



MDF-JRF Working Paper Series: Lessons Learned from Post-Disaster Reconstruction in Indonesia



Effective Post-Disaster Reconstruction of Infrastructure: Experiences from Aceh and Nias

The Kuala Bubon Bridge under construction on Aceh's west coast. The bridge was funded through the MDF's Infrastructure Reconstruction Financing Facility (IRFF) project with the Ministry of Public Works.

Photo: Kris Hedi



MDF-JRF Working Paper Series: Lessons Learned from Post-Disaster Reconstruction in Indonesia

Effective Post-Disaster Reconstruction of Infrastructure: Experiences from Aceh and Nias

Published by:
MDF-JRF Secretariat
The World Bank Office
Indonesia Stock Exchange Building
Tower II, 12th Floor
Jl. Jendral Sudirman Kav. 52-53
Jakarta 12910, Indonesia
Tel : (+6221) 5299-3000
Fax : (+6221) 5299-3111

ACKNOWLEDGEMENTS

The *MDF-JRF Working Paper Series: Lessons Learned from Post-Disaster Reconstruction in Indonesia* was prepared by the Secretariat of the Multi Donor Fund for Aceh and Nias (MDF) and the Java Reconstruction Fund (JRF). The World Bank serves as trustee of both funds. The series, consisting of five working papers, was produced under the guidance of Shamima Khan, MDF and JRF Manager. Anita Kendrick, Monitoring and Evaluation Officer of the MDF and JRF, developed the concepts and managed the production of the Working Paper Series and the short Knowledge Notes based on each paper.

This paper, Working Paper 3 in the series, is entitled *Effective Post-Disaster Reconstruction of Infrastructure: Experiences from Aceh and Nias*. The paper is based on a review of the MDF's work in large infrastructure and transport carried out by an interdisciplinary team of consultants led by Gottfried Roelcke. Other members of the team included Andre Oosterman, Geoffrey Read, Kris Hedi, and Ilham Siregar. Shamima Khan provided general guidance, support and oversight of the entire writing and production process. Shaun Parker, MDF/JRF Operations Officer, managed the review team and led the preparation and editing of the final working paper. Anita Kendrick guided the paper preparation, provided editorial oversight and guidance to the production and content. Andre Bald, Senior Urban Specialist in the World Bank, and Sarosh Khan, Senior Transport Specialist with the Asian Development Bank, provided useful comments on the text as peer reviewers. Sharon Lumbantobing managed the production process, and Kate Redmond and Devi Asmarani provided editorial support.

Other members of the MDF/JRF Secretariat team and consultants provided significant inputs to the working paper on content, design, layout, and production as well as logistical support for the review team: Safriza Sofyan, Deputy Manager of the MDF, along with Akil Abduljalil, Deslly Sorongan, Inge Susilo, Eva Muchtar, Inayat Bhagawati, Nur Raihan, Nia Sarinastiti, Olga Lambey, Amenah Smith, Friesca Erwan, Harry Masyarafah, and David Lawrence. Ola Santo and her team from Studio Rancang Imaji prepared the design and layout of the Working Paper Series and accompanying Knowledge Notes.

The MDF Secretariat would like to thank the many partners and stakeholders who cooperated with the review team during the fieldwork and research period. These included representatives of the Government of Indonesia, including line ministries, as well as local governments of Aceh, North Sumatra, and Nias, and donors, partner and implementing agencies, and beneficiary communities in Aceh and Nias.

Published by:

MDF-JRF Secretariat

The World Bank Office

Indonesia Stock Exchange Building

Tower II, 12th Floor

Jl. Jendral Sudirman Kav. 52-53

Jakarta 12910, Indonesia

Tel : (+6221) 5299-3000

Fax : (+6221) 5299-3111

www.worldbank.org
www.multidonorfund.org
www.javareconstructionfund.org

THE MDF-JRF WORKING PAPER SERIES

The Multi Donor Fund for Aceh and Nias (MDF) and the Java Reconstruction Fund (JRF) are widely recognized as having played a significant role in the remarkable recovery of Aceh, Nias and Java, following some of the worst disasters in Indonesia over the last decade.

The MDF and the JRF, which is patterned after it, are each considered a highly successful model for post-disaster reconstruction. Key factors in this success have been the leadership provided by the Government of Indonesia and the strong partnership of multiple stakeholders in support of the government's reconstruction agenda. The two programs have produced impressive results, both in terms of physical reconstruction, and in the less tangible but equally important benefits such as community empowerment, strengthened governance, and communities that are more resilient to future disasters. The experiences of the MDF and JRF have generated many useful lessons and created effective models and approaches that can be adapted and replicated in other reconstruction contexts.

The Secretariat of the MDF and JRF, as part of its culminating activities, has prepared a series of working papers to document these achievements and lessons learned. The ***MDF-JRF Working Paper Series: Lessons Learned from Post-Disaster Reconstruction in Indonesia*** consists of five working papers covering five key areas. These are: 1) community driven approaches for post-disaster recovery; 2) capacity building in a post-disaster context; 3) reconstruction of infrastructure; 4) promoting gender equality and women's empowerment through post-disaster reconstruction; and 5) multi-donor trust funds as a framework for effective partnerships for reconstruction. Each Working Paper describes the strategy and approaches adopted by the MDF and/or JRF across its projects, notes the achievements, and draws lessons that will be useful in other post-disaster settings. In addition to the full working papers, a series of Knowledge Notes has also been prepared, providing a short summary of the key lessons and conclusions from each of the longer working papers.

This paper, Working Paper 3 in the series, is entitled ***Effective Post-Disaster Reconstruction of Infrastructure: Experiences from Aceh and Nias***. It presents the lessons from the MDF's experience implementing its large scale infrastructure reconstruction program in partnership with the Government of Indonesia and other partners. This paper discusses the value of a phased approach to post-disaster reconstruction as a successful means to manage short-term expectations while delivering long-lasting, results of high quality. These MDF experiences offer many lessons for future reconstruction efforts in similar contexts, including post-conflict situations.

Collectively, the lessons and experiences from the MDF and JRF form a legacy of the remarkable achievements of these two programs and the effective partnerships on which they were based. We hope that the lessons captured in these papers will contribute to future reconstruction and preparedness efforts in Indonesia and other disaster-prone countries around the world.

Shamima Khan
Manager
The Multi Donor Fund for Aceh and Nias
The Java Reconstruction Fund
December 2012

TABLE OF CONTENTS



ACKNOWLEDGEMENTS	4
THE MDF-JRF WORKING PAPER SERIES	5
THE DISASTERS—A MAP OF INDONESIA	8
A SERIES OF DISASTERS IN INDONESIA	10
ABOUT THE MULTI DONOR FUND FOR ACEH AND NIAS (MDF)	15
ABOUT THE JAVA RECONSTRUCTION FUND (JRF)	20
EXECUTIVE SUMMARY	22
CHAPTER 1 – INTRODUCTION	26
1.1 The Disasters	27
1.2 The Immediate Relief Efforts	28
1.3 Coordinating the Reconstruction Efforts	29
CHAPTER 2 – MDF AND ITS INFRASTRUCTURE PORTFOLIO	32
2.1 The MDF’s Support for Infrastructure	33
2.2 Projects in the MDF Infrastructure Portfolio	34
2.3 Design and Implementation of the MDF’s Infrastructure Portfolio	37
CHAPTER 3 – RECONSTRUCTION OF TRANSPORT INFRASTRUCTURE	42
3.1 Reconstruction and Rehabilitation of Roads and Bridges	43
3.2 Reconstruction and Rehabilitation of Ports	54
CHAPTER 4 – RECONSTRUCTION OF OTHER INFRASTRUCTURE	60
4.1 Drainage & Flood Control	61
4.2 Sea Defenses/Coastal Barriers	64
4.3 Solid Waste Management	67
4.4 Urban Water Supply	70



CHAPTER 5 – SUPPORTING OPERATIONS	72
5.1 Sea Delivery and Logistics Services	73
CHAPTER 6 – CAPACITY BUILDING AND SUSTAINABILITY	78
6.1 Capacity Building Efforts	79
6.2 Sustainability of Assets	82
CHAPTER 7 – ECONOMIC IMPACT OF MDF FINANCED INFRASTRUCTURE	84
7.1 Road Infrastructure	85
7.2 Ports	91
7.3 Solid Waste Management	93
7.4 Water Supply	94
7.5 Flood Control	95
7.6 Other Water Infrastructure	95
CHAPTER 8 – CONCLUSIONS AND LESSONS LEARNED	98
8.1 MDF Infrastructure: Addressing Challenges and Delivering Quality Results	99
8.2 Conclusions	102
ANNEXES	104
ACRONYMS AND ABBREVIATIONS	160
BIBLIOGRAPHY AND REFERENCES	164

THE DISASTERS—A MAP OF INDONESIA





A SERIES OF DISASTERS IN INDONESIA

Indonesia is one of the most disaster prone countries in the world. It is vulnerable to earthquakes, tsunamis, landslides, floods, volcanic eruptions, and wildfires. Between 2004 and 2010 Indonesia experienced a series of devastating natural disasters which attracted an outpouring of support from around the world.

December 2004—Earthquake and Tsunami in Aceh

The earthquake and tsunami that struck Indonesia and several other countries in the Indian Ocean region on December 26, 2004 was one of the worst natural disasters in recorded human history. The massive earthquake measuring 9.1 on the Richter scale was centered in the Indian Ocean about 150 kilometers off the coast of the province of Aceh on the northernmost tip of the island of Sumatra. Huge tidal waves fanned across the Indian Ocean, causing death and destruction across Southern Asia including Thailand, Bangladesh, Sri Lanka, India, and as far away as East Africa. No country suffered more than Indonesia. Waves towering ten meters high came crashing into the shoreline in Aceh. The scale of physical devastation and human suffering was enormous. In Aceh alone, 221,000 people were killed or missing, and over a half million were left homeless. As many as 750,000 people lost their livelihoods. At all levels, infrastructure was paralyzed or completely destroyed.

In minutes, human settlements along the coastline of Aceh and parts of North Sumatra were demolished. People, houses, boats, cars, and buildings were engulfed as the tsunami swallowed everything in its way. Villages were reduced to rubble where minutes before thriving communities had flourished. Many roads, bridges, communications systems, schools, hospitals and clinics collapsed or were severely damaged. Fishermen, farmers and others lost their livelihoods and many businesses were destroyed or could no longer operate.

The subsequent assessment of the impact of both disasters, conducted by the Government along with the World Bank and other partners, assessed the damage and needs to be US\$4.9 billion.¹ This figure was later revised to \$6.2 billion.

The massive destruction in Aceh seriously affected provincial and local governments already weakened by years of conflict. The tsunami destroyed 21 percent of public buildings and 19 percent of the equipment in these buildings. Approximately nine percent of civil servants perished and at least 21 percent of surviving civil servants were severely affected, impacting their ability to function as a local government. Twenty-seven percent of public records were destroyed. The replacement value of these losses was estimated to be over \$81 million.

Prior to the tsunami, governance in Aceh already faced numerous challenges, including lack of institutional capacity and inefficient delivery of public services such as health and education, especially in the rural areas. The tsunami exacerbated these challenges to say the least, and the

¹ All \$ amounts refer to US dollar.



Many people were saved from the tsunami by taking refuge in Aceh's Grand Mosque. They could only watch helplessly as the torrent raged through the streets, carrying debris and victims along with it.

Photo:
Antara News
Agency

provincial and local governments were not in a position to manage the immense and extensive recovery effort that would be required. The national government stepped in urgently to take the lead in the reconstruction process.

March 2005—Earthquake in North Sumatra and Aceh

Just three months later on March 28, 2005, another massive earthquake measuring 8.7 on the Richter scale struck Aceh and the neighboring province of North Sumatra. This quake devastated the Nias islands in the province of North Sumatra, located in the Indian Ocean 130 kilometers off the western coast of Sumatra just south of Aceh. The island of Simeulue, part of the province of Aceh off the western coast of the mainland, was also hard hit. This second disaster resulted in the death of nearly 1,000 people and the displacement of nearly 50,000 survivors. The earthquake wreaked more havoc on an already ravaged area. The physical damage was severe. Approximately 30 percent of buildings were destroyed. The destruction rendered transportation and other critical infrastructure inoperative, including the major ports linking the remote island populations with the mainland. Nias and Simeulue stood among the poorest areas of Indonesia prior to the disasters and were only further isolated by the destruction of the earthquake.

These two disasters devastated two areas of Indonesia that were already grappling with multiple challenges. The province of Aceh was in the grip of an internal conflict between the Acehese



Many roads, bridges, communication systems, school and other infrastructure collapsed or sustained such serious damage that they could no longer be used as the result of the disasters. Much of the coastline of Aceh was swallowed by the sea and most ports were annihilated.

Photo:
IREP-IRFF
Team

separatist rebel movement and the Indonesian military. This conflict, stretching over thirty years, had paralyzed development and economic growth, and had seriously weakened both public and private sector capacities. At the time of the December 2004 tsunami, poverty in Aceh was 28.4 percent, substantially higher than the national average of 16.7 percent (*Aceh Poverty Assessment*, World Bank: 2008). The districts of Nias and South Nias on Nias Island ranked among the poorest districts in Indonesia. Poverty, largely attributable to the isolation of the island, was approximately 31 percent at the time of the March 2005 earthquake.² These dual challenges of poverty and isolation created an extremely difficult operating environment for reconstruction in Nias.

The local governments, already weakened by the conflict in Aceh and isolation in Nias, were initially overwhelmed by the disasters. Recognizing this, and recognizing the magnitude of the reconstruction task at hand, the central government created the Agency for the Reconstruction and Rehabilitation of Aceh and Nias (*Badan Rekonstruksi dan Rehabilitasi Aceh dan Nias*, widely known as the BRR) to manage reconstruction. This special agency was based in Aceh and led by a minister-level appointee who reported directly to the President.

² Indonesia Central Statistics Agency National Social Economics Survey 2005-2007

May 2006—Earthquake in Java

Disaster again struck Indonesia on May 27, 2006, when an earthquake measuring 5.9 on the Richter scale hit the island of Java, resulting in extensive damage in the province of Central Java and the Special Region of Yogyakarta. The earthquake hit one of the most densely populated areas in Asia, claiming more than 5,700 lives and destroying over 280,000 homes. Damage to private houses made up more than 60 percent of the total destruction, which also affected small and medium enterprises, a large number of them home-based industries. While infrastructure suffered comparatively less damage, hundreds of thousands of homes and smaller structures were destroyed.

Many houses in the area had been built without proper reinforcement and with low quality building materials, resulting in more deaths and damage than would normally be expected from an earthquake of this magnitude. Approximately 40,000 people were injured in the earthquake. Thousands of people were trapped and buried beneath their toppled houses and buildings.

A joint team led by the National Development Planning Agency (Bappenas), with local governments and the international community, prepared the preliminary Damage and Loss Assessment in order to determine the overall needs for the rehabilitation and reconstruction phase. Total damage and losses from the earthquake were estimated at around \$3.1 billion.

The economic impact of the earthquake was particularly heavy because of the concentration of home-based industries in the areas destroyed by the earthquake. More than 650,000 workers were employed in economic activities directly affected by the earthquake with close to 90 percent of damage and losses concentrated in small and medium enterprises. Many of the home-based industries in the area's important handicraft sector were severely affected. Rebuilding homes would also support recovery of home-based businesses and livelihoods.

July 2006—West Java Tsunami

Just two months later, on July 17, 2006, a second major submarine earthquake struck off the southern coast of Java. The earthquake, measuring a magnitude of 7.7 on the Richter scale, triggered a tsunami that caused widespread damage. The tsunami hit the south coast of West Java, taking more than 650 lives and displacing over 28,000 people. Almost 1,000 people died or remained missing and more than 50,000 people were displaced. Damage and losses reached an estimated \$112 million. Ciamis district, West Java, was the worst affected. Along the coast of Ciamis alone, close to 6,000 families were displaced. The tsunami caused economic destruction in the fishing villages and tourist resorts along the south coast of West Java, where large numbers of fishing boats were lost and the small fishing ports destroyed.

October and November 2010—Mount Merapi Volcanic Eruptions

On October 26, 2010, disaster hit Java once again when Mount Merapi, a volcano located on the border between Yogyakarta and Central Java, erupted. This was followed by seven additional major eruptions, with the last one occurring on November 11, 2010. For two long weeks, the eruptions

spewed hot gas into nearby villages and hot lava accompanied by hot gas flowed into several rivers. The clouds of hot ash and poisonous gas combined with heat clouds at temperatures of 600 to 800 degrees Celsius incinerated everything they reached, including livestock, crops and trees that were essential to the livelihoods of evacuees. Ash rain, which blanketed everything in fine volcanic dust, was found in cities across Java. All villages within 20 kilometers of the crater were evacuated. Along with massive damage to local infrastructure, approximately 2,900 houses were destroyed and 350,000 people were displaced and accommodated in evacuation camps. Due to timely evacuation, casualties were limited but still almost 300 people perished and more than 500 were injured. The eruptions impacted areas in the province of Central Java and the Yogyakarta Special Region, including some communities that had been affected by the 2006 earthquake and were still in the process of rebuilding.

These eruptions resulted in widespread damage to housing and local infrastructure, as well as loss of livelihoods. During the eruptions, volcanic debris mixed with rain flowed down the slopes of Mount Merapi as massive mud flows. In Java this is known as "*lahar dingin*" or cold lava and is made up of ash and sand from the eruption which when combined with rain turns into thick, slushy rivers of mud that gather up everything in the way. Cold lava surged down the mountain burying entire villages, farms and fields. Huge boulders, trees, houses, livestock, motor bikes, and cars were carried away by the mud. Several villages located in the danger zone near the volcano were relocated to safer areas.

Facing the Future

The numerous disasters since 2004 are a stark reminder that Indonesia is highly prone to natural hazards. Improvements in early warning systems are expected to save lives, as will ensuring that homes and other structures are built to seismic resistant standards. Many of the homes destroyed during the earthquakes were found to have used poor quality materials and building techniques, both of which contributed greatly to the number of lives lost and the high level of damage. Through the recovery and reconstruction efforts following these disasters, Indonesia has learned many lessons. It has created institutions and put systems in place for disaster risk reduction. As a result of the recovery and reconstruction process communities across Aceh, Nias, and Java are more resilient to face future disasters.

ABOUT THE MULTI DONOR FUND FOR ACEH AND NIAS (MDF)

The Multi Donor Fund for Aceh and Nias (MDF) was established in April 2005, in response to the Government of Indonesia's request to coordinate donor support for the reconstruction and rehabilitation of affected areas following the December 2004 earthquake and tsunami, and the subsequent March 2005 earthquake.

The MDF pools \$655 million in contributions from 15 donors. These funds amount to nearly ten percent of the overall reconstruction funds. At the request of the Government of Indonesia, the World Bank serves as Trustee of the MDF. Grant funds are provided to projects which are implemented by government and non-government agencies and communities, with partner agencies providing oversight. Partner agencies include the United Nations Development Programme (UNDP), the World Food Programme (WFP), the International Labour Organization (ILO) and the World Bank.

Under the MDF portfolio, 23 projects were financed in six outcome areas: (1) Recovery of Communities; (2) Reconstruction and Rehabilitation of Large Infrastructure and Transport; (3) Strengthening Governance and Capacity Building; (4) Sustaining the Environment; (5) Enhancing the Recovery Process; and (6) Economic Development and Livelihoods. These projects reflected the priorities of the Indonesian government throughout the reconstruction process.

The MDF was coordinated by the Government of Indonesia, initially through the Agency for the Rehabilitation and Reconstruction of Aceh and Nias (BRR), which was set up to manage the reconstruction and recovery effort. After the BRR closed in April 2009, the National Development Planning Agency, Bappenas, took on this critical role. The MDF is governed by a Steering Committee with representatives from the government, donors, the trustee, and civil society. The Steering Committee is supported in its work by a secretariat.

MDF Contributions

MDF Donors	Contributions (US\$ million)
European Union	271.31
Government of the Netherlands	146.20
Government of the United Kingdom	68.50
World Bank	25.00
Government of Sweden	20.72
Government of Canada	20.22
Government of Norway	19.57
Government of Denmark	18.03
Government of Germany	13.93
Government of Belgium	11.05
Government of Finland	10.13
Asian Development Bank	10.00
Government of the United States	10.00
Government of New Zealand	8.80
Government of Ireland	1.20
Total Contributions:	654.67

The MDF provides a successful model for post-disaster reconstruction based on partnerships between government, donors, communities and other stakeholders. The partnerships created by the MDF have played a key role in the strong performance of the program and robust results achieved. Pooling resources through the MDF has resulted in the harmonization of donor efforts and provided an important platform for policy dialogue for many stakeholders. The MDF has filled gaps in the reconstruction in line with government priorities and has brought together key government players, donors, and members of civil society and communities. The MDF's strong support for coordination of the overall reconstruction effort has resulted in huge multiplier effects so that the MDF's impact has been able to exceed the value of its contributions.

The MDF Portfolio

The MDF's portfolio was designed to meet the changing needs of Aceh and Nias as they progressed from recovery to rebuilding infrastructure to laying the foundations of economic development. Consisting of 23 projects in six outcome areas, the projects were implemented by government and non-government partners, including national and provincial governments, agencies of the United Nations, international development institutions, and non-governmental organizations. Environmental sustainability, gender, capacity building and disaster risk reduction were important cross-cutting elements of the MDF program throughout its life cycle.

1. Recovery of Communities (5 projects totaling \$202 million)

The first group of MDF projects supported recovery of communities, with a focus on housing and local infrastructure. Using a community-driven approach and implemented by government, these programs enabled disaster survivors to re-establish their communities and begin rebuilding their lives.

- The **Community-based Settlement Rehabilitation and Reconstruction Project**, better known as **Rekompak**, used a community driven approach to rebuild homes and local infrastructure in Aceh and Nias. Implemented by the Ministry of Public Works (MPW) and managed by the World Bank, **Rekompak** rebuilt nearly 15,000 houses and restored basic infrastructure to 180 villages.
- The **Community Recovery through the Kecamatan Development Project (KDP)** was part of a national program and partly funded by the MDF. Through KDP, the MDF assisted communities in Aceh and Nias to plan and manage the reconstruction of rural infrastructure, schools, clinics, and other public buildings. It also provided business training and loans. The project was implemented by the Ministry of Home Affairs (MoHA) and managed by the World Bank.
- The **Community Recovery through the Urban Poverty Program (UPP)** provided support for reconstruction to urban communities to rehabilitate and develop community infrastructure in municipalities in Aceh. UPP repaired urban infrastructure, rebuilt schools and other public buildings, and provided scholarships. The project was implemented by the MPW and managed by the World Bank.

- The **Kecamatan-based Reconstruction and Rehabilitation Planning in Nias Project (KRRP)** was a community-based recovery and planning project for reconstruction in Nias. Implemented by the MoHA and managed by the World Bank, it rebuilt houses, schools, public buildings, and village infrastructure.
- The **Reconstruction of Aceh Land Administration System (RALAS)** restored land property rights and a computerized land records management system. Over 220,000 land title certificates were issued, nearly one-third to women. The project was implemented by the National Land Agency (BPN) and managed by the World Bank.

2. Recovery of Large Infrastructure and Transport (7 projects totaling \$217 million)

The MDF, working in partnership with the Government of Indonesia, contributed significantly to the reconstruction of large infrastructure in Aceh and Nias. These projects restored transportation links and critical infrastructure, thereby improving people's lives and providing new economic opportunities.

- The **Banda Aceh Flood Mitigation Project (BAFMP)**, implemented by Muslim Aid and managed by the World Bank, repaired pumping stations, flood valves, and drainage systems damaged by the tsunami to protect the central business area of Banda Aceh from storm and tidal flooding.
- The **Infrastructure Reconstruction Enabling Program (IREP)** and its companion project, the **Infrastructure Reconstruction Financing Facility (IRFF)**, planned, designed, and built strategic infrastructure such as roads, water systems and bridges in Aceh and Nias. Co-financed by BRR, the projects were implemented by the MPW and managed by the World Bank.
- The **Lamno-Calang Road Maintenance Project (LCRMP)** maintained a key road from Lamno to Calang to ensure overland access to tsunami-affected communities on Aceh's west coast. The project was implemented by the UNDP.
- The **Sea Delivery and Logistics Programme (SDLP)** met the urgent recovery transportation needs for construction materials in Aceh and Nias. Implemented by the WFP, it also provided training for better management of ports and disaster-risk reduction.
- The **Tsunami Recovery Port Redevelopment Programme (TRPRP)** rehabilitated damaged ports in Aceh and Nias so that equipment and materials could be supplied to isolated communities. The project, implemented by the UNDP, also provided designs and technical support for reconstructing major sea ports.
- The **Rural Access and Capacity Building Project (RACBP)** helped residents of participating districts in Nias effectively use improved rural transport infrastructure and services to take advantage of economic opportunities and social services. Implemented by the ILO, it also included a cultural heritage component.

3. Economic Development and Livelihoods (2 projects totaling \$58 million)

Restoring livelihoods is an important part of disaster recovery. These projects strengthened important sectors that provide employment and income to Aceh and Nias, paving the way for long-term economic growth.

- The **Aceh Economic Development Financing Facility (EDFF)** promoted post-tsunami economic recovery. Managed by the World Bank, the EDFF was implemented by the Ministry for Development of Disadvantaged Areas (KPDT) and the Government of Aceh. The project provided sub-grants to support growth in key sectors including coffee, cocoa, rice, meat and fisheries.
- The **Nias Islands Livelihoods and Economic Development Program (LEDP)** provided training to improve technical and business skills for livelihoods and overall economic development. Implemented by KPDT and managed by the World Bank, the project also developed skills within local government for implementing livelihoods programs in Nias.

4. Strengthening Governance and Capacity Building (3 projects totaling \$40 million)

The MDF encouraged good governance and strengthened the capacity of local communities and district governments. It encouraged the development of civil society organizations involved in the reconstruction process.

- The **Capacity Building for Local Resource-based Rural Roads (CBLR3)** strengthened the capacity of district government and small-scale contractors to undertake local road works. The project was implemented by the ILO.
- The **Support for Poor and Disadvantaged Areas Project in Aceh and Nias (SPADA)** project, implemented by KPDT and managed by the World Bank, strengthened local participation in development planning, promoted private investment and job creation, and improved health, education and dispute resolution services. The project complemented a national program funded by a World Bank loan.
- **Support to Strengthen the Capacity and Role of Civil Society Organizations (CSO)**, implemented by the UNDP, built the capacity of local civil society organizations in Aceh and Nias to enhance grass-roots participation in the reconstruction process.

5. Enhancing the Recovery Process (4 projects totaling \$56 million)

In order to strengthen government capacity to manage the recovery effort, the MDF provided technical assistance and operational support to BRR and other government agencies.

- The **Aceh Government Transformation Programme (AGTP)** provided strategic support to the government of Aceh to provide the capacity and institutional strength to take over projects, resources, and assume oversight of reconstruction and recovery programs after the closure of BRR in April, 2009. The project was implemented by the MoHA and Provincial Government of Aceh and managed by the UNDP.
- **Making Aceh Safer through Disaster Risk Reduction in Development (DRR-A)** established disaster risk reduction in Aceh's local government agencies, its public and private partners, and local communities. The project was implemented by the MoHA and Provincial Government of Aceh, and managed by the UNDP.
- The **Nias Island Transformation Programme (NITP)**, managed by the UNDP and implemented by the MoHA and local governments in Nias, enhanced district capacity to successfully complete the recovery process and reduce risks from future natural disasters.
- **Technical Assistance to the BRR and Bappenas (TS-R2C3)**, managed by the UNDP, the project supported BRR in managing the overall recovery process. After BRR closed in April 2009, the project worked with Bappenas and was referred to as Rehabilitation and Reconstruction Completion and Continued Coordination (TS-R2C3).

6. Sustaining the Environment (2 projects totaling \$57 million)

Throughout the recovery process, the MDF committed to protecting the environment. The MDF played an important part in post-disaster cleanup and long-term waste management. It also worked to protect the ecosystems of Aceh and Nias.

- The **Tsunami Recovery Waste Management Programme (TRWMP)** helped local government clear, recycle and dispose of tsunami waste, rehabilitate waste management infrastructure, and implement sustainable solid waste management systems. It also promoted livelihoods related to waste management. The project was implemented by the UNDP.
- The **Aceh Forest & Environment Project (AFEP)** worked closely with communities, civil society and government to protect the Leuser and Ulu Masen forests from illegal logging and promoted sustainable forest management. Managed by the World Bank, the project was implemented by Fauna & Flora International (FFI) and Leuser International Foundation (LIF).

ABOUT THE JAVA RECONSTRUCTION FUND (JRF)

Following a request from the Government of Indonesia, the Java Reconstruction Fund (JRF) was established to respond to the May 27, 2006 earthquake that struck near Yogyakarta, and the tsunami that hit the southern coast of West Java Province in July 2006. The JRF was later extended to respond to volcanic eruptions of Mount Merapi in October and November of 2010. The JRF program closed on December 31, 2012.

The JRF is based on the successful model of the Multi Donor Fund for Aceh and Nias. Seven donors supported the JRF with contributions totaling \$94.1 million. The donors are: the European Union, the Governments of the Netherlands, United Kingdom, the Asian Development Bank, Canada, Finland and Denmark. The World Bank serves as Trustee of the JRF. Following the government's priorities, the JRF supports the recovery of communities and livelihoods, and increases disaster preparedness.

The JRF was coordinated by the Government of Indonesia, initially through the Government's National Coordinating Team (NCT) and the National Technical Team (TTN). After the mandate of the NCT and the TTN ended in 2008, the JRF worked with the National Planning Agency (Bappenas) and the Provincial Planning Agencies (Bappeda) for the overall coordination of the reconstruction.

Using a governance structure similar to the MDF, the JRF was governed by a Steering Committee with representatives from the Government of Indonesia and donors. Bappenas co-chaired the Steering Committee, along with the European Union as the largest donor, and the World Bank as Trustee. The Steering Committee is supported by a secretariat. Through shared staffing and expertise with the MDF for Aceh and Nias, the secretariat achieved efficiencies of scale, resulting in reduced program administration costs.

The JRF portfolio consisted of five projects which drew from the MDF's experience and used a phased approach to address: (1) Transitional Housing; (2) Restoring Housing and Community Infrastructure; and (3) Restoring Livelihoods. The World Bank had a supervisory and oversight role on all JRF projects as the partner agency.

JRF Contributions

JRF Donors	Contributions (US\$ million)
European Union	51.17
Government of the Netherlands	12.00
Government of the United Kingdom	10.77
Asian Development Bank	10.00
Government of Canada	6.53
Government of Finland	1.99
Government of Denmark	1.60
Total Contributions:	94.06

The JRF Portfolio

The JRF portfolio followed a phased approach to reconstruction, adopting lessons learned from the MDF. Early support focused on meeting housing and community recovery needs and subsequent support focused on addressing economic recovery. The JRF prioritized disaster risk reduction in all its programs. Five projects were supported:

- **Transitional Housing Projects (2 projects totaling \$2.3 million).** The JRF financed two transitional housing projects, implemented by the International Organisation for Migration (IOM) and Cooperative Housing Foundation (CHF) International and managed by the World Bank. The projects provided nearly 5,000 transitional shelters.
- **The Community-based Settlement Rehabilitation and Reconstruction Project (1 project totaling \$75.1 million),** better known as ReKompak, made up most of the JRF funding allocation. Following the model established in Aceh, it used a community driven approach to rebuild homes and local infrastructure in earthquake affected areas of Yogyakarta Special District, and Central Java, and later, parts of West Java affected by a subsequent earthquake and tsunami. After the 2010 eruptions of Mount Merapi, the project was expanded further. Implemented by the Ministry of Public Works (MPW) and managed by the World Bank, the project rebuilt over 15,000 houses and completed over 4,000 local infrastructure projects.
- **Livelihood Recovery Projects (2 projects totaling \$17.1 million):**
 - **The Livelihood Recovery in Yogyakarta Special District and Central Java project** contributed to the Government of Indonesia's initiatives to assist micro, small and medium enterprises (MSMEs) affected by the earthquake to revitalize their businesses and re integrate affected low-income communities into economic life. The project provided access to finance, developed loan work-out strategies for defaulting borrowers, restored capacity and improved competitiveness of medium-sized companies in Yogyakarta and Central Java. The project was implemented by the *Deutsche Gesellschaft für Internationale Zusammenarbeit* (GIZ) and managed by the World Bank.
 - **The Access to Finance and Capacity Building for Earthquake Affected Micro and Small Enterprises** project, implemented by the IOM and managed by the World Bank, supported the recovery of micro and small enterprises in Yogyakarta and Central Java to enable them to reach their pre-earthquake capacity. It provided asset replacement, marketing support, and technical assistance. The project worked with over 4,000 micro and small enterprises (MSEs), over 40 percent run or owned by women.

EXECUTIVE SUMMARY

In December 2004 and March 2005, two devastating earthquakes and a tsunami hit northern Sumatra, especially the Province of Aceh and the Island of Nias. The disasters claimed a huge human death toll, inflicted colossal damage on housing and infrastructure, and paralyzed local government structures. To undertake the reconstruction, the Government of Indonesia (GoI) formed a special agency, *Badan Rehabilitasi dan Rekonstruksi Aceh and Nias* – BRR (Agency for Rehabilitation and Reconstruction of Aceh and Nias). Assistance poured in from around the world, from governments, international agencies, the private sector, non-governmental organizations (NGOs) and individuals. In addition to numerous bilateral support operations, 15 donors pooled resources totaling about \$655 million in the Multi Donor Fund for Aceh and Nias (MDF). The MDF aided the reconstruction and economic recovery efforts from mid 2005 until the end of 2012 through 23 projects, nine of which pertained to the reconstruction of large-scale infrastructure or transport and logistics. Roughly \$285 million was allocated to these.

There was huge pressure on all actors involved in the reconstruction process to act fast and get projects ready for implementation. Infrastructure investments, however, particularly large investments, have critical quality and ownership requirements which may supersede speed considerations, and care needed to be taken to balance the cost of speed and the cost of delay. The lack of readily available information about post-disaster situations – studies or in-depth analyses – also complicated response.

Against this backdrop, the MDF implemented its highly successful program, spanning a wide range of activities. The design and implementation of the MDF infrastructure portfolio, as a part of this overall response, can also be considered very successful and an example of good practice. MDF investments covered physical investments in roads, transport logistics, ports, drainage and flood control, solid waste management, urban water supply, and coastal protection and were complemented by a strong focus on safeguards and capacity building.

The MDF adopted a phased approach to the reconstruction. The program firstly addressed the immediate recovery needs such as housing, logistics and transport links, and this was followed by the second phase, which concentrated on reconstruction activities, including infrastructure and protecting the environment. The final phase focused on developing livelihoods and economic opportunities and enhancing the capacity of agencies to manage the newly created assets.

The MDF was a gap-filling mechanism, designed to respond to needs that were not addressed by other reconstruction partners. As such, decision makers supporting the reconstruction program, together with the Government of Indonesia (GoI), needed to exercise authority and flexibility to make adjustments to the response activities as needs arose and became apparent. The Infrastructure Reconstruction Financing Facility (IRFF) project was approved as a flexible mechanism for funding infrastructure reconstruction, with no specific investments identified at the time that the project was designed and approved. This allowed the government to identify where needs remained after other reconstruction partners had identified activities, and the

MDF could respond accordingly. However, at project implementation level, BRR's policy of fixed-price or "balanced budget" contracts often limited the flexibility to adjust pricing within reason, when dealing with unexpected site conditions and price escalations. As a result, some elements (such as road shoulders and roadside drainage canals) were omitted from contracts to ensure that there would be no price overruns. The MDF responded to the unfinished works by implementing a "Gaps Program," using IRFF funds that remained unallocated to projects to fund these elements.

The implementation of nearly all projects in the roads sub-sector was fully satisfactory, with positive economic benefits attributable to the various projects. Strong coordination between different development partners strengthens the overall impact of a reconstructed transportation network, which leads to increased access to isolated areas, as well as broader markets and social services. The close working relationships with the relevant GoI agencies and the emphasis on increased capacity for operating and maintaining the assets created has, in general, resulted in a high sense of ownership by the GoI of the newly created assets. The construction of numerous small rural roads, trails, and bridges will contribute to the long-term economic recovery in Aceh and the long-term economic development of Nias that had been hampered by extreme accessibility challenges.

Support for transport logistics was a cornerstone of the reconstruction efforts and facilitated a wide range of operations supported by a multitude of donors. This required speed in response and the benefits were great. Access to areas which were cut off by the disaster were opened up for relief and reconstruction efforts, and the essential shipping services provided by the Sea Delivery and Logistics Programme (SDLP), implemented by the World Food Programme (WFP), brought much needed necessities and relief supplies to these isolated towns and regions. Later emphasis on capacity building reached a broad audience of port staff, and enhanced the capacity to adequately operate and maintain the systems and facilities put in place by the program.

The ports projects funded by the MDF are technically sound. Strong emphasis was placed on increasing the capacity of port staff to adequately operate the improved facilities and equipment. In a disaster reconstruction context, as illustrated by the case of the reconstruction of ports, it is important to take into account the longer-term vision of relevant authorities related to broader trends and policies that may affect transportation and movement of goods in the future. In those cases where the ports do meet demand and usage is high, substantial benefits resulted from the investments. However, in other cases where potential demand has been overestimated or other structural constraints overlooked, benefits from these investments are less certain. In such cases, the principle of "Build Back Better" may have resulted in overinvestment in selected infrastructure. An important lesson is that, even though a broad reconstruction strategy is paramount in a reconstruction context, it is also important to think through the reconstruction strategy selectively, rather than applying it to all investments across the board.

Drainage and flood control, solid waste management and urban water supply projects were also mostly implemented well. However, all projects did not always address the full range of challenges to improve the service levels effectively. Strong coordination between various partners, and a strong commitment to work towards common goals would mitigate risks of this happening in the future. Particularly in these sectors, the lack of accurate geological data available hampered the preparation of suitable designs to meet the needs of end users. Environmental concerns were dealt with appropriately, and capacity building for operations and maintenance was addressed.

Several technical innovations were introduced through the MDF portfolio, and some were mainstreamed into government procedures. These include new types of one-way valves for drainage, and an improved solid waste management system that addresses waste collection, recycling and proper disposal. The introduction of the Contractor Environmental Action Plan (CEAP), which was to be submitted by contractors for each of the projects implemented under IRFF, has become a standard procedure for Ministry of Public Works (MPW) projects. Improved technologies for the construction of rural roads, trails and bridges were also introduced.

The infrastructure projects also took into account solutions employing suitable technology against the backdrop of limited capacity and resources. This is often overlooked and is an important lesson for reconstruction and development contexts. The water treatment system in Lhokseumawe City employed a low-tech purification system that does not necessarily attain high levels of purification, but requires a lower level of human and financial resources to operate and maintain. This is more commensurate with the city's financial means and the capacity of available human resources than a more sophisticated plant. For the construction of small rural roads, trails and river crossings, a community based labor-intensive method was used that helped develop community skills to adequately maintain the roads. In both these cases, it is therefore realistic to expect a relatively high degree of sustainability.

Safeguards were addressed at all levels and across the breadth of the infrastructure portfolio. All issues pertaining to social and environmental safeguards were handled well, with flexible and new approaches as appropriate. Environmental concerns were well considered during the identification and preparation of projects; there are no indications that any significant adverse side effects in environmental matters arose in the MDF portfolio. Likewise, even in hindsight there are no indications that significant opportunities were missed to improve the environmental aspects of the portfolio. Reconstruction of roads was mostly confined to pre-existing rights-of-way, which led to technical compromises but avoided protracted land acquisition issues. However, in the waste management project, severe delays were experienced due to land acquisition challenges. The MDF management also upheld the highest standards to combat corruption, collusion, fraud, and mismanagement.

The economic benefits of most MDF-financed investments in the roads, ports and flood management sectors have a far-reaching effect. These benefits include long-term reductions in transport costs and increases in regional economic growth. Although appropriate screening criteria were identified, other factors were also important in making the decisions to prioritize road proposals, aimed at objectives beyond direct economic benefits. BRR's mandate encompassed areas directly and indirectly affected by the tsunami. As such, BRR also prioritized geographic equity, making sure all the districts got some benefits, in order to prevent tensions that could jeopardize the peace efforts. This is one of the "quality criteria" in the Reconstruction Action Plan (RAP), and the MDF Steering Committee explicitly agreed to support this criterion. The MDF was also intended and used by BRR as a "gap filling" mechanism, which provided flexibility in reaching areas where other donors or players were not able or willing to operate. Given the complex context of Aceh and Nias, the roads portfolio thereby included investments with lower direct benefits and higher costs, while non-quantifiable social benefits of these investments were significantly higher. Rural roads, for example, have been highly successful in opening up remote areas, leading to increased agricultural productivity and greatly improved access to schools and medical facilities for remote settlements.

Most of the projects under the MDF infrastructure portfolio placed significant emphasis on capacity building to enhance the sustainability of assets created. The capacity building focus intensified during the later phases of each project. Women were adequately included in all capacity building measures. However, allocation of sufficient funds for routine maintenance is a general challenge for all investments. This applies to all the investments made in infrastructure, but is particularly evident in the solid waste management and water infrastructure and flood control investments that lack sufficient operations and maintenance budgets. Insufficient maintenance funds adversely affect the long-term sustainability of infrastructure and reduce economic benefits. The need for local governments, particularly local legislatures, to allocate and budget adequate funds for proper operations and maintenance cannot be overstated.

Aceh was a very complex post-disaster situation embedded in a post-conflict context. As a result, there were factors other than purely economic ones that had to be considered in selecting types and locations of investments. Priorities, strategic decision making, and expectations of results have to be context-specific, especially in a situation involving conflict, isolation and low capacity – factors common in fragile situations across the world. The MDF's experience in implementing its large-scale infrastructure program, in partnership with the Government of Indonesia and other development partners, over offers many lessons for future reconstruction efforts in similar contexts in Indonesia elsewhere.

Chapter 1

INTRODUCTION



1.1 The Disasters

On December 26, 2004, a major earthquake occurred in the Indian Ocean off the west coast of Sumatra, close to Aceh, the westernmost province of Indonesia. Its magnitude of 9.2 on the Richter Scale made it one of the biggest earthquakes ever recorded. This earthquake triggered a disastrous tsunami, in some places reportedly up to 30 meters high, flooding as far as 2 kilometers inland and destroying everything in its path: ports, roads, bridges, dams, and buildings. The enormous scale of physical destruction also rendered local government structures virtually paralyzed for a substantial time as buildings had been completely destroyed, computers, files and records washed away, and numerous staff members killed. The west coast of Aceh, including Simeulue Island, and the provincial capital of Banda Aceh were the most seriously affected. The tsunami left behind a trail of death and devastation in Aceh and, to a lesser degree, in other coastal areas around the Indian Ocean, including Thailand, Sri Lanka, India, and East Africa.

While the damage from this earthquake and the resulting tsunami was still being assessed, and while plans for rehabilitation and reconstruction were still being prepared, another major earthquake with a magnitude of 8.5 occurred slightly further south in the Indian Ocean, causing severe damage and loss of life on the Nias Islands, in neighboring North Sumatra province, and parts of Aceh. Unlike the earlier earthquake, however, this event did not trigger a major tsunami, and the number of casualties was far lower than from the tsunami in Aceh.



Across Aceh and Nias infrastructure like this collapsed bridge and road was left in shambles, making travel nearly impossible in some areas in the aftermath of the tsunami.

Photo:
Antara News
Agency

A large portion of the wooden debris left by the tsunami could be recycled for the manufacture of furniture. Other materials of non-contaminating nature (sediment, brick rubble, and unusable bits of wood) were deposited in the old landfill. The MDF's Tsunami Recovery Waste Management Programme built capacity in local government to clear, recycle and dispose of tsunami waste, and implement sustainable waste management systems.

Photo: Kristin Thompson

The Government of Indonesia¹ lists the following casualties and damages from the two disasters:

128,000	persons confirmed dead
93,000	persons missing
635,000	persons internally displaced
2,600	kilometers of road destroyed
119	bridges destroyed
22	ports destroyed
8	airfields/airports destroyed
140,000	houses destroyed
3,400	schools destroyed
1,900	teachers killed
500	health facilities destroyed
700	government buildings destroyed
1,100	religious facilities destroyed
14,000	fishing boats destroyed
74,000	hectares of agricultural land destroyed
105,000	small and medium businesses ruined

The context for infrastructure was one of vast destruction resulting in greatly limited accessibility to affected areas. The tsunami and earthquakes destroyed numerous ports, seriously affecting the islands of Nias and Simeulue and many areas along the west coast of Aceh. Bridges and sections of the national road were also destroyed, which, in combination with the destruction of the ports, rendered the area nearly inaccessible for relief and reconstruction efforts. In the more densely developed areas, and especially in Banda Aceh, the enormous amounts of debris and sediment rendered the urban drainage system totally dysfunctional. Urban water supply systems were also affected.

1.2 The Immediate Relief Efforts

In immediate response to the disaster, government agencies, the armed forces, and numerous national and international organizations, including NGOs, rendered assistance in the form of providing emergency shelter and a minimum of food and water supply. The UNDP, using funds from the UN Flash Appeal for Aceh, deployed a unit that started to clear rubble and debris.

Many of the immediate repairs to vital infrastructure, especially road infrastructure, were carried out by the Indonesian Armed Forces. Only they had the means to

¹ Badan Rekonstruksi dan Rehabilitasi Aceh dan Nias (BRR) book series on the reconstruction and rehabilitation of Aceh and Nias 2005

immediately mobilize heavy equipment, such as bulldozers, to clear the most important road links from debris and tsunami sediment and the resources to construct temporary river crossings where bridges had been destroyed.

1.3 Coordinating the Reconstruction Efforts

In response to the earthquake and the resulting tsunami in Aceh, the National Development Planning Agency (Bappenas), supported by the international donor community, represented by the Consultative Group on Indonesia, prepared a preliminary Damage and Loss Assessment Report in January 2005.² The next step, which was also led by Bappenas, was the preparation of a comprehensive masterplan for the reconstruction of Aceh and Nias. This masterplan for the reconstruction was issued through Presidential Regulation No. 30 in March 2005. The BRR, *Badan Rehabilitasi dan Rekonstruksi Aceh dan Nias* (Agency for the Rehabilitation and Reconstruction of Aceh and Nias), was formally established through Government Regulation in lieu of Law no. 2/2005. Starting on April 16, 2005, BRR would be effective for a period of 4 years. BRR was an agency directly answerable to the President; its head had the rank of a minister. Vested with emergency privileges, BRR was not tied to the complete set of rules and regulations that govern the identification, preparation, and implementation of projects under normal circumstances. BRR turned out to be a highly capable and committed agency, led by individuals hand-picked for their competence, dedication and integrity, and provided with special authority and resources. These were critical factors for the success of the reconstruction and rehabilitation process in Aceh and Nias.

Working Modality of the BRR

From its formation in April 2005, the BRR was bestowed special authority which allowed it to follow emergency procedures in the reconstruction rather than the regular government procedures. BRR defined the overall reconstruction strategy and coordinated all the various reconstruction activities and players, including donors. Operational decisions could be made quickly, greatly aided by the ability to cut through the red tape of regular government procedures. These factors for success can be applied at various scales in future disaster responses.

From 2007 until its closure in April 2009, BRR worked with local government in a formally established Joint Secretariat with a seat at the Aceh Provincial Development Planning Agency (Bappeda). After the closure of BRR, the responsibility for coordinating the overall reconstruction effort reverted to Bappenas.

² No separate, similar damage and loss assessment report was made in response to the earthquake in Nias.

In formulating a manageable response to the massive and geographically dispersed reconstruction challenge, BRR developed the ANTERP (Aceh/Nias Tsunami & Earthquake Response Program) consisting of a number of initiatives designed to address the needs of discrete infrastructure areas:

Initiative 1: Housing/shelter infrastructure initiative including water, sanitation, drainage, solid waste management, and local transport

Initiative 2: Sea defense, flood protection, refuge and early warnings systems initiative

Initiative 3: Primary and secondary provincial level infrastructure, including intra-settlement/village roads, connector roads and ports, power, water resources

Initiative 4: Economic infrastructure

Initiative 5: A separate program for Nias Island

The MDF support for reconstruction of infrastructure and related services was structured and designed in response to this broad program. Some of the key challenges facing the BRR were to: (a) coordinate between donors, government agencies, and levels of government; (b) ensure pledges for infrastructure were prioritized and matched with institutional needs; and (c) ensure there was a systematic plan linking housing/settlements with appropriate infrastructure.

Although some had expected that the mandate of the BRR would be extended, the BRR closed as originally planned in April 2009. After that, the responsibility for the reconstruction efforts reverted back to the institutions that handle regional development, including infrastructure development, under normal circumstances. Following this transition, the usual consultation and coordination procedures required for working through government systems were required for the Aceh and Nias reconstruction efforts. The transition from the modality of working through a single entity, the BRR, to working through the government's regular procedures and structures was a challenge for all reconstruction partners, including the MDF and its projects. This meant that the various donor organizations supporting the reconstruction process had to re-orient themselves towards the institutions that continued the work of BRR. A crucial part of this transition was to arrange for the amendment of the various grant agreements for MDF projects that had been signed by the BRR and that now needed the partnerships of other government entities for the completion of the projects.

Pros and Cons of Working through a Dedicated Reconstruction Agency such as BRR

The MDF established a very positive working relationship with the BRR, and each agency has clearly expressed its appreciation of the other. Working through BRR provided the MDF with a capable partner organization that could:

- Work effectively in place of local government. Cooperation with local governments would not have been feasible in the immediate aftermath of the disaster because they were largely paralyzed: staff had perished, many of the surviving staff had lost their houses or members of their families, and governments' offices had been crippled if not outright destroyed, complete with all their files and records;
- Focus exclusively on this reconstruction, with only a minimum of staff changes during the cooperation period;
- Use its mandate to identify, design, and implement multi-sector infrastructure projects from local to national level on behalf of, or in lieu of, the government institutions that would undertake such projects under non-emergency circumstances;
- Provide immediate access to a coordinated plan that was updated in very short time intervals and took into account the frequently changing priorities of donors, including those that did not work under the umbrella of the MDF;
- Speed up preparation and endorsement of sub-projects, reducing the need for time consuming consultation and coordination procedures with a large number of sectoral and local-level agencies;
- Speed up procurement which was quite important for the specific working modality of the MDF where most sub-projects were classified as "prior review." (In a working modality like the ADB used, i.e. predominantly "post review," the advantage would have been less on the acceleration side but more on the quality assurance side);
- Increase the confidence of donors in procurement processes; the BRR managers had been handpicked on the grounds of their integrity.

On the other hand, this arrangement also had some disadvantages:

- In some cases, it diluted the sense of ownership on the part of the entities that were to be the eventual owners of the newly-created assets because their involvement in the identification and design of the sub-projects had been limited in an emergency context;
- It generated the potential for mismatches between the specifications of newly-created assets and the preferences of national policies and/or local agendas; such mismatches (or perceived mismatches) led to complications and delays in the formal handing-over of assets to the eventual owners, mostly government institutions.

Chapter 2

MDF AND ITS INFRASTRUCTURE PORTFOLIO



This chapter covers the establishment and functioning of the MDF, lists the nine projects that made up the MDF infrastructure portfolio with their main features, shows the implementation times of these nine projects, and outlines general policies on infrastructure reconstruction.

2.1 The MDF's Support for Infrastructure

Given the incredible scale and extensive nature of the damage resulting from the tsunami and earthquakes in Aceh and Nias, the reconstruction of large infrastructure was a critical priority of the Government of Indonesia. The MDF was seen as a key partner for rebuilding infrastructure because of the large amount of funds it had available to assist with the reconstruction and the extensive experience MDF partners offered in infrastructure and logistics support. The Indonesian partner institutions appreciated that the MDF provided pooled donor resources, so that projects could be designed based on overall strategy and needs rather than the funding limitations of individual donors. The Government of Indonesia also appreciated having the single institution of the World Bank as the appointed trustee of the MDF for managing the reconstruction funds from MDF donors.

MDF implemented its infrastructure program through several Partner Agencies – the World Bank, International Labour Organization (ILO), World Food Programme (WFP) and United Nations Development Programme (UNDP) – building on the comparative advantages and core competencies of each. The Partner Agencies worked with various Implementing Agencies, including the line ministries of the Government of Indonesia and non-governmental organizations (NGOs), to implement projects to rehabilitate and rebuild infrastructure, restore vital transport links, and provide logistical support for the overall reconstruction. Implementing Agencies appreciated working with one Partner Agency for each project that was implemented, as questions pertaining to the implementation management could be directed at one agency, and one single, consolidated set of rules, particularly procurement rules, applied.

The national highway connecting Calang with Meulaboh on Aceh's west coast was the last major infrastructure project completed under the MDF. The road included the Kuala Bubon bridge shown in the background.

Photo: MDF Secretariat

The MDF's Partner and Implementing Agencies

The MDF provided the Government flexibility in the use of MDF resources to implement projects through a mix of implementation modalities. These included implementation through government line ministries with funds channeled through the national budget, or implementation through other development partners, including NGOs. About 75 percent of MDF funds were allocated to projects implemented by government agencies.

Under the MDF, Partner Agencies were responsible for the oversight and financial management of the project funds, while project implementation was carried out by implementing agencies. In the selection and appointment of partner agencies, the MDF's Steering Committee coordinated closely with the Government of Indonesia.

Where the Partner Agency was an institution other than the World Bank, a Fiscal Agency Agreement was concluded between the World Bank as the trustee of the MDF and the respective agency. Procurement, financial management, safeguards and all M&E (Monitoring & Evaluation) activities then followed the standard procedures of the Partner Agency.

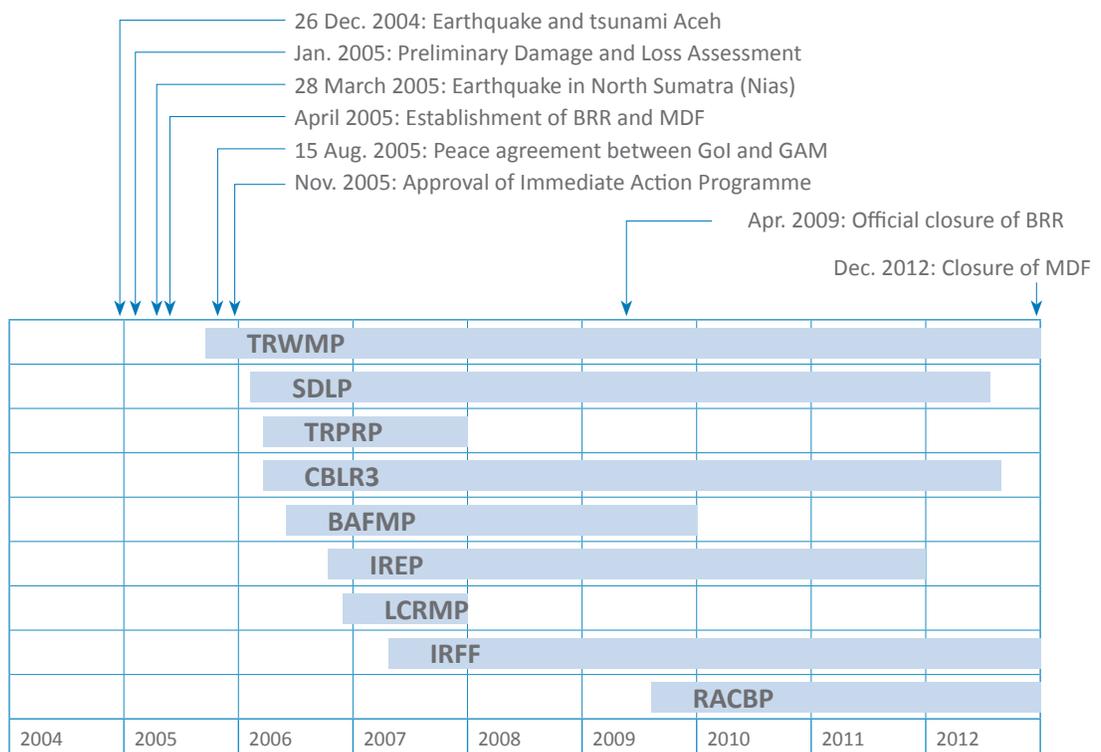
In some cases, MDF funds were channeled to an Implementing Agency in an "off-budget" modality, for example to the NGO Muslim Aid for the Banda Aceh Flood Mitigation Project. In most cases though, MDF funds were channeled through the government's national budget in an "on budget" modality.¹

To some extent the Implementing Agencies implemented activities with their own resources (staff and others), but for most of the operations, they procured consultants and contractors.

2.2 Projects in the MDF Infrastructure Portfolio

The MDF invested approximately \$270.2 million in the recovery of infrastructure. The principal infrastructure services rehabilitated with MDF resources were roads, bridges and trails, ports, water supply, coastal protection, urban storm drainage, and solid waste management. This paper covers the following nine projects that constituted the MDF's infrastructure related portfolio:

¹ The meaning of the terms "off-budget" and "on-budget" are explained in Annex 2.

Table 2.1. Implementation Timelines for MDF Infrastructure Projects

This pump station in Lampaseh is one of three pump stations constructed by BAFMP. The drainage and flood prevention rehabilitation works were designed to be compatible with the existing long-term plans for the Banda Aceh drainage system. It was completed in 2009.

Photo:
Tarmizy Harva

Table 2.2 Projects in the MDF's Infrastructure, Transport and Logistics Portfolio

Name and Main Features of Project	Project Details
Tsunami Recovery Waste Management Programme (TRWMP)	
<p>This program first helped clear rubble and waste from the tsunami devastated areas (mainly urban areas), thus making urban reconstruction possible, then established an improved municipal solid waste management system, thus contributing to significantly improved environmental management as well as improved livelihoods.</p>	<p>Implemented December 2005 to December 2012 Grant amount: \$39.4 million</p> <p>Partner Agency and Implementing Agency: United Nations Development Programme (UNDP)</p>
Sea Delivery and Logistics Programme (SDLP)	
<p>The SDLP initially provided essential shipping services for reconstruction materials and other logistical support; later on the project focused on capacity building for port and logistics management.</p>	<p>Implemented February 2006 to June 2012 Grant amount: \$25 million; Cost recovery revenue: \$2.7 million</p> <p>Partner Agency and Implementing Agency: World Food Programme (WFP)</p>
Lamno-Calang Road Maintenance Project (LCRMP)	
<p>This project maintained a temporary road link along the west coast of Aceh that had to be used after the tsunami had rendered the old road along the coast largely unusable and before a permanent new road on a new alignment was completed.</p>	<p>Implemented December 2006 to December 2007 Grant amount: \$1.5 million</p> <p>Partner Agency and Implementing Agency: United Nations Development Programme (UNDP)</p>
Tsunami Recovery Port Redevelopment Programme (TRPRP)	
<p>TRPRP facilitated the basic planning for, and redesign of, various ports that had been severely damaged or even destroyed by the tsunami.</p>	<p>Implemented March 2006 to December 2007 Grant amount: \$3.8 million</p> <p>Partner Agency and Implementing Agency: United Nations Development Programme (UNDP)</p>
Infrastructure Reconstruction Enabling Program (IREP)	
<p>IREP provided technical assistance (i. e. consulting services for project preparation and implementation management support) on a large scale; this laid the indispensable groundwork for the projects funded through the IRFF.</p>	<p>Implemented July 2006 to December 2011 Original grant amount: \$42 million</p> <p>Partner Agency: The World Bank Implementing Agency: BRR and later Ministry of Public Works (MPW)</p>
Infrastructure Reconstruction Financing Facility (IRFF and IRFF-AF)	
<p>IRFF is an open-menu facility that provided funding for a significant number of mainly road reconstruction projects and water supply projects, whereby large amounts of MDF funds were complemented by even larger amounts from Gol.</p>	<p>Implemented May 2006 to December 2012 Original grant amount: \$136.7 million (including \$36.7 million Additional Financing (AF)) Counterpart funds: \$107 million</p> <p>Partner Agency: The World Bank Implementing Agency: BRR and later Ministry of Public Works (MPW)</p>

Banda Aceh Flood Mitigation Project (BAFMP)	
This project rehabilitated and reconstructed the drainage system and flood protection installations in one designated zone of Banda Aceh City, thus laying essential groundwork for rebuilding houses, roads and sustainable urban development (other zones were handled by other organizations).	Implemented April 2006 to December 2009 Grant amount: \$6.5 million Partner Agency: The World Bank Implementing Agency: Muslim Aid (a London-based NGO)
Capacity Building for Local Resource-based Rural Roads (CBLR3)	
This project enhanced the capacities of local governments and small contractors to construct and maintain local feeder roads in Aceh and Nias using cost-effective local resource-based methods. The approach uses basic technology and local labor, builds local capacity and creates short and long term labor opportunities.	Implemented March 2006 to November 2012 Grant amount: \$13.9 million Partner Agency: United Nations Development Programme (UNDP) Implementing Agency: International Labour Organisation (ILO)
Nias Island Rural Access and Capacity Building Project (RACBP)	
This project replicated the local resource-based approach for the construction of roads, trails, bridges and other small infrastructure on Nias Island. The project complements the MDF's Livelihoods and Economic Development Project in Nias to link increased agricultural production with increased access to markets and social services.	Implemented October 2009 to December 2012 Grant amount: \$16 million Partner Agency and Implementing Agency: International Labour Organisation (ILO)

2.3 Design and Implementation of the MDF's Infrastructure Portfolio

The MDF's initial infrastructure investments focused on addressing logistics needs and restoring vital transport links to provide access to affected areas, thereby supporting urgent community recovery processes. Once these were established, the MDF redirected attention to large-scale infrastructure reconstruction. Investments in large infrastructure have critical quality and ownership requirements which may supersede speed considerations, and care needed to be taken to balance the cost of speed and the cost of delay. In its final phase, the focus expanded to include enhancing the capacity of agencies to manage the newly created assets. The experiences in Aceh and Nias demonstrate that a sequenced approach to infrastructure investments, and indeed to overall reconstruction, based on balancing the need for urgency with the need for quality and ownership, can be highly effective in managing short-term expectations while delivering long lasting results.

During the early phase of the reconstruction process, the MDF supported infrastructure and logistics linked to the Immediate Action Plan (IAP) that the GoI and the donor community had agreed on in November 2005. The IAP provided for the MDF to start the first batch of infrastructure, transport and logistics projects in an off-budget modality. Support for the TRWMP, the SDLP, the TRPRP, the BAFMP, and the CBLR3 began in this phase. Other projects that the MDF funded during the early phases of reconstruction focused on the recovery of communities through a community-driven reconstruction approach, which included the reconstruction of housing and small community-level infrastructure.

In the second phase of the reconstruction process, the MDF launched its tandem pair of large infrastructure projects, the Infrastructure Reconstruction Enabling Program (IREP) and the Infrastructure Reconstruction Financing Facility (IRFF) with the World Bank as Partner Agency and BRR as the initial Implementing Agency. After BRR closed, the role of Implementing Agency was handed over to the Ministry of Public Works (MPW). The last MDF infrastructure project to be launched was the Nias RACBP in 2009, part of the MDF's final phase of support designed to lay the foundation for economic development.

IREP and IRFF: Flexible Funding and Enabling Approach

The MDF's complementary pair of large infrastructure projects, the IREP and IRFF, were designed to work in tandem to support the government's program for the reconstruction of large infrastructure. The IRFF was meant to provide flexible funding for infrastructure reconstruction with an emphasis on filling gaps identified by BRR or other agencies and not covered by other funding sources. Thus, it became necessary to create a mechanism through which sub-projects to be funded from the IRFF could be identified, scoped, designed, adequately prepared and implemented with supervision and monitoring. The IREP provided technical assistance (i.e. consultant services) pertaining to strategic planning, project design, project preparation (including the handling of relevant social and environmental safeguards aspects), implementation support and construction supervision as well as financial management and operation and maintenance. IREP was – in the words of the BRR – a “strategic enabler,” a prerequisite for launching the IRFF.

The IREP was a high-risk project: never before had a pure technical assistance project of this financial magnitude been launched in Indonesia. However, it turned out to be a successful, high-reward project.

In addition to the total \$137 million in MDF funding for IRFF, the Government of Indonesia provided \$107 million in counterpart funds, demonstrating its commitment to the partnership with MDF. Combined with IREP's allocation of \$42 million from the MDF, the total IREP-IRFF effort amounted to more than \$286 million.

Enabling Good Governance

The MDF took the anti-corruption agenda very seriously as did the BRR, who initiated concrete action to minimize potential problems. One volume of BRR's 14-volume book series on the reconstruction effort is devoted to this agenda and describes the various measures that BRR took to address governance issues, in line with the policies of the administration of President Susilo Bambang Yudhoyono. BRR points out in its book series that by December 2008, it had blacklisted 129 companies for various procedural violations, rendering those companies ineligible to join any more tenders.²

BRR management designed a fairly elaborate system of checks and balances, with mechanisms to enhance transparency, accountability, and fairness in of all its actions and transactions and to involve the wider public in its efforts. The top management of BRR consisted of individuals who had been hand-picked by the President on the grounds of their reputation for integrity and competence.

Within its own jurisdiction, the MDF management upheld the highest standards of combating corruption, collusion, fraud, and mismanagement. The Anti Corruption Action Plan (ACAP) was implemented in all the World Bank managed projects; however, there is room for improvement in terms of recording complaints and reporting them to the public.

The obstacles faced in reducing corruption, collusion, and mismanagement are of concern in any reconstruction program, and systems and procedures need to be designed, implemented and actively monitored for effective utilization of funds.

² Badan Rekonstruksi dan Rehabilitasi Aceh dan Nias. Book Series part 4: *Supervision: Eradicating Corruption with No Tolerance*, 47

“Building Back Better” – What Does It Mean?

The Government of Indonesia and the donor community, including MDF, agreed that the reconstruction should not just recreate the state of infrastructure development that had existed before but should contribute to the region’s further development. The new assets should be better than those that had existed before the disaster. “Build Back Better” was the motto. Some examples of what this meant on the ground include the following:

Betwter Roads

Where roads were rebuilt, they were mostly designed to better standards than the old roads had been. For example, new roads were constructed on a stronger base and with a thicker surface, and better drains were provided. These improvements will reduce wear and tear, thus reducing the cost of maintenance. In the long run, a higher-cost investment resulting in lower operations and maintenance costs will be more economical than a low-cost investment that is expensive to maintain. The width of new roads were consciously expanded to provide more load capacity than is needed at present. This may also be quite economical in the long run, as phased road widening in short intervals disturbs the flow of traffic, is technically inefficient, and often yields technically unsatisfactory, short-lived results.

Bigger Ports

Expanded ports, consisting of larger jetties and storage facilities, were built in six locations: Malahayati Port near Banda Aceh, the ports of Lhokseumawe and Kuala Langsa on Aceh’s east coast, Calang Port on Aceh’s west coast, Sinabang Port on Simeulue Island, and Gunung Sitoli Port on Nias Island. The latter two are vital for the economy of those islands, and they are well utilized. The other four ports have considerable spare capacity that will probably not be fully utilized for many more years. They were designed with the hoped for, long-term perspective of the region’s economic development in mind, but these assumptions may have been unrealistic.

Better Landfills

The better landfills for solid waste built under the MDF portfolio may be costlier to build and also costlier to operate and maintain than the old ones, but they are much more sound from an environmental point of view. The original Banda Aceh landfill (at Gampong Jawa) was situated just 200 meters from the shore and virtually at sea level, with hardly any groundwater protection measures implemented. The tsunami completely destroyed that landfill and scattered the waste all over the city. Under the Tsunami Recovery Waste Management Programme, a new combined landfill for both Banda Aceh City and Aceh Besar District was built to high technical and environmental standards. This landfill is considered a showpiece for modern environmental engineering that is feasible in Indonesia. Both local governments involved have committed themselves to operate and maintain this state-of-the-art facility adequately. A modern, low operation-cost natural reedbed treatment for the leachate (effluent) will help minimize the burden on local government budgets.

Sustainability of Investments

Plans for newly created assets that may exceed local budgetary capacity need to be carefully considered before proceeding with any such investments. Where substantially upgraded facilities bring with them significantly increased costs for operations and maintenance, a local authority may be reluctant to take on the responsibility. Using effective technology that is appropriate for the situation, and which requires lower operations and maintenance costs, should be considered.

Chapter 3

RECONSTRUCTION OF TRANSPORT INFRASTRUCTURE



This chapter describes the MDF's efforts towards the reconstruction of transport infrastructure, i. e. ports and roads. A more detailed description of these projects is in Annex 3. Several textboxes highlight crucial issues of wider relevance.

3.1 Reconstruction and Rehabilitation of Roads and Bridges

Context and Impact of the Disasters

The two disasters inflicted colossal damage to the road infrastructure and road transport sector. The Damage and Loss Assessment of January 2005 estimates damage to be about \$350 million and economic losses totaling \$140 million for this sub-sector. This does not include the damage and losses of the March 2005 earthquake. Immediate emergency repairs to the road network and road transportation systems were therefore undertaken with the highest priority even before the MDF commenced its operations.

MDF Support for Road Reconstruction

In the second phase of the reconstruction process, the MDF launched the Infrastructure Reconstruction Enabling Program (IREP) and the Infrastructure Reconstruction Financing Facility (IRFF) with the World Bank as Partner Agency and the Ministry of Public Works (MPW) as the Implementing Agency. The IREP consultants prepared studies and designs for the road reconstruction projects. Table 3.1 shows the road reconstruction sub-projects included under IRFF.

Table 3.1 IRFF Sub-projects for Road Reconstruction

Type of road	Number of road links	Approximate total length
National road	2 *	355 km
Provincial road	9	355 km
District road	21	185 km
Total	32	895 km

* One of these two links consisted of 8 sub-links that were contracted individually

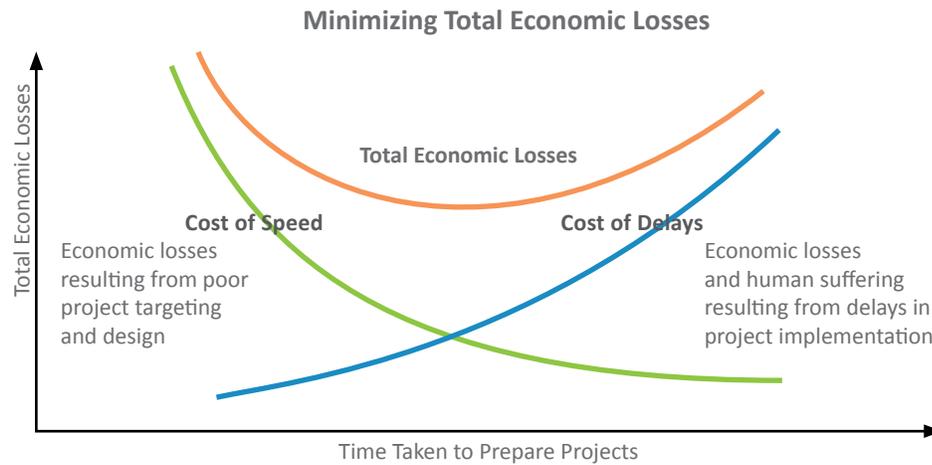
The MDF has helped to restore vital transportation networks across Aceh and Nias through the construction and rehabilitation of national, provincial and district roads. These roads not only restored linkages destroyed during the disasters but also helped to lay the foundation for future economic growth and development.

Photo: Irwansyah Putra

The Economics of “Having to Act Fast”

In a post-disaster environment like in Aceh and Nias, the “Economics of Having to Act Fast” are very relevant, much more so than in typical donor funded investment projects, and especially during the immediate aftermath of the disasters.

In view of the enormous destruction and profound human suffering, there was huge pressure on all actors involved in the reconstruction process to act fast and get projects ready for implementation. Acting too fast and/or cutting corners would result in poorly targeted, poorly prepared, and/or poorly designed projects with consequent negative effects. On the other hand, proceeding with the same degree of care and meticulousness that donors strive for in their typical investment projects would have taken too long, prolonged human suffering, and exacerbated the economic losses resulting from the continued lack of adequate infrastructure facilities. The responsible actors had to strive for an optimum balance between these two aspects to minimize total economic losses.



These two types of losses can also be thought of as “The Cost of Speed” and “The Cost of Delay.” The objective of project design and management should be to minimize their sum.

The responsible actors considered these factors in their work and used relatively simple and straightforward rules to select projects instead of following usual project development procedures. In hindsight, it appears that an acceptable balance was achieved, and the total economic losses were acceptably low. Some officers called the inevitable economic losses from having to act fast “The Cost of Speed,” implying that they were acceptable under the given extraordinary circumstances.

Even so, there are ways to reduce this “Cost of Speed.” The MDF adopted a phased approach, addressing immediate recovery needs, such as housing and logistics first, followed by the second phase which concentrated on reconstruction activities, including infrastructure and protecting the environment. The final phase

focused on developing livelihoods and enhancing the capacity of agencies to manage the newly created assets. It is essential that the management of a portfolio like the MDF has the authority to show an unusual degree of flexibility and more room for discretion than usual in making adjustments to project concepts as their necessity becomes obvious. This pertains to adjusting the scope and coverage of investments, bearing in mind that initial project plans are often based on uncertain information, as well as to employing flexible procurement options. A strong presence on site and high degree of delegated decision making authority are essential to speed up implementation.

In post-disaster or fragile situations, there is often the criticism that local stakeholders are not involved more closely in the identification and scoping of projects, that data gathering and analysis could have been more thorough, that communities could have been consulted more intensively, or, in the specific case of Aceh and Nias, that some implications of “building back better” had not been explored to full depth. However, this has to be seen against the background of the cost of delayed results outlined above, and the need to manage expectations.



Entire sections road between Lamno and Calang were badly damaged. Providing emergency transportation links was among the first priorities of the MDF. The repair works on the Lamno to Calang road helped reduce travel time by half. The improved access was vital to the recovery efforts on the west coast of Aceh.

*Photo:
UNDP
Collection*

The MDF portfolio addressed the reconstruction and betterment of the road network in a very comprehensive manner, always in close coordination with BRR, and later with Bappenas. Suitable sections of the national, provincial, and district road networks were selected for reconstruction under the IREP and IRFF projects. In addition, the MDF supported the reconstruction of the national road along Aceh's west coast by funding a separate project, the Lamno-Calang Road Maintenance Project (LCRMP), that focused on the maintenance of a temporary road during the reconstruction of the national road. Furthermore, the MDF launched the Capacity Building for Local Resource-Based Rural Roads Project (CBLR3) and Nias Rural Access and Capacity Building Project (RACBP) that focused on capacity building and physical implementation for the construction of small rural roads, trails, and bridges. The rationale was that a holistic and comprehensive approach would be most effective in helping Aceh and Nias recover from the disasters and helping specifically Aceh recover from the consequences of the protracted conflict.

National Roads

Under the Additional Financing to IRFF project, the MDF financed the reconstruction or betterment of the southern section of the national road along Aceh's west coast, from Calang to the border of North Sumatra Province, completing a vital transport link with a total length of approximately 340 kilometers. This project was undertaken both in response to earthquake and tsunami damage that the old national road had experienced in some sections and in an effort to help the regional economy recover from the economic impact of the disasters and the protracted conflict. Although subdivided into nine sub-links, this has to be considered one single, vital arterial road connection. It connects to a project undertaken by the United States Agency for International Development (USAID), namely the reconstruction of the northern section of the same national road, from Lamno to Calang. Similarly, the Japan International Cooperation Agency (JICA) had in 2006 undertaken a temporary rehabilitation and reconstruction of the section from Calang to Meulaboh (over 80 kilometers in length). Thus, the rehabilitation of the vital national road along Aceh's west coast was a concerted joint effort by MDF, USAID, and JICA, coordinated by and with BRR.

The rehabilitation of the vital national road along Aceh's west coast was a concerted joint effort by MDF, USAID, and JICA, coordinated by and with BRR.

To keep the vital road connection along Aceh's west coast operational while the new national road was being constructed by USAID, the Lamno-Calang Road Maintenance Project (LCRMP) was launched; it arranged for the maintenance of a temporary road on a separate alignment between Lamno and Calang at a total cost of \$1.5 million. This involved continuous, intensive maintenance of a string of local roads along a length of more than 100 kilometers (note: while the distance between Lamno and Calang is only approximately 90 kilometers on the main road, the string of zigzagging local roads was considerably longer). The LCRMP was implemented only from December

2006 to December 2007. After that, the further maintenance of the temporary road became the task of the contractor that USAID had hired for the construction of the new national road. For more details, see Annex 3.

Another national road link rehabilitated by the MDF was located in the interior of Aceh, between Pidie and Aceh Barat; its length was approximately 65 kilometers. All national road links were built to very good standards and completed satisfactorily. The roads were handed over to the Ministry of Public Works which is responsible for the continued operations and maintenance of these investments.

Provincial Roads

The MDF infrastructure portfolio included over 350 kilometers of provincial roads. This included two provincial roads that provide alternative access from the less damaged northeast of Aceh to the heavily damaged southwest. All these road improvements were made on the existing alignment and within the existing right-of-way in order to avoid time consuming land acquisition procedures. A special case was the construction of a totally new two kilometer long road link within the territory of Banda Aceh City. That sub-project was not a reconstruction effort but an initiative to aid the further expansion and economic development of the city and resulted in rapid development along its corridor with substantial economic benefits.

The most striking improvements to local accessibility on Nias Island were achieved by constructing two sections of provincial road that are of vastly improved quality compared to the previous roads. The economic benefits of these two road links will be long-term in nature, and include substantial savings in vehicle operation costs and travel time. The rationale for constructing these roads lies in the vast improvement to local accessibility and the long-term benefits this will probably engender. All provincial road links were built to very good standards and completed satisfactorily. The roads were handed over to the provincial governments of Aceh and North Sumatra who will maintain them.



Vital transportation links were restored and improved with MDF grant funds. This photo shows the foundation being laid for the Kuala Bubon bridge, which forms a key part of the west coast highway and links the districts of Aceh Jaya and Aceh Barat.

Photo:
Akil Abduljalil

District Roads

The MDF infrastructure portfolio included roughly 190 kilometers of district roads. These were considered important elements in the overall effort to revive the local economies of Aceh and Nias.

For the selection of district roads that were to be eligible for funding from the reconstruction budget, BRR had set three criteria: (1) the road link had to be disaster affected; (2) the road link had to pass through an area of at least average population density and corresponding potential for significant economic development; and (3) the road link had to be connected to other major road links.

One district road in Nias that was improved under the IRFF portfolio effectively substitutes a longer provincial road link whose improvement (currently being done by provincial government without support from BRR or MDF) was not completed by 2012. It was recognized that district roads play an important role in reviving the local economy. The MDF was also mindful, however, of the potentially problematic environmental implications of improvements to district roads in areas with rich forest and other natural resources. Therefore in Nias, the proposal by local government to connect two district road links by an alignment through protected forest could not be accepted.

In general, district road links were built to very good standards and completed satisfactorily. Bridge replacements were typically excluded from the scope of the sub-projects; the reasons for this policy are explained in Annex 3. All these roads have been handed over to the respective district governments who are responsible for the continued operations and maintenance of these roads.

Rural Roads, Trails and Bridges

In addition to the reconstruction and rehabilitation of national, provincial, and district roads, the MDF portfolio included two projects with a specific focus on capacity building and physical implementation for the construction of small rural roads, trails, and bridges. These were the Capacity Building for Local Resource-Based Rural Roads (CBLR3) project, and the Nias Rural Access and Capacity Building Project (RACBP). For the first, the Partner Agency was the UNDP, and the Implementing Agency was the ILO; for the second, the ILO was both Partner Agency and Implementing Agency.

Both projects were designed to complement the reconstruction works on national, provincial, and district roads. The CBLR3 covered three districts along the north and



A district road in Aceh Besar District before (top) and after (bottom) reconstruction. The project scope included better protection against coastal abrasion.

Photo:
Kris Hedi

east coasts of Aceh and two districts in Nias and focused on the betterment of small rural roads (district and village roads) of two to eight kilometers length, converting dirt tracks into simple but adequate all-weather roads that are a maximum of three meters wide.

The RACBP started in October 2009 and was the last project to be launched under the MDF infrastructure portfolio. It focused on improving access for residents in remote areas of the Nias Islands. The project built all-weather roads, bridges and trails in 21 sub-districts across the four districts and one municipality of Nias. Besides the construction of small rural roads and trails that are often less than two meters wide, the RACBP included the rehabilitation or construction of nearly 80 river crossings and bridges (mostly suspension bridges or suspended bridges) that are maximum 1.5 meters wide and meant for pedestrians, bicycles, and motorcycles.

Both projects were aimed at sustained capacity building in local governments and other entities for the construction of small rural access roads with an emphasis on community involvement and local resource-based construction techniques. However, the CBLR3 focused on capacity building for the construction of roads in order to complement the improvement of district and provincial roads, resulting in more comprehensive reconstruction and recovery efforts for Aceh. The RACBP, on the other hand, was more closely linked with the Nias Livelihoods and Economic Development Project (LEDP) which is under the MDF portfolio but outside the infrastructure portfolio. These two projects provided complementary support between increased production in the area (LEDP) and increased access to neighboring areas, markets and social services (RACBP). The assets created by the RACBP were mostly handed over to village authorities while many of the roads rehabilitated under the CBLR3 were district roads. The villages may be in a position to handle basic maintenance of these assets but will require financial support from higher levels of government when major repairs are needed.



A local worker spreads asphalt in Aceh Besar under the ILO Rural Roads project, CBLR3. By employing a local workforce that used tried and tested techniques and durable materials, the project ensured benefits go directly to the people who need it most, and the results will have lasting impact.

*Photo:
Kristin
Thompson*

The economic benefits of these small roads, trails and bridges are probably substantial, although hard to quantify. For many remote villages, access by vehicle (even if only by motorcycle) has become possible for the first time. Similarly, there is a quantum leap in accessibility (a non-linear benefit) where new bridges and swamp crossings were constructed. Improved access to large tracts of farmland or potential farmland will turn their use from “economically unfeasible” to “economically viable” with long-term socio-economic benefits. Benefits may not be easy to detect in the short term as much of the agricultural in these remote rural areas is based on tree crops. In addition to these economic benefits, the small roads, trails and bridges provide substantial, non-quantifiable social benefits in the form of improved access to education and health facilities.

The RACBP also included a small component for the repair and restoration of traditional houses and other structures related to the preservation of the unique cultural heritage on Nias Island.



A suspension bridge in rural Nias before (left) and after (right) reconstruction.

*Photo:
MDF Secretariat*

Involving Communities

MDF has consistently used approaches across its portfolio that involve local communities in the planning, construction, operation and maintenance of reconstruction assets. No significant opportunities were missed.

Community participation was at the core of the CBLR3 and the RACBP. Sub-projects were planned on the basis of agreements reached with local communities. Local labor was used to the maximum extent possible to construct small rural roads, trails, and bridges. In the construction sub-projects funded by the IRFF, main contractors engaged small local subcontractors for minor, less sophisticated works to address potential tension with local communities. Similarly, local laborers were hired for the LCRMP where feasible. Community participation during the operation phase was also used by BAFMP and TRWMP in the regular collection of household waste from residential areas, in the payment of waste collection fees, and in waste separation, composting, and recycling. Local communities also committed themselves to maintaining the assets created under CBLR3 and RACBP.

Community consultations are an important part of all large-scale infrastructure projects. Consultation processes may be constrained where there is enormous time pressure to complete projects and people are struggling to overcome the emotional trauma, rebuild their houses, and re-establish their income generating activities. The MDF used a phased approach to the reconstruction, as previously described, to balance the cost of delays with the cost of speed, and ensured that procedures were followed to meet required safeguards.

What Worked Well

Roads constructed under the MDF are generally of good quality, one of the results of the strong supervision carried out by the Partner Agencies and the commitment of the Implementing Agencies. Another significant contributing factor was the provision of training and the powerful sense of ownership by the communities involved.

The close working relationships with the relevant GoI agencies have in general also resulted in a high sense of ownership by the GoI of the assets created. All roads and bridges reconstructed under the MDF were successfully handed over to the government at project closure. In cases where projects may not have been complete at project closure, the GoI has demonstrated its commitment to the reconstruction by continuing works using GoI funds.

The rehabilitation of the road along Aceh's west coast illustrates the coordinated efforts of various development partners. The commitment to maintaining temporary roads also enabled transport links to remain operational during the reconstruction process.

To avoid time-consuming land acquisition procedures, almost all roads were reconstructed or improved along the existing alignments, within the existing right-of-ways. Where land acquisition was unavoidable it was handled in accordance with the required social and environmental safeguards of the respective Partner Agencies (see textboxes "Land Acquisition" and "Environmental Management" for more details). The provincial and local governments demonstrated their commitment to fair and proper land acquisition procedures, by providing the required funds where needed to compensate for land and, where appropriate, livelihoods that were impacted by land acquisition.

"If I could turn back the clock, I would place much more emphasis on smaller roads."

A Public Works Agency Officer

The rationale for the reconstruction of roads destroyed or heavily damaged by the disasters was often obvious; in many cases there was no feasible alternative. Less obvious at first glance was the rationale for the considerable upgrading that was implemented on several other road links, for example the provincial road along the west coast of Nias Island. Conventional economic assessments, based on short-term savings of travel time and vehicle operation costs would not provide an acceptable justification. Instead, such road upgrading has to be seen as an intervention to provide improved access and reduce regional disparities, with more significant social than economic benefits. The economic justification lies more in the prospect that reduced transportation cost, especially if combined with substantial improvements to the network of feeder roads and trails, would help stimulate agricultural production and the rural economy in general. The benefits of this would, however, only materialize after a relatively long lead time. Reduced transportation cost would encourage farmers to grow more cash crops that in the case of rural Aceh and Nias would mostly be tree crops, and tangible increases in production would only be recorded after a decade or so. Still, it is realistic to expect that the improvement of such roads would have a benefit that justifies the investment.

In the context of Aceh and Nias, it can be estimated that the economic benefits of improvements to small rural roads, trails, and bridges are fairly high compared to improvements to national, provincial, and district roads. In addition, the benefits of such roads accrue to a population group that shows a higher incidence of poverty than the regional average.

Lessons Learned for the Future

Many construction contracts were made on a fixed-price basis, without price escalation clauses. This was the declared policy of BRR, partly to help manage transaction costs and unwarranted spending. Therefore, whenever unanticipated additional works became necessary or input prices increased, some other items had to be dropped from the contract, for example road shoulders or river crossings. To address works that were omitted, the MDF funded a “Gaps Program” with funds that were unallocated to projects under IRFF. The overall value of the unfinished works comprised a small portion of the total value of the infrastructure investments made, but the impact of addressing these had significant sustainability implications.

In hindsight, the competition between road and boat transport could have been more accurately assessed. Even so, all forecasts for future transport demand volumes would have had a high margin of error because there were simply too many unknown factors in this post-disaster, post-conflict environment. There are indications that road transport volumes have not increased significantly during the last few years, after peaking during the reconstruction boom.

Reconstruction of roads should not be seen in isolation, but rather in the context of a transportation network that connects local communities to a larger district and provincial network, providing access to broader markets and social services. Strong coordination between different development partners strengthens the overall impact of a reconstructed transportation network.



Under the Nias Access and Capacity Building Project (RACBP), almost 2,000 meters of bridges were constructed, improving access to markets, schools and healthcare facilities for isolated villages across the islands.

Photo:
MDF
Secretariat

Fixed-Price Contracts – Pros and Cons

It was BRR's policy that all contracts for civil works be made on a fixed-price basis, without provisions for physical contingencies and without price escalation clauses. BRR called these "balanced budget contracts." One of the reasons for this policy was that most contracts were expected to be implemented within relatively short time spans and thus price escalations were not expected to be an issue. Provisions for physical contingencies were also avoided for fear that this would open the door for poorly substantiated or hard-to-verify claims from contractors. The very high transaction costs of approving payments on this basis are not cost effective in an emergency context. Combined with BRR's declared commitment to transparency and integrity, this policy was understandable.

In reality, there were indeed price escalation issues as well as delays to contract implementation, often beyond the control of the contractors. In addition, cases did arise where works that had not been specified in the contract were nevertheless needed. Under the policy of "balanced budget contracts" there was no other way to compensate for these effects than to selectively eliminate lower priority items that appeared in the original bill of quantities documentation.

The MDF responded to the unfinished works under the IRFF program by implementing a "Gaps Program," using IRFF funds that remained unallocated to projects. At the closure of the IRFF project in December 2012, the GoI committed to completing unfinished Gaps Program works using its own funds.

3.2 Reconstruction and Rehabilitation of Ports

Context and Impact of the Disasters

According to the Damage and Loss Assessment of January 2005, 14 ports in Aceh and another five ports in North Sumatra had suffered damages totaling approximately \$25 million from the earthquake and tsunami of December 2004. Most of the damage had occurred in the ports along Aceh's west coast (especially Meulaboh), on Simeulue Island (Sinabang) and also in Banda Aceh (in the Ulee Lheue ferry port and the Malahayati cargo port). More damage was recorded, especially in Gunung Sitoli, as a result of the March 2005 earthquake.

MDF Support for Ports Reconstruction

The MDF focused first on the issue of getting the ports reconstructed and/or expanded. During 2005, the stakeholders to the reconstruction considered that the restoration

of the ports' functionality would be a cornerstone of the reconstruction efforts. In late 2005, UNDP proposed a comprehensive port reconstruction project with a budget of \$40 million, but this was subsequently reduced to emergency repairs and port design management. The Tsunami Recovery Port Redevelopment Programme (TRPRP) was launched in March 2006 as part of the Immediate Action Plan agreed upon in November 2005, in accordance with the overall port redevelopment strategy that was endorsed by BRR. The budget for TRPRP was \$3.8 million and the UNDP was selected as the MDF's main Partner Agency for this project that focused on designing a port rehabilitation strategy. This was a logical continuation of UNDP's previous work: UNDP had responded to specific requests for advice from district government of Aceh Barat District and Aceh Provincial Government from March 2005 onward and provided expertise to prepare a sea transport support strategy. Under TRPRP, which closed in December 2007, various studies were undertaken and designs prepared for ports. The reconstruction of four of these ports was funded through the IRFF project under the MDF portfolio.

The port reconstruction activities included the construction of new wharves and supporting facilities, such as offices and storage areas.

Through the studies and design work conducted under the TRPRP, the MDF leveraged substantial additional reconstruction funds from the Governments of Indonesia, Australia, and Singapore. The IREP included studies and design work for two more ports: Malahayati (the port for Banda Aceh) and Krueng Geukueh (the port of Lhokseumawe City, approximately 200 kilometers east of Banda Aceh). These were then implemented with funding from the IRFF. The IREP also included procurement support and construction supervision.

Table 3.2 Leveraging of Funds for Port Reconstruction

Studies/designs funded by MDF	Source of funding for physical implementation
a. under TRPRP	
1. Ulee Lheue Port	AusAID
2. Singkil Port	Gol / BRR
3. Calang Port	Initially MDF through IRFF, later continued by Ministry of Transport
4. Sinabang Port	MDF through IRFF
5. Gunung Sitoli Port	MDF through IRFF
6. Kuala Langsa	MDF through IRFF (one contract package together with No. 7)
b. under IREP	
7. Krueng Geukueh	MDF through IRFF (one contract package together with No.6)
8. Malahayati	MDF through IRFF

What Worked Well

Port facilities were built to high standards and will bring long-term benefits to varying degrees although transport volumes peaked during the reconstruction boom and have not increased significantly during the last few years. The new wharves are used most intensively where there is no competition from road transport or no feasible transport alternative at all, for example on the remote islands of Simeulue and Nias. The new MDF-funded wharf in Gunung Sitoli was crucial for the reconstruction process there: the old wharf had been badly damaged by the earthquake, but it could not be closed for repairs because there was no other wharf on Nias suitable for boat transport to mainland Sumatra. The old wharf was rehabilitated after the new MDF-funded wharf became operational. Both wharves are now used to nearly full capacity, and GoI is now constructing yet another wharf specifically for landing craft.



Piling works for the new wharf in Gunung Sitoli port on Nias Island built under the MDF's IRFF project.

Photo:
Kris Hedi



The Malahayati port of Banda Aceh, rehabilitated through the MDF's IRFF project, seen from the air in May 2012.

Photo:
Gottfried
Roelcke

Lessons Learned for the Future

The plans for the reconstruction and/or expansion of ports were not always based solely on the results of economic assessments but also on other factors. The Project Completion Report for the TRPRP (by UNDP) makes a clear reference to this. In addition, and especially in Aceh, the decision to expand port facilities may sometimes have been based on the assumption that there were substantial regional development potentials that had not been developed as a result of unfavorable circumstances such as the security situation in an environment of armed conflict. In hindsight, the plans for reconstruction and expansion of ports could have been better embedded in integrated overall transport strategies. Various factors that limit or reduce the economic feasibility of ports could thus have been taken into consideration. Among these factors is the competition between road and boat transport whereby every improvement of roads makes transport by boat less competitive. This could have been more thoroughly considered on transport links such as Calang-Meulaboh and Medan-Banda Aceh. Also, the general, worldwide trends in shipping go to ever bigger and ever more specialized

boats, thus making it increasingly difficult for smaller ports with their small volumes of cargo to compete. Boat transport to and from ports in Aceh is relatively unattractive to operators because most of the boat trips are one-way traffic, and a boat would have no or only very little payload on one leg of the voyage. Thus, the ports of Aceh cannot effectively compete with the Belawan Port of Medan where it is much easier for boat operators to find payloads in both directions.

Several port facilities have been designed very generously and have created capacities that exceed the current real demand, in some cases (Kuala Langsa, and Krueing Geukueh) even quite considerably. The wharf in Malahayati port now has approximately three times the capacity it had before the tsunami because the wharf was extended by an MDF funded sub-project on the west side and, in addition, by a new wharf funded by the Government of the Netherlands on the east side. However, the utilization of this expanded new wharf is constrained by the relatively shallow water depth. In general, though, one can argue that generously designed or even over-designed facilities do not entail much economic harm because their operation cost is negligible and their maintenance cost is small.



Further key responsibilities of IREP were to ensure that proper safeguard measures were integrated into project preparation and implementation. This notice board in Aceh Utara, erected by an IRFF-funded project, highlights the importance of not mining sand off beaches for construction.

*Photo:
Shaun Parker*

In a disaster reconstruction context, it is important to take into account the longer-term vision of relevant authorities related to broader trends and policies that may affect transportation and movement of goods in the future. However, this should be balanced with the required speed of response that would enable a return to minimum required functioning of facilities. Furthermore, the roles of central and local governments in port operations have to be clarified to avoid any potential for overlapping.

Environmental Management

Environmental management in the context of development has two main aspects. One is the thorough consideration of environmental concerns during the identification and preparation of projects; the other is the adherence to proper environmental management practices during implementation.

The consideration of environmental concerns during the identification and preparation of projects was done well; there are no indications that any significant adverse side effects in environmental matters arose in the MDF portfolio. Likewise there are no indications that significant opportunities were missed to improve the environmental aspects of the portfolio.

The World Bank, in its role as one of the MDF's Partner Agencies, developed a new approach for environmental management through the IRFF project. The specifications for "proper environmental management during construction" were not only included in every contract, they were in many cases already part of the bids. This implied that "proper environmental management during construction" became a paid item under the contract. Also, it implied that the contractors themselves were at liberty to define and propose the approach and implementation methods they thought sensible and feasible, and these parts of their proposal were subject to evaluation, just like the proposed methods for the construction itself. This created much more ownership and acceptance by the contractors. With this innovation, the contractors could no longer claim that the eventual contractual stipulations for environmental management were "externally imposed," "unfeasible," "impractical," "or too costly." This approach became known as "Contractor's Environmental Action Plan" (CEAP).

In addition, MDF projects were allocated significantly more resources for implementation support than usual due to the challenging operational context, and this also helped secure the environmental quality in the results.

Chapter 4

RECONSTRUCTION OF OTHER INFRASTRUCTURE



This chapter describes the MDF's efforts towards the reconstruction of other infrastructure, such as drainage and flood control sea defenses/coastal protection, solid waste management, and urban water supply. It also describes the efforts in transport logistics. Several textboxes highlight crucial issues of wider relevance.

4.1 Drainage & Flood Control

Context and Impact of the Disasters

The tsunami devastated the drainage systems of Banda Aceh and many towns in Aceh, exacerbated by the tectonic movements associated with the earthquake which had altered local topography in these places and made repeat surveys necessary. A further challenge was the lack of hydrological data on which designs, cost estimates, and the overall size of the proposed investment would normally be based. In addition to the devastation, the low-lying areas of Banda Aceh had been prone to flooding and waterlogging before the disaster. Banda Aceh's Zone 2, where the MDF was to provide support, was regularly waterlogged during spring tides (twice a month) and flooded after virtually every heavy rain.

Working within this context, GoI and the donor community made huge efforts to restore the drainage and flood protection systems in Aceh as quickly as possible, and the coordination by BRR was crucial in this context.

The groundwork was laid by some crucial technical assistance (TA) operations: commissioned by the Government of France, new topographical data was compiled on the basis of latest aerial photography that had been commissioned by the Government of Norway. In addition, and on the basis of intensive preparation work by MDF staff, the Government of the Netherlands commissioned, in parallel to its contribution to the MDF, TA for the design of drainage and flood control systems as well as sea defenses. This TA designed several potential projects whose total value was over \$100 million.

The new water treatment plant for Sabang, built by the MDF's IRFF project.

Photo: Irwansyah Putra

MDF Support

Drainage and flood control is, in general, a crucial sub-sector in urban infrastructure development anywhere; it lays the basis for all other construction and development works. Beneficiaries from improvements to drainage and flood protection are typically the urban poor who tend to live in areas that are prone to waterlogging because land prices are much lower there.

The MDF funded two major operations for drainage and flood protection: the Banda Aceh Flood Mitigation Project (BAFMP), and the Lhokseumawe Stormwater Retention Basin, a sub-project under the IRFF (both are described in more detail in Annex 3).

The BAFMP was the main operation for drainage and flood control under the MDF portfolio. This project emerged out of the wider portfolio that the TA for drainage, flood control, and sea defenses had prepared. After the clearing of rubble, debris, and tsunami sediments had been completed, BRR subdivided the lowest-lying portions of Banda Aceh into eight zones. The MDF lent support to this planning process and also implemented the physical improvements in one of these eight zones. The Partner Agency was the World Bank and the Implementing Agency was Muslim Aid, a UK-based NGO. Adjacent zones were handled through efforts supported by other donors in close coordination with MDF and with each other. None of these drainage and flood mitigation projects could have succeeded without the others but ultimately, through all these combined efforts in the lowest-lying portions of Banda Aceh, a substantial part of the city could be developed again at affordable cost to the residents and businesses.



The rainwater retention basin and pumping station at Lampaseh in Banda Aceh, part of the flood control system built under the BAFMP.

Photo:
Tarmizy Harva

The technical scope of the project included the construction of drains, water retention basins, and pumping stations. All these have been handed over to the city's drainage department that will operate the pumps and maintain the whole system. The project also introduced a new type of one-way valves of ingenious design, with long lifespans and minimal maintenance needs (see Annex 3 for more details). The total cost of this project was \$6.3 million.

The other major operation for drainage and flood control funded by the MDF was implemented in Lhokseumawe City, about 200 kilometers east of Banda Aceh. There, about 60 hectares of tidal flats along an estuary were dammed in and converted into a stormwater retention basin at a cost of \$13.2 million of which \$9.7 million were contributed by the MDF. This operation was a sub-project funded from the IRFF and greatly improved the living environment of approximately 30,000 beneficiaries.

The construction of this stormwater retention basin was coupled with the establishment of a simple wastewater collection and treatment system. Based on the principle of "Build Back Better," wastewater is now treated in a low-tech plant consisting of three basins before it is released into the estuary.

What Worked Well

Before the BAFMP, Zone 2 was regularly waterlogged twice a month during spring tides and flooded after virtually every heavy rain. This is no longer the case now. The design parameters were such that the drainage system could still handle the once-in-five-years flood, and the zone handled by the MDF (like the adjacent zones) has not been flooded since project completion. As all drainage and flood protection projects in Banda Aceh mutually support each other, the number of beneficiaries of each project is hard to specify. The area where the BAFMP was implemented has approximately 20,000 residents.

The Lhokseumawe City project has improved drainage and reduced the flooding hazard in the catchment area. This will bring with it substantial public health benefits, and these benefits will accrue largely to the low-income households in the catchment area. In addition, the sub-project has provided the first wastewater treatment plant in the city which will help improve urban environmental conditions. The sub-project is thus an excellent example of "Build Back Better." Although the water treatment system in Lhokseumawe City does not attain high purification levels, it is more commensurate with the city's financial means to cover operations and maintenance cost and the

capacity of the available human resources than a more sophisticated plant would be. It is therefore realistic to expect a relatively high degree of sustainability. The importance of providing solutions employing suitable technology against the backdrop of limited capacity and resources is often overlooked and is an important lesson to be learned in reconstruction and development contexts.

4.2 Sea Defenses/Coastal Barriers

Context and Impact of the Disasters

The tsunami affected many coastal regions, not only destroying settlements and livelihood activities along the coast, but also affecting the topography. The coast and the sea floor with its sandbanks and mudflats affected would typically take several years to settle into their new equilibrium. These changes affected the flow of rivers, deposits of sediment and also many fragile ecosystems along the coast such as mangrove forests. In some areas off Nias, coral that had previously been submerged below sea level was now protruding above the surface of the water.



This set of coastal barriers (“groins”) protects the beach in front of the Krueng Geukeuh port near Lhokseumawe, approximately 200 km east of Banda Aceh.

Photo:
Kris Hedi

MDF Support

With altered ground levels and massive damage to areas subjected to normal tidal ranges and constant wave action, the MDF infrastructure portfolio included five IRFF sub-projects for coastal protection. These projects were designed to protect the shoreline as well as roads, ports, or other facilities close to the shore from waves and the resulting abrasion hazard. Funded through the IRFF, the total investment was over \$4 million.

The designs for these works were prepared through the technical assistant for drainage, flood control, and sea defenses commissioned by the Government of the Netherlands.

Lessons Learned for the Future

The sea defense consultants advised to wait with detailed design work of the coastal barriers until the coast and the sea floor with its sandbanks and mudflats had settled into a new equilibrium after the tsunami. This process typically would take several years. There was, however, considerable pressure to implement protective structures fast even if their design might not be optimal, especially given the trauma coastal communities had experienced in the tsunami. In one sub-project near Lamno on the west coast of Aceh, riverbank protection and two coastal barriers groins were constructed to make a river mouth passable by reversing and preventing sedimentation. The IREP consultants pointed to the unfavorable natural conditions for such groins but the sub-project was carried out given urgent demands for implementation. After one year, sedimentation set in again, and based on more thorough investigation, the groins should have been much longer. The need to act fast in this particular case resulted in a project that did not achieve the desired outcome. The clear lesson from this experience is that investments are better chosen in view of technical realities which may not be consistent with popular demand (see textbox “The Economics of Having to Act Fast”). In such situations, managing the expectations of local governments and communities and providing more technical information to them could be one way to get buy-in for the time needed to design interventions for more effective results.

Contractor Performance and Quality of Work

The regular supervision missions during project implementation paid considerable attention to the quality of contractor performance. It was found that nearly all contractors worked with great commitment and to good standards. The tight supervision by the IREP consultants did much to ensure this. Random inspections at construction sites showed that record keeping and quality testing were generally good, better than many had expected, with only a few cases of serious deficiencies. Contractual specifications were adhered to well and no cases of deliberate manipulation of quality standards were found. In this regard, MDF funded works generally achieved better quality than those funded by many others.

In this context, the role of the IREP has to be emphasized. The resources IREP consultants provided along with their extended authority played a very important role to help ensure that construction supervision was tight and effective. The quality assurance staff working under the MDF portfolio were able to assess quality with support of the IREP consultants, and this led not only to better-quality physical outputs but also to a capacity building effect among the contractors. Without the prominent role of the IREP consultants, the results and outcomes of the MDF infrastructure reconstruction efforts may very well have been much less impressive. In the isolated cases where contractor performance was not deemed acceptable, appropriate measures were taken by the Partner Agency for correction.



The TRWMP team meets with local contractors and national, provincial and district government officials detailing the plans to build the Blang Bintang Regional Landfill serving Aceh Besar and Kota Banda Aceh. The US\$10 million facility has an immediate lifespan of ten years and space for decades to come.

*Photo:
Faisal
Ridwan*

4.3 Solid Waste Management

Context and Impact of the Disasters

Immediately after the tsunami, the clearing of rubble and debris was obviously of highest priority. Especially urgent was the clearing of sediment, rubble, and debris from the various drainage canals before any reconstruction activities could commence.

MDF Support

Operating with funds from the UN Flash Appeal for Aceh, the UNDP was a main actor in this field even before the MDF had been formed. It was therefore logical that UNDP served as the partner and Implementing Agency for the Tsunami Recovery Waste Management Programme (TRWMP), a mainstay of the MDF's activities in solid waste management. The implementation of the TRWMP began in December 2005, as the first project under the MDF infrastructure portfolio.

Following its initial push to remove tsunami waste from devastated urban areas, the TRWMP developed its agenda to construct better landfills and to lay the groundwork for their sustained operation to improve waste management standards, an important contribution to improving environmental management. In Aceh Province, the largest construction project was a new regional landfill to serve two local authorities, namely Banda Aceh City and the adjacent Aceh Besar District. The Government of Germany supported this project through its technical cooperation arm, GIZ,¹ which funded a study to identify a suitable location and prepared an environmental impact analysis. The old landfill for Banda Aceh, located in an extremely environmentally unsuitable location just above sea level in the middle of aquaculture ponds, was used to deposit non-contaminating materials such as rubble, bricks, and tsunami sediments, and had to be used as a temporary dumpsite for general municipal waste. At the time of preparation of this working paper, indications are that the regional landfill at Blang Bintang will be completed by project closure. The old dumpsite location will then no longer be used as a dumpsite, but will continue to be used for solid waste management: a new waste transfer station was built there, and it houses a workshop for the maintenance of vehicles and other equipment.

Apart from the regional landfill at Blang Bintang, three other landfills were constructed under the TRWMP.

¹ GIZ, or *Gesellschaft für International Zusammenarbeit* (German Agency for International Cooperation), was formerly known as GTZ, or *Deutsche Gesellschaft für Technische Zusammenarbeit* (German Organization for Technical Cooperation).

What Worked Well

While the old Banda Aceh dumpsite was operated as an open dump, the Blang Bintang site has been fitted with an adequate system for the collection and treatment of effluent (leachate) and will be operated as a controlled landfill, one of the best-managed facilities of this kind in Indonesia and a showcase for other government entities. In addition, the natural reedbed treatment method employed for the leachate (effluent) will help minimize the burden on local government budgets. It can be considered an excellent example of “Build Back Better.”

All construction activities were complemented by intensive capacity building efforts to mitigate risks related to institutional and managerial sustainability (see below). For the operation of the regional landfill site at Blang Bintang, a new body was set up as a joint venture between Banda Aceh City and Aceh Besar District. This has been undertaken only in very few previous instances in Indonesia.

In designing an improved system for solid waste management, care was taken to incorporate the interests and the potential economic role of scavengers and workers in the recycling industry. The waste transfer station was designed to permit the work of waste pickers and actively reduce the occupational hazards for them. In addition, special activities were designed to assist the establishment of small businesses in the recycling sector. These businesses, numbering over 160, have shown a fair success rate (approximately 70%) and provide several hundred new job opportunities, the

Handling of Land Acquisition, Compensation, and Social Safeguards Issues

The rehabilitation and reconstruction program was designed to avoid and minimize land acquisition and other challenges pertaining to social safeguards. The inevitable cases where compensation was required were all handled in accordance with The World Bank procedures. No waiver from standard policies was ever applied for.

To facilitate land acquisition in the whole reconstruction process (not limited to the MDF portfolio), BRR established a Directorate of Land Affairs whose task is, among others, to establish land value with the assistance of the appraisal team (supported by UNDP), based on the best available information on current market values. These benchmarks were relatively higher than the officially registered land tax values (known as “NJOP,” the Indonesian acronym for “land tax object sale value”), and in many cases were used by the sub-projects financed by IRFF to ensure that fair compensation was paid.

In the immediate aftermath of the disaster, it was often very difficult to establish land rights. In many cases, property owners had perished, markers had become

untraceable, privately held documents as well as official records were lost as houses and government offices were washed away. It was also difficult to establish genuine current market values because there were no regular land transactions. Consequently, compensation prices were set on the basis of agreement between land owners and local governments. BRR oversaw these processes and ensured that prices were balanced between different local governments. In many cases, where local governments were unable to allocate sufficient budget in good time, BRR paid adequate compensation to eligible land owners. Compensation was paid as long as it was commensurate with the land value determined by the appraisal team of the BRR Directorate of Land Affairs.

Where final alignments of new roads were defined for the reconstruction process, proper land acquisition procedures were implemented, taking into account all required safeguards, and with all necessary community consultations and agreed-upon compensation. In some cases, for emergency road construction, villagers voluntarily made land available on a temporary basis.

Land price appraisal teams were formed by the relevant district governments, and provincial government funded both the operations of those teams (including survey work) and the eventual compensation of land owners. Compensation was typically paid before construction works began. In isolated cases, where land needs were only identified during the construction stage, land acquisition and compensation were carried out in parallel with construction, after affected persons agreed with the scheme.

A number of very small areas or slivers of land were needed to make the drainage works under the BAFMP technically feasible. These issues were discussed extensively in community consultation meetings that were convened by the Implementing Agency, Muslim Aid. Land owners agreed to voluntarily donate without compensation such very small areas for the common good; this kind of approach is often used in community-based programs as well as in urban upgrading projects, including projects funded by the World Bank in other countries. In some sites, for example the pump station, the local government of Banda Aceh City paid compensation for the acquired land.

In addition to land acquisition, compensation was also given where livelihoods were affected, as in the case of the cockle collectors who used the tidal flats on which the stormwater reservoir was built in Lhokseumawe City (see Annex 3 for technical details of that sub-project). The MDF handled all issues pertaining to land acquisition, compensation, and other social safeguards with the greatest possible flexibility. Even so, some partners within implementing agencies and local governments found the required procedures complicated, burdensome and time consuming.

majority of them for women. The activities of the TRWMP were complemented by activities of the BAFMP that was mainly focused on drainage and flood management but also included a solid waste management component, on the grounds that regular and fairly complete collection of waste and litter is essential for keeping the urban drainage system functional. The Implementing Agency, Muslim Aid, procured a fleet of three-wheel vehicles for the collection of waste and litter from its project area. These vehicles transport garbage to the waste transfer station at the old dumpsite from where it will be taken to the new landfill site at Blang Bintang.

The sanitation departments in the relevant local governments have received the assets and will continue all activities for solid waste management.

Lessons Learned for the Future

The construction of all landfills was delayed, in some cases considerably, because the difficulties of land acquisition had been underestimated in the original plans. When considering the construction of landfills, these need to be seen in the larger context of a solid waste management system which could encompass collection, sorting, recycling and livelihoods, and where possible, facilities should accommodate these aspects.

More details on the TRWMP are given in Annex 3.

4.4 Urban Water Supply

Context

As with other infrastructure sectors, the urban water supply to affected villages also suffered significant damage. The earthquake and tsunami not only interrupted the flow of water to households, but also affected the water levels of supply sources.

MDF Support

The IRFF portfolio included four sub-projects in water supply. This included the construction of new water treatment plants, complemented by other elements such as mains water supplies, with a total investment volume of approximately \$13 million.

What Worked Well

The water treatment plants funded by the MDF have generally been constructed to good technical standards. However, other support elements for the water supply systems, such as water distribution networks, have been implemented with varying degrees of success and this has influenced the operations of some systems.

Environmental concerns were addressed appropriately, and where water sources used prior to the tsunami were no longer a viable option, alternate sources were tapped into.

Water supply projects affect both men and women, but often have a greater impact on women than on men as women and girls usually bear responsibility for household chores such as washing and cooking and also usually are the ones who have to fetch and carry water when it is not available near their homes. In Banda Aceh, the number of households with connections to permanent water supply reached approximately 18,000 in 2012, a significant increase from approximately 7,000 in 2004 and approximately 5,000 immediately after the tsunami.

The enormous importance of successful capacity building for operations and maintenance was addressed, with varying degrees of success. The proper management of the Banda Aceh water supply system has illustrated that operation and maintenance costs for the system can fully be covered by revenue generated from tariffs on usage.

Lessons Learned for the Future

Construction quality varies and this may be an indication of different contractor capabilities across the different regions, combined with other factors such as supervision and technical support. In some cases, different contractors installed different elements of the supply system. This has resulted in different parts of the same system having varying quality, which has affected the operation of the system. Strong coordination between the different development partners, and a strong commitment to work towards common goals, would mitigate risks of this in future situations.

The availability of accurate geological data is important to enable the preparation of suitable system designs to address the needs of end users. At the same time, technical design constraints need to be carefully considered.

Chapter 5

SUPPORTING OPERATIONS



5.1 Sea Delivery and Logistics Services

Context

The tsunami and earthquakes destroyed ports, seriously affecting the islands of Nias and Simeulue and many areas along the west coast of Aceh. Bridges and sections of the national road were also destroyed, and the combination rendered the area nearly inaccessible for relief and reconstruction efforts.

The World Food Programme (WFP) was one of the first UN organizations to participate in the relief efforts after the tsunami. Its very first efforts focused on providing essential shipping services, and opening access to areas that had become virtually inaccessible as a result of the roads and ports destroyed by the tsunami. This brought much needed daily necessities and relief supplies to isolated towns and regions.

MDF Support

The WFP commenced the implementation of the Sea Delivery and Logistics Programme (SDLP) as a Partner Agency of the MDF in February 2006, supporting the coordinated reconstruction efforts by providing much needed access to hard to reach areas. Later efforts focused on capacity building to support the sustainable management of the newly constructed ports. The initial shipping operations certainly served the relief effort and were free of charge; however, it was realized that continued shipping services at no cost would distort the commercial shipping market. Therefore, in the



Immediately after the disasters, the WFP used shallow-draft landing craft to bring supplies to remote areas and areas where ports were damaged or destroyed.

*Photo:
WFP Collection*

The movement of goods from ship to final destination relied on the availability of heavy equipment, which SDLP provided. The project also ensured key port staff received training on the proper implementation of logistics and transportation systems.

Photo: WFP Collection

later stages of implementation, a cost recovery mechanism was introduced through which \$2.7 million were collected and added to the MDF grant of \$25 million. The result, however, was a significant drop in demand for the shipping services of the SDLP. The final phase of the SDLP focused on disaster risk mitigation, and the project worked closely with both the National and Provincial Disaster Management Agencies (BNPB and BPBA). The work done by SDLP has resulted in strengthened capacity of the institutions through policies and resources to better prepare for future disasters.



Temporary emergency wharves were constructed by TRPRP, with provision from the MDF, using old shipping containers filled with sand and cement. This temporary wharf at Calang and Sinabang enabled much-needed supplies and materials to reach affected areas cut off by the tsunami.

*Photo:
UNDP
Collection*

What Worked Well

The contribution of the WFP shipping service to the overall reconstruction efforts was significant. During the initial period of the reconstruction phase, WFP provided access to many recovery and reconstruction partners outside of the MDF funded projects. It enabled the delivery of reconstruction material, which was of enormous importance for many other activities, especially the housing sector reconstruction. A total of 98,000 tons of materials were shipped (including 60,000 tons of timber/construction materials and 30,000 tons of vehicles).

The contribution of the SDLP to the capacity of the port management staff has greatly impacted the sustainability of investments made in the ports and shipping sector. The success of the training is illustrated by the adoption of the training program into a Master degree program offered by the University of Syah Kuala.

Lessons Learned for the Future

In a disaster reconstruction context, it is critical to make sure that areas can be reached for immediate relief as well as reconstruction and rehabilitation efforts. This requires speed, and the benefits to this are great. The type of disaster and geographical constraints will determine the best modes of providing access.

Having made investments in facilities and systems, it is important to enable sustainability through proper investments in adequate capacity building for operations and maintenance.

Selected Innovations Introduced under the MDF Infrastructure Portfolio

New types of one-way valves for drains. Instead of the conventional flap valves made from steel, the BAFMP used rubber valves (“duck bill valves”). These cost substantially more than conventional flap valves but they have a much longer life time and are virtually maintenance free, which reduces the risk that these valves become dysfunctional as a result of insufficient operations and maintenance.

Improved waste separation and recycling. The TRWMP constructed a modern waste transfer station at the site of the previous landfill that facilitates improved transfer of municipal waste from the collection vehicles to trucks that transport the refuse to the landfill. This allows the extraction of reusable or recyclable materials on the spot rather than at the landfill. The design and operation provides improved protection from occupational hazards for workers, and enhances the social and economic viability of the trash picking professions.

Improved landfills for solid waste. The TRWMP constructed new landfills for municipal waste to advanced technical specifications like they had never been implemented before in Indonesia. Specifications included site selection, sealing of the bottom of the waste deposition cell, collection and primary treatment of leachate (effluent), and final treatment of leachate in a quasi-natural reedbed. Sufficient land for future expansion has also been set aside adjacent to the landfill.

Innovative institutional set-up for solid waste management. The TRWMP facilitated the establishment of a Joint Secretariat between two local authorities (Banda Aceh City and Aceh Besar District) to manage the newly constructed regional landfill at Blang Bintang. The Joint Secretariat forms the “embryo” of a dedicated agency to be established in the future.

Improved environmental management during project implementation. Under the IRFF, “Contractor’s Environmental Action Plans” (CEAPs) were introduced to achieve improved environmental management during project implementation. Letting the contractors themselves design the CEAPs as part of their bids led to enhanced ownership and much better adherence to environmental safeguards during construction works.

Improved technologies for constructing small rural roads, trails, and bridges. For the construction of small rural roads the two projects CBLR3 and RACBP introduced innovative and well-proven labor intensive construction methods that had been developed decades earlier by the ILO and the World Bank in Africa. For the construction of small bridges in difficult terrain, the RACBP enlisted the technical assistance of Helvetas Nepal, an NGO that specializes in this field enabling good South-South cooperation in reconstruction.

Nias Island – Unique Challenges to Reconstruction and Recovery, and a Distinct Local Culture

Nias is an island approximately 100 km off the west coast of Sumatra and administratively, it is part of Indonesia's North Sumatra Province. The island has a population of about 800,000 and, with an area of 5,100 square km, it is almost the size of Bali. Most of the damage and losses in Nias were caused by the earthquake of March 2005. The challenges faced in Nias for post disaster reconstruction and recovery include its mountainous topography, frequent landslides, isolation from the Sumatra mainland, total dependence on shipping and air services for external access, and a poorly developed internal road network.

Improving External Access through Port Reconstruction

Like Simeulue Island (part of Aceh Province), Nias depends totally on shipping and air services for external access. The reconstruction of the port of Gunung Sitoli (the island's main urban center) was therefore included as a priority sub-project under the IRFF. Not surprisingly, the additional jetty constructed under the IRFF portfolio gets intensive use. Another port reconstruction was completed by BRR in Lahewa, at the northwest corner of Nias.



The new wharf at the port in Gunung Sitoli funded by the MDF helped restore transport between Nias Island and mainland Sumatra.

Photo:
Gottfried
Roelcke



An optimized construction method with diagonal beams lends earthquake resistance to traditional houses in Nias. Preserving these techniques as well as other unique cultural features was part of the reconstruction and recovery effort under the RACBP implemented by the ILO.

*Photo:
Gottfried
Roelcke*

Improving Internal Access and Assisting Economic Recovery through Roads and Bridges

The main focus of the RACBP Project was to improve accessibility to support local economic recovery in conjunction with the Local Economic Development Project (LEDP) under the MDF portfolio. To this end, numerous local trails were constructed (total length: roughly 70 kilometers) to specifications similar to the roads constructed under the CBLR3P Project: a relatively narrow width meant to facilitate mainly the movement of motorcycles, bicycles, and pedestrians. The project employed innovative technologies specifically optimized for this kind of trails, using construction approaches that maximized the use of locally available resources. Numerous bridges were reconstructed or newly built (total number: 79, average length: 25 meters), which significantly improved access to markets and improved links between settlements and areas of production.

Preserving the Unique Local Culture of Nias

As a result of its isolation, Nias has developed a distinct local culture, and the reconstruction and recovery program included efforts to preserve and strengthen it. These efforts were all part of the RACBP and included:

- Restoration of traditional houses that had been damaged by the earthquake,
- Training and capacity building for local craftsmen, and
- Awareness raising pertaining to local history and culture.

Chapter 6

CAPACITY BUILDING AND SUSTAINABILITY



This chapter describes the MDF's efforts to build additional capacity in the infrastructure sector across a wide range of institutions/stakeholders as part of its efforts to ensure the sustainability of the investments made in this sector.

6.1 Capacity Building Efforts

The capacity building activities under the infrastructure portfolio were implemented in the broader context of capacity building across the MDF portfolio and against the backdrop of diminished capacity of the remaining work force after the disasters. Most of the projects under the MDF infrastructure portfolio placed significant emphasis on capacity building, employed measures that included women and marginalized groups, and tended to increase intensity during the later phases of each project. These capacity building efforts were undertaken to varying degrees to support the physical investments made across the sector.

Improving capacity of government entities. Capacity building for all levels of government agencies was a priority. At the national level, this was done primarily through IREP, targeted towards MPW and focused on contract management, design review and construction management. Capacity building for local government staff was done under the CBLR3, the RACBP, the BAFMP, the SDLP, and the TRWMP. Under CBLR3 and RACBP, the teams trained relevant government staff (largely through a learning-by-doing approach) in innovative concepts for constructing small rural roads, trails, and bridges. BAFMP trained staff of the Banda Aceh Drainage Department in the operation and maintenance of the new drainage and flood protection systems provided by the MDF and several other donors. SDLP trained several hundred port operations staff, from the various ports in Aceh and Nias, in improved port management. TRWMP trained over 600 local government sanitation department staff in improved techniques for solid waste management, especially the improved operations to be introduced in the newly constructed landfill sites. Through SDLP, the majority of port staff was trained in ports management and operations. The curriculum modules used for these training sessions were formally handed over to the new Institute of Shipping, Logistics, and Maritime Studies of Aceh's Syiah Kuala University, to be used for training future generations of port operating personnel. The Tsunami Recovery Waste Management

The SDLP provided training for key staff from 18 ports in Aceh and Nias to support the continued effective operation of the infrastructure investments made by the MDF. Approximately 80 percent of all ports staff in Aceh and Nias were trained.

Photo: WFP Collection



Training was conducted for both male and female site supervisors who will oversee trail and road building in Nias. Capacity building and training in the local resource-based approach are key elements of the RACBP project.

*Photo:
ILO Projects
Collection*

Project facilitated the formation of a new entity (jointly owned by Banda Aceh City and Aceh Besar District) to operate the newly constructed regional landfill at Blang Bintang. In addition, TRWMP advised and supported a few local governments in the articulation and promulgation of new local regulations (*qanun*) that are intended to govern the management of municipal solid waste in the relevant districts, including the introduction of user charges. Similar regulations can now easily be promulgated in other districts as well because the conditions do not vary much between districts.

Capacity building of a non-government organization. Capacity building of an NGO was done under the BAFMP. The capacity building efforts, undertaken by the MDF Partner Agency (the World Bank), were directed at the Implementing Agency itself (Muslim Aid). These efforts will benefit the relief operations of Muslim Aid in other emergency situations/locations.

Capacity building of small enterprises, contractors and individual craftsmen. TRWMP supported approximately 200 small start-up businesses in the waste recycling sector towards self-propelled commercial development. Many of these were owned by or employed women. RACBP trained individual craftsmen by facilitating the transfer of knowledge in traditional house construction/maintenance from older craftsmen to the younger generation. Capacity building of small contractors was done under the CBLR3 and the RACBP. They were trained in improved commercial practices, especially the skills required for participation in competitively procured public-sector projects, and in innovative concepts for constructing small rural roads, trails, and bridges.

Improving capacity of communities and village leaders. In the infrastructure sector, capacity building of communities and village leaders was done under the RACBP and CBLR3 projects. This was mostly done through a learning-by-doing approach pertaining to the construction and regular maintenance of small rural trails and bridges as well as small rural water supply systems. Capacity was also developed through information sharing in semi-formal meetings with village leaders that included raising awareness about the conservation and restoration of cultural heritage.

Building Womens’s Capacity. Reconstruction processes in the wake of a disaster provide a window of opportunity to address gender and other social inequalities. Disasters create legitimate reasons to do things differently, including opportunities for women to take on new roles in their communities. Three projects funded by the MDF—the Tsunami Recovery Waste Management Program (TRMWP) implemented by the UNDP and the Capacity Building for Local Resource Based Roads (CBLR3) and the Nias Rural Access and Capacity Building Project (RACBP) implemented by the ILO—used the post-disaster reconstruction program to actively open up opportunities for women to work in non-traditional wage based jobs in the construction sector.

The ability to adequately operate and maintain infrastructure assets is crucial to ensure that these assets can remain operational for an extended period. Without proper maintenance, assets deteriorate more quickly, resulting in a shorter lifespan. Given that the investments in infrastructure components are generally very costly, adequate maintenance will mitigate the premature deterioration of the assets. This requires skills development and allocation of resources, both of which were priorities of the MDF in the infrastructure sector, as well as across the portfolio.



Fithri, 22 years old, is one of nine women and 21 men sharing the workload at TRMWP’s Bireuen landfill site. This and other MDF-funded projects opened up opportunities for women to work in non-traditional jobs in the construction sector.

Photo:
UNDP Collection

6.2 Sustainability of Assets

The whole reconstruction process faced a challenge with regard to ensuring sustainability of assets. A compromise between two elements had to be developed: on the one hand, sub-projects were to be implemented fast by short-cutting excessively complex government procedures; on the other hand, sufficient ownership by national and local governments had to be ensured so that the newly created assets would be taken over and maintained as required beyond project closing.

At the design stage of the IRRF, it was recognized that a robust mechanism was essential to facilitate and ensure that the newly created assets would be accepted by the respective public entity, and operated and maintained during their economic lifespan. To achieve this, it was agreed that a Memorandum of Understanding (MoU) between the client (BRR) and the recipient (the local government entity that was to become the eventual owner and thus the party responsible for its maintenance) would be entered into for all the sub-projects funded by the MDF-supported IRRF. These documents were formally prepared and are legally binding. The IREP Project Management consultants prepared and administered the system on behalf of the BRR and GOI, and handed over the formal records to the MPW on completion of their assignment (and following the closing of BRR). In most cases, this did indeed pave the way for a successful transfer of assets; time delays were observed only in a few



Staff in the Nias district finance unit participate in data entry training to learn how to create a database for entering all the new assets created during the reconstruction.

*Photo:
NITP Team*

instances. However, despite these MoUs not all local governments have allocated sufficient budgets for the operations and maintenance of the newly created assets.

Asset transfer of goods and works funded by the MDF was generally completed satisfactorily. Transfer was undertaken as part of the PHO/FHO (Preliminary and Final Hand Over) contractual steps. These steps also dealt with repaying any remaining retention moneys. The inclusion of PHO/FHO contractual steps in large-scale infrastructure construction contract management demonstrates the importance of:

- strategic and project planning which allow sufficient time to complete physical works and related commissioning; and
- adoption of proven and robust procurement, financial management and legal aspects in the reconstruction process.

In general, better constructed assets require lower maintenance costs than assets of poorer quality, resulting in improved sustainability of assets. The assets created with MDF resources have largely been accepted by their new owners, and arrangements have been made for budgetary allocations for operations and maintenance, in accordance with good practice. However, in some cases these measures may still be insufficient to ensure the full economic working life of the asset. The arrangements made for achieving service sustainability for various assets constructed by the MDF are shown in the table below.

Table 6.1 MDF Infrastructure Assets

Infrastructure Asset	Responsibility for O&M
All IRFF funded assets	Subject to MOU signed before works undertaken
Public water supply and sewerage	Local PDAM (<i>Perusahaan Daerah Air Minum</i>), under national PDAM regulations and rules
Provincial, district and town Roads	District or Provincial Government
National road	National Ministry of Public Works, delegated to provincial level
Footpaths	Local community, with help from District Government
Ports and related facilities	National Ministry of Transport
Solid waste collection facilities	Local communities and local district government
Solid waste recycling & disposal	District Government
Flood management and storm drainage	City or District Government

Chapter 7

ECONOMIC IMPACT OF MDF FINANCED INFRASTRUCTURE



This chapter summarizes the benefits, costs, and overall economic impact of the MDF's investments in the infrastructure sector. A more detailed economic analysis is provided in Annex 4.

The MDF invested approximately \$270.2 million in projects for the reconstruction and rehabilitation of infrastructure in Aceh and Nias, including related technical assistance projects. Of this, approximately \$58.2 million was allocated for the reconstruction and rehabilitation of water supply, flood control, and solid waste management systems. Given the different nature and scope of the investments in these three areas, the analysis of economic costs and benefits was different for each of the three sectors; as such, they are discussed separately. For each sector, expected economic benefits are compared to actual economic benefits, followed by lessons learned from cases where benefits were lower than expected.

7.1 Road Infrastructure

The MDF invested approximately \$133 million in the reconstruction and rehabilitation of the road networks of Aceh and Nias through the IRFF project.¹ The road projects had three primary objectives.

The first objective was to provide road access to districts along Aceh's west coast, and \$32.6 million was invested by the MDF for this purpose. The tsunami destroyed a major part of the national road along the west coast of Aceh. The MDF funded the reconstruction and rehabilitation of parts of the road and also co-financed the rehabilitation of the sections of the provincial road from Meulaboh via Geumpang to Banda Aceh which served as an alternative access road to west coast. The MDF also financed the maintenance of a road link from Lamno to Calang, until the contractor tasked with the reconstruction of the Lamno-Calang road took over the maintenance of the temporary road in January 2008.

A second objective was to promote socio-economic recovery. The MDF financed about \$99.6 million towards the reconstruction and rehabilitation of a large number of provincial, district and village roads with the objective to help the regions return to

¹ This amount does not include the cost of MDF-financed consulting services for the planning, design and construction supervision of road projects. If this amount is included, the total investment in the road sector increases to about \$165 million.

Banda Aceh's New Town Access Road has been a catalyst for economic development, and has also made it easier for residents to commute to school and to go about other daily activities.

Photo: Abbie Trayler-Smith/Panos Pictures/DfID (UK)

their pre-disaster social and economic development trajectories. The MDF allocated about half of its funds for roads aimed at economic recovery to Nias, and most of the remainder to districts in Aceh that were highly affected by the tsunami and earthquake (Table 1).

Table 7.1 MDF Investments in Road Projects by Primary Objective

Primary Objective of Road Project	MDF Investment	
	US\$ million	% Total
Provide road access to districts along Aceh's west coast		
Reconstruction of national road along west coast	24.1	18
Rehabilitation of alternative provincial road via Geumpang	7.0	5
Temporary maintenance of Lamno-Calang road link	1.5	1
Promote socio-economic recovery**		
Promote recovery of districts along Aceh's west coast*	33.6	25
Promote recovery of other districts in Aceh	18.7	14
Promote recovery of Nias	47.3	36
Provide tsunami escape route		
New access road in Banda Aceh	1.3	1
TOTAL	132.7	100

Source: MDF

* Districts of Aceh Barat, Aceh Jaya, Nagan Raya, Aceh Barat Jaya, Aceh Selatan and Aceh Singkil

** See Table 7.3 for a detailed breakdown over the three sub-categories.

A final important objective was to provide a tsunami escape route, in view of the emerging acceptance of the need to prepare communities for future disasters. About \$0.6 million was spent on this activity. The MDF co-financed a new intra-urban road in Banda Aceh aimed at being both an escape road for city dwellers in the case of another tsunami and a road that would aid further urban expansion and economic development. The latter objective has clearly been achieved: the road has facilitated new commercial developments and the construction of a new bus terminal. Thus, the road did contribute to the urban expansion and economic growth of Banda Aceh city. During a recent earthquake in 2012, this road was used by the population of Banda Aceh as an escape route; however, its impact has not been estimated yet.

The investment in the existing national road (and the rehabilitation of alternative access roads) was undertaken as a public service obligation. Road projects aimed at promoting economic recovery were selected based on the benefits they were likely to provide to the regional economy.

Methodology for the Economic Analysis of Roads Projects

The economic costs of a road project consist of: (i) investment costs; and (ii) incremental maintenance costs.² Both cost items can be estimated with a reasonable degree of accuracy. In contrast, the estimation of the economic benefits of a road project is fraught with methodological difficulties. At its most basic level, roads are constructed (or improved) to lower transport costs. The economic benefits of lower transport costs can be classified as first order and second order benefits.³

Two different approaches were used in the analyses for roads, based on primary objectives of the roads. Annex 4 describes the methodologies employed in the analyses, and justification for their use.

Economic Analysis of Roads Aimed at Providing Access to Districts along Aceh's West Coast

Transport costs

There is clear evidence that the reconstruction and rehabilitation of the national road along the west coast of Aceh has resulted in a significant reduction of transport costs. Moreover, the reduction directly benefits the population living in the districts served by the road in the form of lower tariffs for passenger and goods transport⁴. As elsewhere in Indonesia, the provincial government of Aceh regulates tariffs for intercity transport. Table 7.4 presents official tariffs for minibus trips from Banda Aceh to two sets of destinations: (i) towns along the national road from Banda Aceh to Medan, which was not materially affected by the December 2004 tsunami and earthquake; and (ii) towns along the national road from Banda Aceh to Singkil, which was largely destroyed by the tsunami and reconstructed with support from the MDF and other development partners. Because of reductions in gasoline prices, the provincial government lowered minibus tariffs on all routes in November 2011. However, it lowered minibus tariffs from Banda Aceh to towns along the west coast by much higher rates, in recognition of the reduction in transport costs caused by vastly improved access (Table 7.2). At present, minibus tariffs for trips from Banda Aceh to towns in the southwest remain about 40 percent higher than tariffs for trips along the national road to Medan, but the gap is much smaller than before 2009, when large parts of the coastal road were still under construction. This suggests that MDF's investments in the reconstruction of the road have played a major role in reducing transport costs to the districts most adversely affected by the natural disasters.

² Incremental maintenance costs are maintenance costs compared to a "without project" scenario, net of taxes.

³ For a detailed discussion on first and second order benefits, please refer to Annex 4.

⁴ The "area of influence" was defined as the districts of Aceh Barat, Aceh Jaya, Nagan Raya, Aceh Barat Daya, Aceh Selatan and Aceh Singkil.

Purchasing power of Gross Regional Domestic Product (GRDP)

In 2010, the nominal GRDP of the six districts that constitute the area of influence was approximately IDR 15.5 trillion, or about \$1.72 billion. In the same year, road transport and related services accounted for about 5.2 percent of the combined GRDP of the districts. The economic benefit to the six districts is estimated at \$26 million per annum in constant 2010 prices, which is equivalent to a benefit stream with a present value of \$236 million. As the MDF financed the rehabilitation of 295 kilometers of road sections out of a total length of 684 kilometers, this means that \$102 million of the benefit stream can be attributed to MDF-financed investments. This compares favorably with the construction cost of \$33.1 million. After assuming annual incremental maintenance costs of 5 percent of the construction cost throughout the 25-year economic lifetime, the present value of the economic cost increases to about \$47 million, which is a benefit/cost ratio of approximately 2.2, far higher than the minimum required value of 1.0.

Other potential second-order benefits

From 2004 to 2010, the GRDP (excluding oil and gas) of the assumed area of influence increased at much higher rates than the GRDP of other districts in Aceh (Table 7.2). The GRDP of the area of influence increased at very high rates during 2005-2007, at the height of the reconstruction effort. However, after 2007 the GRDP of the area continued to grow at much higher rates than elsewhere in Aceh. Although it is likely that MDF's investments in the road sector will have contributed to these high and sustained growth rates, it was also likely impacted by the improved security situation and the significant increase in public spending that occurred in the same period. Another major but unquantifiable impact of the MDF-financed roads in the area was the social benefit of enabling displaced persons to resume their lives in their original homes and communities.

Conclusions

The economic benefits generated by reductions in transport costs alone exceed the economic costs of the MDF's investment in providing road access to the district along the west coast by a substantial margin. They are also substantially higher than first-order benefits from travel time savings (Annex 4, Box 1). Unquantifiable impacts of the roads include a general higher growth in GRDP in the area of influence, as well as social benefits to the affected population.

Table 7.2 GRDP Growth in the West Coast and the Rest of Aceh, 2004-2010*

	2004	2005	2006	2007	2008	2009	2010
Year-on-year growth							
West coast**		8.2%	24.4%	11.1%	9.1%	9.1%	10.6%
Rest of Aceh		-0.1%	4.2%	6.3%	0.1%	2.5%	3.7%
GRDP (2004=100)							
West coast**	100	108	135	150	163	178	197
Rest of Aceh	100	100	104	111	111	114	118

Source: MDF analysis, based on BPS (Badan Pusat Statistik)

* In constant 2000 prices excluding oil and gas

**The districts of Aceh Barat, Aceh Jaya, Nagan Raya, Aceh Barat Daya, Aceh Selatan and Aceh Singkil

Economic Analysis of Roads Aimed at Promoting Economic Recovery

The selection of road projects aimed at recovery is less straightforward than selecting roads to provide access. Annex 4 discusses the theory related to the identification and prioritization. This section contains a qualitative assessment of the economic costs and benefits of roads aimed at promoting economic recovery based on a review of the various methods that were used to identify and prioritize MDF-financed road projects.

In practice, three sets of criteria were used to identify and prioritize road projects aimed at economic recovery. For roads in Aceh, BRR developed a procedure to screen and rank proposals submitted by provincial and district government agencies. For Nias, provincial and district roads projects were selected based on a detailed procedure described in the Strategic Road Network Study. For rural roads in both Aceh and Nias, a detailed set of criteria was developed by the ILO, for links constructed under the RACBP, and the CBLR3. In addition, the World Bank as Partner Agency of the MDF is not able to co-finance roads that would result in significant adverse social or environmental impacts (notably improved access to protected forest lands), thereby imposing an additional set of selection criteria. For further details on the selection criteria to identify and prioritize roads, please refer to Annex 4.

Table 7.3 MDF Investments in Roads Aimed at Economic Recovery (US\$ million)

Regional Scope	Originator of Selection Criteria			TOTAL
	BRR, Aceh	BRR, Nias	ILO*	
Districts along Aceh's west coast**	33.6	–	–	33.6
Other districts in Aceh***	10.4	–	8.3	18.7
Nias	–	25.8	21.6	47.3
TOTAL	43.9	25.8	29.9	99.6

Source: MDF

* Total of MDF allocations to RACBP and CBLR3

** Road projects in Aceh Barat, Aceh Jaya, Aceh Barat Daya, Nagan Raya, Aceh Selatan and Aceh Singkil (other than the reconstruction of the national road, and the rehabilitation of alternative provincial road via Geumpang; these are in the category to "provide access to Aceh's west coast").

*** In the absence of a regional breakdown of the cost for Capacity Building and Local Resource-Based Rural Roads (CBLR3), 40% the cost of this project was allocated to Nias, and 60% to other districts in Aceh (where CBLR3 was active in the districts of Aceh Besar, Pidie and Bireuen).

While appropriate screening criteria were identified, other factors were also important in making the decisions to prioritize road proposals, aimed at objectives beyond direct economic benefits. BRR's mandate encompassed areas directly and indirectly affected by tsunami. As such, BRR also prioritized geographic equity, making sure all the districts received some benefits, in order to prevent tensions that could jeopardize the peace efforts. This is one of the "quality criteria" in the Reconstruction Action Plan, and the MDF Steering Committee explicitly agreed to support this criterion. MDF financing

was also intended, and used by BRR, as a “gap filling” mechanism, to provide flexibility in reaching areas where other donors or players were not able or willing to operate. Given the complex context of Aceh and Nias, the roads portfolio thereby included investments with lower direct benefits and higher costs, while non-quantifiable social benefits of these investments were significantly higher.

For Nias, the prioritization method described in the Strategic Road Network Study seeks to maximize the net economic benefits of a road development program under budget constraints. The method for identifying and prioritizing road projects that are likely to generate long-term economic benefits was found to be highly appropriate. Although the MDF-financed investments in the Nias road network are likely to have long-term benefits, further analysis is needed to determine if the economic benefits of the investments will outweigh the costs, with the possible exception of road sections in landslide-prone areas where the benefits are significantly high.



New roads in Nias are vastly improved after the reconstruction and are expected to have long-term economic benefits for the agricultural sector, which is largely based on tree crops.

Photo: Ron van de Kuilens

A recent evaluation of CBLR3 concluded that the project has been able to deliver rural roads of better quality and at a lower cost than district government contractors. Field visits suggest that many ILO roads have been highly successful in providing substantial economic benefits to their intended beneficiaries. The benefits mainly consist of travel time savings (for example, bridges have opened up access of hitherto isolated villages to school and medical facilities) and lower transport costs. In areas where ILO has provided motorcycle access to areas which were formerly only accessible by foot, agricultural production can be expected to increase significantly, at least after a certain lead time (bearing in mind that much of the agricultural yield is obtained from tree crops).

A key concern is that most districts in Aceh and Nias do not seem to regularly allocate a budget for routine maintenance, particularly through the budget approval process in local parliament. This underinvestment in operations and maintenance adversely affects the long-term sustainability of the roads and reduces economic benefits.

7.2 Ports

The MDF allocated approximately \$15.6 million to facilitate the reconstruction and rehabilitation of ports in Aceh and Nias. Ports facilitate the transport of persons and goods over water. Transport over water competes with other modes of transport (such as road and air). In the long run, a port will only be economically viable if it meets both of the following conditions:

1. The port serves shipping routes that have a competitive advantage vis-à-vis other transport modes.
2. The volume of persons or goods shipped through the port generates benefits that are sufficiently high to cover the cost of the using the port.

It is possible for a port to serve shipping routes where sea transport has a competitive advantage, but not be economically viable in the long term because of low shipping volumes. Annex 4 describes the key features of ports in Aceh and Nias, and details the conditions that a port must meet to be economically viable in the long run.

Economic benefits of MDF-supported ports

A qualitative assessment of the economic benefits of the five MDF-supported ports was undertaken, based on:

- A review of port statistics for 2005-2011 (and, where possible, data for pre-tsunami years);
- Site visits (the Consultant visited all six ports in May and July 2012); and
- Interviews with government officials involved in port management and regional development.

The assessment concluded that MDF-financed investments on ports have mixed results in terms of economic benefits. Economic benefits were considered “significant” if the MDF-financed infrastructure facilitated much higher shipping volumes than would have been the case in a “without MDF” scenario. Economic benefits were considered “insignificant” if MDF-financed port infrastructure was not (and is unlikely to be) used for its intended purpose. Investments in two of the ports – the Krueng Geukeuh and Kuala Langsa ports – have thus far not generated significant economic benefits, and are unlikely to become economically viable in the near future. In contrast, investments in the ports of Malahayati, Sinabang and Gunung Sitoli have generally delivered the expected economic benefits.

Ports with significant economic benefits

The ports of Gunung Sitoli and Sinabang provide the only transport connection between the islands on which they are located—Nias and Simeulue, respectively—and mainland Sumatra (with the exception of air transport, which is prohibitively expensive for most purposes). Without the MDF-supported reconstruction of the ports, the import of basic needs that are not manufactured on the islands themselves (such as cement or gasoline) or the export of agricultural products would either not be possible or far more expensive. Stated differently, the reconstruction of the ports

has avoided very high economic costs to populations in the hinterlands. The port of Malahayati is likely to have generated economic benefits for different reasons: (i) the volume of goods movements is high and rising (after Krueng Geukeuh, Malahayati is Aceh's largest port by volume); and (ii) it is the only port where incoming and outgoing shipments are relatively balanced, which suggests that shipping costs are lower than elsewhere.

Ports without significant economic benefits

In 2011, Kuala Langsa port was barely used, recording fewer than two ship arrivals per week. Because of the extremely low shipping volumes recorded by this port (not only in 2011 but also in preceding years), and no realistic prospect of substantial increases in the near future, investments in Kuala Langsa port have not resulted in significant economic benefits and are unlikely to do so. The same observations apply to MDF's investments in the upgrading of Krueng Geukeuh, which is Aceh's largest port by volume. Most of the MDF-financed facilities here are rarely used, and because of several structural factors (including dwindling energy reserves, and a heavy reliance on exports of fertilizer with subsidies that may be discontinued), a reversal of fortunes is not anticipated.

Potential causes of insignificant economic benefits of the Lhokseumawe and Langsa ports seem to span many factors. The actual movement of goods through harbors in 2011 was overestimated by a substantial margin. It is possible that the competition that road transport would offer on the movement goods was underestimated, especially along the west coast of Aceh. Along this route, the completion of (major parts) of the national road did erode the competitive position of the port in Meulaboh (and the port in Calang) that is also connected by that road. Furthermore, incoming shipping volumes may have been overestimated due to insufficient access to data, and the expectations of the impacts of minor improvements on shipping volumes may have been unrealistic.

Conclusions

In those cases where the ports do meet demand and usage is high, substantial benefits have been forthcoming and the investments justifiable. However, in other cases where potential demand has been overestimated or other structural constraints overlooked, these investments are not likely to be viable now or in the future. In such cases, the principle of "Build Back Better" seems to have resulted in overinvestment in selected infrastructure, revealing an important lesson: even though a broad reconstruction strategy is paramount in a reconstruction context, it is also important to think through the reconstruction strategy selectively, rather than applying it to all investments across the board.

7.3 Solid Waste Management

The MDF invested about \$39.9 million to improve the solid waste management system in 13 district governments in Aceh, mainly through the TRWMP. It should be noted, however, that a substantial portion of funding for TRWMP was not only used to finance infrastructure (mainly consisting of landfills), but to also build district government capacity for solid waste management, clear debris in the immediate aftermath of the tsunami, and to develop livelihood programs to help social and economic recovery. This section only considers TRWMP's infrastructure and capacity building components as part of MDF's infrastructure sector portfolio.

In Indonesia, a municipal solid waste management (SWM) system typically consists of three activities: (i) waste collection (waste is collected from households by hand carts or small motorized vehicles and transported to a trans-shipment point); (ii) waste transport (move ship waste from the trans-shipment point to landfill); and (iii) waste disposal (bulldozers compact waste on site to avoid waste dispersion and increase the lifetime of the landfill). The economic benefits of such a system mainly consist of a reduction in public and private health costs. Revenue-generating activities such as recycling and composting may lower the overall cost of a SWM system, but are not considered as economic benefits in their own rights. The economic benefits of a solid waste management system are highest in densely populated urban areas, where environmental pressures and waste generation are higher than elsewhere. TRWMP assisted 13 district governments in Aceh and Nias with improving SWM systems. Of these, only Banda Aceh and Lhokseumawe are urban areas with a population of more than 100,000.

Economic benefits

A review of TRWMP progress reports suggests that the landfill development program is much more likely to generate long-term economic benefits than the capacity-building program.

- **Landfills.** Through TRWMP, MDF financed low-tech landfills in nine districts that are easy and inexpensive to maintain. More importantly, the project established a regional sanitary landfill, which will be managed by a newly established technical implementation unit (*Unit Pelaksana Teknis Daerah* or UPTD). The Blang Bintang landfill is the first truly sanitary landfill in Indonesia, and it is hoped that this will trigger the construction of other such landfills elsewhere in the country.
- **Capacity building.** This was a major component in the TRWMP, to promote the proper operations and maintenance of the investments. A fee recovery system, better known as a solid waste collection charge (*retribusi sampah*), was developed. However, fee collection income alone is inadequate to cover all costs, and district governments need to commit themselves to increased spending from own budgetary resources.

7.4 Water Supply

The MDF invested a relatively small amount (approximately \$2.3 million) in the water supply systems of four districts (Sabang City, Langsa City, Aceh Besar District and Pidie District). In all cases, the MDF supported the construction of bulk water infrastructure (water treatment plants, reservoirs and transmission mains) to supply distribution systems. MDF-financed infrastructure is currently managed by the municipal water company (*Perusahaan Daerah Air Minum or PDAM*) owned by the respective districts. The economic benefits of a piped water supply system consist of: (i) direct financial benefits to water users (as shown in, the cost of piped water – expressed in IDR per cubic meter – is six to 15 times lower than the cost of water purchased from a vendor); and (ii) indirect financial or non-financial benefits (which largely consist of reduction in health costs resulting from a lower incidence in water-borne diseases). For obvious reasons, the economic benefits of a piped water supply system are highest in areas where service coverage is low, and alternative sources of water (such as potable groundwater or surface water) are scarce or unavailable. Three of the four districts met these criteria.

Economic benefits

Water supply projects, while directly affecting both men and women, often tend to have a greater impact on women, especially at the household level. In Banda Aceh, the number of households with connections to permanent water supply reached approximately 18,000 in 2012, a significant increase from approximately 7,000 in 2004 and approximately 5,000 immediately after the tsunami.

The actual economic benefits of MDF-supported investments are varied, depending on the district. The PDAM Aceh Besar District is relatively well-managed and profitable, being able to provide sufficient resources and income generated for the proper operations and maintenance. Central and local governments have allocated additional funding to expand the water supply to further households in Aceh Besar.

However, at PDAM Pidie District and PDAM Sabang City, issues related to poor construction leading to high technical losses, limited supporting distribution networks and insufficient resources are influencing the sustainability of the investments.

Conclusions

The single most important underlying problem to the poor sustainability of the investments is the lack of resources that have been allocated for the operations and maintenance of the assets: district government budgets as approved often do not include sufficient funds for their PDAMs, either in the form of cost-recovery tariffs or by providing additional funds transfers that are sufficiently high to cover the cost of a proper service. In this context, it is worth noting that PDAM Aceh Besar District – which is a relatively well-managed and profitable PDAM – does not suffer from any of the above issues.

7.5 Flood Control

MDF invested about \$15.9 million to improve the flood control systems of the two largest cities in Aceh: Banda Aceh and Lhokseumawe. In the case of Lhokseumawe, MDF also invested in a wastewater treatment system. In each city, the MDF-financed infrastructure is managed by a special unit that forms part of the district government's public works department (*Dinas Pekerjaan Umum*).

The economic benefits of a flood control system arise from a reduction in the frequency and severity of floods. Reduced flooding will, in turn, result in reduced damage to public infrastructure and private property, reduced health costs, and a reduction in the interruption of economic activities such as trading and transport. Because of methodological difficulties in the measurement and valuations of these benefits, the economic benefits of a flood control project are usually measured indirectly, by estimating the value of land price increases in the project's "area of influence." The economic benefits of a flood control system are therefore highest in flood-prone urban areas (where potential increases in land prices are highest), and this is precisely where the MDF-financed flood control systems were located. It is also worth noting that flood control projects have a pro-poor bias, because the poor tend to live in the most flood-prone areas of a city, where land prices are lowest.

Economic benefits

Interviews with the managers of the flood control systems in Banda Aceh City and Lhokseumawe City indicate that both systems have generated their intended benefits: floods have all but disappeared in the area of influence, and land prices have increased substantially since the systems became operational (anecdotal evidence suggests that the increase was higher than the average land price increase in both Banda Aceh and Lhokseumawe, but this claim could not be verified empirically because detailed data on land prices are not in the public domain).

However, the economic benefits of the projects have been adversely affected by the delays in transferring the project's assets from the Ministry of Public Works to Lhokseumawe City and financing of pumping costs. This has led to delays in starting clean up operations. The sustainability of benefits is also affected by the limited budget allocated or assumed by local government for proper operations and maintenance.

7.6 Other Water Infrastructure

The MDF allocated a small amount of funds to co-finance the reconstruction and rehabilitation of coastal barriers and sea and river embankments in four locations in Aceh (see Table 7.4 for details).

Table 7.4 Key Features of MDF-Supported Water Infrastructure Projects

Code	Project Location	Cost (US\$ million)		Main Project Components
		TOTAL	MDF share	
WR-1	Aceh Besar	0.62	0.19	River alignment works (1.9km)
WR-2	Aceh Selatan	0.53	0.16	Coastal barriers (0.5km)
WR-3	Banda Aceh	1.50	0.45	Coastal barrier (0.9km), sea embankment (1.0km), river alignment works (0.3km)
WR-5	Aceh Jaya	1.75	0.52	Jetty (100m), river embankment (0.6km)

Source: MDF

Economic rationale of water infrastructure projects

The sea defense strategy formulated by BRR distinguishes three types of natural hazards: (i) tsunami hazard; (ii) coastal erosion; and (iii) flooding (rainfall, river and tidal).⁵ The main purpose of three of the four MDF-financed projects (WR-1, WR-2 and WR-3) is to alleviate coastal erosion, while WR-5 was mainly designed to mitigate the adverse impacts of river and tidal flooding.

A simplified assessment of the economic benefits of the four projects was undertaken, measuring the expected increase in the value of the physical assets protected by the project. The net present value of economic benefits arising from lower road operations and maintenance costs and a lower likelihood of flood damage were assessed. If the minimum required increase in land values (of the area affected by the project) was deemed realistic, the project was considered economically viable.

The limited analysis suggests that the investment in coastal barriers cannot be justified solely on the grounds of improving the value of the road sections they were designed to protect. Similarly, the economic benefits of water infrastructure on land values were also not deemed to exceed the investment costs.

⁵ For details, refer to Sea Defense Consultants Completion Report, SDC-R-90161, November 2009. This report also lists the MDF-financed contracts for the rehabilitation of the Lhokseumawe flood control sea system (which is described in Annex 3 of this report).

Table 7.5 Results of Scenario Analysis for WR-2

Assumption	WITHOUT PROJECT	WITH PROJECT SCENARIOS		
		Pessimistic	Likely	Optimistic
Routine O&M cost road (% investment)	10%	10%	5%	2.5%
# Major repairs during lifetime of road	5	5	2	1
Likelihood of complete destruction (%)*	50%	50%	25%	0%
NPV Economic Benefits @10% (US\$ million)		-0.48	-0.25	-0.11

Source: MDF

* Assumed to occur in year 10 of the 25-year economic lifetime of the road

Conclusions

Given the nature of the tsunami and the devastation it had caused, the Government of Indonesia was motivated to invest in infrastructure that would mitigate the impacts of future disasters. The MDF as a gap filling mechanism supported the government's need to reassure the population that measures were being put in place to reduce the risks of disasters in the future.

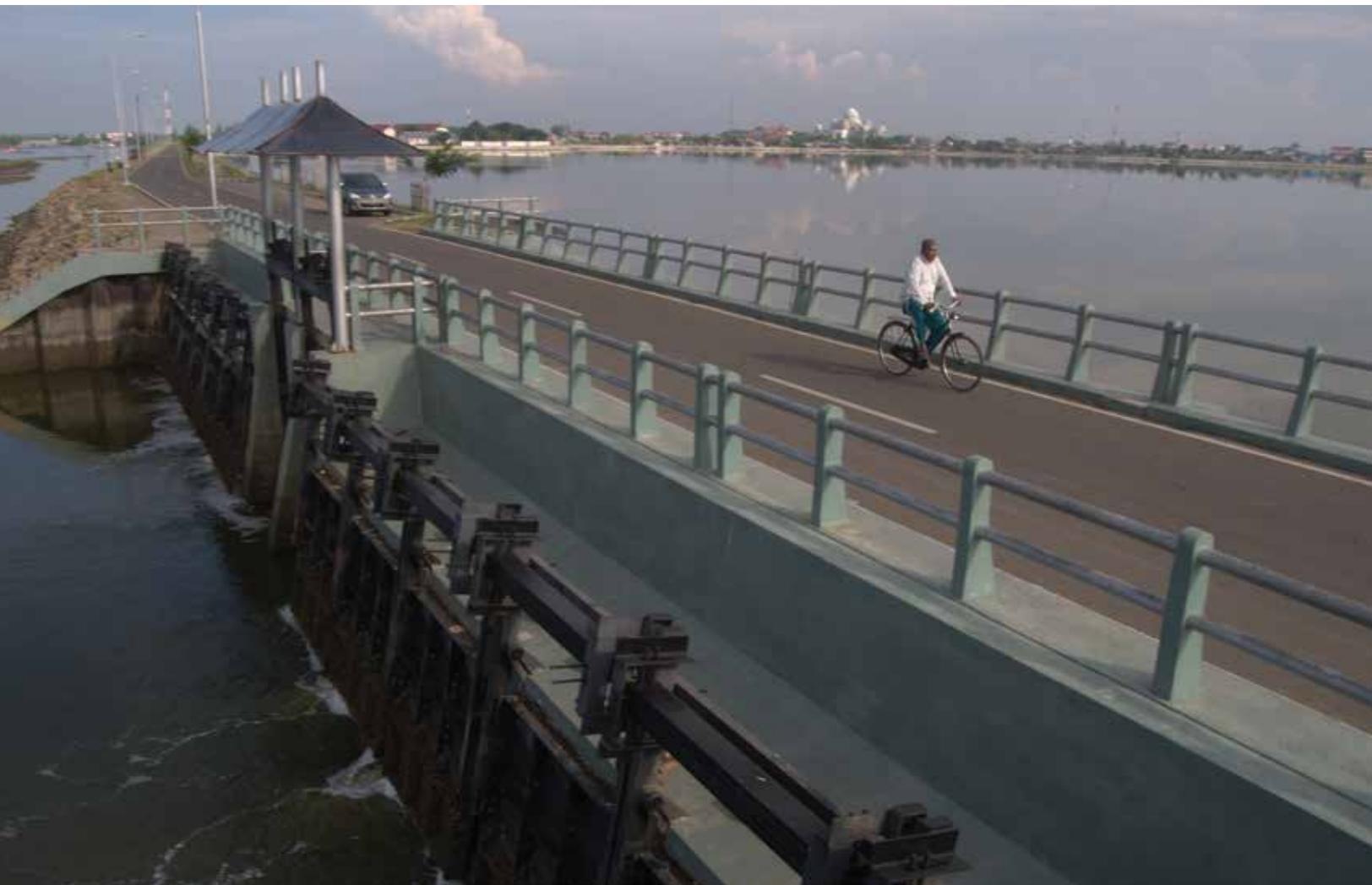


The MDF infrastructure portfolio included five IRFF sub-projects for coastal protection. These projects were designed to protect the shoreline as well as roads, port facilities, or other facilities close to the shore from waves and the resulting abrasion hazard.

Photo:
Shaun Parker

Chapter 8

CONCLUSIONS AND LESSONS LEARNED



This chapter summarizes the experiences, challenges and lessons learned from the financing and implementation of the MDF infrastructure portfolio of projects. Overall results and achievements are highlighted together with some conclusions that can be drawn from the MDF's wide range of experiences in implementing post-disaster infrastructure reconstruction activities. The chapter concludes with some general lessons that have relevance for the reconstruction of infrastructure in future post-disaster contexts around the world.

8.1 MDF Infrastructure: Addressing Challenges and Delivering Quality Results

Stakeholders see the overall MDF program and its operations in infrastructure reconstruction and rehabilitation as well-designed and well-implemented. Using a phased approach, the MDF program prioritized its response activities to deal with immediate needs first. In the infrastructure portfolio, this addressed logistics needs to provide access to affected areas. The second phase of the MDF concentrated on infrastructure reconstruction. The projects overcame challenging circumstances to achieve outcomes that are effective, fairly sustainable, and economically justified. Good governance modalities were implemented across the portfolio, which supported local accountability and stakeholder buy-in. The implementation of nearly all sub-projects in the roads, solid waste management, and drainage sub-sectors was fully satisfactory, and their economic benefit is clearly evident.

The support in transport logistics required speed in response and the benefits were great, reaching a multitude of reconstruction and response players. Access was opened to areas that had been cut off by the disaster in order to provide relief and reconstruction efforts, and the essential shipping services provided by the WFP brought much needed necessities and relief supplies to these isolated towns and regions.

Roads and ports constructed under the MDF are generally of good quality and bring economic benefits. One of the reasons for the construction quality was the strong supervision carried out by the Partner Agencies and the commitment of the Implementing Agencies. Further strong contributing factors were the provision of training to continue operating and maintaining physical investments and systems, and the strong sense of ownership by the government and stakeholders involved. However, at times there was not sufficient flexibility to adjust pricing within reason and when dealing with unexpected

The MDF has allocated approximately 35 percent of its contributions to the reconstruction of large infrastructure and transport. Large infrastructure projects, such as this drainage system and reservoir in Lhokseumawe city, completed in June 2010, provide a springboard for future economic growth and development.

Photo: Mosista Pambudi/Antara News Agency

site conditions. In a disaster reconstruction context, it is important to take into account the longer-term vision of relevant authorities related to broader trends and policies that may affect transportation and movement of goods in the future. In those cases where infrastructure outlays do meet demand and usage is high, substantial benefits have been forthcoming and the investments justifiable. However, in other cases where potential demand was overestimated or other structural constraints overlooked, these investments may not be viable, as seen in the case of some of the ports investments. In such cases, the principle of “Build Back Better” may have resulted in overinvestment in selected infrastructure. An important lesson from this is that, even though a broad reconstruction strategy is paramount in a reconstruction context, it is also important to think through its application selectively.

Investments made in drainage and flood control, solid waste management and urban water supply projects were also mostly implemented well. In future situations, strong coordination between various partners, and a strong commitment to work towards common goals would mitigate risks of challenges arising in effectively improving sustained service levels. Particularly in these sectors, the lack of accurate geological data available is likely to hamper the preparation of suitable designs to address the needs of end users after a significant disaster, and such risks may need to be accepted in a disaster response context.

Investments in infrastructure should be approached from a wider perspective of regional or national networks and systems. Reconstruction of roads should not be seen in segmented isolation, but rather in the context of a transportation network that connects local communities to a larger district and provincial network, providing access to broader markets and social services. Strong coordination between different development partners strengthens the overall impact of a reconstructed transportation network.

Without the allocation of sufficient resources, the sustainability of investments is impacted. Even though there seems to be no shortage of funds overall, government budgetary processes and appropriations led to lower allocations for operations and maintenance. This adversely affects the long-term sustainability of roads and other infrastructure and reduces economic benefits. Creating a strong sense of ownership for the assets generated facilitates the smooth transfer of ownership to the relevant government authorities, and allocation of operations and maintenance budget. Where finished assets were not handed over to a recipient agency right after completion, the recipient agency were in some cases reluctant to receive the “old” asset, and frequently asked for asset revaluation or audit to determine its value at hand over. Proper registration of assets helped mitigate the lack of funds allocated for operations and maintenance to a large degree.

Relevant safeguards and good governance measures need to be implemented from the start to maximize impact. The complaints handling mechanisms established by infrastructure projects were an effective means to promote transparency and accountability. Projects were encouraged to establish clear mechanisms through which stakeholders gave feedback, asked questions and delivered complaints regarding project activities. The Anti Corruption Action Plan (ACAP) was implemented in all the World Bank managed projects; however, there was room for improvement in terms of recording complaints and reporting them to the public. All issues pertaining to social and environmental safeguards were handled well, with flexible and new approaches as appropriate. Environmental issues were considered very carefully, especially in the construction of district roads in remote and mountainous areas. Reconstruction of roads was mostly confined to pre-existing rights-of-way, which often led to technical compromises but avoided protracted land acquisition issues.

The involvement of local governments is a key to successful mainstreaming of disaster risk mitigation. This required special attention through strengthening of institutions and policies, and through educating and building capacity of local government to develop and implement Disaster Risk Reduction plans. It is important to ensure that disaster risk reduction principles and practices are included in the planning and implementation process.

The economic benefits of the reconstruction and rehabilitation of infrastructure vary across the different subsectors. Economic benefits from reconstructing roads damaged by a natural disaster are, in general, substantially higher than their economic costs. These benefits mainly consist of second-order benefits in the form of long-term reductions in transport costs and increases in regional economic growth. Rural roads (constructed under the management of ILO) have been highly successful in opening up remote areas, increasing agricultural productivity and providing isolated villages improved access to social services. The economic benefits of the reconstruction and rehabilitation of ports damaged by a natural disaster are, in general, substantially higher than their economic costs if they provide the only connection with the mainland. Where ports compete with road transport, the economic benefits do not necessarily outweigh the costs. The MDF's investments in other urban infrastructure have improved the social services available to inhabitants of targeted settlements. For the MDF's investments in solid waste management and flood control systems the economic benefits (as measured by land price increases) exceed the economic costs.

Aceh was a very complex post-disaster situation embedded in a post-conflict context, and as a result there were factors other than purely economic ones that had to be considered in selecting types and locations of investments. As such, priorities and strategic decision making, and expectation of results have to be context-specific, especially in a situation involving conflict, isolation and low capacity – many factors which are common in fragile situations across the world.

8.2 Conclusions

The MDF's experience demonstrates that it is critical to balance the competing demands of speed, quality and ownership in infrastructure investments, and a phased approach allows a possible solution to the need for balance. Long-term sustainability is a direct result of quality of construction and ownership by local authorities, and is enhanced through capacity building at all levels of government to take on their operations and maintenance beyond reconstruction. The MDF's experience in implementing its large-scale infrastructure reconstruction program, in partnership with the Government of Indonesia and other development partners, offers many lessons for future reconstruction efforts in similar contexts, including post-conflict situations.

Lessons for Future Post-disaster Reconstruction of Infrastructure

Strong coordination is a critical success factor in any reconstruction effort. The Government of Indonesia led the coordination of donors, partners and other stakeholders in the \$7 billion overall reconstruction effort. Lessons from Indonesia's reconstruction show that clearly defined roles and strong commitment from various reconstruction partners and government are essential to the coordination and reconstruction process. Close communication between all parties is key to prevent duplication of efforts and identification of response activities. Delegation of decision-making authority to local offices speeds up implementation.

A strong working relationship with government is also critical for a successfully coordinated response. The MDF facilitated the coordination role of the government as it provided a single institution to work with in terms of program design, project development, implementation and related procurement. The MDF infrastructure portfolio was designed in close coordination with the Government of Indonesia, and was primarily used to fill gaps in overall infrastructure reconstruction activities. The MDF allocated approximately \$290 million to infrastructure reconstruction, and the government provided counterpart funding of just over \$100 million. The majority of these funds were channeled through the government's budget, giving the government a strong sense of ownership over the investments and contributing to success.

A phased approach allows a balance between the speed of response and quality of investment. Firstly, the MDF addressed the immediate recovery needs such as logistics and housing. During this phase, project identification and design for the second phase, which concentrated on reconstruction activities such as infrastructure and protecting the environment, was undertaken. Project preparation and planning for the second phase for technically complex infrastructure required more time than the initial response activities. With the physical reconstruction work underway and in some instances completed, the MDF shifted focus to ensure sustainability of the investments. The final phase focused on developing livelihoods and enhancing the capacity of agencies to manage the newly created assets. Using this approach, the MDF managed to balance the required speed of response with quality investments.

It is essential that the management structure of a reconstruction program has the required authority and flexibility to make necessary adjustments to project concepts. This pertains to adjusting the scope and coverage of investments, bearing in mind that initial project plans are often based on uncertain information, as well as employing flexible procurement options. A strong presence on site and a high degree of delegated decision-making authority are essential in this context to speed up implementation.

Using a financing facility mechanism allows for flexibility in responding to reconstruction needs. The IRFF project was approved as a financing facility. This meant that funds were made available for infrastructure reconstruction, but no specific reconstruction investments were identified at the time that the project was designed and approved. This allowed the government to identify where needs remained after other reconstruction partners had identified activities. These gaps were then accommodated in the MDF infrastructure portfolio.

Technical assistance is critical to support a flexible financing facility. Through the IREP project, technical assistance (i.e. consultant services) pertaining to strategic planning, project design, project preparation (including the handling of relevant social and environmental safeguards aspects), implementation support and construction supervision as well as financial management and operation and maintenance was a “strategic enabler” for implementing infrastructure funded by the IRFF project in a flexible manner.

Involving local government in the project planning and implementation processes enhances their capacity. Putting in place a mechanism for the active involvement of local government provides opportunity to directly learn from the implementation process and to gain practical knowledge for managing donor funded projects in reconstruction and development contexts. This empowers local officials to develop, manage and maintain the infrastructure and, most importantly, creates a strong sense of ownership for the investment.

Investments are likely to be more sustainable when matched to the local ability or willingness to finance operations and maintenance. Plans for newly created assets that may exceed local budgetary capacity need to be carefully considered before proceeding with any such investments. Where substantially upgraded facilities bring with them significantly increased costs for operations and maintenance, a local authority may be unable or unwilling to take on the responsibility. The importance of providing solutions employing suitable technology against the backdrop of limited capacity and resources is often overlooked in reconstruction and development contexts.

ANNEXES



Annex 1 – Coordination of Infrastructure Reconstruction by BRR

Several significant infrastructure-focused programs with bilateral support were assembled under the overall strategic guidelines and plans set out by the BRR. The principal ones and their relationship to the BRR thrust and MDF-supported investments as completed by July 2012 are shown below:

Item	Bilateral Agency / IGO / NGO or Program	Infrastructure program description and outcome, where these interfaced with MDF-supported programs
1.	Government of Norway	Base mapping update following tsunami and dissemination. Updated base maps enabled the planning and design of much of the reconstruction works to be undertaken based on the current topography.
2.	Netherlands Government	Sea Defense Consultancy (SDC). The objective of the SDC was to (a) prepare an appropriate strategy for sea defense, flood protection, multifunction refuge construction, and near-field and far-field early warning systems, and (b) support the planning and design of subsequent prioritized infrastructure.
3.	French Ministry of Economic Planning (DGT)	FASEP (France) Consultant support for infrastructure reconstruction phasing, planning, investment preparation, and design/bid documentation. Focused on Banda Aceh, enabling shelter reconstruction to facilitate service provision.
4.	UNICEF	Water supply program, focusing on emergency supplies, maintaining temporary supplies, and meeting gaps in damaged systems. Reconstruction of part of BRR water supply renewal program. Acted as sector coordinator.
5.	USAID/IRC Water programs	Capacity building programs for local government and PDAMs, and support for temporary and emergency supplies.
6.	Habitat	Shelter reconstruction sector coordinator, including identification of basic infrastructure and service needs.
7.	Japan (JICS)	Roads and water supply programs. All dealt with directly by BRR teams.
8.	GTZ/GIZ	Municipal solid waste and bulk water supply. Close collaboration and follow up of Banda Aceh regional solid waste proposals by UNDP Solid waste team (see No. 12 below).
9.	USAID	Major West Coast highway project, also facilitating planning and reconstruction of related infrastructure and services renewal.
10.	Muslim Aid	Banda Aceh storm drainage, and support for initial service provision for shelter reconstruction through pilot local infrastructure program providing essential township services.
11.	Catholic Relief Service (CRS)	Initial facilitation of road rehabilitation to improve access along West Coast.
12.	UNDP	Initial vital coordination role and continued involvement through UNOPS Support to BRR planning process; Ports and Transport; Mobilization of rapid response to clean up and re-use debris, followed by development of municipal waste management programs.

Coordination and cooperation between the MDF teams, these agencies and the BRR was vital, enabling gaps in the reconstruction to be identified, providing technical and administrative skills destroyed by the tsunami disaster, and avoiding duplication of effort. This partnering of effort and resources supported an accelerated implementation of the reconstruction, achieving results on the ground which would not have been possible otherwise.

The Banda Aceh New Town Road, funded through IRFF, has improved transportation links in this fast-growing city of over 300,000 people, many of whom are car and motorcycle owners.

Photo: Tarmizy Harva

Annex 2 – Options for Fund Flow Mechanisms, and Implications

In numerous documents pertaining to the reconstruction effort, the terms “on-budget” and “off budget” as well as “on-treasury” and “off-treasury” appear. These are explained here.

“On-budget” and “off-budget”: An activity is classified as being “on-budget” if the activity is included in the (original or revised) budget of a central or sub-national government, either before or after the activity was undertaken. If the activity is not recorded, it is classified as “off-budget.”

“On-treasury” and “off-treasury”: An activity is classified as being “on-treasury” if the payment for that activity is channeled through Gol’s own payment system (which consists of central and sub-national treasury offices, known as *Kas Negara*, and *Kas Daerah*, respectively). If an activity is “on-treasury,” this does not automatically mean that the activity is financed from Gol’s own sources. For example, the World Bank co-finances block grants for the national community empowerment program (PNPM), but these grants are channeled through Gol’s own treasury.

On or off – why does it matter? Originally, most foreign entities involved in disaster relief and construction financed their activities “off-budget” and “off-treasury.” The activities were not recorded in the Gol budget and paid for through the systems of the foreign entities themselves. The main advantage of this approach: speed. Gol continues to have difficulties to mobilize funds at short notice, even in the event of a major natural disaster, especially if such disasters occur towards year-end when budget appropriation processes have already been completed. The main disadvantage is a lack of integration with other activities. Initially, speed was more important than an integrated approach to planning. However, in a later stage, the haphazard approach to reconstruction become a burden to BRR, and Gol attempted to address this problem by not allowing foreign entities to undertake activities in Indonesia which were not recorded in a (revised) central or sub-national government budget. This approach was codified in 2006, when the Director General of Treasury in the Ministry of Finance issued a decree that effectively ended the “off budget, off treasury” approach by an “on-budget” (but not necessarily “on-treasury”) approach. Since the signing of the “Jakarta Convention,” most development partners have committed themselves to moving towards the use of in-country budgeting and payment systems – i.e. the “on-budget/on treasury” approach.

	Off-budget	On-budget
Off-Treasury	A foreign entity undertakes an activity in Indonesia, and pays for this activity by itself. The activity is not included in the Gol budget.	A foreign entity undertakes an activity in Indonesia, and pays for this activity by itself. The activity is nonetheless recorded in the Gol budget.
On-Treasury	This combination does not exist. It is not possible for Gol to pay for an activity not included in the budget. If an unexpected activity has to be paid for, it will be included in the revised budget.	Gol includes an activity in its budget. The activity is paid for through Gol’s own payment system (the treasury).

Annex 3 – Profiles of the Nine Projects under the MDF Infrastructure Portfolio

This annex provides brief profiles of the following nine projects that constituted the infrastructure related portfolio of the MDF's operations:

1. Sea Delivery and Logistics Programme (SDLP),
2. Tsunami Recovery Port Redevelopment Program (TRPRP),
3. Banda Aceh Flood Mitigation Project (BAFMP),
4. Infrastructure Reconstruction Enabling Program (IREP),
5. Infrastructure Reconstruction Financing Facility (IRFF),
6. Lamno-Calang Road Maintenance Project (LCRMP),
7. Capacity Building for Local Resource-based Rural Roads (CBLR3),
8. Nias Island Rural Access and Capacity Building Project (RACBP), and
9. Tsunami Recovery Waste Management Programme (TRWMP).

These nine projects all provided significant investments in infrastructure and included projects not just in the infrastructure outcome area of the MDF portfolio's categories of projects. Nos. 1-6 and 8 are associated with Outcome Area 2 "Reconstruction and Rehabilitation of Large Infrastructure and Transport" whilst the CBLR3 is associated with Outcome Area 3 "Strengthening Governance and Capacity Building" and the TRWMP is associated with Outcome Area 4 "Sustaining the Environment."



The Sea Delivery and Logistics Programme (SDLP) was aimed at meeting urgent recovery transportation needs and to support the recovery of the marine transportation system in Aceh and Nias.

Photo:
SDLP
Collection

Sea Delivery and Logistics Programme (SDLP)

Partner Agency	World Food Programme
Implementing Agency	World Food Programme
Implementation Period Original Implementation period: Extension 1: Extension 2: Extension 3:	February 2006 - June 2012 February 2006 - February 2010 September 2010 September 2011 June 2012
Grant Amount Original Grant Amount: Additional Financing (July 2008) Cost recovery funds	US\$ 25.03 million (excluding cost recovery funds of US\$2.72 million) US\$ 24.7 million US\$ 0.33 million US\$ 2.72 million
Disbursements	US\$ 25.03 million

The objective of the project was to fulfill urgent recovery transportation needs and to support the recovery of the marine transportation system in Aceh and Nias through the efficient and safe transportation of reconstruction goods, tsunami initiatives based on the demand of multiple reconstruction stakeholders, and through enhancing capacities of the relevant government authorities to manage ports operations in target ports, aided by the availability of accurate cargo forecasting.

“The Shipping Service stands out for special mention because of its importance in filling a giant hole in our reconstruction supply chain.”

Kuntoro Mangkusubroto - Head of BRR

The tsunami had destroyed or badly damaged many facilities in the 18 main ports of Aceh and Nias. This created a very serious bottleneck in the supply chain for materials required for the reconstruction. Restoring the facilities and capacities for port operations was thus one of the first rehabilitation priorities, especially for the islands of Sabang, Simeulue, and Nias. The SDLP, implemented by the World Food Program Shipping Service, first temporarily restored some essential port facilities including basic equipment for loading/unloading of cargo. It also provided shipping services for international organizations and government agencies as well as NGOs and other stakeholders with a focus on materials for reconstruction. When the private sector began to recover and increasingly take on this role again, the SDLP gradually shifted its focus toward providing logistics support and capacity building for advanced port management.

Best Practice

In its second phase, the SDLP conducted intensive training and capacity building for personnel who are to operate the reconstructed ports of Aceh and Nias in the long run. After the completion of the training courses, the SDLP handed over its training modules to the new Institute of Shipping, Logistics, and Maritime Studies of Aceh's Syiah Kuala University. In this way, these modules can now be used for training future generations of port operating personnel and will thus have an extraordinarily sustainable benefit.

In its second phase, the SDLP trained relevant public sector staff working in the 18 main ports of Aceh and Nias in advanced techniques of port operations and related logistics management. On top of that, it provided logistics support and consultancy services to humanitarian organizations and private sector entities. In so doing, the SDLP developed cooperation mechanisms with the Provincial Training and Human Resource Agency and the Syiah Kuala University of Banda Aceh.

In its last phase, the SDLP focused on strengthening the institutional capacity of the Provincial Disaster Management Agency, including its Rapid Reaction Team, in disaster risk reduction.

Lesson Learned

In its initial phase, the SDLP provided free transportation services in the context of relief and reconstruction. Following a disaster, providing access to affected areas is critical in both immediate relief and later reconstruction contexts. Demand was high, and a lot of equipment was purchased but inefficiencies began to creep in. When the program introduced cost recovery tariffs, demand and misuse decreased dramatically. In hindsight, the services should never have been totally free of charge, and the increase in tariffs should have been more gradual. Also, some of the equipment for ports operations could perhaps have been hired rather than purchased; in this way, the project could have responded more flexibly to changes in demand, and local port operators would not be burdened now with the O&M cost of equipment that exceeds their real long-term needs. However, all assets purchased have been handed over to various agencies for continued use.

In addition, the SDLP supported the infrastructure investments of the MDF in facilities and systems by providing capacity building for continued operations and maintenance.

Tsunami Recovery Port Redevelopment Project (TRPRP)

Implementing Agency	United Nations Development Programme
Partner Agency	United Nations Development Programme
Implementation Period	March 2006 - December 2007
Grant Amount	US\$ 3.8 million
Disbursements	US\$ 3.8 million

The objective of the project was to create immediate employment and longer-term livelihood development by developing the destroyed and damaged ports so that equipment and materials could be efficiently supplied to isolated communities for the reconstruction process. The project provided designs and further technical support for the reconstruction of major seaports in Aceh and Nias, as well as minor rehabilitation works to ports.

A first phase of UNDP work towards the rehabilitation of ports commenced in March 2005 and was undertaken within the framework of the Aceh Emergency Response and Transitional Recovery (ERTR) Programme, executed by UNDP in partnership with the BRR, and implemented through partnerships with the Provincial Government Transportation Department (Dinas Perhubungan) for Aceh and with the Department of Sea Communications for Nias. From December 2005 onward, the MDF funded the continuation of this work under the label TRPRP.

The TRPRP was designed to align with the overall port redevelopment strategy developed by UNDP supported ports specialists and endorsed by the BRR to rebuild the ports of Aceh and Nias. Ports are essential infrastructure elements and were particularly critical for the areas that were devastated by the tsunami.

The work of TRPRP included studies, economic assessments, environmental impact assessments, and designs for various ports: Calang, Kuala Langsa, Meulaboh, Singkil, and the ferry port of Ulee Lheue (in Banda Aceh), all in “mainland” Aceh Province, as well as Sinabang (on Simeulue Island, Aceh Province) and Gunung Sitoli (on Nias Island, North Sumatra Province).

Of these, Singkil port was reconstructed with BRR funds, Meulaboh port was reconstructed with funds from the Government of Singapore, and the Ulee Lheue ferry port was reconstructed with funds from the Government of Australia. Calang Port was ultimately completed with Gol funds. The remaining ports were incorporated in the MDF portfolio for port reconstruction and funded from the IRFF.

In most of the new ports in Aceh, current real transport demand is significantly below the levels for which these ports have obviously been designed. One explanation for this observation is that the projections for regional economic growth following the peace agreement and rehabilitation

of infrastructure as well as the economic assessments of port reconstruction based on these expectations may have been overestimated. In addition, the mutual competition between boat transport and road transport – the latter supported by the construction of better roads – should probably have been analyzed more thoroughly. It has to be borne in mind that most bulk goods that could potentially be shipped out of Aceh are agricultural commodities that are produced in heavily scattered locations from where they are collected by road vehicles. There is a strong inclination to transport these commodities straight to the nearest major processing center or export terminal by road. All the costs associated with reloading discourage transport entrepreneurs from using boat transport, especially when transport to a processing facility would require yet another reloading back to a land vehicle. All these factors may not have been fully explored during the planning phase but this can perhaps be regarded as one example for “the cost of speed” (see textbox “The Economics of Having to Act Fast” in the main part of this report).

The question has been asked whether the ports of Aceh could not be used more intensively for the direct export of agricultural commodities. The answer to this lies in more than one field. In terms of regulation, the Ministry of Trade restricts the export and import from small ports. In terms of economics, the quantities of such agricultural commodities are not very great. Provincial statistics show annual production figures of 74,000 tons for cocoa, 58,000 tons for rubber, and 49,000 tons for coffee. Each figure translates into no more than a handful of shiploads per year. Shipping these relatively small quantities directly would require rather long storage times before shipping, and this in turn would increase the costs and/or result in a deterioration of the products. In any case, these commodities are collected from the production areas by truck and can therefore quite efficiently be transported straight to the much larger port of Medan.



The Tsunami Recovery Ports Redevelopment Programme (TRPRP) targeted key ports and wharves for immediate temporary reconstruction like this one in Calang that was destroyed in the disaster. This allowed the early opening of access routes in the immediate aftermath of the tsunami.

Photo:
Kristin
Thompson

Banda Aceh Flood Mitigation Project (BAFMP)

Partner Agency	The World Bank
Implementing Agency	Muslim Aid
Implementation Period Original Implementation period: Extension 1: Extension 2:	April 2006 - December 2009 April 2006 - June 2008 June 2009 December 2009
Grant Amount Original Grant Amount: Additional Financing (June 2009):	US\$6.5 million US\$4.5 million US\$2 million
Disbursements	US\$6.27 million

The project development objective was to quickly re-establish functionality of the flood protection systems damaged by the tsunami and earthquake. This project has helped protect the central business area of Aceh's provincial capital Banda Aceh against storm water and tidal flooding.

The devastation of Banda Aceh City by the tsunami had also rendered the drainage and flood control system dysfunctional. Because Banda Aceh is situated on flat terrain virtually at sea level, the restoration of a functioning drainage and flood control system was a precondition for successful reconstruction.

The very first step was the clearing of debris and sediment from drainage canals. This was done under the Tsunami Recovery Waste Management Project (see respective section). For the next step, BRR subdivided the core area of Banda Aceh into eight zones whereby MDF was requested to manage the restoration of the drainage and flood control system in Zone 2. A UK-based NGO, Muslim Aid, proposed to take on this task, and BRR endorsed this proposal although Muslim Aid had little prior experience in this field. Project implementation began in April 2006.

Before the project, Zone 2 was regularly waterlogged during spring tides (i.e. twice a month) and flooded after virtually every heavy rain. As a result of the tectonic movements that had triggered the earthquake and the tsunami in the first place, the topography of coastal Aceh had altered: elevations had changed by several decimeters in some places, including in Banda Aceh. This necessitated fresh topographic surveys and a redesign of the erstwhile drainage system before construction works could begin. A crucial element in this context was the support lent by the Government of Norway; a French company was contracted to produce high-quality stereo aerial photography which provided the basis for the redesign of the urban drainage system and other urban infrastructure in Banda Aceh. These funds were made available in parallel to the contribution of the Government of Norway to the MDF.

While initial project implementation progress was rather slow, the strong commitment of Muslim Aid and the World Bank as Partner Agency took the project to eventual success. After two extensions of the implementation period, construction was completed in December 2009.



An officer checks equipment (left) at the pump house constructed under BAFM project (right). Staff were trained in the proper operation and maintenance of the equipment. Since the project was completed, no floods have occurred in the neighborhood.

Photo:
Irwansyah
Putra

There are now several new drainage canals, some of them with additional walls to contain exceptionally high water levels, three rainwater retention basins, and three pumping stations with a combined pumping capacity of 4,000 liters/second. The system has been designed to withstand the once-in-five-years flood, and Zone 2 has been flood free from 2009 to 2012. The project was handed over to the city's drainage department that will operate the pumps and maintain the whole system in the future.



A "duck bill valve" for one-way flow. The valve will open to water pressure from inside as much as needed but will close when outside pressure exceeds inside pressure, e. g. during high tides.

Photo:
Geoffrey
Read

Innovations introduced by the project:

- **One-way flow valves made from rubber, to protect the smaller drains from backflow during high tides.** Conventionally, flap valves made from steel are used for this purpose. These, however, rust quickly in brackish water and require rather intensive, continuous maintenance. The rubber valves (the technical term is “duck bill valves”) are completely maintenance free, have a manufacturer warranty of 15 years and a likely useful life of 30 to 50 years. Towards the end of their useful life, they will show gradually deteriorating performance but probably not a sudden, total failure that would require immediate replacement (such occurrences are always a problem for a local government department that relies on a pre-approved annual budget).
- **Improved garbage collection.** Garbage thrown into drains is a major reason for waterlogging and flooding problems in many cities in developing countries. Muslim Aid introduced small three-wheel garbage collection vehicles, consisting of a motorcycle chassis and a small container attached to it (see photo). These vehicles combine the versatility and mobility of a pushcart with the speed and capacity of a motorized vehicle, and they have proven very effective in collecting and removing garbage. They are now operated by the city’s sanitation department.



A three-wheel vehicle for garbage collection in the maintenance workshop of the TRWMP at Gampong Jawa, the previous landfill site.

Photo:
Geoffrey
Read

Infrastructure Reconstruction Enabling Program (IREP)

Partner Agency	Ministry of Public Works
Implementing Agency	The World Bank
Implementation Period Original Implementation period: Extension 1: Extension 2:	July 2006 - December 2011 September 2006 - October 2009 June 2010 December 2011
Grant Amount	US\$42 million
Disbursements	US\$35.62 million

The project supported the coordination of infrastructure reconstruction in Aceh and Nias. It provided strategic planning and implementation support, and designed physical infrastructure which was financed and built under the Infrastructure Reconstruction Financing Facility (IRFF) project. The objective of the IREP was to support the BRR's strategy for district and provincial infrastructure reconstruction by providing high quality technical assistance in infrastructure program management, planning, design, and construction management.

The IREP has to be seen in conjunction with the IRFF (see next section). Neither would have materialized without the other. The IRFF was meant to provide flexible funding for infrastructure reconstruction with an emphasis on filling gaps, with a minimum of up front project identification and preparation efforts, identified by BRR or other agencies and not covered by other funding sources. In other words, the IRFF had no pre-defined scope of works. Thus, it became necessary to create a mechanism through which sub-projects to be funded from the IRFF could be identified, scoped, designed, adequately prepared, and their implementation be supervised and monitored. The IREP was to provide technical assistance (i. e. consultant services) pertaining to strategic planning, project design, project preparation (including the handling of relevant social and environmental safeguards aspects), implementation support and construction supervision as well as operations and maintenance. IREP was – in the words of the BRR – a “strategic enabler,” a prerequisite for launching the IRFF.

In early 2006, a review of BRR's 2005 project portfolio showed a significant lack of capacity to manage and implement this portfolio. Hence BRR proposed a new strategy for the reconstruction of Aceh requiring increased capacity to manage and complete the crucial program for Aceh reconstruction.

This resulted in a Phase 1 support of technical assistance (IREP) to provide infrastructure program management, planning, design and construction management. The support was also designed to manage and significantly reduce the risk of program failure. Several projects and programs were already in initial stages of concept formulation and planning. The scope and estimated costs, as well as availability of programmable funds from different potential sources had been projected, but detailed preparation would require support from core technical assistance programs. Phase

2 support comprised a financing facility (IRFF) to finance the identified prioritized investment sub projects. The table below shows the estimated costs and proposed sources of funding for this support.

Proposal	MDF Request \$million	BRR Co-Financing \$million	Local Gov't Co-Financing \$million
Phase 1: Immediate MDF support – Infrastructure Reconstruction Enabling Program (IREP)			
A: Infrastructure Project Management	21.0	Local support costs	Local support costs
B: West Coast Infrastructure Planning & Design	10.0	Local support costs	Local support costs
C: Nias Roads, Transport & City Development Planning & Design	5.0	Local support costs	Local support costs
D: Provincial-level Strategic Infrastructure Planning & Design	6.0	Local support costs	Local support costs
Sub Total	42.0	2.5	2.5
Phase 2: Proposals for Medium Term MDF Support Program (IRFF)			
Core capital works programs	TBD	TBD	TBD
Other capital works programs	TBD	TBD	TBD

Before the launching of IREP, the MDF was supported by Crown Agents from the UK in its reconstruction efforts.

Under the IREP, five big technical assistance (TA) contracts with a total financial volume of \$42 million were awarded for the following assignments:

- IREP-1 Infrastructure Program Management (IPM)
- IREP-2 Aceh West Coast Infrastructure Reconstruction
- IREP-3 Nias Infrastructure Reconstruction
- IREP-4 Strategic and Provincial Infrastructure Reconstruction
- IREP-5 Financial Management

The launching of the IREP was not without major risks. Never before had a TA project with such a financial volume been launched in Indonesia, and it was not guaranteed that the Implementing Agency (the Ministry of Public Works - MPW) could steer this operation to the desired outcome. On the other hand, the launching of the IREP was seen as an indispensable precondition for the launching of the IRFF. As such, the IREP was a high-risk/high-reward operation.

To its credit, the MPW implemented the IREP quite satisfactorily. The outputs of these TA contracts laid the groundwork for sub-project implementation under the IRFF.

The need for providing intensive high-quality TA at the start of the whole reconstruction process may seem obvious, but it took nearly a year to determine what sort of TA would be required in total. Once the requirements were identified, it was necessary to work out funding sources as well as how the TA would be packaged and contracted. IREP was approved 18 months after the tsunami. The lead time from the conception of the IREP to the actual mobilization of consultant personnel was rather long, despite the deployment of a dedicated individual advisor tasked with supporting the procurement procedure and the deployment of a team of procurement agents using funds from the Government of the United Kingdom.



IREP supported the rehabilitation of infrastructure projects through the provision of construction designs and supervision of works. The Malahayati port pictured above is one of five ports supported through IREP and implemented through IRFF.

*Photo:
Mosista
Pambudi*

Infrastructure Reconstruction Financing Facility (IRFF)

Partner Agency	Ministry of Public Works (MPW)
Implementing Agency	The World Bank
Implementation Period Original Implementation period: Extension 1: Extension 2: Extension 3:	January 2007 – December 2012 March 2007 - June 2010 December 2011 June 2012 (for Additional Financing only) December 2012 (for Additional Financing only)
Grant Amount Original Grant Amount: Additional Financing (July 2008) Cost recovery funds	US\$136.7 million US\$100.0 million US\$36.7 million US\$109 million (Originally US\$191 million)
Disbursements	US\$128.7 million

The IRFF was a BRR co-financed project providing funds for key infrastructure projects identified through another MDF project, the Infrastructure Reconstruction Enabling Program (IREP). The objective of the IRFF was to assist the province of Aceh and local governments in Aceh and Nias to reconstruct/rehabilitate strategic infrastructure and extend key infrastructure services of adequate quality standards that meet the needs of communities where infrastructure was damaged by the disasters.

Following the formulation and setting up of the broad strategic approach by BRR to infrastructure reconstruction, IREP funded consultants were procured, engaged and mobilized. It was decided that a clear methodology for identification, selection, optimization and testing for acceptability was essential for these investments, concluding with an appraisal-type format (a standardized checklist) and formal approval by the concerned key agencies (BRR, the World Bank, and the consultant). The initial list of projects to be funded by IRFF was then reviewed and screened, followed by proceeding with acceptable sub-projects. This methodology, set out in a Project Management Manual, was an important mechanism established to optimize investment integrity for an emergency operation. The Project Management Manual also set out the methodology to be adopted for overall implementation. This was an important and innovative approach to underpin and enable rapid implementation of a large and rapidly defined investment program under the given circumstances. The initial IRFF project was designed as an open-menu financing facility, with eligibility criteria defined for the selection of sub-projects. The MDF grant amount was complemented by counterpart funds from Gol through BRR.

The initial IRFF was complemented by an operation named “IRFF - Additional Financing” that was conceptually a continuation of the IRFF but administratively a new project with a budget of \$36.7 million, all of which was to be MDF contribution (no counterpart funds). The debate on the definition of the agenda for this Additional Financing was rather protracted; initially a proposal to finance a number of district roads had been put forward, but national government, especially

MPW, saw the priority on national road construction and argued that a national institution had no mandate to construct local roads. In addition, there were criticisms raised that new district roads could lead to accelerated deforestation. After a two-year long deliberation process it was decided that the Additional Financing should be used to complete the national road along Aceh's west coast from Calang to the border of North Sumatra Province. Thus, three road construction packages and one bridge construction package were financed under this project. Details are described further below in this section.

The following pages present summary profiles of a few selected prominent sub-projects.

Road Reconstruction and Betterment Sub-projects

The IRFF portfolio included improvements to 32 district and provincial road links, and 2 corridors of national road.

National Roads

Early in the reconstruction process it was agreed that the national road along Aceh's east coast would be funded by ADB, and MDF would focus on the west coast road, in coordination with USAID and JICS. Thus, seven contract packages on the west coast road were implemented; their total length was 295 kilometers and their total cost was \$33.1 million, of which the MDF funded \$14.7 million and the BRR the balance of \$18.4 million.

The Additional Financing covered four contract packages that completed the national road along Aceh's west coast from Calang to the border of North Sumatra Province. This included one major bridge of 800m length at Kuala Bubon near Meulaboh. The four packages together covered 50 kilometers of road length at a cost of \$31.5 million.

The three roads packages were for the reconstruction of the national road between Calang and Meulaboh, i. e. a continuation of the Lamno-Calang section that had been undertaken by USAID at a cost of approximately \$320 million. Much of the Calang-Meulaboh section had been destroyed by the tsunami, and a quick rehabilitation/ reconstruction had been undertaken with funds from the Government of Japan as a temporary measure. That rehabilitation/ reconstruction, however, was found to have had some serious negative environmental side effects including the crossing of large areas of peat swamp. The MDF financed new national road from Calang to Meulaboh has reverted to the original alignment and paid great attention to environmental issues including the provision of sufficient facilities for cross-drainage (culverts and bridges). While these provisions caused the road to be rather costly, they were required on environmental grounds.

Provincial Roads

Nine contract packages were implemented; their total length was 355 kilometers and their total cost was \$62.8 million of which the MDF funded \$34.1 million and the BRR the balance of \$28.7 million.

The sub-projects included the construction of a new intra-urban road in Banda Aceh that was meant to be both an escape road for city dwellers in the case of another tsunami and a road that would aid further urban expansion and economic development. Both objectives have been achieved: the road contributed to urban expansion and economic development by facilitating new commercial developments and the construction of a new bus terminal. The road was also used as an evacuation route when a tsunami alert was issued after an earthquake in 2012.

District Roads

For the selection of district road links that were to be eligible for funding from the resources for reconstruction, BRR defined three main criteria: (1) the road link had to be in a tsunami affected area, (2) the road link had to be within a densely populated area and thus have a potential to stimulate economic development, and (3) the road link had to connect to other road links that were in good condition or to be reconstructed.



This provincial road on Simeulue Island (off the west coast of Aceh) was improved through a sub-project under the IRFF.

Photo:
MDF Secretariat

Twenty three contract packages were implemented; their total length was 188 kilometers and their total cost was \$32.2 million of which the MDF funded \$15.2 million and the BRR the balance of \$17.0 million. During the deliberations to design the agenda of the IRFF Additional Financing, the MDF objected to the inclusion of more district roads as had been proposed by the Provincial Government of Aceh. It argued that many of the proposed district road links were problematic under environmental considerations; in addition, construction appeared to be difficult, and the necessary quality assurance would be hard to implement.

General Issues

In all road reconstruction projects, the MDF aimed at high-quality outputs in order to maximize economic benefits (primarily in the form of giving the new assets the longest feasible technical lifespan) and to minimize negative environmental and social impacts.



MDF road reconstruction projects, such as crosswalks, included markings proper signage and safety.

Photo:
Kris Hedi

In agreement with BRR, MDF-funded road improvements were mostly limited to the existing right-of-way, in order to avoid time consuming land acquisition and social safeguards procedures that would otherwise be necessary. Therefore, the improvements covered rehabilitation and resurfacing but rarely included a widening of the carriageway, let alone a reconstruction on a different alignment. Where sensible, road markings were improved by providing “zebra” pedestrian crossings in front of schools, mosques, markets, or health centers, and road signs were installed in some instances.

Storm Water Retention Basin in Lhokseumawe City

Lhokseumawe City (155,000 inhabitants) is located on Aceh’s east coast, approximately 200 kilometers east of Banda Aceh. The city center is situated on a peninsula between a river estuary on the west and the sea on the east. The residential areas at the southern tip of the peninsula have chronically suffered from poor drainage and resulting flooding problems. The elevation of these areas is barely above the mean low-tide sea level. The sub-project included the construction of a 60 hectare stormwater retention basin on an area that used to be tidal flats. First, a dam was constructed along the perimeter of the basin; then the bottom of the basin was dredged and the material thus removed was used to reclaim low-lying land to the northwest of the basin.

The scope of the sub-project included the rehabilitation and expansion of several main drains that run into the basin from the built-up area further north. An interceptor sewer was constructed with the intention to channel the low-water flow (i.e. the wastewater from households and businesses) into a wastewater treatment plant that comprises three ponds. This system provides a low-tech, low-cost basic treatment before the effluent is released into the retention basin.

The sub-project will greatly improve drainage and reduce the flooding hazard in the catchment area. This will bring with it substantial public health benefits, and these benefits will accrue largely to the low-income households in the catchment area. In addition, the sub-project has provided the first wastewater treatment plant in the city that will help improve urban environmental conditions. The sub-project is thus an excellent example of “Building Back Better.” The total cost was \$13.2 million of which the MDF funded \$9.7 million and the BRR the balance of \$3.5 million.

The wastewater treatment plant next to the stormwater retention basin in Lhokseumawe is an installation whose operations and maintenance requirements may be unfamiliar to a typical sanitation department in a typical Indonesian local government. To achieve maximum sustainability of the project and the necessary capacity building, the construction supervision consultant (contracted under the IREP) provided Lhokseumawe local government with a special operations and maintenance manual in Indonesian.



Before the Kuala Bubon bridge was completed, pedestrians and motorcyclists had to queue to take the makeshift ferry across the river.

Photo:
Mosista
Pambudi

Lamno-Calang Road Maintenance Project (LCRMP)

Implementing Agency	United Nations Development Programme
Partner Agency	United Nations Development Programme
Implementation Period	December 2006 – December 2007
Grant Amount	US\$1.5 million
Disbursements	US\$1.5 million

This project provided maintenance work to the 103 kilometers stretch of road from Lamno to Calang to ensure uninterrupted overland access to tsunami-affected communities on the west coast of Aceh, thereby facilitating the reconstruction and recovery process, and promoting social and economic recovery in Aceh.

The west coast of Aceh was the area most dramatically affected by the tsunami. In some places, the damage was colossal. The water washed away whole villages and previously dry land was replaced by lagoons. Some villages had to be reconstructed in totally different places. Likewise, some sections of road infrastructure were completely destroyed and could only be reconstructed along a different alignment. This applied also to several sections of the national road along the west coast, from Banda Aceh City to Meulaboh City, over 250 kilometers further south.

Immediately after the disaster, Indonesian army pioneer units created a temporary emergency track where the old national road had been washed away, using bulldozers and transportable bridges that could quickly be erected from prefabricated parts (“Bailey bridges”).



Traffic mishaps, here at a temporary “Bailey” bridge, caused great losses of time along the temporary road from Lamno to Calang.

Photo:
MDF Secretariat

Following that, the BRR coordinated further reconstruction works whereby USAID was to construct a new road from Lamno (approximately 80 kilometers from Banda Aceh) to Calang (approximately 170 kilometers from Banda Aceh), and Japan International Cooperation System (JICS) was to reconstruct the national road from Calang to Meulaboh. The latter reconstruction was completed in 2006 to relatively simple standards (a better road was later constructed with MDF funding under the IRFF Additional Financing).

The MDF financed the maintenance of the temporary road connection between Lamno and Calang from October 2006 through December 2007 with a budget of \$1.5 million. This connection linked together usable sections of the old national road with sections of local road that bypassed areas where the old national road had been totally washed away or where it was to be replaced by the new USAID-built road. The Partner Agency entrusted with the implementation was UNDP. The maintenance required extraordinary resources because those local road links had not been designed for the traffic of a national road, and the reconstruction-related traffic on this temporary road was even heavier than it had been on the old national road, leading to rapid and ever-repeating deterioration including damages to the temporary Bailey bridges that had been constructed as emergency solutions in the immediate aftermath of the tsunami. However, there was no other option for keeping a road link, even one of inferior quality, operational along Aceh's west coast.

Through this project, travel time from Lamno to Calang was reduced by half between the end of 2006 and the end of 2007. However, the main achievement of this project was to keep a traversable connection intact. Although the costs for the temporary maintenance of this road may appear to have been very high (in terms of cost per kilometer per year, for a road that was only used for a short time span) the economic benefits of this project were enormous. In fact, the "without project" scenario was considered totally unacceptable. Without this project, road transport from Banda Aceh to Meulaboh would come to a complete stop, the supply of daily necessities would have been disrupted, and all reconstruction activities along the west coast corridor would have been severely impeded.

The LCRMP was implemented by UNDP until December 2007. After that, the further maintenance of the temporary road became the task of the contractor that USAID had hired for the construction of a new national road. Since 2011, some sections of the old national road alignment are no longer used at all, bypassed by the new road alignment. Some local road sections that had been used for the temporary Lamno-Calang road link are now used for light local traffic only (as before), and their maintenance to usual standards can thus be covered by local resources.

A long section of the national road from Calang to Meulaboh had been improved by JICS in 2006. However, another section was left unimproved. Both sections were later taken up by the MDF and improved through a sub-project under the IRFF project (see previous section of this annex), mostly on the alignment of the pre-tsunami national road. As a result of the joint and coordinated efforts by USAID, JICS, and MDF, there is now a good, new national road link all the way from Banda Aceh to Meulaboh and further on to the border of Aceh and North Sumatra.

Capacity Building for Local Resource-Based Rural Roads (CBLR3)

Partner Agency	United Nations Development Programme
Implementing Agency	International Labour Organization
Implementation Period Original Implementation period: Extension 1: Extension 2: Extension 3: Extension 4: Extension 5:	March 2006 – November 2012 March 2006 – March 2008 December 2009 September 2010 June 2011 December 2011 August 2012
Grant Amount Original Grant Amount: Additional Financing (June 2009):	US\$13.9 million US\$11.8 million US\$2.1 million
Disbursements	US\$13.9 million

The development objective of the project was to strengthen the capacity of district government and small-scale contractors to adopt and undertake local resource-based road works. The project built capacities of local governments, contractors and communities for the planning, budgeting, programming, reconstruction and maintenance of district and village roads, using local resource-based approaches and appropriate labor-based technologies. It rehabilitated district roads in three districts in Aceh, drawing on local resources and creating short-term and long-term employment opportunities. Before the RACBP was launched (see following section in this annex), the CBLR3 also covered Nias.

The project was designed to complement the reconstruction works on national, provincial, and district roads. It covered three districts (Aceh Besar, Pidie, and Bireuen, along the north coast of Aceh). The project focused on the betterment of small rural roads (district and village roads) of 2 to 8 kilometers length, converting dirt tracks into simple but adequate all-weather roads. These have a maximum width of three meters and surfaces of Macadam or gravel, asphalt (in a light construction), or coldmix. They are feeder roads, meant to provide improved access to minor villages and/or agricultural production areas, typically at a cost of around \$40,000 per kilometer. For their construction, the Implementing Agency (ILO) chose innovative and well-proven labor-intensive construction methods that had been developed decades earlier by the ILO and the World Bank in Africa.

Technically, construction standards are more flexible than for conventionally built roads, with a preferential use of locally available resources (including local labor, gravel, or treated coconut timber for bridges). The input of unskilled labor and light equipment is maximized, and only the unavoidable minimum of heavy equipment is used.

Organizationally, local governments focus on small contractors. Frequently, these contractors (effectively often just local builders) are not skilled and experienced in contract administration for minor public-sector projects. Therefore, ILO first ran a simple pre-qualification procedure, then trained those pre-qualified small contractors in the basic techniques for submitting bids that meet the minimum standards for ILO procurement procedures. Only after this, the bidding and contracting procedure itself was conducted.

For construction management and self-monitoring, ILO trained the selected micro contractors in the use of a range of construction techniques that were better than their previous techniques but still fairly simple and easy to apply. Laborers were mostly hired from villages adjacent to the new roads. This was to ensure that these laborers would have a stake in the final output, and therefore strive to deliver the best results they were capable of and be more motivated to maintain the road in the future. In addition, this approach created employment opportunities specifically in more remote villages. There was often a high percentage of female workers in these small projects. This is compatible with the socio-cultural traditions of Aceh. On one project, a small play school was formed so that mothers could be near their children while working.

All these efforts constituted capacity building both for the micro contractors and for the road management entities (*Dinas Bina Marga*) of local governments.

The resulting roads are typically of comparable quality for light traffic to roads constructed using conventional (mechanical plant intensive) methods. The local *Dinas Bina Marga* acknowledged this and highlighted tight construction supervision by both ILO and local government as one success factor. In addition, the involvement of local communities generated both income and a sense of commitment to these new local roads. Most roads constructed in this manner are still in good condition several years after construction. In some instances, *Dinas Bina Marga* have already attempted to replicate this approach in other, similar locations. However, this innovative and flexible approach is not fully compatible with Ministry of Public Works (MPW) requirements for district roads.



Locally-sourced materials used to build roads under CBLR3 limit the impact on the environment and also increase the likelihood that roads will be maintained going forward.

Photo:
ILO Projects
Collection

Nias Rural Access and Capacity Building Project (RACBP)

Implementing Agency	International Labour Organization
Partner Agency	International Labour Organization
Implementation Period	October 2009 – December 2012
Grant Amount	US\$16.0 million
Disbursements	US\$16.0 million

The Nias RACBP and Nias Livelihoods and Economic Development Project (LEDP) were designed as complementary projects with a shared program objective: to facilitate post-disaster economic recovery and poverty alleviation by creating an environment for improved livelihood and human development in the Nias Islands for the communities affected by the tsunami and the earthquake. This higher level objective was supported by the two main objectives of RACBP, which were (1) for residents of participating districts to utilize improved rural transport infrastructure and services and benefit from enhanced access to economic activities and social services; and (2) to increase capacity of stakeholders and increase awareness about cultural heritage preservation.

The RACBP, which started in October 2009, was the last project to be launched under the MDF infrastructure portfolio. The MDF's Partner Agency for this project is the ILO. Whilst the regional scope of the CBLR3 was limited to Aceh, the RACBP was implemented in Nias only. Both projects aimed at sustained capacity building, in local governments and other entities, for the construction of small rural access roads with an emphasis on community involvement and local resource-based construction techniques.

Conceptually, the two projects are slightly different: the CBLR3 focus was on capacity building for the construction of roads that would complement the improvement of district and provincial roads, thus lending comprehensiveness to the reconstruction and recovery efforts for Aceh. The RACBP, on the other hand, is more closely linked with the LEDP (Nias Livelihoods and Economic Development Project) which is under the MDF portfolio but outside the infrastructure reconstruction portfolio. Along with capacity building, its goal is to aid the economic recovery of an island region that was already remote and poor before 2005 and suffered even more economic hardship as a result of the March 2005 earthquake.

The RACBP's scope was tailored to the specific conditions and constraints of Nias Island. It was less focused on creating employment and introducing local resource-based construction techniques than the CBLR3. By 2005, fewer than 10 items of heavy construction equipment were available on Nias Island, were labor-intensive construction techniques were used anyway, especially in view of the mountainous topography. The improvement brought about by the project was more in the field of higher-quality construction standards that led to much longer lifespans for the trails and bridges. Technically, the work programs and approaches of these two projects are somewhat similar. A technical difference is that the RACBP focuses much more on trails that are often less than 2 meters wide and meant only for pedestrians, bicycles, and motorcycles. This is because most of the villages



Numerous trails were constructed using various techniques and a local resource-based approach.

*Photo:
Gottfried
Roelcke*

and agricultural areas that are to be accessed by these trails are located in mountainous terrain with very steep slopes where the construction of bigger roads would require land acquisition and earthworks that would render such sub-projects unfeasible under the umbrella of the MDF portfolio. Although simple in construction, these trails, now adequately constructed and surfaced, constitute very significant improvements over the unsurfaced trails and footpaths that had existed before. Approximately 70 kilometers of trails were built with individual trails up to 7 kilometers in length. Most of these trails are part of a rural transport infrastructure network, and sometimes the project addressed only specific gaps in existing networks. The roads were designed and constructed using various techniques, depending on each location's specific characteristics: coldmix, concrete-embedded telford (coarse crushed stones), or others.

Another difference is that the mountainous terrain and the high number of rivers, many of them deeply incised, required the construction of numerous bridges in varying designs. Some of these were replacements or reconstruction of previously existing bridges, others were new river crossings. In either case, the bridges significantly improve access to remote villages and agricultural areas and have an enormous benefit for the economic recovery of Nias.

The construction of the numerous bridges employed a variety of designs, depending on the specific topographic situation: some were suspension bridges with pylons, others were bridges

suspended from suitable anchor points on the ground, yet others were straight truss bridges (see photographs). To select the most appropriate design and fine tune it to the exact conditions of each location, the RACBP mobilized expertise from Nepal, specifically the Trail & Bridge Support Unit of Helvetas Nepal, a Swiss NGO. A total of 79 bridges were reconstructed or newly constructed with a total length of over 2000 meters, the longest single span being 134 meters. Bridge widths were deliberately limited to a maximum of 1.2 meters to ensure that only two-wheel vehicles can pass so that the bridges will not be overloaded.

Best Practice

To introduce state-of-the-art knowledge on the design of narrow bridges in mountainous terrain, the project linked up with the Trail & Bridge Support Unit of Helvetas Nepal (a Swiss NGO) and mobilized Nepalese experts familiar with working in a resource constrained environment. This South-South Knowledge Exchange enhanced the acceptance by local stakeholders.

Both commercial contracting and community contracting were used for the construction/reconstruction of trails and bridges. Commercial contracting was the tool of choice for activities that required technical skills such as the erection of steel structures including welding works and such. Community contracting was the tool of choice for most of the construction of trails, for three reasons: (1) to provide gainful employment to the rural population, (2) to enhance the sense of ownership among the village communities because the assets would eventually be handed over to them (see below), and (3) in some sections, existing footpaths were so steep that trails for motorcycle traffic had to be built along different alignments, and community contracting was the only way to avoid lengthy formal land acquisition procedures.

Similarly as for the CBLR3, the economic benefits of this project were highly significant: more than twenty remote villages and a total agricultural production area of over several thousand hectares now have much improved access to markets and social services. The replacement of footpaths with trails that can be used by motorcycles has substantially reduced the efforts required for transport of goods. For example, previously one person could transport, hand-carried, a payload of approximately 20-30 kilograms at a speed of approximately 3-4 kilometers/hour; now, one person can transport, on a motorcycle, a payload of approximately 80-100 kilograms at a speed of approximately 15-20 kilometers/hour. This is highly significant especially for the commodities typically produced in rural Nias, such as raw caoutchouc (rubber) with its very high transport resistance. In addition, the improved access to schools and health facilities has enormous social benefits.

The newly created assets under RACBP were mainly handed over to the villages, which are the lowest-level local government entities in Indonesia. In contrast, the rural roads built by the CBLR3 in Aceh were mostly handed over to the district administrations. The village communities were given training and tools for the basic maintenance of the trails and bridges; in most cases they had already been involved in the construction and thus had first-hand experience in this kind of work. Even so, it has to be expected that assistance from the district government will be needed for larger repair works required at longer time intervals.

Lesson Learned

Efforts are needed to dispel the notion that narrow trails such as those improved or built under the RACBP were incompatible with applicable Indonesian technical standards. Personal discussions with relevant local government officers can be effective in the short term but more efforts are needed at the national level where technical standards for rural roads are defined.



A traditional North Nias dwelling which has been constructed to withstand earthquakes. The rounded roof shape is well suited to the thatch traditionally used as roof covering.

Photo:
Gottfried
Roelcke

It is sometimes difficult to persuade staff of government agencies to use methods that are different from standard procedures, even if prevailing technical or environmental conditions warrant such adaptability. Some officers in the public works departments of district governments would still prefer to construct rural roads in strict accordance with theoretical government standards, at a minimum width of 4 meters, rather than apply the more tailored approaches suggested by the project. The project did attempt to involve and convince local government officers of the appropriateness of its approach with limited success. Changes in behavior are not long lasting, and reservations tend to re-emerge when changes in local government staff occur. There have been cases where district governments widened newly improved trails, resulting in much damage to the surfaces in the process. To avoid this, the project purposely designed trail improvements in such a way that a physical barrier (e. g. a narrow bridge next to the starting point of a trail) prevents access by heavy construction equipment. For a long-term solution, the MPW should allow and urge district governments to be more flexible in the application of technical standards because rigid technical standards can be inappropriate in very difficult terrain. A network of roads suitable for four-wheel vehicles and a network of trails for two-wheel vehicles only can complement each other very sensibly for regional economic development. Changes in government policy and procedures are needed to encourage behavior change, and cannot be achieved through project interventions.

The RACBP also included a component focused on the preservation of the unique cultural heritage of Nias. This component comprised three main activities: (1) the repair or reconstruction of traditional buildings, (2) training and capacity building in traditional building techniques, and (3) awareness raising, especially among the younger generation. Training and capacity building took place by facilitating the transfer of knowledge from older craftsmen to the younger generation. Awareness raising took place through workshops and public meetings.

To support the documentation and conservation of cultural heritage, the MDF co-funded a special publication "Rehabilitation and Reconstruction of Nias Island," in parallel to the efforts of the RACBP. These efforts can be considered adequate in this particular context. In principle, more could have been done but the conservation of cultural heritage was not the core mission of the MDF.

Tsunami Recovery Waste Management Programme (TRWMP)

Implementing Agency	United Nations Development Programme (UNDP)
Partner Agency	United Nations Development Programme (UNDP)
Implementation Period	December 2005 – December 2012, including Phase 3
Grant Amount	US\$39.4 million (Phases 1-3)
Disbursements	US\$39.4 million

The project built capacity in local government to clear, recycle and dispose of tsunami waste, implement sustainable solid waste management systems that benefit the environment through the collection, recovery, recycling and safe disposal of waste materials, and incorporate cost recovery through the promotion of waste management-related livelihoods.

Local governments faced the challenge of having to handle the enormous quantities of rubble and debris resulting from the disaster in addition to the routine municipal waste management operations. Furthermore, all stakeholders wanted to achieve improved environmental management as part of the rehabilitation and reconstruction effort. The scope of the TRWMP, implemented by UNDP, initially included the demolition of damaged buildings, clearing of tsunami waste as well as its utilization (e. g. extraction of recyclables, reuse of timber for building or furniture making, use of timber for firing brick kilns. etc.), and rehabilitation of the main waste dump site (Gampong Jawa) in Banda Aceh for temporary use.



The MDF's Tsunami Recovery Waste Management Project (TRWMP) cleared over 1.3 million cubic meters of tsunami debris. In the emergency response, TRWMP focused mainly on Banda Aceh but expanded its scope to include other affected areas such as Meulaboh, Calang and Bireuen. The photos above show the Governor's Office in Banda Aceh immediately after the tsunami (left) and after debris clearing and reconstruction (right).

*Photo:
UNDP
Collection*

The program started off in two districts and was first expanded to eight districts in 2006 and later to 13 districts in 2007. By December 2007, the program had largely achieved its short-term aims of debris clearance (more than 1 million cubic meters in total, which is equivalent to the volume of a 0.5 m thick sediment layer covering an area 10 kilometers long and 200 meters wide), employment and income generation, recovery of reusable or recyclable materials, and use of rubble as filling material for the rehabilitation of over 100 kilometers of roads.

By 2009, the program was already widely seen as a very positive initiative. By then it had already been successfully implementing its three main components: (1) capacity building for better environmental management, (2) construction of better landfills than had existed before the disaster, and (3) creating livelihoods especially for disaster victims and women.

The project included the construction of a maintenance workshop and the purchase of spare parts to a total amount of \$1 million through a consolidated procurement procedure using UN standards. This was meant to compensate for the fact that many donors provided vehicles whose maintenance was difficult or impossible for the city.

In cooperation with UN-Habitat, the program trained 600 staff of the sanitation departments in 12 local governments in technical and managerial matters. The program also worked towards the official accreditation of such training that would help improve the benefit for the individuals and thus the institutional sustainability. Improved local regulations for waste management were also drawn up; they include regulations for waste separation and recycling.

A new regional landfill has been constructed at Blang Bintang, in support of better environmental management. It replaces the old landfill at Gampong Jawa in Banda Aceh and was built to vastly improved specifications. The Government of Germany supported this project by funding a study to identify a suitable location and preparing an environmental impact analysis through its technical cooperation arm, GIZ. The TRWMP also designed eight (smaller) local landfills and implemented the construction of three of these, namely in Pidie District and Bireuen District in Aceh Province, and on Nias Island.

Table Annex 3.1 Specifications of landfills built under TRWMP

Item	Blang Bintang regional landfill	District landfills (each)
Total area	135 ha	6-7 ha
Area developed under the project	35 ha	5-6 ha
Population served (approximately)	450,000	180,000
Estimated lifetime (approximately)	15-20 years, extendable to 50 years	15 years
Total cost	US\$7.0 million	US\$1.0 million

Lastly, the TRWMP facilitated the establishment of over 160 new small enterprises and organizations for improved waste management, e. g. composting and recycling. Two thirds of these were still in operation in 2012, providing gainful employment for unskilled persons, many of whom are women. These operations also reduce the amount of waste to be transported to the landfill, thus lowering costs and extending the lifetime of the landfill. Much of the city's organic waste is currently processed into compost.

There were many challenges to clearing debris and sediment from agricultural land after the tsunami, and TRWMP was one of several actors that contributed to the clearance efforts. Several years after the tsunami, it became technically more difficult to clear debris as a result of sediment settlement and vegetation growth.

Some of the main difficulties faced in the clearing of the debris and sediment included:

- The layers of tsunami sediment were often so thick that heavy equipment was necessary to remove them, and there were different opinions regarding how much of the sediment really needed removing.
- The sediment contained human remains.
- The technical challenges included the re-creation of functioning irrigation and drainage systems that required careful consideration of the surrounding terrain.
- Many coastal villages had been completely abandoned by their erstwhile inhabitants for various reasons, and the clearing of debris and sediment from agricultural land alone would thus solve only one of many interlinked problems.

Landfill Sites for Banda Aceh

The MPW regards the Blang Bintang landfill as one of the most technically advanced landfills in the country and has begun to take other relevant stakeholders to see it. Thus, the TRWMP is beginning to develop a demonstration and capacity building effect far beyond Aceh Province.

Although the Blang Bintang landfill is very modern by Indonesian standards, it does not feature a collection system for the gases that will emerge from it. This was consciously omitted; firstly, the operation of such a system would be technically challenging; secondly, TRWMP wanted to leave this opportunity for the city and the district to participate in a future CDM/carbon trading program, bearing in mind that donor funded improvements of this kind do not qualify for compensation schemes.



The reedbed treatment basin at the new Blang Bintang landfill which uses a natural system to purify leachate (effluent). The heavy duty poly-ethylene liner visible in the photograph seals the bottom of the reedbed. This is a technical innovation in Indonesia.

Photo:
Gottfried
Roelcke

Annex 4 – Economic Analysis of MDF Financed Infrastructure

The MDF invested approximately \$285 million in projects for the reconstruction and rehabilitation of infrastructure in Aceh and Nias, including related technical assistance projects.

Road Infrastructure

Introduction. The MDF invested approximately \$133 million (or about 50% of its infrastructure sector portfolio) in the reconstruction and rehabilitation of the road networks of Aceh and Nias.¹ The investments were allocated to various types of road projects, ranging from the construction of narrow gravel roads to the reconstruction of over 200 kilometers of national road. This section first presents an overview of the types of road projects financed by the MDF, the most important of which are roads aimed at providing access to disaster-affected areas, and roads aimed at promoting socio-economic recovery. It then describes the limitations to applying standard economic cost/benefit analysis to road projects supported by the MDF, and presents alternative methods of analysis to overcome these limitations. This is followed by a presentation of the results of the analysis, and recommendations for future reconstruction and rehabilitation efforts.

Overview of MDF-financed investments in the road sector. The MDF invested in road projects with the following primary objectives:

- **Provide road access to districts along Aceh’s west coast (\$32.6 million).** The tsunami destroyed a major part of the national road along the west coast of Aceh. The MDF used a significant portion of its funds to co-finance the reconstruction and rehabilitation of parts of this road, with other parts financed by BRR, USAID and JICA. Because this process was expected to be time-consuming, the MDF also co-financed the rehabilitation of the sections of the provincial road from Meulaboh via Geumpang to Banda Aceh. This road served as an alternative access road to the west coast from 2005 until 2011, when the national road from Banda Aceh via Calang to Meulaboh was (mostly) completed. The MDF also financed the maintenance of a temporary road link from Lamno to Calang, until the contractor tasked with the reconstruction of the permanent Lamno-Calang road took over the maintenance of the temporary road in January 2008.
- **Promote socio-economic recovery (\$99.6 million).** BRR was not only mandated to coordinate the reconstruction and rehabilitation of physical infrastructure damaged or destroyed by the tsunami and earthquake, but also to foster the recovery of Aceh and Nias. Against this background, the MDF financed the reconstruction and rehabilitation of a large number of provincial, district and village roads with the objective to help the regions return to their pre-disaster social and economic development trajectories. MDF allocated about half of its funds for roads aimed at economic recovery to Nias, and most of the remainder to districts in Aceh that were highly affected by the tsunami and earthquake (Table Annex 4.1).

¹ This amount does not include the cost of MDF-financed consulting services for the planning, design and construction supervision of road projects. If this amount is included, the total investment in the road sector increases to about US\$165 million.

- **Provide a tsunami escape route (\$0.6 million).** The MDF co-financed a new intra-urban road in Banda Aceh that was meant to be both an escape road for city dwellers in the case of a tsunami and a road that would aid further urban expansion and economic development. The latter objective has clearly been achieved: the road has facilitated new commercial developments and the construction of a new bus terminal. Thus, the road did contribute to the urban expansion and economic growth of Banda Aceh city. One may, however, argue whether this alone was a sufficient justification for including this road link in the MDF portfolio.

The reconstruction of the national road (and the rehabilitation of alternative access roads) was undertaken as a public service obligation. Road projects aimed at promoting economic recovery were selected based on the benefits they were likely to provide to the regional economy (the selection method is described in some detail at the end of this section).

Table Annex 4.1 MDF Investments in Road Projects by Primary Objective

Primary Objective of Road Project	MDF Investment	
	US\$ million	% Total
Provide road access to districts along Aceh's west coast		
Reconstruction of national road along west coast	24.1	18
Rehabilitation of alternative provincial road via Geumpang	7.0	5
Temporary maintenance of Lamno-Calang road link	1.5	1
Promote socio-economic recovery		
Promote recovery of districts along Aceh's west coast*	33.6	25
Promote recovery of other districts in Aceh	18.7	14
Promote recovery of Nias	47.3	36
Provide tsunami escape route		
New access road in Banda Aceh	1.3	1
TOTAL	132.7	100

Source: MDF

* Districts of Aceh Barat, Aceh Jaya, Nagan Raya, Aceh Barat Daya, Aceh Selatan and Aceh Singkil

Economic analysis of road projects. The economic costs of a road project consist of: (i) investment costs, and (ii) incremental maintenance costs (i.e. increases in maintenance costs compared to a “without project” scenario), net of taxes. Both cost items can be estimated with a reasonable degree of accuracy. In contrast, the estimation of the economic benefits of a road project is fraught with methodological difficulties. At its most basic level, roads are constructed (or improved) to lower transport costs. The economic benefits of lower transport costs can be classified as follows:

- **First-order benefits.** These are the direct benefits of a road project to existing road users, and mainly consists of: (i) reductions in vehicle operating costs (such as fuel and maintenance costs), and (ii) travel time savings (which are normally derived from average hourly wage

rates). Economic feasibility studies usually only consider first-order benefits when estimating the economic benefits of a road project, mainly because first-order benefits often already exceed economic costs, but also because of difficulties in assessing second-order benefits.

- **Second-order benefits.** These are indirect benefits of a road project on persons living in the area affected by the road project (also called “area of influence”). The second-order benefits of a road project mainly consist of (i) reductions in the price of goods shipped to “area of influence” by road transport (assuming that at least part of the reduction in transport costs are passed on to the customer, which is normally the case in competitive transport markets), and (ii) increased economic activity caused by lower road transport costs.

Assessment of first-order economic benefits. The first-order economic benefits of a road project are directly related to the number of road users who are expected to benefit from the project. Experience suggests that a road project in Indonesia is generally economically viable (based on first-order benefits only) if it will serve at least 5,000-7,000 passenger car units (PCUs) per day. According to the Strategic Road Network Study for Nias, traffic on the roads near Gunung Sitoli will increase to about 4,000 vehicles by the end of 2018; all other roads on the island will have substantially lower traffic volumes. Field visits indicate that intercity traffic volumes on roads in Aceh are also far below the 5,000-7,000 PCU threshold (however, traffic counts were not available to corroborate this). This means that none of the road projects financed by MDF will, in all likelihood, generate sufficient first-order economic benefits (vehicle operating cost and travel time savings) to offset the economic costs of the investment and incremental maintenance during the remainder of their economic lifetimes.

Assessment of second-order economic benefits. Because first-order economic benefits of MDF-financed roads are likely to be modest (compared to the investment and operations and maintenance costs), it is highly relevant to prepare proper estimates of the second-order benefits, which consist of the impacts of the road project on regional price levels and economic growth rates. Unfortunately, the preparation of such estimates is constrained by several methodological problems, the most important being:

- **Influence of other factors on second-order benefits.** The reconstruction or rehabilitation of MDF-financed roads is one of several factors that are likely to affect regional economic growth rates and regional price levels. Other potential influences are: (i) substantial capital investments in roads and other economic infrastructure financed by BRR and other development partners, (ii) substantial increases in central government grants, especially in Aceh, and (iii) a marked improvement in the security situation (Aceh only). In practice, it is difficult to disentangle the impacts of MDF-financed investments from the impacts of other credible factors.
- **Sensitivity of benefits to assumed increases in GRDP growth rate.** The Gross Regional Domestic Product (GDRP) of an “area of influence” of a road project is normally substantially higher than the economic cost of that project. As a result, even very minor increases in the annual GDRP growth rate (that are attributed to the project) will generate economic benefits that far exceed the economic costs. There is, however, no sound

theoretical basis for assuming that a road project will increase the annual growth rate of the GRDP of the affected area by, say, 0.1% instead of 0.05%, even though a project may be economically feasible under the former assumption but not under the latter.

- **Potential delays in benefits. Many MDF-financed roads were completed in 2009 or later.** Because the economic lifetime of these roads is about 25 years (except for unpaved village roads), they may start generating substantial economic benefits in later years, even if they are underutilized at present. This argument is especially relevant for road projects aimed at socio-economic recovery, which are intended to facilitate the long-term development of a region.

Proposed approach for economic analysis. Because second-order benefits are difficult to estimate, two alternative methods were used to assess economic costs and benefits. The method varied by the primary objective the road projects were expected to fulfill:

- **Method for roads aimed at providing access to districts along Aceh’s west coast.** In spite of the abovementioned methodological difficulties, it was possible to prepare an accurate estimate of the impact of the reconstruction and rehabilitation of the national road along the west coast of Aceh on price levels in districts affected by the road. This was because of two favorable circumstances: (i) the availability of detailed data on transport costs from Banda Aceh to towns in the “area of influence” before February 2009 (when the road was still under construction) and after November 2011 (when most of the road was complete), and (ii) the absence of alternative transport routes. The estimated impact on price levels was used to estimate the increase in purchasing power parity of the population of the affected area and compared to the economic cost of the road sections.
- **Method for roads aimed at promoting socio-economic recovery.** For these roads, it was not feasible to estimate the impact on regional price levels (or economic growth rates) with any degree of confidence. Therefore, a qualitative assessment was made of the appropriateness of the economic cost (to what extent was the designed road capacity appropriate to meet future demand?) and the likelihood that the road would generate higher economic benefits than alternative road projects (to what extent was the project appropriately targeted?).

Economic Analysis of Roads Aimed at Providing Access to Districts along Aceh’s West Coast

Evidence of reduced transport costs after improved access. There is evidence that the reconstruction and rehabilitation of the national road along the west coast of Aceh has resulted in a significant reduction of transport costs. Moreover, the reduction directly benefits the population living in the districts served by the road in the form of lower tariffs for passenger and goods transport (the “area of influence” was defined as the districts of Aceh Barat, Aceh Jaya, Nagan Raya, Aceh Barat Daya, Aceh Selatan and Aceh Singkil). As elsewhere in Indonesia, the provincial government of Aceh regulates tariffs for intercity transport. (Table Annex 4.2) presents official tariffs for minibus trips from Banda Aceh to two sets of destinations: (i) towns along the national road from Banda Aceh

to Medan, which was not materially affected by the December 2004 tsunami and earthquake, and (ii) towns along the national road from Banda Aceh to Singkil, which was largely destroyed by the tsunami and reconstructed with support from MDF and other development partners. Because of reductions in gasoline prices, the provincial government lowered minibus tariffs on all routes in November 2011. However, it lowered minibus tariffs from Banda Aceh to towns along the west coast by much higher rates, in recognition of the reduction in transport costs caused by vastly improved access (Table 2). At present, minibus tariffs for trips from Banda Aceh to towns in the southwest remain about 40% higher than tariffs for trips along the national road to Medan, but the gap is much smaller than before 2009, when large parts of the coastal road were still under construction. This suggests that MDF's investments in the reconstruction of the road have played a major role in reducing transport costs to the districts most adversely affected by the natural disasters.

Table Annex 4.2 Minibus Tariffs from Banda Aceh to Selected Destinations in Aceh

Destination	Distance (km)	Tariff (IDR '000/trip)		Tariff (IDR/km)		% Increase (Feb 2009- Nov 2011)
		Until Feb 2009	Since Nov 2011	Until Feb 2009	Since Nov 2011	
North coast						
Sigli	112	28	25	250	223	-11%
Bireuen	218	50	45	229	206	-10%
Lhokseumawe	274	60	55	219	201	-8%
Langsa	437	100	90	229	206	-10%
West coast						
Calang	156	100	50	641	321	-50%
Meulaboh	245	135	70	551	286	-48%
Blang Pidie	371	165	105	445	283	-36%
Tapaktuan	445	175	120	393	270	-31%
Singkil	684	220	195	322	285	-11%

Source: MDF analysis, based on Dinas Perhubungan Provinsi Aceh

Estimated impact of MDF-financed roads on purchasing power of GRDP. In 2010, the nominal GRDP of the six districts that constitute the area of influence was approximately IDR 15.5 trillion, or about \$1.72 billion. In the same year, road transport and related services accounted for about 5.2% of the combined GRDP of the districts, which was therefore estimated at about (5.2% x 1.72 =) \$90 million. It was assumed that the completion of the road reduced transport costs by 29% (the average of the reductions in minibus costs from Banda Aceh to five towns along the west coast from February 2009 to November 2011, minus the reduction caused by the reductions in gasoline prices that affected all districts equally). The economic benefit to the six districts was therefore estimated at (29% x 90=) \$26 million per annum in constant 2010 prices. Assuming a remaining economic lifetime of 25 years and a discount rate of 10%, this is equivalent to a benefit stream with a present

value of \$236 million. However, the MDF only financed the rehabilitation of 295 kilometers of road sections, out of a total length of 684 kilometers. This means that only $(295/684 \times 236=)$ \$102 million of the benefit stream can be attributed to MDF-financed investments. This compares favorably with the construction cost of \$33.1 million. Assuming annual incremental maintenance costs of 5% of the construction cost throughout the 25-year economic lifetime, the present value of the economic cost increases to about \$47 million. As a result, the benefit/cost ratio is approximately $(102/47=)$ 2.2, which is far higher than the minimum required value of 1.0. In conclusion, the economic benefits generated by reductions in transport costs alone exceed the economic costs of the MDF's investment in providing road access to the district along the west coast by a substantial margin. They are also substantially higher than first-order benefits from travel time savings (Box 1).

Value of Travel Time Savings on MDF-Financed West Coast Roads

In 2010, there were 621 inter-city buses registered in Aceh. In that year, the six west coast districts accounted for approximately 20% of the total population of Aceh. It was therefore assumed that $(20\% \times 621=)$ 130 buses were used to serve the six districts. On average, a bus will be able to complete a single one-way trip from Banda Aceh to a destination along the national coast road via Meulaboh to the border of North Sumatra (a distance of almost 700 kilometers). The total number of bus trips is therefore $(130 \times 365=)$ 47,450 per year. Assuming a load factor of 80% and an average capacity of 50 persons per bus, each bus transports an average of $(80\% \times 50=)$ 40 persons per day. It was estimated that each bus passenger would save, on average, two hours of travel time per day, which was valued at $(2 \times 0.30=)$ \$0.60. The value of travel time savings was therefore estimated at $(47,450 \times 40 \times 0.6=)$ 1.14 million \$ per year. This is equivalent to a benefit stream of about \$10 million over a 25-year period. Because the MDF only financed the rehabilitation of 295 kilometers of the 684 kilometers road, approximately $(295/684 \times 10=)$ \$4 million of the benefit stream is attributable to MDF-financed investments. Note that this estimate only captures travel time savings by bus passenger traveling to and from Banda Aceh. Actual travel time savings will be higher because the estimate ignores travel time savings from bus passengers travelling to and from North Sumatra, and from passengers using cars, motorcycles and other vehicles, as well as growth in transport demand. If savings from these sources would be added, total travel time savings would be substantially higher (perhaps as high as \$10-20 million), but still remain much smaller than second-order benefits from reductions in transport costs.

Other potential second-order benefits of MDF-financed roads in districts along Aceh's west coast.

From 2004 to 2010, the GRDP (excluding oil and gas) of the assumed area of influence increased at much higher rates than the GDRP of other districts in Aceh (Table 3). The GRDP of the area of influence increased at very high rates during 2005-2007, at the height of the reconstruction effort. However, after 2007 the GRDP of the area continued to grow at much higher rates than elsewhere in Aceh. Although it is likely that MDF's investments in the road sector will have contributed to these high and sustained growth rates, it was not possible to isolate this impact from the improved security situation and the significant increase in public spending that occurred in the same period. Another major but unquantifiable impact of the MDF-financed roads in the area was the social benefit of enabling displaced persons to resume their lives in their original communities.

Table Annex 4.3 GRDP Growth in the West Coast and the Rest of Aceh, 2004-2010*

	2004	2005	2006	2007	2008	2009	2010
Year-on-year growth							
West coast**		8.2%	24.4%	11.1%	9.1%	9.1%	10.6%
Rest of Aceh		-0.1%	4.2%	6.3%	0.1%	2.5%	3.7%
GRDP (2004=100)							
West coast**	100	108	135	150	163	178	197
Rest of Aceh	100	100	104	111	111	114	118

Source: MDF analysis, based on BPS

* In constant 2000 prices excluding oil and gas

** The districts of Aceh Barat, Aceh Jaya, Nagan Raya, Aceh Barat Daya, Aceh Selatan and Aceh Singkil

Economic Analysis of Roads Aimed at Promoting Economic Recovery

Selection criteria for road projects promoting recovery: theory. As mentioned before, road projects in Aceh and Nias were undertaken for two main reasons: (i) to restore access to disaster-affected districts along Aceh's west coast, and (ii) to support the socio-economic recovery of Aceh and Nias. The selection of road projects aimed at meeting the first objective was simple and straightforward: reconstruct all roads that were damaged or destroyed by the tsunami and earthquakes (and, if required, provide temporary access by alternative roads during the reconstruction period). For two main reasons, the selection of road projects aimed at recovery is less straightforward:



Because of the improved road in Sabang, midwives can now get from the community health clinic to expectant mothers in rural areas by motorbike.

Photo:
Tarmizy Harva

- **Need for screening criteria (identification).** It is not obvious if a proposed road project will contribute to “recovery.” This requires an operational definition of the concept of recovery, and screening criteria to identify projects that are likely to meet the requirements that this definition implies. Such criteria should eliminate projects that are unlikely to generate substantial economic benefits vis-à-vis their estimated economic costs.
- **Need for ranking criteria (prioritization).** The Government of Indonesia committed itself to reconstruct all physical infrastructure (including roads) that was damaged or destroyed by the natural disasters of 2004 and 2005, and was able to mobilize the resources to finance the reconstruction. However, GoI did not commit itself to finance all roads needed for recovery. It was therefore necessary, at least in theory, to identify a method to rank projects by their potential impact on recovery. Because of difficulties in quantifying second-order economic benefits, it was not possible use standard cost/benefit indicators (such as EIRR on ENPV) as ranking criteria.

This section contains a qualitative assessment of the economic costs and benefits of roads aimed at promoting economic recovery based on a review of the various methods that were used to identify and prioritize MDF-financed road projects.

Selection criteria for road projects promoting recovery: practice. In practice, three sets of criteria were used to identify and prioritize road projects aimed at economic recovery. For roads in Aceh, BRR developed a procedure to screen and rank proposals submitted by provincial and district government agencies. For Nias, provincial and district roads projects were selected based on a detailed procedure described in the Strategic Road Network Study. For rural roads in both Aceh and Nias, a detailed set of criteria was developed by the International Labour Organization (ILO), the Implementing Agency of the Nias Island Rural Access and Capacity Building Project (RACBP), and Capacity Building for Local Resources-based Rural Roads (CBLR3). In addition, MDF informed GoI that it would not be able to co-finance roads that would result in significant adverse social or environmental impacts (notably improved access to protected forest lands), thereby imposing an additional set of selection criteria.

Table Annex 4.4 MDF Investments in Roads Aimed at Economic Recovery (US\$ million)

Regional Scope	Originator of Selection Criteria			TOTAL
	BRR, Aceh	BRR, Nias	ILO*	
Districts along Aceh’s west coast**	33.6	–	–	33.6
Other districts in Aceh***	10.4	–	8.3	18.7
Nias	–	25.8	21.6	47.3
TOTAL	43.9	25.8	29.9	99.6

Source: MDF

* Total of MDF allocations to RACBP and CBLR3

** Road projects in Aceh Barat, Aceh Jaya, Aceh Barat Daya, Nagan Raya, Aceh Selatan and Aceh Singkil (other than the reconstruction of the national road, and the rehabilitation of alternative provincial road via Geumpang; these are categorized of “provide access to Aceh’ west coast”)

*** In the absence of a regional breakdown of the cost for Capacity Building and Local Resource-Based Rural Roads (CBLR3), 40% the cost of the this project was allocated to Nias, and 60% to other districts in Aceh (where CBLR3 was active in the districts of Aceh Besar, Pidie and Bireuen)

BRR selection criteria for Aceh. BRR assigned the highest priorities for the use of MDF funds to the reconstruction and rehabilitation of:

1. Roads most heavily damaged by the tsunami and earthquake,
2. Provincial roads that provide alternative access from the northeast to the heavily damaged southwest coast, and
3. Roads aimed at accelerating regional economic development.

The MDF allocated approximately US\$43.9 million to the reconstruction and rehabilitation of roads aimed at accelerating regional economic development (roads included in the first two categories are discussed in the section “Provide road access to districts along Aceh’s west coast”). Of this amount, about \$31.5m was used to upgrade sections of the national road along Aceh’s west coast, and the remaining \$12.4m to provincial and district roads along the west coast (\$2.1m) and elsewhere in Aceh (\$10.4m). To identify and prioritize roads aimed at regional economic development BRR invited local public works departments (*Dinas Pekerjaan Umum*) of provincial and district governments in Aceh to submit proposals for road projects to be financed by MDF or other development partners. Proposed road projects would, at the minimum, need to meet the following conditions:

- Serve a relatively-densely populated area directly or indirectly affected by the 2004 tsunami or earthquake,
- Connect to an existing higher-level road network,
- Use an existing alignment, and
- Contribute to regional economic development.

Although appropriate screening criteria were identified, other factors were also important in making the decisions to prioritize road proposals, aimed at objectives beyond direct economic benefits. BRR’s mandate encompassed areas directly and indirectly affected by tsunami. As such, BRR also prioritized geographic equity, making sure all the districts got some benefits, in order to prevent tensions that could jeopardize the peace efforts. This is one of the “quality criteria” in the Reconstruction Action Plan, and the MDF Steering Committee explicitly agreed to support this criterion. The MDF financing was also intended and used by BRR as a “gap filling” mechanism, to provide flexibility in reaching areas where other donors or players were not able to willing to operate. Given the complex context of Aceh and Nias, the roads portfolio thereby included investments with lower direct benefits and higher costs, while non-quantifiable social benefits of these investments were significantly higher.

BRR selection criteria for Nias. Based on a comprehensive review of current conditions, the Strategic Road Network Study for Nias defined four sets of road network development criteria (Table Annex 4.5). Based on these criteria, the following priorities were identified:

1. Primary collector roads to provide access to the entire island,
2. Primary local roads to extend road access to most sub-district capitals,
3. Secondary local roads to improve access to densely populated areas, and extend road access to the remaining sub-district capitals,
4. The Afulu – Sirombu provincial road, to complete the ring road around Nias, and
5. Other local roads.

The prioritization method described in the Strategic Road Network Study seeks to maximize the net economic benefits of a road development program under budget constraints. The strengths of the method can be summarized as follows:

- **Focus on optimizing net economic benefits.** The method does not only seek to optimize economic benefits, which are stated in terms of contributions to economic and social development, but explicitly seeks to limit economic costs by the application of efficiency and effectiveness criteria (for example, MDF financed provincial roads with a width of 5 meters, which was unusually low but deemed sufficient in relation to population density).
- **Integrated approach.** The method prioritizes investments for the perspective of the entire island. This avoids fragmentation of investments over many small and unconnected areas.
- **Pragmatic approach.** Although the approach has a sound theoretical foundation, it contains easy-to-use decision-making rules to operationalize the method.

The method for identifying and prioritizing road projects that are likely to generate long-term economic benefits was found to be highly appropriate. Although the MDF-financed investments in the Nias road network are likely to have long-term benefits, further analysis is needed to determine if the economic benefits of the investments will outweigh the costs, with the possible exception of road sections in landslide-prone areas where the benefits are significantly high.

Table Annex 4.5 Summary of Road Network Development Criteria for Nias

Category	Development criteria
Economic development	<ul style="list-style-type: none"> - Provide access to the airport, seaports and major commercial and trading centers - Provide access in support of agricultural development - Provide access in support of tourism development
Social development	<ul style="list-style-type: none"> - Provide access in support of social development to services and facilities in sub-district towns - Minimize walking distance from rural areas to the strategic road network
Efficiency and effectiveness	<ul style="list-style-type: none"> - Develop the strategic road network as a grid of interconnected roads and avoid dead-end streets - Provide access quality in relation to population density - Build on past policies and achievements (policy continuity) - Optimize the strategic road network design with respect to topographical and natural constraints
Safeguards	<ul style="list-style-type: none"> - Optimize the strategic road network design with respect to environmental constraints, impact on indigenous cultures, and impact on private property and assets

Source: *Strategic Road Network Study (2007)*

ILO selection criteria. The MDF financed two road development projects implemented by ILO: the Nias Island Rural Access and Capacity Building Project (RACBP), and Capacity Building for Local Resources-based Rural Roads (CBLR3), which also operated in Nias, and in the districts of Aceh Besar, Pidie and Bireuen. The objectives of both programs were to: (i) construct (or improve) rural roads to improve access to isolated areas, (ii) create jobs for, and build capacity in, local communities, and (iii) build capacity among small contractors and in district governments, so that the ILO approach could be replicated by district governments themselves. A recent evaluation of CBLR3 concluded that the project has been able to deliver rural roads of better quality and at a lower cost than district government contractors. This suggests that ILO-constructed roads were constructed at a relatively low economic cost. ILO defined a series of selection criteria in order to “maximize the impact in terms of the population served, the economic and social facilities and services covered, and the additional benefits that increased rural road access will provide to local economic development” whilst ensuring that they would not result in significant adverse social or environment impacts. These selection criteria are consistent with the objective of maximizing economic benefits, subject to environmental and social constraints. Field visits suggest that many ILO roads have been highly successful in providing substantial economic benefits to their intended beneficiaries. The benefits mainly consist of travel time savings (for example, bridges have opened up access of hitherto isolated villages to school and medical facilities) and lower transport costs. In areas where ILO has provided motorcycle access to areas which were formerly only accessible by foot, agricultural production can be expected to increase significantly, at least after a certain lead time (bearing in mind that much of the agricultural yield is obtained from tree crops).

Ports

Introduction. The MDF allocated approximately \$15.6 million (or 6% of its infra-structure sector portfolio) to facilitate the reconstruction and rehabilitation of ports in Aceh and Nias. More specifically, in the port sector MDF financed:

- The construction of temporary wharves in Calang and Sinabang to enable the shipment of construction materials for rebuilding roads, housing and other infrastructure in the early stages of the reconstruction efforts,
- The preparation of studies and detailed engineering designs for the ports of Calang, Gunung Sitoli, Kuala Langsa, Meulaboh, Sinabang, Singkil, and Ulee Lheue,
- The reconstruction of parts of the Malayahati (Banda Aceh) port, and
- Improvements to the ports of Krueng Geukeuh (Lhokseumawe) and Kuala Langsa.

This section first describes the conditions that a port must meet to be economically viable in the long run. It then summarizes the key features of the largest ports in Aceh and Nias, six of which were rehabilitated or reconstructed with MDF support. Three of the six ports failed to deliver the anticipated economic benefits, whereas the other three largely performed according to expectation. The remainder of the section discusses possible causes for the poor performance of the some of the MDF-financed ports, and identifies lessons learned.

Economic rationale of ports. A port facilitates the transport of persons and goods over water. Transport over water competes with other modes of transport (such as road and air). In the long run, a port will only be economically viable if it meets both the following two conditions:

1. The port serves shipping routes that have a competitive advantage vis-à-vis other transport modes.
2. The volume of persons or goods shipped through the port generates benefits that are sufficiently high to cover the cost of using the port.

It is possible for a port to serve shipping routes where sea transport has a competitive advantage, but not be economically viable in the long term because of low shipping volumes.

Condition #1: competitive advantage vis-à-vis other transport modes. Sea transport has a lower unit cost than most other transport modes, but is also substantially slower. As a result, sea transport usually has a competitive advantage for shipment of large quantities of non-perishable goods with a relatively low value (such as coal, sand or cement). Sea transport is also favored by the poor and near poor, whose travel time value is low. In the absence of inland waterways and a rail network, the only competing transport modes on the mainland of Aceh are road and air. Ports located on Nias and Acehese islands (such as Pulau Weh and Simeulue) only compete with air for the transport of persons and goods to mainland Sumatra. In the absence of competition from road transport, these ports are therefore inherently more viable than ports located on the mainland.

Condition #2: sufficiently high shipping volumes to recover costs. The benefits of a port consist of direct financial benefits to the port operator (in the form of harbor fees) and indirect benefits that accrue to the regional economy in the port's hinterland (such as the production of agricultural and mining products that can be exported to other regions at a competitive price because of the existence of the port, or lower prices for imports vis-à-vis road or air).

Key features of ports in Aceh and Nias.

- **High degree of specialization.** Most ports in Aceh and Nias either specialize in facilitating export of certain products (such as fertilizer or mining products) or in facilitating the import of basic needs (which mainly consist of food, fuel and cement). As a result, ships that visit a port in Aceh or Nias will either arrive or leave mostly empty, which increases the cost of shipping. The only exception is the port of Malahayati, where import and export volumes are of comparable value (Table Annex 4.6).
- **High degree of concentration.** In Aceh, two ports accounted for over 80% of all goods shipments in 2011: Malahayati and Krueng Geukeuh (which are the ports of Banda Aceh and Lhokseumawe, respectively). In Nias, the port of Gunung Sitoli handled over 90% of goods shipments to and from the island.
- **Limited role in national shipping network.** With the exception of fertilizer exports from Krueng Geukeuh, none of the ports in Aceh or Nias is routinely used to ship agricultural or mining products directly to its final destination. Instead, most exports from Aceh are shipped to Belawan (the port of Medan), for transshipment or further processing. Exports from Gunung Sitoli are shipped to either Belawan or the port of Sibolga in North Sumatra. (Nias does not have the scale to support its own processing facilities, and investors are reluctant to set up such facilities in Aceh because of poor economies of scale, relatively high labor costs, limited availability of skilled workers, and lingering security concerns.)

Table Annex 4.6 Goods Movements in Ports in Aceh and Nias ('000 tons), 2011

Port	Loaded	Unloaded	Loaded / Unloaded	Primary Activity
MDF-supported ports				
Calang	–	1	0.00	None
Krueng Geukeuh	2,876	742	3.87	Export of fertilizer
Kuala Langsa	5	3	1.46	NA
Malahayati	964	923	1.04	General trade
Sinabang (Simeulue)	31	47	0.65	Import of food, fuel and cement
Gunung Sitoli (Nias)	52	269	0.19	Import of food, fuel and cement, export of rubber
Other ports in Aceh				
Balohan (Sabang)	19	84	0.22	Import of food, fuel and cement
Idi	13	–	–	NA
Meulaboh	54	246	0.22	General trade (until 2011*)
Singkil	6	12	0.46	Import of food, fuel and cement
Susoh	81	9	8.92	Export of mining products
Tapaktuan	158	58	2.71	Export of mining products

Source: Consultant, based on BPS

* Ceased operations in 2012

Economic benefits of MDF-supported ports. A qualitative assessment of the economic benefits of the five MDF-supported ports was undertaken, based on:

- A review of port statistics for 2005-2011 (and, where possible, data for pre-tsunami years),
- Site visits (the Consultant visited all the ports in May and July 2012), and
- Interviews with government officials involved in port management and regional development.

The assessment concluded that MDF-financed investments in three of the ports have thus far not generated significant economic benefits, and are unlikely to become economically viable in the near future. Economic benefits were considered “insignificant” if MDF-financed port infrastructure was not (and is unlikely to be) used for its intended purpose. Economic benefits were considered “significant” if the MDF-financed infrastructure facilitated much higher shipping volumes than would have been the case in a “without MDF” scenario. Ports without significant economic benefits are Krueng Geukeuh, and Kuala Langsa. In contrast, investments in the ports of Malahayati, Sinabang and Gunung Sitoli have generally delivered the expected economic benefits.

Ports with significant economic benefits. The ports of Gunung Sitoli and Sinabang provide the only transport connection between the islands on which they are located – Nias and Simeulue, respectively – and mainland Sumatra (with the exception of air transport, which is prohibitively expensive for most purposes). Without the MDF-supported reconstruction of the ports, the import of basic needs that are not manufactured on the islands themselves (such as cement or gasoline)

or the export of agricultural products would either not be possible or far more expensive. Stated differently, the reconstruction of the ports has avoided very high economic costs to the populations they serve. The port of Malahayati is likely to have generated economic benefits for different reasons: (i) the volume of goods movements is high and rising (after Krueng Geukeuh, Malahayati is Aceh's largest port by volume), and (ii) it is the only port where incoming and outgoing shipments are relatively balanced, which suggests that shipping costs are lower than elsewhere.

Table Annex 4.7 Goods Movements in Economically Viable Ports ('000 tons)

	2005	2006	2007	2008	2009	2010	2011
Malahayati							
Goods loaded	NA	128	508	4,701	NA	558	923
Goods unloaded	NA	252	936	1,422	338	381	964
Sinabang							
Goods loaded	NA	2	2	5	10	12	31
Goods unloaded	NA	68	77	NA	68	NA	47
Gunung Sitoli							
Goods loaded	35	35	58	67	59	46	52
Goods unloaded	132	190	294	282	240	237	269

Source: BPS, Dinas Perhubungan of Aceh and North Sumatra

Ports without significant economic benefits. Kuala Langsa port recorded fewer than two ship arrivals per week. Because of the extremely low shipping volumes recorded by both ports (not only in 2011 but also in preceding years), and no realistic prospect of substantial increases in the near future, investments in these ports have not resulted in significant economic benefits and are unlikely to do so. The same observations apply to MDF's investments in the upgrading of Krueng Geukeuh, which is Aceh's largest port by volume. Most of the MDF-financed facilities are rarely used, and because of several structural factors (including dwindling energy reserves, and a heavy reliance on exports of subsidized fertilizer), a reversal of fortunes is not anticipated.

Table Annex 4.8 Goods Movements in Krueng Geukeuh and Kuala Langsa ('000 tons)

	2007	2008	2009	2010	2011
Krueng Geukeuh					
Goods loaded	6,566	5,227	3,322	4,786	2,876
Goods unloaded	2,189	1,128	2,099	608	742
Kuala Langsa					
Goods loaded	7	25	–	0	5
Goods unloaded	3	9	8	9	3

Source: BPS

Potential causes of insignificant economic benefits of the Lhokseumawe and Langsa ports seem to span many factors. As shown in Table Annex 4.9, the actual movement of goods in 2011 was substantially overestimated, the main reasons being:

- **Underestimation of impact from competition of road transport on goods exports.** Commodities produced in Aceh or Nias for export to other national or international markets are almost without exception transported by truck to Medan for transshipment or further processing (even in Aceh Barat, which is 18 hours by truck from Medan; similarly, exports from Nias are not shipped directly to Medan, but to Sibolga in North Sumatra, from where they are trucked to Medan). This is partly because road transport is faster and more reliable than sea transport, but also because many producers do not ship sufficiently large volumes to make sea transport cost-effective. Moreover, shipping services from minor ports are infrequent, and can therefore not be used to ship perishable products, such as palm nuts and fruit. For this reason, the differences between actual and projected goods movement were highest for the two ports that are in direct competition with road transport. Especially along the west coast of Aceh, the completion of (major parts) of the national road has eroded the competitive position of the ports in Meulaboh and Calang that are also connected by that road.
- **Overestimation of incoming shipping volumes.** For some ports, the economic assessment projected incoming shipments by assuming constant growth of imports that were recorded in the first 6-9 months of 2006. However, because the reconstruction effort had already started at the time, imports of construction materials were unusually high and therefore unsuitable for use in long-term projections (for example, the volume of goods unloaded in Gunung Sitoli was very high during the reconstruction years 2006 through 2008 before leveling off in later years; see Table Annex 4.7).

- **Unrealistic expectations about the impacts of minor improvements on shipping volumes.** As mentioned before, the port of Krueng Geukeuh was already in decline before the December 2004 tsunami or earthquake, and the MDF-financed investment (which mainly consisted of additional open storage space “hard standings”) did nothing to address the underlying causes of the decline. For the same reason, it was unrealistic to expect that investments in additional storage space in Kuala Langsa would increase the use of the port (which already had sufficient storage space to begin with). According to some government officials, the Ministry of Trade does not allow imports of foodstuffs into the ports of Krueng Geukeuh and Kuala Langsa. However, even if the two ports would import the same amount of food as the port of Gunung Sitoli (about 25,000 tons per year), Kuala Langsa would still remain an insignificant port, and the incoming shipping volume of Krueng Geukeuh would increase by less than 3%. In other words, the removal of the restriction by the Ministry of Trade, in all likelihood, would not make a material impact on the economic feasibility of the MDF-financed investments.

Table Annex 4.9 Actual vs Projected Goods Movement, Selected Ports ('000 tons), 2011

Port	Actual (A)		Projected (P)		A as % of P	
	Loading	Unloading	Loading	Unloading	Loading	Unloading
Calang	–	1	65	55	–	2
Kuala Langsa	5	3	145	17	3	18
Sinabang (Simeulue)	31	47	49	88	63	53
Gunung Sitoli (Nias)	269	52	382	198	70	26

Sources: BPS (actual), UNDP (projected)

Solid Waste Management

Overview of MDF-financed investments in the water supply sector. MDF invested about \$39.9 million to improve the solid waste management system in 13 district governments in Aceh, mainly through the Tsunami Recovery Waste Management Program (TRWMP). It should be noted, however, that a substantial portion of funding for TRWMP was not only used to finance infrastructure (mainly consisting of landfills), but to also build district government capacity for solid waste management, clear debris in the immediate aftermath of the tsunami, and to develop livelihood programs to help social and economic recovery (Table Annex 4.10). This section only considers the former two components (i.e. components 1b and 2 in the table) as part of MDF’s infrastructure sector portfolio.

Table Annex 4.10 TRWMP Budget and Actual Spending (US\$ million)

Component	Budget (including interest)	Spent until June 2011	% Budget Used
1a. Clearance of tsunami waste	} 18.5	} 18.5	} 100%
1b. Local government capacity building			
2. Landfills	16.9	16.8	100%
3. Livelihood program	3.5	3.6	100%
Monitoring	1.5	1.5	100%
TOTAL	40.4	40.4	100%

Source: TRWMP reports

Expected economic benefits. In Indonesia, a municipal solid waste management (SWM) system typically consists of three activities: (i) waste collection (waste is collected from households by hand carts or small motorized vehicles and transported to a transshipment point), (ii) waste transport (trucks ship waste from the transshipment point to landfill), and (iii) waste disposal (bulldozers compact waste on site to avoid waste dispersion and increase the lifetime of the landfill). The economic benefits of such a system mainly consist of a reduction in public and private health costs. Revenue-generating activities such as recycling and composting may lower the overall cost of a SWM system, but are not considered as economic benefits in their own rights. The economic benefits of a solid waste management system are highest in densely populated urban areas, where environmental pressures and waste generation are higher than elsewhere. TRWMP assisted 13 district governments in Aceh and Nias with improving SWM systems. Of these, only Banda Aceh and Lhokseumawe are urban areas with a population of more than 100,000.

Actual economic benefits. A review of TRWMP progress reports suggests that the landfill development program is much more likely to generate long-term economic benefits than the capacity-building program.

- **Capacity building.** By the end of 2011, TRWMP had spent approximately \$10 million on building capacity in the sanitation departments of 13 district governments (11 in Aceh and two in Nias). Most of these funds were spent on the development of “a fee recovery system,” which is better known as a solid waste collection charge (*retribusi sampah*). An attempt to certify SWM officials (through MPW) proved extremely time-consuming and was eventually abandoned. Fee collection rates have remained low, which is surprising in view of the very low fee level (IDR 10,000 per household per month). More importantly, the emphasis on developing a fee recovery system does seem a cost effective method to achieve increased spending on SWM by district governments. This is because most of the cost of a municipal SWM system is financed from subsidies rather than waste collection charges—a quality applicable to many other countries too, not only Indonesia.

- **Landfills.** Through TRWMP, MDF financed low-tech landfills in nine districts that are easy and inexpensive to maintain. More importantly, the project established a regional sanitary landfill, which will be managed by a newly established technical implementation unit (*Unit Pelaksana Teknis Daerah* or UPTD). The provincial government finances 50% of the operating cost, and Banda Aceh City (30%) and Aceh Besar District (20%) the remainder. When completed, the Blang Bintang landfill will be the first truly sanitary landfill in Indonesia, potentially triggering the construction of other such landfills elsewhere in the country.

SWM Services in TRWMP-Assisted District Governments

Ten of 13 local governments assisted by the project presently collect a solid waste collection fee. Cost recovery ratios are less than 10%. Coverage ranges from nearly 100% in Banda Aceh City to 20% in less developed district capitals. At the end of 2011, 12% of households with a solid waste collection service in the 13 local governments pay a solid waste fee.

Source: MDF analysis

Water Supply

Overview of MDF-financed investments in the water supply sector. MDF invested a small amount (approximately \$2.3 million) in the water supply systems of four districts (Sabang City, Langsa City, Aceh Besar District and Pidie District). In all cases, MDF supported the construction of bulk water infrastructure (water treatment plants, reservoirs and transmission mains) to supply distribution systems. The MDF-financed infrastructure is currently managed by the municipal water company (*Perusahaan Daerah Air Minum* or PDAM) owned by the respective districts. In May 2012, the general directors of each PDAM were interviewed for this working paper, except the director of PDAM Langsa City.

Expected economic benefits. The economic benefits of a piped water supply system consists of: (i) direct financial benefits to water users (as shown in Table Annex 4.11, the cost of piped water – expressed in IDR per cubic meter – is six to 15 times lower than the cost of water purchased from a vendor), and (ii) indirect financial or non-financial benefits (which largely consist of reduction in health costs resulting from a lower incidence of water-borne diseases). For obvious reasons, the economic benefits of a piped water supply system is highest in areas where service coverage is low, and alternative sources of water (such as potable groundwater or surface water) are scarce or unavailable. Three of the four districts met these criteria (in 2010, PDAM coverage in Sabang City was about 85%, which is far above the national average of approximately 20%).

Table Annex 4.11 Key Features of PDAMs with MDF-Financed Infrastructure*

	Aceh Besar District	Pidie District	Sabang City
Water tariffs			
Average PDAM tariff (IDR/m3)	2,375	2,200	1,200
Average water vendor tariff (IDR/m3)**	37,500	18,750	7,500
PDAM connections and finances***			
# Connections ('000)	18.0	4.3	5.2
Coverage (% DG population in 2010)	26%	4%	85%
DG subsidy in 2012 (IDR million)	None	100	2,150
Capacity of MDF-supported infra			
Capacity of WTP (l/s)	40	80	40
# Connections served by WTP ('000)	4.0	3.5	4.0

Source: Interviews with PDAM officials

* No data available for PDAM Langsa City

** Average of the cost of public and private water tankers

*** DG = District government

Actual economic costs and benefits. The actual economic benefits of MDF-supported investments were substantially lower than potential benefits for two PDAMs visited in May 2012, the main reasons being:

- **High technical losses (PDAM Pidie District) due to poor construction.** As a result, there were delays in benefits reaching households and fewer households than targeted are supplied by this system (the system provides water to about 3,500 households, which is far lower than the planned capacity of 8,000 households).
- **Limitations in distribution systems (PDAM Pidie District, PDAM Sabang City).** Since the completion of the MDF-financed WTP, the water treatment capacity of PDAM Sabang City increased from 20 l/s to 40 l/s. However, the PDAM is unable to supply existing customers with a better service because the distribution system is outdated and unable to handle higher water pressures. It is also unable to provide water to more customers than before because it does not have the funds to invest in new water connections, which it must offer at a heavily subsidized price. PDAM Pidie District does not have the funds required to expand the distribution system to use the water that would become available in case the transmission main was repaired.
- **Limited sustainability of benefits (PDAM Pidie District, PDAM Sabang City).** Neither PDAM is operating at a profit or covering costs. District government funds barely cover the minimum required operating cost. For this reason, PDAM Sabang City is unable to operate the pumps of its transmission mains on a 24/7 basis, and PDAM Pidie District claims that it is unable to finance the repair of the transmission main from its own sources.

All these problems are symptoms of a single underlying problem: district governments do not provide sufficient funds to their PDAMs, either in the form of cost-recovery tariffs or by providing additional funding that is sufficiently high to cover the cost of a proper service. In this context, it is worth noting that PDAM Aceh Besar District is a relatively well-managed and profitable PDAM.

Flood Control

Overview of MDF-financed investments in the flood control sector. The MDF invested about \$15.9 million to improve the flood control systems of the two largest cities in Aceh: Banda Aceh and Lhokseumawe. In the case of Lhokseumawe, the MDF also invested in a wastewater treatment system. In each city, the MDF-financed infrastructure is managed by a special unit that forms part of the district government's public works department (*Dinas Pekerjaan Umum*).

Expected economic benefits. The economic benefits of a flood control system arise from a reduction in the frequency and severity of floods. Reduced flooding will, in turn, result in reduced damage to public infrastructure and private property, reduced health costs, and a reduction in the interruption of economic activities such as trading and transport. Because of methodological difficulties in the measurement and valuations of these benefits, the economic benefits of a flood control project are usually measured indirectly, by estimating the value of land price increases in the project's "area of influence." The economic benefits of a flood control system are therefore highest in flood-prone urban areas (where potential increases in land prices are highest), and this is precisely where the MDF-financed flood control systems were located. It is also worth noting that flood control projects have a pro-poor bias, because the poor tend to live in the most flood-prone areas of a city, where land prices are lowest.

Actual economic benefits. Interviews with the managers of the flood control systems in Banda Aceh City and Lhokseumawe City indicate that both systems have generated their intended benefits: floods have all but disappeared in the area of influence, and land prices have increased substantially since the systems became operational (anecdotal evidence suggests that the increase was higher than the average land price increase in both Banda Aceh and Lhokseumawe, but this claim could not be verified empirically because detailed data on land prices are not in the public domain). However, the economic benefits of the projects have been adversely affected by two factors:

- **Delays in benefits (Lhokseumawe system only).** Because of avoidable delays in a transfer of the project's assets from the Ministry of Public Works to Lhokseumawe City, the wastewater system was not used for 6-12 months. As neither party wished to assume responsibility for the payment of pumping costs, the state-owned electricity company disconnected the power supply (the facility was reconnected in early May 2012).
- **Limited sustainability of benefits (both systems).** Both systems operate on a "skeleton budget" that is far lower than the minimum required budget to operate each system properly. For example, the feasibility study of the flood control system in Lhokseumawe assumed that the annual operations and maintenance costs would be 10% of the investment cost, or at least IDR10 billion per year. In 2011, Lhokseumawe City had allocated IDR300 million for the flood

control system, which was not only far lower than the assumed budget, but also lower than the minimum required budget according to *Dinas Pekerjaan Umum* itself (IDR 2 billion). In both cities, the city government has conducted campaigns to make the general public aware of the adverse impacts of disposing garbage in drains and open water.

Water Infrastructure

Introduction. The MDF allocated a minor portion of its resources (about \$1.3 million or 0.5% of its infrastructure sector portfolio) to co-finance the reconstruction and rehabilitation of coastal barriers and sea and river embankments in four locations in Aceh (see Table Annex 4.12 for details). This section first describes the economic rationale of the four projects in the context of the sea defense strategy that was formulated by BRR in July 2006. It then describes to what extent the projects were likely to have generated their intended benefits.

Table Annex 4.12 Key Features of MDF-Supported Water Infrastructure Projects

Code	Project Location	Cost (US\$ million)		Main Project Components
		TOTAL	MDF share	
WR-1	Aceh Besar	0.62	0.19	River alignment works (1.9km)
WR-2	Aceh Selatan	0.53	0.16	Coastal barriers (0.5km)
WR-3	Banda Aceh	1.50	0.45	Coastal barrier (0.9km), sea embankment (1.0km), river alignment works (0.3km)
WR-5	Aceh Jaya	1.75	0.52	Jetty (100m), river embankment (0.6km)

Source: MDF

Economic rationale of water infrastructure projects. The sea defense strategy formulated by BRR distinguishes three types of natural hazards: (i) tsunami hazard, (ii) coastal erosion, and (iii) flooding (rainfall, river and tidal). The main purpose of three of the four MDF-financed projects (WR-1, WR-2 and WR-3) is to alleviate coastal erosion, while WR-5 was mainly designed to mitigate the adverse impacts of river and tidal flooding. The sea defense strategy also indicated that physical investments should only be undertaken in cases where low-cost, flexible and “soft” solutions would not be effective. To operationalize this principle, it stipulates that, “coastal erosion protection measures should be limited to situations where the do-nothing option is not possible because of major economic or social interests.” In other words, physical investments in coastal protection should only be undertaken if the expected economic or social benefits are substantial. It was assumed that the same principle applied to investments in flood control infrastructure, even though the strategy does not explicitly mention this.

Economic benefits of MDF-supported water infrastructure projects. A simplified assessment of the economic benefits of the four projects was undertaken. The economic benefit of a water infrastructure project was defined as the expected increase in the value of the physical assets protected by the project. For WR-2, it was relatively easy to estimate economic benefits, because this project was undertaken with the explicit purpose of protecting the national road from Aceh Barat Daya to Aceh Selatan, the asset value of which could be assessed with a reasonable degree of accuracy. For this project, the net present value of economic benefits arising from lower road operations and maintenance costs and a lower likelihood of flood damage were assessed. For each of the other three projects, estimates were prepared of the minimum required increase in land values (of the area affected by the project) that would be required to render the project economically feasible. If the minimum required increase was deemed realistic, the project was considered economically viable.

Economic benefits of coastal barrier to asset value of national road sections (WR-2). MDF co-financed two coastal barriers with a combined length of 0.47 kilometers along the national road on the southwest coast of Aceh. The total cost of the barriers was \$0.53 million. The budgeted cost of the USAID-financed road from Banda Aceh to Meulaboh was (\$245 million/150 miles [240 kilometers]) about \$ 1 million per kilometer (this is a conservative estimate, because the actual unit cost was higher). This means that the construction cost of the asset protected by the coastal barriers is about (0.47 x 1 =) \$0.47 million. The expected increase in the value of this asset is determined by two factors, which can both be ascribed to the MDF-financed barriers: (i) a reduction in the operations and maintenance costs of the road sections, and (ii) a reduction in the likelihood that the road sections will need to be reconstructed because of flood damage. If the expected increase in the value of the road sections would exceed the investment and operations and maintenance cost of the coastal barriers, the project is considered economically feasible. Table 13 shows the net present value of investment in the barriers for three “with project” scenarios, which are based on a pessimistic, likely and optimistic set of assumptions. Perhaps surprisingly, the net present value of the assumed economic benefits is negative in all three scenarios.

This limited analysis suggests that the investment in coastal barriers cannot be justified solely on the ground of improving the value of the road sections they were designed to protect.

Table Annex 4.13 Results of Scenario Analysis for WR-2

Assumption	WITHOUT PROJECT	WITH PROJECT SCENARIOS		
		Pessimistic	Likely	Optimistic
Routine O&M cost road (% investment)	10%	10%	5%	2.5%
# Major repairs during lifetime of road	5	5	2	1
Likelihood of complete destruction (%)*	50%	50%	25%	0%
NPV Economic Benefits @10% (US\$ m)		-0.48	-0.25	-0.11

Source: MDF

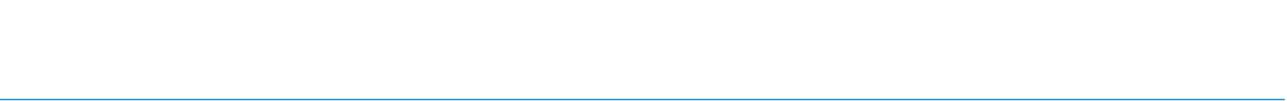
* Assumed to occur in year 10 of the 25-year economic lifetime of the road

Economic benefits of water infrastructure on land values (WR-1, WR-3, and WR-5). For the remaining three projects, land prices were conservatively estimated at IDR100,000/m² in Banda Aceh (WR-3), IDR25,000/m² for peri-urban areas in Aceh Besar District (WR-1), and at IDR10,000/m² in rural areas of Aceh Jaya District (WR-5). It was furthermore assumed that each project would affect land prices up to 50m from the embankment or sea barrier. As shown in Table 14, the projects in Banda Aceh and Aceh Besar District require modest increases in land prices before economic benefits outweigh the construction and operations and maintenance costs of the projects. However, land prices in villages benefiting from WR-5 would need to increase almost threefold to render the investment economically viable. This was not deemed realistic, and therefore the economic benefits of water infrastructure on land values were not deemed to exceed the investment costs.

Table Annex 4.14 Minimum Required Land Price Increases to Justify Economic Costs of WR-1, WR-3 and WR-5

Code	Project Location	Length (km)	Land price (IDR/m ²)		Required Increase	Increase Realized?
			Existing	Required		
WR-1	Aceh Besar	1.9	25,000	31,500	26%	Yes
WR-3	Banda Aceh	2.6	100,000	115,700	16%	Yes
WR-5	Aceh Jaya	0.6	10,000	28,300	183%	No

Source: MDF



ACRONYMS AND ABBREVIATIONS

\$	US dollar
ACAP	Anti-Corruption Action Plan
ADB	Asian Development Bank
AF	Additional Financing
AFEP	Aceh Forest & Environment Project
AGTP	Aceh Government Transformation Programme
ANTERP	Aceh/Nias Tsunami & Earthquake Response Program
AusAID	Australian Agency for International Development
BAFMP	Banda Aceh Flood Mitigation Project
Bappeda	<i>Badan Perencanaan Pembangunan Daerah</i> (Provincial Development Planning Agency)
Bappenas	<i>Badan Perencanaan Pembangunan Nasional</i> (National Development Planning Agency)
BNPB	<i>Badan Nasional Penanggulangan Bencana</i> (National Disaster Management Agency)
BPBA	<i>Badan Penanggulangan Bencana Aceh</i> (Aceh Provincial Disaster Management Agency)
BPS	<i>Badan Pusat Statistik</i> (Central Bureau of Statistics)
BRR	<i>Badan Rekonstruksi dan Rehabilitasi Aceh dan Nias</i> (Agency for the Reconstruction and Rehabilitation of Aceh and Nias)
CBLR3	Capacity Building for Local Resource-based Rural Roads
CDM	Clean Development Mechanism
CEAP	Contractor Environmental Action Plan
CHF	Cooperative Housing Foundation
CRS	Catholic Relief Service
CSO	Support to Strengthen the Capacity and Role of Civil Society Organizations
DfID	Department for International Development
DGT	Direction Générale du Travail (French Directorate General of Labor)
DRR-A	Making Aceh Safer through Disaster Risk Reduction in Development
EDFF	Aceh Economic Development Financing Facility
EIRR	Economic Internal Rate of Return
ENPV	Expected Net Present Value
ERTR	Emergency Response and Transitional Recovery
FASEP	French Ministry of Economic Planning
FFI	Fauna & Flora Indonesia
FHO	Final Hand Over

GAM	<i>Gerakan Aceh Merdeka (Aceh Liberation Movement)</i>
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit (German Agency for International Cooperation)
Gol	Government of Indonesia
GRDP	Gross Regional Domestic Product
GTZ	Deutsche Gesellschaft für Technische Zusammenarbeit (German Agency for Technical Cooperation)
ha	Hectare
IAP	Immediate Action Plan
IDR	Indonesia Rupiah
ILO	International Labour Organization
IOM	International Organisation for Migration
IPM	Infrastructure Program Management
IRC	International Rescue Committee
IREP	Infrastructure Reconstruction Enabling Program
IRFF	Infrastructure Reconstruction Financing Facility
JICA	Japan International Cooperation Agency
JICS	Japan International Cooperation System
JRF	Java Reconstruction Fund
KDP	Community Recovery through the Kecamatan Development Program
KPDT	<i>Kementerian Pembangunan Daerah Tertinggal</i> (Ministry for Development of Disadvantaged Areas)
KRRP	Kecamatan-based Reconstruction and Rehabilitation Planning in Nias Project
LCRMP	Lamno-Calang Road Maintenance Project
LEDP	Nias Islands Livelihoods and Economic Development Program
LIF	Leuser International Foundation
M&E	Monitoring & Evaluation
m ²	Square meter
MDF	Multi Donor Fund for Aceh and Nias
MoHA	Ministry of Home Affairs
MoU	Memorandum of Understanding
MPW	Ministry of Public Works
MSE	Micro and Small Enterprise
MSME	Micro, Small and Medium Enterprise
NCT	National Coordinating Team
NGO	Non-Governmental Organization
NITP	Nias Island Transformation Programme

NJOP	<i>Nilai Jual Objek Pajak</i> (Sales Value of Tax Object)
NPV	Net Present Value
NW	Northwest
O&M	Operations and Maintenance
PCU	Passenger Car Unit
PDAM	<i>Perusahaan Daerah Air Minum</i> (Municipal Water Company)
PHO	Preliminary Hand Over
PNPM	<i>Program Nasional Pemberdayaan Masyarakat</i> (National Community Empowerment Program)
RACBP	Rural Access and Capacity Building Project
RALAS	Reconstruction of Aceh Land Administration System
RAP	Reconstruction Action Plan
Rekompak	<i>Rekonstruksi Masyarakat dan Permukiman berbasis Komunitas</i> (Community-based Settlement Rehabilitation and Reconstruction Project)
SDC	Sea Defense Consultancy
SDLP	Sea Delivery and Logistics Programme
SPADA	Support for Poor and Disadvantaged Areas in Aceh and Nias
SWM	Solid waste management
TA	Technical Assistance
TRPRP	Tsunami Recovery Port Redevelopment Programme
TRWMP	Tsunami Recovery Waste Management Programme
TS-R2C3	Rehabilitation and Reconstruction Completion and Continued Coordination
TTN	<i>Tim Teknis Nasional</i> (National Technical Team)
UK	United Kingdom
UN	United Nations
UNDP	United Nations Development Programme
UNICEF	United Nations Children's Fund
UNOPS	United Nations Office for Project Services
UPP	Community Recovery through the Urban Poverty Program
UPTD	<i>Unit Pelaksana Teknis Daerah</i> (Regional Technical Implementation Unit)
USAID	United States Agency for International Development
WFP	World Food Programme
WTP	Water Treatment Plant

BIBLIOGRAPHY AND REFERENCES

Bapennas. January 2005. *INDONESIA: Preliminary Damage and Loss Assessment, the December 26, 2004 Natural Disaster*. With the International Donor Community, for the Consultative Group on Indonesia. Jakarta: Bappenas

Badan Rekonstruksi dan Rehabilitasi Aceh dan Nias. December 2005. *Aceh and Nias One Year after the Tsunami, the Recovery Effort and Way Forward*. Joint Report of BRR and International Partners. Jakarta: BRR.

Badan Rekonstruksi dan Rehabilitasi Aceh dan Nias. February 2006. *BRR Strategy Paper for the Remaining Resources of the Multi Donor Fund for Aceh and Nias*. Jakarta: BRR.

Badan Rekonstruksi dan Rehabilitasi Aceh dan Nias. December 2008. *Funding Disaster Recovery: Appraising the MDF's Contribution to the Reconstruction of Aceh and Nias*. Presented by Dr. Kuntoro Mangkusubroto to the Steering Committee. Jakarta: BRR.

Badan Rekonstruksi dan Rehabilitasi Aceh dan Nias. 2009. *Supervision: Eradicating Corruption with No Tolerance*. BRR Book Series Part 4. Jakarta: BRR.

Badan Rekonstruksi dan Rehabilitasi Aceh dan Nias and the World Bank. October 2005. *Rebuilding a Better Aceh and Nias, Stocktaking of the Reconstruction Effort*. Brief for the Coordination Forum Aceh and Nias (CFAN). Jakarta: BRR.

Catalan, Edilberto L. March 2007. "An Assessment of Tsunami Recovery Port Redevelopment Program (TRPRP)." *Report to the Multi Donor Fund for Aceh and Nias*.

Da Silva, Jo. 2010. "Key Considerations in Post-Disaster Reconstruction." *Lessons from Aceh*.

Disch, Arne, Riselia Bezerra, Atle Karlen, and Endre Vigeland. 2009. *Multi Donor Fund for Aceh and Nias: Mid-term Review. Vol. 1: Main Report*. Jakarta: MDF.

Disch, Arne, Jan-Douwe Meindertsma, Riselia Bezerra, Wolfgang Clauss, Atle Karlen, Helge Rieper, Thomas Ryan, Endre Vigeland. 2009. *Multi Donor Fund for Aceh and Nias: Mid-term Review. Vol. 2: Annexes*. Jakarta: MDF.

Global Procurement Consultants Limited. November 2008. *Report on Independent Procurement Review (Extended Review) of Infrastructure Reconstruction Financing Facilities*. The World Bank.

Government of Indonesia. April 2005. *Master Plan for Rehabilitation and Reconstruction of the Regions and People of the Province of NAD and Nias Islands of the Province of North Sumatra*. Main Book of Rehabilitation and Reconstruction, Attachment 1. Regulation of the President of Republic of Indonesia Number 30, 2005. Jakarta: Gol.

Government of Indonesia. 2008. *Master Plan for Rehabilitation and Reconstruction for the Regions and People of the Province of NAD and Nias Islands of the Province of North Sumatra*. Regulation of the President of Republic of Indonesia Number 47, 2008 on Amendment for President Regulation Number 30, 2005. Jakarta: Gol

Infrastructure Reconstruction Enabling Program Project Management. June 2010. *Final Completion Report*. Jakarta: IPM IREP 1.

International Labour Organization. February 2003. *A Global Programme: Investing in Employment for Poverty Reduction and Local Economic Growth*. Jakarta: ILO.

International Labour Organization. August 2010. *Benefits of Improved Roads Access*. Jakarta: ILO.

International Labour Organization. 2010. *Comparative Costs and Benefits of the Local Resource Base Approach to Rural Road Development*. Synopsis of Findings from Aceh. Jakarta: ILO.

International Labour Organization. August 2010. *Effects of the Training of Contractors on their Employability and Business Opportunities*. Jakarta: ILO.

International Labour Organization. February 2011. *Initial Concept for a Programme of Trail Bridge Construction*. Nias Islands Rural Access and Capacity Building Project (Nias – RACBP). Jakarta: ILO.

Moreland, Robert. January 2007. *Post-tsunami Construction of Gunung Sitoli Port, Economic Assessment*. Prepared for UNDP.

-
- Moreland, Robert. April 2007. *Post-tsunami Construction of Kuala Langsa Port, Economic Assessment*. Prepared for UNDP.
- Moreland, Robert. March 2007. *Post-tsunami Construction of Meulaboh Port Cargo Facilities, Economic Assessment*. Prepared for UNDP.
- Moreland, Robert. April 2007. *Post-tsunami Construction of Singkil Port, Economic Assessment*. Prepared for UNDP.
- Moreland, Robert. December 2006. *Post-tsunami Construction of Calang Port, Economic Assessment*. Prepared for UNDP.
- Moreland, Robert. December 2006. *Post-Tsunami Construction of Sinabang Port, Economic Assessment*. Prepared for UNDP.
- Multi Donor Fund for Aceh and Nias. December 2011. *Partnerships for Sustainability*. Multi Donor Fund Progress Report. Jakarta: MDF.
- Multi Donor Fund for Aceh and Nias. December 2011. *In-depth Progress Report for the Performance Period of April 1, 2011 to September 30, 2011*. Jakarta: MDF.
- Multi Donor Trust Fund for Aceh and Nias. 2006. *Operations Manual*. March 2006 Revision. Jakarta: MDF.
- Multi Donor Fund for Aceh and Nias. 2006. *Recovery Assistance Policy*, March 2006 Version. Jakarta: MDF.
- Multi Donor Fund for Aceh and Nias. December 2005. *Rebuilding Together*. Progress Report. Jakarta: MDF.
- Multi Donor Fund for Aceh and Nias. 27 October 2005. *Minutes of the Sixth Meeting of the Steering Committee (SC)*. Jakarta: MDF.
- Planning Design Construction and Supervision for Provincial Strategic Infrastructure in NAD, Infrastructure Enabling Program. 2011. *Final Completion Report*. Jakarta: PDCS IREP 4.

Planning Design Construction and Supervision for West Coast Infrastructure in NAD, Infrastructure Enabling Program. December 2008. *Final Report on Environmental Safeguards*. Jakarta: PDCS IREP 2.

Sea Defense Consultants. November 2009. *Sea Defense Consultants Completion Report*. Jakarta: Sea Defense Consultants.

United Nations Development Programme. February 2012. "Tsunami Recovery Waste Management Programme (TRWMP)". *Annual Report January – December 2011*. Jakarta: UNDP.

United Nations Development Programme. April 2008. *Completion Report Lamno-Calang Road Maintenance (LCRM) Project and Tsunami Recovery Port Redevelopment Programme (TRPRP)*. Jakarta: UNDP.

United Nations Development Programme. January 2007. *Tsunami Recovery Waste Management Programme (TRWMP), Mid-Term Assessment. Mission Report*. Jakarta: UNDP.

World Bank. June 2012. *Implementation Completion and Results Report (TF-56894)*. On A Multi-Donor Trust Fund (MDF) for Aceh and Nias, Grant in the Amount of \$42 Million to the Republic of Indonesia through the Agency for Reconstruction and Rehabilitation for Aceh and Nias for the Infrastructure Reconstruction Enabling Program. Jakarta: World Bank.

World Bank. July 2010. *Implementation Completion and Results Report (TF-56386)*. On A Grant for the Benefit of the Republic of Indonesia in the amount of \$6.35 Million to Muslim Aid for An Emergency Rehabilitation of the Drainage and Flood Protection System of Banda Aceh Project. Jakarta World Bank.

World Food Programme. November 2010. *Sea Delivery and Logistics Programme (SDLP). Lessons Learned Report*. Jakarta: WFP

World Food Programme. April 2012. *Logistics Support Units, Situation Report*. Jakarta: WFP.



THE WORLD BANK



Published by:

MDF-JRF Secretariat

The World Bank Office

Indonesia Stock Exchange Building

Tower II, 12th Floor

Jl. Jendral Sudirman Kav. 52-53

Jakarta 12910, Indonesia

Tel : (+6221) 5299-3000

Fax : (+6221) 5299-3111

December 2012

www.worldbank.org

www.multidonorfund.org

www.javareconstructionfund.org