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### Original Citation

Palliyaguru, R. S., Amaratunga, Dilanthi and Haigh, Richard (2008) Economic development perspectives of post-disaster infrastructure reconstruction: Post-tsunami reconstruction in Sri Lanka. In: CIB W89 International Conference on Building Education and research (BEAR), 11-15th February 2008, Sri Lanka. (Unpublished)

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# Economic development perspectives of post-disaster infrastructure reconstruction in Sri Lanka

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## Abstract

Sri Lanka was found to be a disaster prone country in the recent past. The impact is more severe when developing countries are faced to various natural or man-made disasters. Impact appears in many forms; loss of lives and property, economic impact, social impact etc. As a developing country, Sri Lanka is much more concerned with the country's economic development. Therefore, it is wise to look into post-disaster activities in development perspectives and integrate disaster risk reduction concerns into economic development activities. This paper reveals the importance of post-disaster infrastructure reconstruction in economic development. A comprehensive literature review was carried out regarding the role of infrastructure in disaster management, economic development together with the key indicators of economic development.

**Keywords:** Tsunami 2004, Disaster management, Post-disaster infrastructure reconstruction, Economic development.

## 1. Background

The whole world is prone to natural disasters. Developing countries are faced with various natural risks leading to disasters, which cause immense loss of life and property [1]. The Tsunami of 2004 is enough to substantiate this argument. Disasters, man-made or natural, aggravate inequality and hinder progress towards the 'development goals'. Many researches have concluded that disasters damage the entire economy of the country including physical and human resources when disasters predominantly exist in the developing countries [2 and 3]. An average of 354 natural disasters occurred a year in the period 1991 to 1999. From 2000 to 2004, this rose to an average of 728 a year. The total number of people affected each year has doubled over the last decade. However, the most noticeable thing is, most of the victims are from developing countries [2 and 4]. Of the world's ten most severe natural disasters in 2004, five

occurred in the Asia and Pacific Region, causing damage amounting to \$55 billion, about 70 percent of the total damage, estimated at \$80 billion [2].

Sri Lanka has experienced frequent natural hazards commonly caused by floods, cyclones, landslides, droughts and coastal erosion for generations with increasing losses to life and property in the past few decades [5]. Moreover, the tropical climate and heavy rainfalls, the climatically differentiated 'dry-zone', which subjects it to periods of drought while seasonal monsoons regularly bring about flash floods, river floods and storm surges in certain parts of low-lying river basins can also be seen. The Mahawansa' (Sri Lanka's ancient history chronicle dating from the Sixth Century) tells of a wall of water flooding the land 2,000 years ago. The undersea earthquake near the west coast of Northern Sumatra set off a series of other earthquakes, in December 2004, which led to a widespread disaster. The Tsunami in 2004, particularly in Sri Lanka, India, the Maldives, Indonesia and Thailand, also caused damage in Malaysia, Bangladesh, Somalia, the Seychelles and Kenya. The devastation caused by the tsunami in 2004, however, took Sri Lanka by surprise, warning that Sri Lanka is also vulnerable to low-frequency, high impact events causing extensive damage [5 and 6]. Sri Lanka faced one of the worst natural disasters with a large proportion of losses in housing and infrastructure. The destructive ocean waves killed more than 35,000 people and displaced nearly 2,500,000 people in Sri Lanka. The coastal infrastructure, namely roads, railways, power, telecommunications, water supplies and fishing ports were also significantly affected. The damage to its infrastructure is estimated to be over \$1.7 billion [7]. As more infrastructure, is developed in rural areas, to combat poverty, and as the frequency and severity of natural disasters increase, the impact on the poor will become more critical [8].

## **2. Enormity of impact on infrastructure due to recent natural disasters**

Natural catastrophes destroy essential rural infrastructure. According to Munich Re 1998, Asia, which accounts for half the number of the natural catastrophes in the world and 70% of all floods, the average annual costs of floods over the past decade is approximately 15 billion USD [8 and 2]. Much of the damage inflicted by floods is to the infrastructure [8 and 2]. By some estimates, infrastructure loss accounts for 65% of all flood loss [8 and 2]. For Asia, this would account for an average annual infrastructure loss of approximately 12 billion USD for the past decade [8].

If the size of the loss to infrastructure is compared to the worldwide lending activity of the World Bank, approximately 50% of the World Bank's total lending is equivalent to the total cost of damage to infrastructure due to natural disasters in the Asian context [8 and 2]. Over the past decade, the Bank has annually loaned approximately 25 billion USD [8]. The annual investment needed for post-disaster reconstruction of infrastructure and economic recovery in developing countries of the Asia and Pacific region would require an estimated \$15 billion, for a total infrastructure-financing requirement estimated at \$55 billion per year [2].

### 3. Disaster management and infrastructure reconstruction

#### 3.1 What does infrastructure mean?

The term ‘infrastructure’ has different meanings in different fields. Infrastructure is generally structural elements that provide the framework supporting an entire structure. Infrastructure appears in many forms as economic infrastructure, social infrastructure, IT infrastructure etc. Economically infrastructure could be seen to be the structural elements of an economy, which allow for production of goods and services without themselves being part of the production process.

Economic infrastructure primarily consists of transportation (road, railways and bridges), energy and utilities (electricity, gas), water supply and sanitation services, telecommunication systems, health services and essential government services. The economic infrastructure system is composed of manifold elements. These are organised in hierarchical levels.

- Level of sectors (Ex: Energy, Information & Telecommunication, Transportation)
- Level of infrastructures (Ex: In Transportation: Road, Railway, Waterway, Postal)
- Level of components (Ex: In Railway Tracks, Stations, Control Centres, Vehicles)

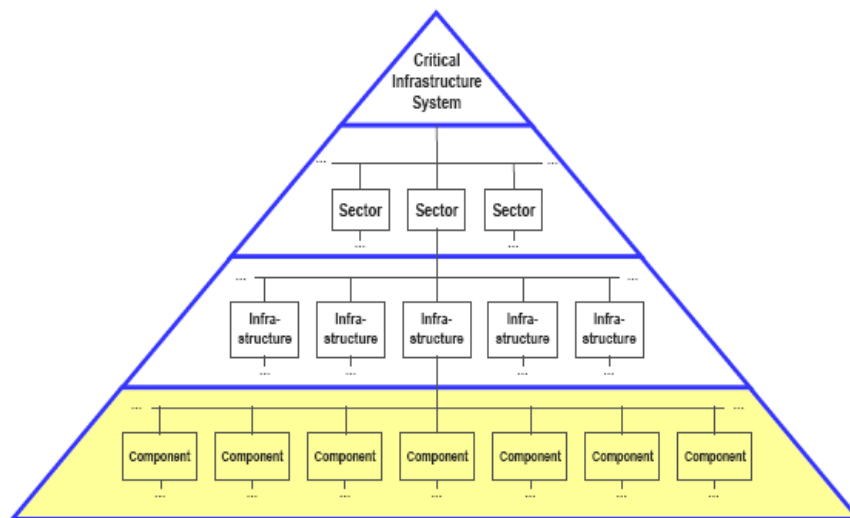


Figure 1: Critical Infrastructure System [Source: 9]

Social infrastructure consists of health, education, safety nets etc. However, in other applications, infrastructure may refer to information technology, informal and formal channels of communication, software development tools etc. The term “critical infrastructure” has been widely adopted to distinguish those infrastructure elements that, if significantly damaged or destroyed, would cause serious disruption to the dependent system or organisation. Natural

disaster damage leading to the loss of certain transportation routes in a city (for example, bridges crossing a river), could make it impossible for people to evacuate and for emergency services to operate; these routes would be deemed critical infrastructure. Critical infrastructure is broadly defined to include the systems, facilities and networks, which support the health, safety and economic well-being of the population, during and after natural disasters [2].

This paper deals with the economic infrastructure, which comes to the society as an output of the 'construction industry'. The infrastructure of a country is part and parcel of the construction industry. Morton (2002) stated that on the whole, the built environment is designed, built and maintained by the construction industry, which includes civil engineering and infrastructure work such as roads, bridges and railways [10]. Construction is the one industry most likely to be beneficially impacted, at least in terms of increased activity, by an actual disaster [11]. Natural hazards potentially cause severe damage to buildings and infrastructure, resulting in considerable post-disaster construction. On the other hand some argue that in the longer term a major natural disaster can even generate a construction-led economic boom, for example Albala-Bertrand, 1993 [11].

### **3.2 What happens if infrastructure fails during disasters or if post-disaster infrastructure reconstruction process fails?**

Infrastructure is critical to a safe and a resilient economy. Natural or even man made disasters have a profound impact on the quality of life through various means, such as the destruction of aspects of the built environment [2]. Therefore, a sudden disruption of infrastructure affects the whole humanity. Creation of significant negative consequences to infrastructure together with other built environment facilities due to disasters would lead to pathetic economic consequences and depauperated quality of life often for long periods of time [12]. There is a more limited sense of their broader macroeconomic significance or the problems they could pose for longer-term development [13]. This is partly because most assessments of the economic impacts of disasters have concentrated on the most easily measured direct losses and the practical difficulties of isolating and measuring the indirect and secondary impacts that result from the transmissions of a disaster shock through the economy [13]. Thus, when events such as natural disasters destroy infrastructure, their opportunity cost becomes painfully evident [2].

'Ignorance of infrastructure' affects the society in many ways. It exacerbates civil imperfections, demoralizes staff working in remote locations, mainly in vulnerable areas and thus further delays the process of state rebuilding, and undermines the effectiveness of the rebuilding process [14]. It also leads to poverty, hunger and infectious diseases [14]. Moreover, infrastructure failures can act on gender and other aspects of identity and exaggerate powerlessness, vulnerability and disability [14]. Admittedly, due to the strong dependency of society on goods and services provided by critical infrastructure, their failure may lead to disaster [9]. Poorly planned development can turn a phenomenon into a human and economic disaster. Infrastructure failures in the post-disaster period can become the fundamental reason for another series of devastating effects followed by other natural disasters. Whilst infrastructure

can increase productivity, reduce the cost of production, increase trade and reduce poverty, it can create major disasters or can enhance the effects of one in a completely negative manner.

### **3.3 Role of the construction industry in managing disasters: Special emphasis on infrastructure**

Ofori [3] has documented the importance of develop the construction industries of the poorer nations in order to equip them to manage disasters. Although the developed countries are considered to be well prepared to tackle disasters there are instances where even developed countries lacks the proactive measures to prevent them. For example, Boshier et al. [10] report that the construction industry in the UK does not appear to play a sufficiently integrated role in emergency management.

At the disaster reduction/mitigation phase, where the population returns to pre-disaster standards of living after the event, people recognise the need for certain measures, which may be needed to make the impact less severe during the next similar event. Investment in the infrastructure for disaster management is essential in this context as it can result in reduced loss of lives. The physical infrastructure can be developed to withstand disasters, reduce and even prevent damage from natural disasters [2]. For instance, drinking water systems can be very effective for flood management [2]. Infrastructure reconstruction programmes should however aim to change the vulnerable conditions for the development of the country. Reconstructing the infrastructure is often essential to sustain recovery after major disasters [14]. Moreover, critical infrastructure reduces the risk of failure and thus contributes to disaster reduction and prevention [9]. Investment in the infrastructure for disaster management is essential in this context. At the same time, it is necessary to explore the management of infrastructure systems and an association between natural disaster reduction/mitigation with infrastructure management and development.

As Asia and Pacific regional cooperation in developing the physical infrastructure for disaster management has so far been limited, the ‘United Nations Economic and Social Commission for Asia and the Pacific’ has recently declared their priority concerns on rebuilding infrastructure and investing in infrastructure for disaster prevention and preparedness [2]. The increased frequency of major disasters, such as the December 2004 tsunami and earthquakes in Gujarat, India; Bam, Islamic Republic of Iran has underlined the importance of technical cooperation in the region for developing better physical infrastructures [2].

It is claimed that the developing countries are less able to face the impacts of disasters and so it is imperative to develop the construction industries of the poorer nations in order to equip them to manage disasters [3]. The prevailing demand for development of infrastructure of the poorer nations is apparent as infrastructure can facilitate the day-to-day activities, reduce the losses resulting from disasters and facilitate post-disaster recovery [2]. Every nation must ensure that damage to the critical infrastructure is kept to a minimum during disasters through the necessary mitigatory measures. If mitigation activities before disasters aim, in particular, at protecting these critical infrastructures, it would result in effective and efficient relief and reconstruction activities in post-disaster phases [2]. As a nation, Sri Lanka should demonstrate a firm resolve in

protecting infrastructures from further disasters, compared to what was significantly affected by the Tsunami 2004. The basic community infrastructure must be secured as much as possible and immediate approaches to such infrastructure and smooth recovery and reconstruction of them are very important in assisting humans on an emergency basis and immediate fulfilling of sanitation requirements of the community. Without doubt, major disasters require effective planning and programming for post disaster reconstruction, including rehabilitating physiologic, social and economic infrastructures, which are badly mutilated as a consequence of these disasters [1].

When the Tsunami struck the Sri Lankan coastal belt, there were no early warning systems to communicate the impending event to government or to coastal communities [15]. Physical infrastructures including early warning systems can make a major contribution both to preparedness for disasters and recovery from them [2]. Disaster planning and preparedness, is an important phase in the disaster management cycle. Construction and operation of signaling and communication systems like earthquake observation systems, meteorological observation systems and early warning systems, facilitation of additional water supplies and sanitation systems are a few activities coming under this phase. On the other hand, necessary preparedness measures are required to protect the infrastructure from coming disasters and also the infrastructure has a key role to play in saving people and other property at this phase.

After a disaster takes place, the most challengeable issue is to restore the society back to its original status or moreover restore it to a better state. Muzaffer and Faruk [1] have clearly identified one of the serious challenges confronting the developing countries is to provide sustainability of interventions undertaken as part of post disaster reconstruction. Sufficient examples have been identified to show that in many cases, reconstruction serves to reinforce and sometimes even increase the vulnerability of rural and urban areas [1], for example, in Turkey in the case of reconstruction following 1999 Marmara earthquake [1]. According to Anand [14], in post-conflict contexts, the infrastructure planners need to cope with the problem of the 'missing baseline'. This is basically applicable to natural post-disaster reconstruction process. The process needs to address not only the infrastructure that may have been damaged in the disaster but also the infrastructure that never existed or that has been damaged due to lack of maintenance over years. Within each phase of the disaster-management cycle, short-range goals can simultaneously contribute to long-range ones, such as strengthening people's capacity to withstand disasters. For example, the reconstruction of water supplies should merge naturally into on-going development activities (such as community mobilisation) to further improve the water-supply systems (or other agreed environmental health goals). During "normal" times, these health development activities should aim to reduce the vulnerability of people and infrastructure to future emergencies and disasters. Thus, the routine construction of water works should, for example, incorporate design features that protect them from known hazards.

#### **4. What is economic development?**

The major task of development economics is to explore the possibility of emancipation from poverty for developing countries [16]. From a policy perspective, 'economic development' can

be defined as efforts that seek to improve the economic well being and quality of life of a community. It should be strongly focused on low-income developing countries where poverty is especially acute [16]. There are significant differences between ‘economic growth’ and ‘economic development’. The close link between these two is simultaneously a matter of importance as well as a source of considerable confusion [17]. ‘Economic growth’ has a connotation of quantitative expansions in economic variables, especially aggregate and per capita national incomes as measured by such statistics as GDP and GNI [16]. On the other hand, ‘economic development’ refers to not only quantitative expansions but also improvements in non-quantitative factors such as institutions, organisations and culture under which economies operate [16]. In linking infrastructure development with economic development, economic development encompasses policies and programmes to provide infrastructure and services.

A very wide variety of indicators can be used to measure the economic development differences between developed and developing countries. The key indicators among those are GDP per capita, life expectancy, literacy rates, quality of infrastructure, access to safe infrastructure, poverty reduction etc [16, 17 and 18].

## **5. Economic development through post-disaster infrastructure reconstruction**

### **5.1 Overview**

Calls have been made for a country like Sri Lanka to inform and design development efforts to reduce natural disaster related losses and contribute to truly sustainable social and economic development. Post-disaster infrastructure reconstruction can do a lot towards the achievement of this. Whilst the need for mitigation and reduction of natural disaster risks has been widely recognized all over the world, achieving this ambitious goal has proven difficult in Sri Lanka. The recent Tsunami in December 2004 is one of the best examples to demonstrate this. The tsunami in 2004 is distinctive among other natural disasters due to the massive economic impact it caused in a developing country like Sri Lanka. The tsunami struck at a time when the Sri Lankan macro economy was already under pressure on several fronts, reigniting fears of a slide into the kind of a crisis that was seen in 2001 when the economy contracted by 1.5% [19]. Overall damage to the Sri Lankan economy has been estimated at around US\$ 1 billion (4.5% of GDP) except the assets losses in the informal sectors. However, the disasters have the ability to make an immense contribution to the particular economy where it took place and also to the surrounding economies. For example, the Kobe earthquake of 1995 killed over 6,000 persons, and destroyed more than 100,000 homes, still the economic recovery not only of Japan but also of the Kobe economy was rapid [20]. Lewis [21] has reported that the economic impact of disasters, especially on island states, has been for matter for concern and analysis (e.g. Lewis. 1991 b) and the impact upon development of disaster is frequently deplored (e.g ECLAC, 1978; 1988) – but what of the impact of development upon disasters?

The discipline of economics has very wide coverage, as it is underpinned by a matrix of political, religious, social, technological and environmental strands (Broadbent and Broadbent,



2006). It is therefore understandable why economics should play such a key role in both reconstruction and development initiatives, even though it can have a very frustrating impact when efforts set out to accelerate progress or achieve quick results [22]. Economics in disaster management is necessary to be looked in to several perspectives. According to Broadbent and Broadbent [22], a deeper comprehension of the role of economics in disaster management is required to improve the current way things done. It shows how economic analysis can be used to advise decision-makers about alternative policy options. Backhouse (2002) reports the role of economics in the shaping of history is very interesting and relevant to disaster management [22]. Economics applied objectively can lead to the selection of the best of all alternatives given a range of options [22].

## **5.2 Importance of post-disaster infrastructure reconstruction in it's contribution to economic development: Literature review**

### **5.2.1 Role the economics perspectives play in post-disaster reconstruction phase**

According to Jigyasu [23], the link between disasters and development is very critical. Lewis [19] reports that linkage between development and disasters has to be forged. Davis (2005) has claimed that looking at disasters as development opportunities is becoming one of the core principles of disaster and emergency management [24]. Disasters provide physical, social, political and environmental development windows of opportunities that can be used during the post disaster recovery and reconstruction not only to reconstruct the impacted areas, but also to improve the socio-economic and physical conditions of the impacted population in the long- run [24]. For developing countries or regions, it is a good opportunity to change its original economy development model and to push the urban and rural renewal forward [23]. Lewis [21] questions which way round should it be; disasters and development' or 'development and disasters'? Which comes first and which has the greater influence upon the other? However, disasters are not only consequences of existing 'development' processes, they can also serve to provide new opportunities for development through post-disaster rehabilitation [23]. The 'disaster continuum' approach positively attempts to align post-disaster assistance with development, recognising the intervening stages of recovery, rehabilitation and reconstruction as each stage should lead to the other in that sequence [21]. However, conventionally, reconstruction and development were perceived and represented linearly [21]. In reality however, they are simultaneous, each 'stage' overlapping with others and in responses to the same or different disasters [21].

Lewis [21] clearly admits that, in any case, development will have been taking place appropriately or inappropriately, planned or unplanned, successfully or not, for a long time. However, development does not have a universal frame of reference and it is determined by different 'world-views' and 'perceptions' on what development implies for a particular community or group of people [23]. It is argued, however, that there is a limited time frame of approximately two years for such opportunities to be utilized efficiently [24].

It is difficult to imagine a modern world without infrastructure and therefore the role of infrastructure in people's daily activities and economic growth of a country is apparent [2]. Along with supportive economic and financial policies, infrastructure has long been recognised as a key element of the enabling environment for economic growth [25]. The physical infrastructure is the nation's economic backbone as it constitutes the arteries for the facilitation of productive activity and the spreading of the benefits of growth by enabling goods and services to be distributed [3]. Construction represents most of every nation's savings [30]. Critical infrastructure provides society with essential goods and services on which the society strongly depends [9]. Infrastructure has strong supply and demand side economic linkages and caters directly to demand [2]. Infrastructure can contribute directly by providing and supporting the delivery of key services, such as those seeking to increase households' access to safe drinking water, basic sanitation, and secure tenure [25]. Similarly, the goals related to human development (education and health) rely on services that require supportive infrastructure—water and sanitation to prevent disease, electricity to serve schools and health clinics, and roads to access them [25]. Thus, it is evident that ultimately society strongly depends on critical infrastructure [9]. Improving trade efficiency can do much more to spur economic growth than tariff reform and improving infrastructure is a major factor in improving efficiency of trade [2]. It is found that availability of good quality physical infrastructure improves the climate for foreign direct investment (FDI) by reducing the “cost of total investment” incurred by foreign investors and thus raising the rate of return [2].

In the World Development Report 1994, The World Bank makes the direct link between infrastructure to poverty [8]. Freeman [8] has admitted that the clear link of natural disasters to poverty is through infrastructure. Accordingly, it is convinced that the linkages can be described in at least three components:

- access to infrastructure is often a measure of poverty,
- infrastructure is a key component of economic growth,
- loss of infrastructure may have significant indirect and secondary costs that directly affect the poor [8].

As stated by The World Bank, lack of access to infrastructure is a welfare issue. Further, access to infrastructure for the rural poor, primarily irrigation and transportation, increases income that enables the poor to manage risk [8]. The maintenance of infrastructure is essential to maintain economic growth, the primary linchpin in reducing poverty [8].

As many researchers have identified, Yaoxian [26] too has admitted that reconstruction following a natural disaster is a complicated problem concerning social, economical, cultural, environmental, psychological, and technological aspects. However, post-disaster reconstruction is relevant to development discourse. It is essential, not only to cope with the impacts but also to help ensure that the region sustains its economic growth [2].

Many international organisations work towards socio-economic development of developing countries. But among all such, The World Bank stands out as its mission is to ‘reduce poverty and improve living standards through sustainable growth and investment in people’. In

achievement of the above aim, The World Bank has a clear objective of promoting economic growth strategies based on expanded infrastructures, which are environmentally responsible and socially acceptable and bringing a sustainable future closer to today's reality. Virtually all World Bank activities have a bearing on poverty. Tackling natural or man-made disasters is an important part of this mission. Disasters represent a significant source of risk for the poor and providing assistance to prepare for and recover from natural and man-made disasters is an important activity of the Bank in achieving their above mission. The World Bank's 'Hazard Risk Management Team' aims to reduce human suffering and economic losses caused by natural and technological disasters by helping provide a more strategic and rapid response to disasters and promoting the integration of disaster prevention and mitigation efforts into the range of development activities. The Bank's operational policy on 'Rapid Response to Crises and Emergencies' deals with the issues related to emergency operations, but does not address long-term economic issues, including those triggered by economic shocks and requiring a policy response from the government that the Bank normally supports through development policy operations. The World Bank aims to contribute with sound economic foundations to infrastructure policy making. The 'infrastructure economic' approach emphasises the links between infrastructure service provision, economic growth, and poverty alleviation; while providing instruments of dialogue between different sector specialists, policy makers, and macroeconomics. The World Development Report 1994 [27], the seventeenth in the annual series, examines the link between the infrastructure and development and explores ways in which developing countries can improve both the provision and the quality of infrastructure services. In recent decades, developing countries have made substantial investments in the infrastructure, achieving dramatic gains for households and producers by expanding their access to services such as safe water, sanitation, electric power, telecommunications, and transport. In Sri Lanka, rehabilitation of the infrastructure focused initially on restoration of key transport and services, initiated speedily by the Government with donor support. Line ministries took the initiative on the repair of (or temporary provision for) broken portions of major roads, railway, electricity, telecommunication etc. on a priority basis. This raises the dilemma of what is to be prioritised, because the identification of priority infrastructure reconstruction issues is important to sustain the recovery.

### **5.2.2 Importance of post-disaster infrastructure reconstruction for millennium development goals**

If we look at the role economic perspectives play in post-disaster reconstruction and the economic and development perspectives of natural disasters, it is worth further investigating the necessity of infrastructure in achieving Millennium Development Goals (MDG) of the United Nations and the World Bank because MDGs are set with a greater expectation of contributing to the economic development. More recently, the development community has emphasised that by promoting growth; reliable and affordable infrastructure can reduce poverty and contribute to the achievement of the Millennium Development Goals (MDGs) and there have been many recent attempts to quantify these linkages between infrastructure and growth, poverty reduction, and achieving related development goals [25].

Both the policy and the academic debates on the Millennium Development Goals of the United Nations have been a source of some frustration for infrastructure practitioners [28]. There is a sense that the goals fail to recognise the relevance of transport and to a lesser extent energy (since rural energy was recently added as a priority) in the fight against poverty [28] except for water and sanitation and to some extent telecommunications. This is partly because there is little knowledge about the basic relationship between infrastructure coverage and household income [28]. The frustration among practitioners has not been met by academics [28]. Indeed, while there has been a lot of talk about the MDGs in the development community and many publications on the health and education goals, there has been little academic work on the water and sanitation goals or the MDG gaps [28].

## **6. Sri Lanka's situation with regard to infrastructure reconstruction and development**

An efficient network of economic and social infrastructure is a pre-requisite for achieving sustained high economic growth and development. Development, reconstruction, continuous improvement and maintenance of infrastructure network are vital to attain a sustained high level of economic development. Now, more than two years after the tsunami disaster, it is worth questioning whether these development opportunities have been used or lost? In Sri Lanka, although several initiatives were taken by the governments in the past to mitigate disaster damages they were mostly reactive emphasising relief and recovery rather than proactive with damage prevention or minimisation strategies [5]. In the aftermath of the tsunami, three task forces were set up; (1) Task Force for Rescue and Relief (TAFRER), (2) Task Force for Law and Order and Logistics (TAFLOL), (3) Task Force to Rebuild the Nation (TAFREN). Immediately after the tsunami 'The Centre for National Operation' (CNO) was set up in order to facilitate and coordinate emergency rescue and recovery needs. Later, in January 2005, the CNO was replaced when TAFRER and TAFLOL were merged to form TAFOR (Task Force for Relief), with a mandate for looking after the well being of affected groups. In November 2005 another institutional change took place - the TAFREN was replaced with the Reconstruction and Development Agency (RADA). However, the 2004 Tsunami made responsible parties act collectively for a comprehensive, long term and holistic disaster risk management framework (Jayawardane, 2006). In May 2005, the Sri Lanka Disaster Management Act No 13 of 2005 was enacted providing a solid legislative and institutional arrangement for Disaster Risk Management establishing a powerful National Council for Disaster Management under the President and the Disaster Management Centre (DMC) as the lead agency for disaster risk management. In November 2005, the Ministry of Disaster Management was established to provide undiluted leadership. The Ministry of Disaster Management declared its Road Map in December 2005 focusing on seven thematic components. 'Towards a Safer Sri Lanka - The Road Map for Disaster Risk Management – Volume II Project Proposal' [6] is a key Government policy document. The Road Map aims to provide an overall framework for disaster risk management in the country and is an effort, through the MoDM to unify efforts of different agencies [15]. The Road Map recognises that the tsunami has highlighted policy and institutional weaknesses in disaster risk management in the country [15]. It is expected that proper implementation of this Road Map will go a long way towards saving Sri Lanka from

natural disasters. 'Towards a Safer Sri Lanka - Road Map for Disaster Risk Management – Volume II Project Proposal' [6] is not just about the tsunami. It is part of a need to fill the gaps, creating the social and political will to manage disaster risk and to coordinate activities [15].

'The Road Map' [6] has well documented that disaster events reported in the history have affected infrastructure facilities in varying degrees in Sri Lanka and resulted in people suffering for lack of basic facilities. This has led to the responsible agencies struggling to get the facilities back to normal functioning conditions. This policy document is focused on seven thematic components, which are consistent with ongoing and past efforts in the field of disaster risk management and development planning, and as Hyogo Framework of Action 2005-2015. Critical infrastructure is deemed to be included under the theme called 'Mitigation and Integration of Disaster Risk Reduction (DRR) into Development Planning'. 'Providing safer critical infrastructure in hazard prone areas' has been prioritised as one of the project proposals under the theme called 'Mitigation and Integration of DRR into Development Planning'. The above project proposal suggests that all critical infrastructure facilities must be designed to a given level of safety from disaster impact. Moreover, it suggests that such guidelines must be provided to designers and an adequate monitoring system be in place [6]. The activities identified in the proposal are;

- Formation of an Expert Group to cover different types of infrastructure
- Implementation of guidelines, codes for hazard resistant infrastructure construction
- Conduct a training programme for the infrastructure facility providing agencies and the engineers, planners and technical officers on the use of guideline
- Identify the critical infrastructure to be provided in hazard prone areas
- Develop guidelines for construction of critical infrastructure in hazard prone areas
- Review construction programmes to ensure adoption of hazard mitigation measures in all infrastructure development activities

(Source: [6])

The expected outcome of these actions is to increase the disaster resilience in critical infrastructure in hazard prone areas ensured through use of planning and construction guidelines.

On the other hand, the Ten-Year Horizon Development Framework (2006-2016) of the Government (The Ten-Year Vision) has recognised the importance of infrastructure to accelerate economic development [29]. For example, a series of large-scale infrastructure projects are to be implemented during 2006-2016 under the Ten-Year Vision. This includes power projects such as upper Kotmale hydropower plant, coal power plants at Norochcholai, Trincomalee and Hambantota, combined cycle power plant in Kerawalapitiya, transport development projects such as upgrading the Colombo – Matara railway line, new railway lines of Matara – Kataragama and Kurunegala – Habarana, light transit systems connecting Ratmalana - Battaramulla and Dematagoda - Battaramulla, [29]. At the same time small-scale

infrastructure projects are also being developed under the Maga Neguma (road development) and Gama Neguma (village development) programmes [29].

Experience increasingly affirms that the post-disaster recovery phase provides a critical opportunity to introduce measures to reduce future disaster risk through new physical infrastructure. The study concludes that infrastructure can both reduce the losses resulting from natural disasters and facilitate easy post-disaster recovery and thus more investment in infrastructure reconstruction is needed while lessening the challenges confronted in the post-disaster reconstruction phase.

Sri Lanka has achieved an acceptable recovery in the southern part of the country but the northern region is lagging behind expectations, largely because of escalating conflict in the north and east of the country. What Sri Lanka was doing has not been working well enough in light of the enormous challenges faced by developing countries. The current infrastructure reconstruction process in the country is basically hindered due to the lack of institutional capacity and current security problems prevailing in the north and east region of the country. However, the main issue is whether these construction and reconstruction projects consider the economic development perspectives during the process. Moreover, whether they take into account the disaster reduction measures in the long-term construction?

While the infrastructure needs are increasingly well recognised, in many developing countries key infrastructure services are still in serious short supply and of poor quality. In particular, the coverage is typically much lower in rural areas where most poor people live in developing countries. But urban coverage is also under pressure, partly because of rapid rural-urban migration in many countries [25]. According to 'The Central Bank of Sri Lanka Annual Report–2005' [30], infrastructure facilities have been expanding in Sri Lanka but are not adequate or competitive yet, thereby constraining economic growth. Although these problems are most severe in low-income countries, they remain sizable in most middle-income countries too [25]. In Sri Lanka, the adequacy and quality of services provided by public enterprises in the areas of electricity generation, transmission and distribution, passenger transportation and water supply leave much to be desired while infrastructure facilities in the liberalised service sectors such as ports and telecommunications have demonstrated improved performance and an ability to face competition [30]. Also according to the report, the country has the potential to develop these service sectors and turn them around to be significant foreign exchange earners.

After the Tsunami 2004, the initial restoration work of infrastructure was completed within a relatively short period of time. Even though reconstruction and rehabilitation of the infrastructure is often essential to sustain recovery, there are some clearly identified key challenges in infrastructure sectors in post-disaster phases in Sri Lanka, particularly in Post-Tsunami 2004 [31]. The South Asian Disaster Report called, 'Tackling the Tides and Tremors' authored by Duryog Nivaran [15] has identified a key challenge with respect to the longer-term and larger task of developing the infrastructure and services along the devastated coastal belt and to new settlements; whether recovery is used to address disparities in quality and access of infrastructure and services to communities? Duryog Nivaran [15] questions, in particular, the

extent to which infrastructure re-development extend towards and deals with issues related to poor people's infrastructure and service needs, reconcile environmental-development complexities and link development to future disaster risk management? [15].

## **7. The way forward**

Within this context, it is worth studying how post-disaster infrastructure reconstruction projects address the above loopholes compared to general infrastructure construction projects. This leads to investigation of the speciality of post-disaster reconstruction projects compared to general infrastructure construction projects and whether the current post-disaster infrastructure reconstruction activities consider long-term sustainability and its contribution to economic development? In other words, how should reconstruction of infrastructure be carried out in a way that would contribute to the economic development of developing countries. Should there be any added or special strategies, features, objectives or concerns in post-disaster infrastructure reconstruction projects compared to general projects? If so, what are those? How can the above theoretical contribution of infrastructure on economic development be boosted? Identification of key indicators of economic development may be the first step towards this. Assessing the projects' special strategies, features, objectives or concerns against their impact on the indicators of economic development may lead to identification of necessary improvements in the post-disaster infrastructure sector, particularly sector wise impact of implementation of measures on mainstreaming of future disaster risk reduction on economic development.

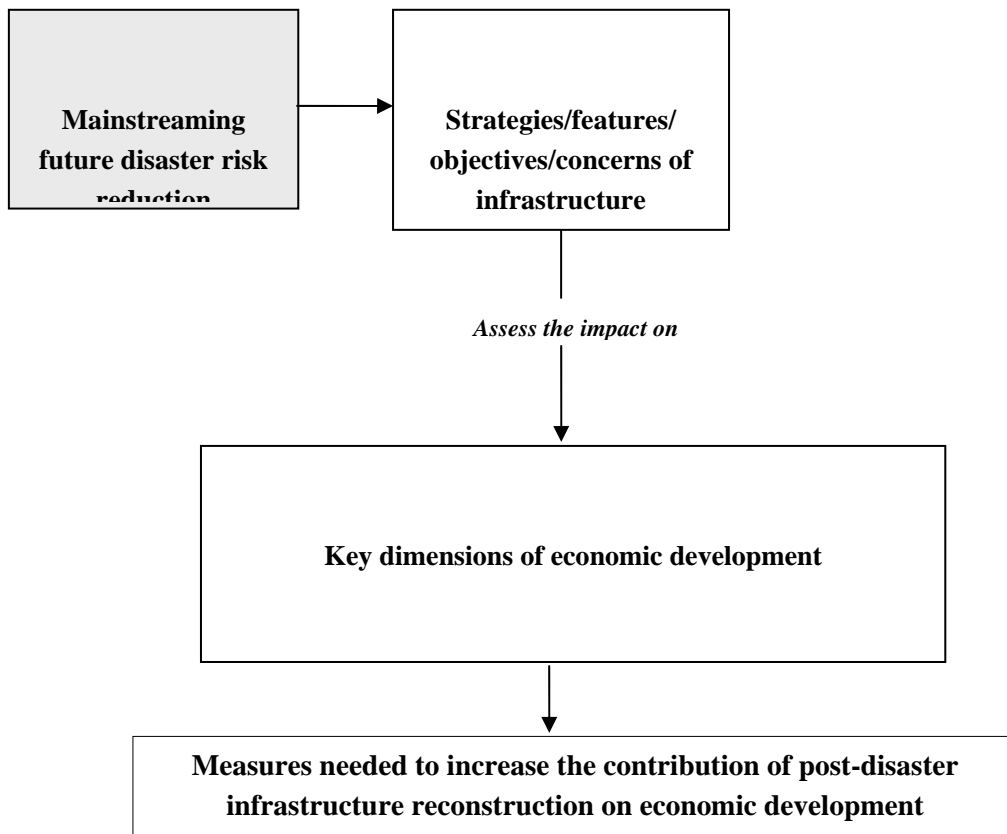


Figure 2: Research focus

## 8. Conclusion

Natural disasters destroy critical infrastructure. Through this research, an effort was made to identify the importance of post-disaster infrastructure reconstruction in economic development. Many researchers have affirmed that infrastructure has a strong link to economic development and then largely to the economic growth. Infrastructure development plays an essential role in reducing poverty in developing countries. Post-disaster reconstruction is found to be a good opportunity for focusing activities into development perspectives. In Sri Lanka, infrastructure facilities have been expanding but are not adequate or competitive yet, thereby constraining economic growth. In addition, the quality of some of the services remains insufficient. In the post-tsunami context, a key challenge with respect to the reconstruction of infrastructure is whether recovery is used to address disparities in quality and access of infrastructure and services to communities.

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