TRAFFIC CONTROL ENFORCEMENT – THE PROBLEMS AND DILEMMA IN MAINTAINING POST-DISASTER ROAD INFRASTRUCTURE ASSETS, A CASE STUDY FROM ACEH, INDONESIA

Ezri HAYAT*, Dilanthi AMARATUNGA*, Richard HAIGH*

*Global Disaster Resilience Centre, University of Huddersfield, UK

ABSTRACT: In 2004, Aceh province was devastated by the earthquake and tsunami. Within the four-year reconstruction period between 2005 and 2009, more than 3600 km of roads were rehabilitated and reconstructed. The ownerships of the reconstructed road assets were transferred back to the Local Governments for the operational and maintenance needs. Hence, the responsibility to maintain most of the road sections are now held by the Local Governments.

This paper highlights the problems and dilemmas identified in enforcing the traffic loading control as part of the road maintenance efforts. The data was collected from the literature, documents and through semi-structured interviews conducted with 28 respondents from the case study districts in Aceh province. The finding suggest that conflicting institutional arrangement and policies, socioeconomic consideration and corruption have been the major constraints to effective traffic control enforcement efforts.

KEYWORDS: Road infrastructure, traffic control, post-disaster reconstruction

1 INTRODUCTION

The tsunami disaster in Aceh in 2004 caused damage to more than 2700 km of roads. Within the four year reconstruction period between 2005 and 2009, more than 3600 km of road were reconstructed by the national government and donor agencies working in the reconstruction of road infrastructure in Aceh (Sihombing, 2009).

The life-cycle of the road infrastructure generally consists of procurement, operation and maintenance, as well as renewal or disposal of assets (BSi, 2008). Prior to that, feasibility studies will need to be performed to justify and support the needs of the project. However, due to the post-disaster condition, a complete feasibility studies may not be performed and are replaced with the simplified ones. The local governments may not be actively involved in the procurement process, as most of the reconstruction projects were carried out by the national government and donor agencies, as in Aceh. The reconstructed assets were transferred back to the local governments for the operational, maintenance, and renewal (reconstruction) needs.

1.1 The important of road infrastructure

Many studies have highlighted that improved road infrastructure conditions may benefit the community in various ways. For instance, Crafts (2009) indicates that the reduced transport cost may create economic development opportunities due to increased market agglomeration, productivity and labour supply. The improvement of the road networks may lead to better trade, communication and economic and social growth as well as increased international competitiveness (Anapolsky, 2002). During the construction process, Bryan et al. (1997) highlight that the construction of the A55 road networks in the North Wales, UK, was estimated to have created more than 4,200 job opportunities with an annual income of more than £53 million.

From disaster management perspective, functioning road networks play an important role in all stages of disaster cycle; pre-disaster, disaster/ emergency, and post-disaster recovery. In the pre-disaster stage, which is the prevention and mitigation phase, well-planned road infrastructure construction may help avoid or minimise the impact of the disaster due to the application of preventive and adaptive design. In a disaster emergency condition, Grünewald et al. (2010) suggest that transport disruption into and out of the disaster affected area is a vital constraint to the provision of an efficient response to the emergency and post-disaster reconstruction activity. Not only would functioning road networks save lives through the provision of evacuation access, it also made speedy distribution of aid into the disaster affected areas possible.

Furthermore, in the post-disaster recovery stage, as

suggested by Chang et al. (2011), poor transport infrastructure condition may lead to increased transportation cost and construction lead-time, which consequently results in higher reconstruction cost and project delays.

1.2 Factors affecting the performance and deterioration of road pavement

Despite their initial quality, road pavement deteriorates over time, and the structural strengths would gradually decrease. Deteriorated road pavement eventually affect the ride quality, safety and increased the road user cost. When it reaches a certain level, maintenance intervention is required to restore its condition and accordingly extend the service life. As Robinson et al. (1998) emphasise, for a road network to be sustained over its designed life-cycle period, adequate maintenance must be allocated in accordance with its life-cycle. Martinez (2001) highlights that the most important consequences of road deterioration are:

- Exponential increase in vehicle operating cost and the resulting loss of efficiency in the road transportation system
- Increase in investment cost due to the earlier need for road reconstruction
- Increase in the number of accidents

The design life of road infrastructures might be intended to last between 10-40 years. Nevertheless, the design life can only be achieved if the required maintenance are provided timely and adequately. There are a number of factors affecting the pavement performance which determines the pavement design life and the needs for maintenance. These factors can be considered as being “internal” and “external," relative to the road structure.

1.2.1 The internal causes

The internal causes are those related to method and material properties, which determines the structural strength of the pavement. These include construction quality, material standard, design specification and proper craftsmanship (Kendrick, 2004), and the age of pavement.

Harral and Faiz (1988), argue that typically two-third of deterioration problems take place in the final third of the pavement design life. Accordingly, in the first two-third of the design life period, road pavement may survive even without maintenance, which is followed by surge needs of road maintenance. This is probably why the allocation of road maintenance is often delayed until it is too late to rectify the level of damages which have occurred.

1.2.2 External causes

In addition to the internal causes, the external causes include environmental factors, vehicle accidents, and traffic loading. The environmental factors are generally affected by the climatic condition, solar radiation, temperature, soil type, and terrain condition. Not only vehicle accidents may cost life and damages to the vehicle and the affected people, it may result in damages to the road infrastructure. When vehicles collide in an accident, the resulting impact may cause damage to the road surface and nearby facilities such as guard rail and kerbs.

Traffic loading is the main external factor affecting the performance of a pavement. Road pavements are designed to withstand pressure provided by the wheel or axle load, tyre pressure, the configuration of vehicle axles, and the number of axle loads to be carried during the design life. (ACMA, 1976). Furthermore, the horizontal force resulting from vehicle braking and turning may cause slippage cracking on the pavement.

In practice, traffic loading need to be controlled and monitored. The authority needs to ensure that the traffic passing through a particular road network does not exceed the intended load-bearing capacity. Accordingly, this paper highlights the problem and challenges faced by the local governments in enforcing the traffic loading control. The finding suggest that conflicting institutional arrangement and policies, socioeconomic consideration and corruption have been the major constraints to effective traffic control enforcement efforts.

2 METHODOLOGY

The study conducted semi-structured interviews with twenty-eight respondents from the stakeholders of road infrastructure at the national, provincial, and the local level. Three case study districts were selected; Aceh Besar, Aceh Jaya, and Aceh Barat Daya. The respondents are representatives of various organisation and institutions, including the public works, Public works, Consultant, Contractors, Planning agency, Disaster management agency, Donor organisation, Transport agency, and the Secretary of province. The basic profile and distribution of the interview respondents is presented in Table 1. Additionally, the literature and project documents were also consulted.

A combination of purposive sampling and snowballing methods were used to select the respondents. Each of the interviewees was briefed

about the objective of the study, and subscribed to the Participant Consent Form. The interviews were transcribed into NVivo 10, and were coded using multiple stages approach; open coding, axial coding, and selective coding. The data was analysed using content analysis technique with the aid of NVivo 10. For the purpose of findings triangulation, the result of the analysis were consulted with five experts in the post-disaster reconstruction and road infrastructure management areas, as well as with the literatures. The basic profile of the experts are presented in Table 1 – Basic Profile of the Respondents

Institution Types	Total
Public works	9
Consultant	4
Contractors	3
Planning agency	5
Disaster management agency	3
Donor organisation	2
Transport agency	1
Secretary of province	1
Total	28

Table 2).

Table 1 – Basic Profile of the Respondents

Institution Types	Total
Public works	9
Consultant	4
Contractors	3
Planning agency	5
Disaster management agency	3
Donor organisation	2
Transport agency	1
Secretary of province	1
Total	28

Table 2 – Profile of respondents for the Expert validation semi-structured interviews

Code	Professional Background
Val01	Academic
Val02	Consultant
Val03	Consultant
Val04	Academic
Val05	Consultant

3 DISCUSSIONS

3.1 Conflicting institutional arrangement and policies

The road maintenance problems in the case study districts were rooted in the poor road quality and the overloading traffic. In Indonesia, there are five government institutions involved in the management of road infrastructure and traffic.

Vertically, the distribution of road networks are separated and classified based on the ownership level; national, provincial, and local road. Accordingly, each road section is owned by one particular government level. Horizontally, however, the authority and responsibility of road and traffic management are distributed between various agencies.

As stipulated in law no 22/2009 (Law, 2009), the responsibility and authority related to the management of road infrastructure and traffic are distributed as the following

- Road matters are under the responsibility of the ministry responsible for the road sector
- Transportation and traffic infrastructure and facilities are under the responsibility of the ministry responsible for the transportation and traffic infrastructure and facilities
- Transportation and traffic Industrial development are under the responsibility of the ministry responsible for the industry
- Transportation and traffic technology development are under the responsibility of the ministry responsible for the development of technology
- Motor vehicle and driver registration and identification, law enforcement, operational management and traffic management and traffic education are under the responsibility of the police force.

Due to the frequently changing names of the ministries, the ministries responsible for the first four tasks are not explicitly named in the law. Nevertheless, at the national level these ministries are currently named as the ministry of public works and public housing, ministry of transportation, ministry of industry, and ministry of research, technology and higher education. In addition, due to the autonomous region system, the district governments may therefore establish their own agencies, which names may consequently differ between districts. Generally, the

road networks are constructed and maintained by the public works department, and the traffic is controlled and monitored by the department of transportation.

As these institutions are practically working on the same road networks, the horizontal distribution of authorities apparently result in conflicting and contradictory roles between them.

With regards to traffic control enforcement, as stipulated in Law no 22/2009 article 8, the public works is responsible, among others, for the planning, development and repair/ maintenance of the road infrastructure. Article 9 of the same law further describe that the transportation agency is responsible, among others, for investigating the breach in public transport licence, motor vehicle technical requirement, fitness and properness. Additionally, in controlling the vehicle axle load capacity, the transportation agency collaborates with the police force since the police force (article 12) is responsible, among others, for enforcing the law which includes breach of the traffic regulations.

Accordingly, disputes arise frequently between the transportation agency and the public works, with regards to the rapid deterioration of the road infrastructure.

For instance, the directorate general of road transportation explicitly stated in the decrees no SK.81/AJ.108/DRJD/2004 (Dirjenhubdat, 2004), article 5.1 that "the (rapid road deterioration) problems are not rooted in the failure of the operator to enforce the limit, but the existing roads are not built with adequate standard." On the other hand, the public work agency denied the accusation by stating that it was the failure of the transportation agency in monitoring and controlling the traffic, particularly the heavy-loaded vehicles, which caused the road to deteriorate rapidly. Other similar cases in Indonesia have also been reported, such as in Riau (Riau Terkini, 2013), Surabaya (Bappeda Jatim, 2011), and Jakarta (Dewi and Maris, 2014). These examples illustrate the conflicting and contradictory roles of the various government institutions involved in the road management.

In Aceh, dispute also occurred between the transportation agency and the public works. Respondent PM10 highlighted that the law no 22/2009 (Law, 2009), stipulates that the public works is responsible for the construction of road infrastructure, and the transportation agency is responsible for the management of road transportation and traffic. However, it does not explicitly stipulate which agency is responsible for the installation of the road marks and signs. This eventually led to confusion and overlapping tasks between the two agencies. As described by PM10, "Yes, there has been overlapping (roles) as I see it. So, recently there was a workshop in Batam, and this was questioned. Where and in what condition should Public Works do the road marks and signs, and vice versa, in what condition should the transportation agency do them? And this was still unsolved." PM10 further argued that the unfamiliarity of public works on road marks and road signs installation had led to public works installing poor-quality products.

The research identified that both institutions appeared to have reasonable claims and at the same time are responsible for the rapid deterioration of the road infrastructure. The study identified that whilst road infrastructure have been poorly constructed particularly due to the corruption, security threats, and poor supervision quality. On the contrary, the department of transportation failed to monitor and control the maximum axle loading capacity of the passing vehicles due to corruption, and the lack of weighing station facilities.

As there are conflict of authorities between the public works and the department of transportation, the public works agency as the agency which is responsible for the construction and the maintenance of the road networks, cannot be held accountable for the poor road condition, referring it as being a consequence of poor traffic loading control. Likewise, the department of the transportation cannot be held accountable for the poor road condition, referring it to the poor road construction quality.

A clear division of tasks and a framework to ensure the accountability of the agencies involved in the road maintenance is essential. Heggie (2003) emphasizes the importance of the institutional framework and highlights that strengthening the institutional framework is a prerequisite to overcome "the numerous technical, organisational and human resource constraints that hampered the introduction of better road maintenance policies."

3.2 Conflicting policies

In addition to the conflicting institutional arrangement between institutions involved in the road infrastructure and traffic management, it appears that there were problems arising from conflicting policies between the national and the regional institutions. The fist problem identified was with regard to the enforcement of the traffic loading control regulation. Particularly aimed at controlling the overloading traffic in Aceh Province, the ministry of

transportation issued an instruction to enforce the zero overload policy from January 2009 (MoT, 2008). This policy was later supported by the directorate general of land transportation, ministry of transportation, by issuing an instruction to enforce the zero overload tolerance limit to the passing traffic (Dirjenhubdat, 2012). These regulation were issued as part of the implementation and enforcement of law no 22/2009, article 307, which stipulates that no administrative penalty or loading excess charges can be enforced with regards to overloading vehicle. Instead, the overloading vehicle must be prosecuted with a penalty of imprisonment for a maximum period of 2 months or Rp 500,000 (£25) in fine.

However, the instructions, which primarily reemphasising the national law, were not respected in Aceh. As highlighted by PM10, "The instruction could not be implemented nationwide; all over Indonesia… because the reality is that each region allows a tolerance limit. A certain percent (of overloading capacity) will be tolerated. Each region has their own policies." – PM10. The case was covered by the local media (Waspada, 2009). The newspaper reported that the Head of the transportation agency of Aceh Province allowed a tolerance limit of up to 25% of the vehicle maximum loading capacity, which led to confusions between the weighing station operators.

3.3 Socioeconomic consideration

The west coast area of Aceh province, where the three case study districts are located, was mainly occupied by the palm tree agricultural and mining industries. Accordingly, heavy-loaded vehicles frequently and regularly pass through the public road networks, on their way to the storage or to the ports. These activities greatly contributes to the rapid deterioration of the road infrastructure in the region, particularly when the roads are not structurally designed for the heavy good vehicles. This condition was explained by CS12, "The roads which are designed for normal traffic are later on used for trucks transporting palm trees. The damaging factor is different, right? ... This means that on the one hand the government is faced with the dilemma that if it (traffic loading control) is enforced, they (business investment) may not come to the area. If they are allowed, the infrastructure will be damaged."

Respondent CS12's comment also suggest the dilemmatic position of the local governments with regards to enforcing the traffic loading control and the needs to improve the economic condition of the area. Respondent CS12 further added that in reality, the local governments tend to ignore the impacts of the caused by the overloading vehicles to the road infrastructure, and were more focused towards the direct and visible impacts the palm tree and mining industries provide to the districts through taxes and job creation. In fact, the development of the rural road networks were probably intended to provide access for these industries in the first place. As described by Donnges et al. (2007), the development of the rural road networks is vital to the development of the agricultural sector, which would lead to economic improvement of the area. Nevertheless, Donnges et al. (2007) add that the development of the rural road networks in the decentralized road management system need to be accompanied by the provision of basic minimum of fund for road maintenance and the adequate capacity to spend the fund effectively.

3.4 Traffic loading control facilities

Furthermore, the fact that the regional governments are more focused on the immediate impacts provided by the industries are reflected in the limited number of traffic loading control facilities available in the area. It was identified that the limited number of weighing station available to control the traffic was also found as a major constraint to effective traffic control in Aceh. After the tsunami, there were only two weighing stations functional in Aceh; one in Semadam, near the border with the North Sumatra province, and the second one was in Jontor, in the west coast area of Aceh (Dirjenhubdat, 2014). As these stations were located near the border of the north Sumatra province, the transportation agency could only control the interprovincial traffic which passed the route where the weighing stations were located. Accordingly, the overloading traffic moving within the province of Aceh was virtually untouched. To cope with the lack of overloading vehicle controlling facilities, the transportation agency was provided with portable weighing stations. However, most of the equipment was no longer working.

3.5 Corruption

Corruption is probably the root cause of most road maintenance problems in Indonesia. As reported by the Transparency International (2013), the global corruption perception index of Indonesia was 114 out of 117 countries surveyed. World Bank (2009) suggests that in the road sector, the transaction cost of the capital works can reach between 5% and 20% due to corruption. (Kenny, 2007) also argues that every dollar worth of stolen materials may lead to reduced returns to the project as much as $3.41

The corruption issue was also identified in the traffic loading control. As described by PM10, becoming an

operator of weighing stations had been one of the most favourite job positions in the transportation agency, due to its corruptibility, and was frequently offered to those nearer to their retirement as a retirement 'gift'. Shleifer and Vishny (1993) indicate that the practice of corruption spreads due to the competition between both the officials and the consumers. They further add that when officials compete to get a job through an 'auction' mechanism will assure that maximal bribes are collected.

A joint report between the World Bank and the BRR (World Bank and BRR, 2006) supports this findings as the report reveals that there are four forms of illegal payment truck drivers in Aceh had to pay; police and military post, weighing stations, convoy fees, and facilitation agencies. The police and military post and convoy fees are less relevant to the scope of this paper, as they are basically fees paid for transporting illegal materials. The weighing station and facilitations fees, on the other hand, are fees paid due to overloading capacity of the vehicles.

The report conclude that the weighing station fee have been the largest illegal charges for the truck drivers, as they need to pay as much as Rp 20,000 ($1.5) per overloaded ton goods. As expected, none of this charges income went to the government treasury (World Bank and BRR, 2006).

Similar to the weighing station fee, the facilitation agency are fees paid through mafia-like freight transporter organizations which provide discounted overload charges of for their members as they pass the weighing stations. A collusion between the organisations with the transportation agency personnel at the weighing stations had been arranged. Some organisations provide a fixed rate of between Rp 50,000 and Rp 70,000 per trip, regardless of the overloading capacity. Some others would provide a discount rate of Rp 10,000 per overloaded ton goods.

4 CONCLUSION.

The problems and dilemma faced by the local governments in enforcing traffic control and maintaining the road infrastructures have been presented in this paper. The problems resulting from the conflicting institutional arrangement and policies are argued to require political commitment of the stakeholders of the road sectors, by creating a platform to discuss and demonstrate the worthiness of investment made for the road maintenance activities. It would also need to be accompanied by the provision of technical capacity, tools, and procedure to produce effective road maintenance plan.

On the other hand, the need to accelerate the economic condition through the provision of access to the agricultural and mining industries, would have to consider the long-term impact to the road infrastructure, as the actual damage and cost to the road infrastructure may not be immediately visible. Nevertheless, the issue of corrupt practices in the traffic loading control is probably the root causes of the road maintenance problems and traffic loading control in the case study districts. The bribe given in the weighing stations and through the facilitation organisations have also been the largest illegal charges for the truck drivers, which resulted in higher transport cost and consequently more expensive prices of good for the consumers.

REFERENCES

ANAPOLSKY, S. 2002. Challenges of Road Infrastructure In Montenegro. *Montenegro Economic Trends*, 60-65.

BAPPEDA JATIM. 2011. *Memalukan, Dinas PU dan Dishub Saling Tuding Penyebab Jalan Rusak* [Online]. Available: http://bappeda.jatimprov.go.id/2011/05/31/memalukan-dinas-pu-dan-dishub-jatim-saling-tuding-penyebab-jalan-rusak/ [Accessed 17 May 2013].

BRYAN, J., HILL, S., MUNDAY, M. & ROBERTS, A. 1997. Road infrastructure and economic development in the periphery: the case of A55 improvements in North Wales. *Journal of Transport Geography,* 5, 227-237.

BSI 2008. PAS 55-2:2008 Asset Management Part 2: Guidelines for the application of PAS 55-1.

CHANG, Y., WILKINSON, S., POTANGAROA, R. & SEVILLE, E. 2011. Donor-driven resource procurement for post-disaster reconstruction: Constraints and actions. *Habitat International,* 35, 199-205.

CRAFTS, N. 2009. Transport Infrastructure Investment: Implications for Growth and Productivity. *Oxford Review of Economic Policy,* 25, 327-343.

DEWI, S. N. & MARIS, S. 2014. Dishub DKI Klaim Jalan Rusak Bukan Karena Truk Berat. *Viva News*, 19 January 2014.

DIRJENHUBDAT. 2012. *Pengawasan dan Pengendalian Muatan Lebih* [Supervision and Monitoring of Overloading Vehicles]. SE.01/AJ.108/DRJD/2012. TRANSPORTATION, D. G. O. R.

DIRJENHUBDAT. 2014. *Daftar Jembatan Timbang Nanggroe Aceh Darussalam* [Online]. Available: http://simlalin-hubdat.web.id/jemtim/data/detail/14 [Accessed November 3rd 2013].

DONNGES, C., EDMONDS, G. & JOHANNESSEN, B. 2007. Rural Road Maintenance - Sustaining the Benefits of Improved Access. ILO.

GRÜNEWALD, F., BINDER, A. & GEORGES, Y. 2010. *Inter Agency Real Time Evaluation in Haiti*. Global Public Policy Institute.

HARRAL, C. & FAIZ, A. 1988. Road Deterioration in Developing Countries - Causes and Remedies. The World Bank,.

HEGGIE, I. G. 2003. Commercializing management and financing of roads in developing and transition countries. *Transport Reviews,* 23**,** 139-160.

KENDRICK, P. S. 2004. *Roadwork: Theory And Practice*, Elsevier Butterworth-Heinemann.

KENNY, C. 2007. Infrastructure Governance And Corruption : Where Next ?, The World Bank.

LAW. 2009. *Lalu Lintas dan Angkutan Jalan* [Road Traffic and Transportation]. 22/2009.

MARTINEZ, A. J. T. 2001. Road maintenance policies in Sub-Saharan Africa: unsolved problems and acting strategies. *Transport Policy,* 8**,** 257-265.

MOT. 2008. *Kebijakan Penerapan Batas Muatan Angkutan Barang di Provinsi Aceh* [Enforcement of Freight Loading Capacity Limit in Aceh Province]. AJ.403/1/10 Phb-2008.

RIAU TERKINI. 2013. PU Salahkan Dinas Perhubungan Dumai Terkait Kerusakan Jalan HR Soebrantas. *Riau Terkini*, 26 January 2013.

ROBINSON, R., DANIELSON, U. & SNAITH, M. 1998. *Road maintenance management: concepts and systems*, Macmillan.

SHLEIFER, A. & VISHNY, R. W. 1993. Corruption. *Quarterly Journal of Economics,* 108**,** 599-617.

SIHOMBING, B. S. 2009. Infrastructure - Stimulating the Triggering Sector, BRR NAD -NIAS.

TRANSPARENCY INTERNATIONAL. 2013. *Corruption Perceptions Index 2013*. Transparency International.

WASPADA. 2009. *Kadishubkomintel Abaikan Surat Menhub* [Online]. Available: http://www.waspada.co.id/index.php?option=com_content&view=article&id=31794:kadishubkomintel-abaikan-surat-menhub-&catid=13&Itemid=29 [Accessed June 30th 2013].

WORLD BANK 2009. Deterring Corruption and Improving Governance in Road Construction and Maintenance. *TRANSPORT PAPERS,* TP-27.

WORLD BANK & BRR 2006. Trucking and Illegal Payments in Aceh. *In:* BANK, W. (ed.). World Bank.