route (on which the bus will operate) is selected, drivers and operator training will be conducted not only to familiarise them with the new design but also to provide better assistance to the disabled users.

Our Last Edition

Dear readers and partners,

This is the last edition of *Prakarsa*. When IndII started *Prakarsa* in January 2010, we realised that there were not many publications attempted to contribute to the policy dialogue and engage with partners on infrastructure concerns in Indonesia. Each edition features a key theme related to IndII's work in infrastructure policy, planning and delivery – be it local road development, new research in water and sanitation, gender and disability issues in infrastructure, and engagement with the private sector. *Prakarsa* was never intended to be a newsletter on IndII activities. Rather it was intended to provide a robust, yet accessible, discussion of the key infrastructure issues that Indonesia must now confront.

Although no further issues of *Prakarsa* will be published, we will continue to carry forward the vision of *Prakarsa* to develop an insightful publication that showcases the highlights of, lessons learned from, and next steps for Indonesia's infrastructure development as the Phase 2 of the IndII program ends in January 2017. We will inform our readers and partners through an e-blast once this final publication is ready by the end of the year. If you have not registered on our mailing list or would like to inform others, please do so by sending an email to enquiries@indii.co.id

We would like to extend our sincere appreciation to readers and partners for supporting *Prakarsa* and providing valuable contributions to the journal. We value your time, insights, and efforts which enabled *Prakarsa* to facilitate knowledge sharing and in-depth dialogues on priorities, realistic approaches, and workable solutions to strengthen Indonesia's infrastructure development. We hope that all the learning and sharing will continue among us.