

**FINAL REPORT OF THE FAO FOREST
PRODUCTS CONSULTANT FOR
ASSISTANCE TO INDONESIA ON
WOOD SUPPLY FOR
RECONSTRUCTION**

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PREFACE

This document constitutes the final report of the *FAO Forest Products Consultant on Wood Supply for Reconstruction*. The work of the consultant was completed under the aegis of the Government of Finland-funded *Forestry Programme for Early Rehabilitation in Asian Tsunami-Affected Countries (OSRO/GLO/502/FIN)*. The report summarizes the work of the consultant, carried out during three consultancies, for a total of 5 months – between March 2005 and February 2006 – and the consultant’s findings and recommendations.

The main focus of the consultancies was assessment of the demand and supply of wood products for reconstruction and the provision of technical advice and assistance to Government of Indonesia institutions and other stakeholders in the area of wood supply. The consultancy outputs included preparation of reports and technical documents, organization of and participation in workshops, and provision of advice to Government of Indonesia institutions, NGOs and United Nations (UN) agencies.

The report also includes revision of the supply and demand situation in Nanggroe Aceh Darussalam (NAD) Province one year after the tsunami and earthquake events and recommendations for addressing future wood supply needs.

The main documents generated during the consultancy, in addition to this report, were an initial needs assessment report, three technical information notes on wood usage, wood procurement and wood legality, and a list of wood suppliers in Indonesia. All documents have been prepared in consultation with Government of Indonesia institutions, NGOs and UN agencies.

The consultant acknowledges the kind assistance of the Government of Indonesia and agency staff from Ministry of Forestry, Department Kehutanan, Dinas Kehutanan NAD, Badan Rehabilitasi dan Rekonstruksi (BRR) NAD-Nias, UN HABITAT, UNDP, UNIMS, WFPSS, FAO Representation for Indonesia in Jakarta, and the forestry team in FAO’s Rehabilitation Support and Coordination Unit in Banda Aceh. The consultant also received invaluable assistance from numerous NGO’s including the Indonesian Association for Concession Holders (APHI), Lembaga Ekolabel Indonesia (LEI), various chapters of the Red Cross, OXFAM, CARE, CONCERN, World Wildlife Fund, and Fauna and Flora International.

EXECUTIVE SUMMARY

Demand situation summary

One year after the tsunami approximately 210 000 people are displaced and living in temporary shelter. A further 300 000 people have found some form of permanent shelter elsewhere but still requires construction or repair of housing of their own [Government of Indonesia (2005); BPS (2005)]. The report assumes new permanent housing needs to be between 80 000 and 100 000 for Nanggroe Aceh Darussalam (NAD) Province and Nias combined. A further 50 000 to 70 000 houses require repairs [DPU (2005); UN HABITAT (2005)]. Damage to other non-residential buildings, infrastructure, and boats has also been estimated.

The consultant has prepared three scenarios for wood supply:

- (i) continuation of current building trends and material usage;
- (ii) increased usage of wood based materials in building construction; and
- (iii) increased usage of cement based materials in building construction.

These scenarios have been used to estimate likely upper and lower bounds of wood demand. In summary:

- total demand for sawn timber for all houses, civic buildings, boats and infrastructure in the programme for reconstruction in Aceh and Nias is estimated to be between 285 000 m³ and 491 000 m³. The total demand for plywood is estimated to be 82 000 m³.
- deducting the estimated amount of timber and plywood used in 2005 for reconstruction in NAD Province and Nias and assuming that the reconstruction in will be completed in 2007, the annual demand for sawn timber for all houses, civic buildings, boats and infrastructure for the reconstruction is estimated to be between 117 000 m³ and 220 000 m³ in 2006 and 2007. The annual demand in these two years for plywood for reconstruction is estimated to be 34 000 m³.
- in addition to demand for wood for reconstruction, the province is estimated to require approximately 70 000 m³ of sawn timber and 61 000 m³ of plywood to meet “normal” annual wood demand in NAD Province.

There will be a large increase in total timber demand over the normal situation during 2006 and 2007 – and perhaps beyond this time – due to the reconstruction needs. It expected that demand will return to approximately pre-tsunami levels after the completion of the reconstruction programme.

NAD Province supply situation¹

NAD province has substantial forest resources. Production forest resources include 581 000 hectares of State licensed natural forest concessions (of which 405 000 hectares are production areas), 638 000 hectares of state natural forests designated for conversion, 53 000 hectares of forest plantations on state lands, large areas of plantation crops suitable for timber production, and private forests.

The total log volume potentially available on an annual basis in NAD province is estimated to be 816 000 m³, including 626 000 m³ from natural forest concessions, 50 000 m³ from forest conversion areas, 100 000 m³ from forest plantations (sawlogs only and not including pulp logs), and 40 000 m³ from plantation crops and private forests.

However, current legal forest production is quite small and estimated to be less than 70 000 m³ of logs, due to the imposition of a moratorium on logging in forest concessions and the suspension of most conversion logging operations. This volume is insufficient to meet the needs of reconstruction. Illegal logging is known to occur in NAD province but there is presently no accurate assessment of the total volume of the illegal harvest. The high demand for timber for reconstruction and an immediate shortage of domestically produced supplies is likely to encourage illegal logging of timber within Aceh, unless either timber supplies can be found from outside the province to meet the shortfall, or increased use is made of timber substitutes.

The Ministry of Forestry and Dinas Kehutanan NAD are in the process of reactivating harvesting licenses in natural forest concessions for 2006, but – as at February 2006 – none of these concessions were producing logs. The forest concessionaires, themselves, are reportedly reluctant to commence logging because of market uncertainties. Log supplies from NAD province are unlikely to significantly increase during 2006, due to infrastructural and capacity constraints, but could substantially increase from 2007. A projected increase in timber production from reactivated harvesting will only become available at a time when the rehabilitation programme is scheduled to wind down. Therefore, an increase in log supply from reactivating harvesting licenses is likely to have an impact on easing the supply situation for reconstruction, but the impact is only likely to be significant from 2007, which is the wind-down period for the reconstruction programme.

The total capacity of legally-issued milling licenses in Banda Aceh is 187 000 m³ of logs. Assuming that all licensed mills were active and running at full capacity, the sawmilling industry could supply approximately 93 000 m³ of sawn timber. This would be sufficient to supply “normal” annual NAD provincial timber consumption of 70 000 m³ of sawn timber, with a residual of only 23,000 m³ being available to meet the additional requirements of 117 000 m³ to 220 000 m³ per year for reconstruction in 2006 and 2007. This suggests an annual sawn timber deficit during the course of the reconstruction programme of between 94 000 m³ and 197 000 m³ of sawn timber for 2006 and 2007.

¹ Statistics on forest resources and production and processing potential were obtained through direct communications with Dinas Kehutanan NAD and Ministry of Forestry officials.

Timber supplies from external sources

During 2006, and perhaps beyond that time, significant volumes of timber will need to be sourced from outside of NAD province to meet timber needs for reconstruction, i.e. from other provinces in Indonesia or imported from other countries.

In principle, there are ample supplies of wood products in Indonesia and other countries sufficient to meet the requirements for reconstruction. However sourcing external supplies wood has proved to be very difficult for most organizations involved in reconstruction.

Communications with timber traders suggest that sawn timber is difficult to source from Sumatra, because of a genuine decrease in available log volumes. Significant volumes of sawn timber are available in Kalimantan and Papua; however, procurement from these regions into Aceh is problematic compared with buying from Sumatra. There is no history of significant timber trade between Aceh and the eastern provinces, transport services are more difficult to access, species are different, and mills require buyers to commit to forward ordering of large volumes of timber. Trade with Kalimantan and Papua is possible and supplies are reportedly becoming available, however, only experienced timber traders can readily access these supplies.

The Government of Indonesia does not prohibit timber importation and there are no legal barriers to timber importing for humanitarian purposes in NAD and Nias. Several organizations have already imported timber from North America, Malaysia, Australia and New Zealand. The first imports of sawn timber occurred in December 2005, though imported volumes, as of February 2006, have been less than 1 000 m³ for each shipment. Several organizations have organized much larger shipments that amount to more than 35 000 m³ over the next three months.

Wood supply and demand balance

Wood demand already exceeds the legal supply capacity in Aceh. Expansion of local timber supplies is possible, but large increases in supplies are not realistic until 2007/2008. Although wood is not the most significant building material by volume, already a lack of wood supplies is constraining the reconstruction programme.

Wood has proved to be very difficult to procure from outside of NAD and Nias and this has exacerbated the timber supply shortage. Timber imports only commenced in December 2005, after many aborted procurement attempts. Domestic supplies from other provinces have also been difficult to procure and this appears to be mainly due to a lack of expertise and experience of NGOs/development assistance agencies in procuring timber in Indonesia.

While progress is slow, the reconstruction programme is progressing and a significant number of buildings are now being built and repaired. It is highly unlikely that the reconstruction will founder completely because factors creating timber supply difficulties will ease over time and many organizations will improve their procurement performance. The main concern is that targets set for reconstruction

could be compromised and that the reconstruction programme may take significantly longer to complete than is targeted.

The main constraints on wood supplies include:

- ❑ lack of easily accessible wood supplies – wood is available in significant volumes, but not in simple retail supply chains that are readily accessible;
- ❑ the complex administrative system for buying and transporting timber makes timber procurement difficult, especially for inexperienced parties;
- ❑ lack of robust transport services and transport infrastructure;
- ❑ general lack of experience in NGOs and development assistance agencies with procurement of timber in Indonesia, makes it difficult for these organizations to secure timber.

Recommendations

The following recommendations are proposed to increase the availability of wood and other building materials for the reconstruction programme:

- ❑ develop a reconstruction timber supply strategy to facilitate access to wood supplies to support reconstruction. The reconstruction timber supply strategy needs to focus on meeting timber requirements specifically for the reconstruction programme over the period from 2006, 2007. It needs to include an analysis of potential timber supply sources including local NAD province, other provinces and imports. The strategy formation should be led by Badan Rehabilitasi dan Rekonstruksi (BRR) and involve all relevant Government of Indonesia institutions including the Ministry of Forestry and Dinas Kehutanan.
- ❑ policy formation regarding wood supply for reconstruction should be coordinated by BRR in its role as coordinator of the reconstruction programme and should involve all relevant Government of Indonesia institutions including BRR, Ministry of Forestry and Dinas Kehutanan.
- ❑ improve the capacity and performance of NGOs and development assistance agencies in timber procurement through awareness campaigns, training programmes and extension services. The implementation of communications, training and extension services is an activity that could be implemented through a coordinated effort led by BRR but in conjunction with Dinas Kehutanan and Ministry of Forestry.
- ❑ increase the investment of organizations in expertise and services for procurement of legal timber. This should be primarily the responsibility of individual Government agencies, NGOs and development assistance agencies.
- ❑ support initiatives such as the proposed BRR timber help desk/timber advisory facility to assist with procurement and identify and resolve problems. BRR is currently working to increase its capacity in this area and this could be supported by the work of FAO and other technical agencies.

- ❑ implement programmes and initiatives that create closer coordination between NGOs, development assistance agencies, BRR, Dinas Kehutanan, Ministry of Forestry, and timber industry groups.
- ❑ reduce the quantity of traditional wood-fired bricks being produced, because this building material is particularly damaging to the environment. This is a strategic decision that needs to be addressed by individual NGO/development assistance agencies.

The implementation of a reconstruction timber supply strategy should not be done in isolation of long-term industry development in NAD province. Therefore, the following recommendations are made regarding the rehabilitation of the wood production and processing sector in NAD Province:

- ❑ create an integrated forest sector plan for NAD Province that addresses both the wood supply needs of the reconstruction programme and the long-term forest management objectives of NAD province. The NAD Provincial Government, Ministry of Forestry and Dinas Kehutanan should develop this plan collaboratively but involve BRR to ensure the needs of the reconstruction programme are suitably addressed.
- ❑ create a wood industry development plan for NAD province that addresses wood processing options, secondary wood processing options, and coordination of wood supply with wood industry development. BRR and the respective line Ministries, the Ministry of Forestry and Dinas Kehutanan, could develop this plan collaboratively.
- ❑ implement monitoring and control programmes to ensure forest production and wood processing industries are based on sustainable and legal production. The responsibility for monitoring reconstruction materials supply lies with BRR although BRR assigns the task to other organizations. The responsibility for timber monitoring and control activities under “normal” (i.e. non-tsunami conditions) lies with the Ministry of Forestry and Dinas Kehutanan.

INTRODUCTION

This document constitutes the final report of the FAO Forest Products Consultant, contracted to provide assistance to Indonesia on wood supply issues relating to post-tsunami reconstruction through three contracts – totaling five months of work – carried out between March 2005 and February 2006.² The work was carried out under the Government of Finland-funded *Forestry Programme for Early Rehabilitation in Asian Tsunami-Affected Countries (OSRO/GLO/502/FIN)*.

The consultancy was carried out under the operational leadership of FAO's Emergency Operations and Rehabilitation Division (TCE), which is locally represented by the FAO Emergency and Rehabilitation Coordination Unit (ERCU) in Banda Aceh. The consultant worked under the technical guidance of the FAO Forestry Department and the technical supervision of the FAO Chief Technical Officer-Forest in Banda Aceh, with assistance from national and international staff of the FAO Forestry Office in Banda Aceh.

In implementing the consultancy, the consultant has worked in close cooperation with Badan Rekonstruksi dan Rehabilitasi (BRR), Dinas Kehutanan NAD, the Ministry of Forestry and other national and provincial Government of Indonesia officials at various levels, and in coordination with representatives of other international organizations, donor countries and NGOs.

This report includes:

1. an update of the supply and demand situation and recommendations for facilitating wood supplies;
2. recommendations for actions to be taken to address the short-term needs for procurement of wood for reconstruction, and issues relating to the long-term development of the forest sector in Aceh; and
3. a summary of technical information documents produced during the consultancy.

² The consultancies were carried out in March 2005; June and July 2005, with an additional consultancy covering November/December 2005 and February 2006).

ASSESSMENT OF WOOD SUPPLY AND DEMAND FOR RECONSTRUCTION

Impact of the tsunami and earthquakes in Aceh and Nias

The earthquake and subsequent tsunami on 26 December 2004 had a large impact on the population of NAD province. Nearly 4 percent of the population (165,000 people) was killed or are still missing while approximately 12 percent of the population was displaced (500 000 people) [Government of Indonesia (2005); BPS (2005)].

The earthquake damaged buildings and infrastructure throughout NAD province, while the tsunami affected coastal areas throughout NAD Province and parts of North Sumatra. Nias Island was also affected by the earthquake and tsunami. The worst affected areas in NAD Province were Banda Aceh, the northwest coast, and islands off the coast. The tsunami swept seawater and debris up to 5 kilometers inland and destroyed or damaged buildings, roads, ports, bridges, telecommunications, water and electricity systems, crops, irrigation, fishery infrastructure, factories, and food and fuel outlets. Trees and forests located along the coast were significantly damaged, although total damage was small relative to total forest resources in Aceh [CGI (2005)].

On March 28, 2005, an earthquake measuring 8.7 on the Richter scale occurred centered on Nias Island. The earthquake claimed the lives of more than 800 people, and left over 6,000 injured. No tsunami occurred after this earthquake, but houses, buildings, ports, bridges, roads and other infrastructure sustained considerable damage.

Effects on the population

The estimates of deaths, missing persons and displaced persons in Indonesia caused by the earthquake and tsunami are shown in Table 1.

Table 1: Estimates Of effects On Population Of Earthquake And Tsunami			
Deaths	Missing	Displaced and living in temporary shelter	Formerly displaced
128 645	37 063	209 822	298 849
1. Sources: Government of Indonesia (2005); BPS (2005)			

Prior to the tsunami, the population of NAD Province was estimated to be 4.4 million people. After the tsunami and earthquake, 3.75 percent of the population was dead or missing while approximately 11.6 percent of the population was displaced.

The estimated number of displaced persons, referred to as “pengungsi”, living in different forms of shelter is:

- ❑ 108 074 living in community barracks (51.51 percent).
- ❑ 71 628 living in temporary housing (34.14 percent).
- ❑ 22 695 living in tents (10.82 percent).
- ❑ 7 425 living in tents built around damaged houses (3.53 percent).

The estimated number of formerly displaced persons (“bekas pengungsi”) is 298 649. Formerly displaced persons are people who considered themselves to be displaced, post-tsunami, but for a variety of reasons no longer consider themselves so. The majority in this category may still require – or are eligible for – a permanent housing solution, but their need is not necessarily as pressing as that of pengungsi. The definition of “bekas pengungsi” is vague but includes:

- ❑ displaced persons who have moved in with family or friends and have permanent shelter; or
- ❑ displaced persons who have relocated and obtained permanent housing through their own means.

Effects on forests and forestry

The direct impact of the earthquake and tsunami on wider Aceh forest resources and tree crop assets was significant, although total damage was small relative to total forest resources in NAD Province. Degrees of damage can be summarized as follows:

- ❑ coastal trees, roadside trees, and coconut plantations suffered widespread damage;
- ❑ coastal mangroves in the tsunami damage zone were heavily damaged. However, the total area of coastal mangroves in the damage zone was relatively small³ and hence the total area of damaged mangrove was also correspondingly small⁴; and
- ❑ coastal forests outside of mangrove areas were also heavily damaged, especially on the west coast. The area of coastal forests pre-tsunami was estimated to be approximately 48 925 hectares and approximately 30 percent of this area (13 678 hectares) was damaged or destroyed [CGI (2005)]. These estimates of forest area and damage should be viewed as broad estimates only.

The large majority of coastal forest comprised secondary forests and village forests. The main production forests in Aceh are located inland and the damage to these was negligible.

³ The main areas of mangrove in Aceh occur on the southeastern coastline where tsunami damage was minimal. Only small areas of mangrove naturally occur on the west coast of NAD Province and only remnant areas occurred in the tsunami damage zone on the northeastern coastline, due to their displacement by coastal fish farming.

⁴ Personal comment, February 2006, Dr Russell Hanley, FAO Mangrove Consultant.

The flow-on impact of the earthquake and tsunami on forests and wood products has been large:

- the Aceh reconstruction programme requires large volumes of sawn timber, plywood, and other wood products. Wood is an important component of houses, boats, bridges, power poles, fencing materials, and other infrastructure;
- the reconstruction programme also requires large volumes of wood for fuel in manufacturing non-wood building materials. For example, one house lot of bricks will consume 6-9 m³ of fuel wood.

Effects on buildings and infrastructure

Estimates of damage to buildings and infrastructure have been obtained from the International Organization for Migration (IOM) report of tsunami damage in NAD Province [DPU (2005b)]. The IOM report is the most comprehensive assessment of damages available to date and provides estimates by type of structure, level of damage, and District. More detailed statistics from the IOM report are presented in Appendix 5 and Appendix 6.

Damage estimates for the Nias earthquake are not as precise⁵. Nias requirements are fundamentally different to those of NAD Province, because of the differences in damage profiles between earthquakes and tsunamis. Consequently, the number of totally-destroyed buildings is lower in Nias than in NAD Province, but the proportion of partially-damaged buildings is higher.

Table 2 provides an estimate of total damage to buildings and infrastructure in NAD Province and Nias.

Buildings		
Houses	140 880	51% destroyed, 17% sustained major damage
Health facilities	810	61% destroyed, 10% sustained major damage
School buildings	1 917	44% destroyed, 14% sustained major damage
Religious buildings	3 235	41% destroyed, 17% sustained major damage
Government buildings	1 669	65% destroyed, 11% sustained major damage
Markets/kiosks	1 490	72% destroyed, 9% sustained major damage
Infrastructure		
Arterial roads	920	20% destroyed, 38% sustained major damage
Neighborhood roads	2 161	21% destroyed, 21% sustained major damage
Provincial highways	603	38% destroyed, 14% sustained major damage
Bridges	2 404	63% destroyed, 20% sustained major damage

⁵ Figures for Nias housing damage were provided by UN HABITAT (2005). Damage level information for Nias is only available for the housing sector. It has been assumed that the same level of destruction occurred to all types of buildings as was documented for houses. For bridges on Nias, it is assumed that approximately 50% of damaged bridges suffered "major" levels of damage and the remaining bridges suffered only minor damage.

Organizations involved in reconstruction and rehabilitation

BRR⁶

The Rehabilitation and Reconstruction Agency (BRR - Badan Rehabilitasi dan Rekonstruksi) for Aceh and Nias was established by the Government of Indonesia to coordinate and oversee the rehabilitation and reconstruction of Aceh and North Sumatra until the end of 2009. BRR was established on April 16, 2005, and its mandate is defined by Regulation in Lieu of a Law (Regulation/Perpu) No. 2/2005 issued by the President of the Republic of Indonesia. On April 29, 2005, President Susilo Bambang Yudhoyono signed Presidential Regulation (Perpres) No. 34/2005 detailing the organizational structure and mechanism of the Agency.

BRR comprises three bodies:

- i. an Executing Agency (Bapel), headed by Kuntoro Mangkusubroto;
- ii. a high-level Advisory Board to guide the reconstruction strategy; and
- iii. an Oversight Board to monitor activities, handle public complaints, and conduct audits.

All three report directly to the President.

In 2005, BRR's priority was to clarify its mission, build its staff and develop a set of standard operating procedures to provide coordination, strategic leadership and quality control for the myriad activities being implemented by donors and NGOs. It established a review and approval process to ensure that projects are compatible with overall recovery priorities and requirements. It drafted policies and guidelines prescribing common standards and practices in key areas with a strong focus on anti-corruption. It also established an operations center to track donor projects and sought to set up new frameworks for donor coordination.

BRR has been given additional powers to implement housing reconstruction projects through direct contracting. The aim of the BRR housing project is to respond to gaps or poorly performing programmes, by assuming responsibility for those programmes or reassigning them to another agency. It also puts priority on engaging district government systems in the reconstruction by passing BRR's own funds to projects managed by provincial and district administrations. BRR will also use block grants to empower local governments to address their middle-level infrastructure needs, while providing necessary capacity building through a "learning-by-doing" approach.

BRR is directly involved in wood supply issues in several ways:

- BRR is responsible for implementing policies relating to materials supplies (including wood products) for reconstruction. Presently, a wood supply policy is in a development phase.
- BRR works with line ministries to coordinate activities that impact on reconstruction. Regarding forestry and timber supply operations, BRR liaises

⁶ Source for information on BRR: http://www.e-aceh-nias.org/oneyear/executivesummary_english.pdf

with the Ministry of Forestry, Dinas Kehutanan NAD, Customs Department, and the Transport Department.

- BRR monitors imports and donations of goods for reconstruction. This includes monitoring all timber imports and issuance of tax-exemption letters.
- BRR is actively involved in procurement of timber for its own construction programme and for other third parties. As at February 2006, BRR had investigated several potential sources of timber, but had not purchased any significant volumes of timber.

United Nations agencies

The United Nations (UN) provides a wide range of services and functions to the overall reconstruction programme. These services and functions are delivered by various UN agencies and specialist UN sponsored services. The UN is involved in a range of capacities including coordination of humanitarian programmes, as well as directly delivering relief work and supplies through various programmes.

In order to achieve strategic coherence across a broad range of multifaceted recovery programmes and activities, the *Office of the United Nations Recovery Coordinator for Aceh and Nias (UNORC)* and BRR, representing the United Nations and the Government of Indonesia respectively, signed a Memorandum of Understanding (MoU) on 30 November 2005. The MoU formalized the role the United Nations has assumed in maintaining capacity to respond to emergencies and to reach out effectively to communities on behalf of the Government – as the reconstruction and recovery phase progresses.

The main UN organizations mentioned in this report are:

- **UNORC** – the *Office of the United Nations Recovery Coordinator for Aceh and Nias* is responsible for facilitating strong coordination among the UN agencies, the international NGO community, and bilateral donors, in full and timely support of the Government's reconstruction and recovery efforts. Staffed by personnel from the UN Secretariat and various UN agencies, UNORC serves as the main point of contact between the UN system, BRR, and Provincial and District governments. UNORC aims to facilitate a unified United Nations system approach, to put into place structures for coordination at all levels, to minimize gaps in the response, and provide linkages and strategic policy that transcend all sectors;
- **UNIMS** – the *United Nations Information Management Service* is responsible for providing a range of information products and services to support humanitarian coordination in Aceh and Nias;
- **UN HABITAT** – the United Nations HABITAT has a programme for delivering up to 20 000 permanent housing units to the reconstruction programme. UN HABITAT also coordinates surveys to monitor shelter construction commitments and progress. It also co-hosts, with BRR, the Shelter Working Group, which facilitates coordination among UN and other international organizations and NGOs assisting with housing reconstruction.
- **UNHCR** – the *Office of the United Nations High Commissioner for Refugees* was initially involved in the tsunami relief effort through the provision of emergency shelter and related humanitarian assistance. The agency has

subsequently been involved in the procurement and distribution of timber to various organizations working in Nias.

- **WFP** – the *United Nations World Food Programme* initially supplied food to displaced and homeless persons. In mid-2005, UNWFP Shipping Services was created to provide shipping services for the distribution of reconstruction materials and basic port facilities.
- **FAO**: the *Food and Agriculture Organization of the United Nations* provides technical advice and support to the Government of Indonesia, other UN agencies and other organizations. FAO's input in the forestry sector includes a timber supply project and coastal zone management rehabilitation projects.
- **UNDP**: In Aceh and Nias, the *United Nations Development Programme* provides a broad range of programmes. The work of the UNDP Construction Boom Team has produced several studies on materials requirements for reconstruction including an analysis of brick needs and timber needs on Nias.

Non-Governmental Organizations

Donor/NGO groups timber buyers: the majority of building reconstruction will be conducted or directly funded by donor and NGO organizations. More than 150 NGO organizations are registered with BRR. Their intentions are mainly to fund and/or provide buildings for reconstruction. Appendix 6 provides a complete list of NGO's involved in reconstruction, their reconstruction commitments, and identifies progress to date.

Indonesian Timber Industry Groups: timber industry groups in Indonesia of significance to reconstruction include:

APHI: Indonesian Association of Forest Concession Holders.

ISWA: Indonesian Sawmilling Association

APKINDO: Indonesian Association of Plywood Manufacturers

APKIN: Indonesian Association of Timber Treatment Organizations

Revised wood demand estimates for reconstruction programme

Housing material needs

It is assumed that housing and infrastructural reconstruction needs roughly match the damage profile described in Table 2. There appears to be a growing consensus among concerned agencies as to the general level of housing needs. However, there remain some differences between estimates made by various agencies. Current estimates of housing needs made by key agencies, including FAO, are described below.

- FAO's revised assessment of housing needs, adopted directly from a survey conducted by the Public Works Department [Departemen Pekerjaan Umum (2005b)], estimates new permanent housing needs to be between 80 000 and

100 000 for NAD Province and Nias combined. A further 50 000 to 70 000 houses will require repairs.

- The UN HABITAT forecast for the reconstruction programme for NAD Province and Nias combined is 70 000 to 100 000 new permanent houses with 35 000 houses requiring repairs.
- UNIMS estimates between 80 000 and 110 000 new houses are required in NAD Province and a further 13 500 in Nias [UN IMS (2005)].
- For planning purposes, BRR estimates that 92 000 new homes are required in NAD Province and Nias. BRR logistics planning has assumed 150 000 additional homes will require repairs⁷.

As of January 2006, 118 organizations were committed to providing shelter to the reconstruction programme in NAD Province and Nias [UN HABITAT (2006)]. This includes commitments for the construction of 162 000 permanent houses and 26 000 temporary houses, and repairs to 18 000 houses (see Appendix 8 for a complete list).

Commitments to housing construction are considerably larger than estimated needs. However, the commitments for repair to damaged houses are below estimated needs. It is assumed that there are sufficient commitments to meet all needs of the shelter reconstruction programme, although priorities may need for some aid programmes to move from building new houses to repairing damaged houses.

Main alternative construction materials for housing

The main construction materials available for NAD Province reconstruction are bricks, concrete and wood. A brief discussion of each alternative material is provided below.

Brick housing

Brick is traditionally the preferred construction material in most of NAD province. Bricks are handmade locally from clay and fired in open wood kilns. Brick is perceived to be more durable, have better thermal properties and is more prestigious than other forms of construction materials.

Typical brick house construction uses structural pillars, spaced at approximately two to four meters and braced with beams at the top of the walls, and by window frames and doorframes. Bricks are used to fill the gaps between the pillars and then the walls are plastered with a layer of mortar to provide a smooth and waterproof finish. External walls usually comprise two layers of bricks while internal walls are typically constructed using one layer. Wood is sometimes used in supporting pillars and beams and almost always used for ring beams, windows, doors, door and window frames and roofing trusses. The volume of wood used in brick house construction in NAD Province is usually less than one cubic meter.

⁷ Personal communication, John Brady, Technical Advisor to the BRR for Transportation and Logistics, February 2006

Brick has several shortcomings as a construction material in the reconstruction process:

- ❑ brick construction is one of the most expensive building options;
- ❑ brick manufacturing capacity is limited to those areas where the raw materials for brick construction are available, e.g. Aceh Besar has a large brick manufacturing capacity, but Simeulue and Nias have none;
- ❑ the quality of locally produced bricks and grouting is quite low and these have relatively low strength properties; and
- ❑ bricks are difficult to transport, especially in NAD Province post-tsunami, because of the damage to land and sea transport infrastructure.

Assuming a standard 36m² house, the main bulk construction material needs for building a standard-sized brick house are estimated to be⁸:

- ❑ 10 000 bricks
- ❑ 3.96 m³ of concrete
- ❑ 0.99 m³ of sawn timber⁹
- ❑ 0.46 m³ of plywood

If the house is constructed using traditional wood-fired bricks, then house construction will indirectly consume large volumes of fuelwood during the brick kilning process. Fuelwood requirements for the producing 10 000 traditional wood-fired bricks are estimated to be 6-9 m³/10 000 bricks. These fuelwood usage estimates have been confirmed in independent interviews with several brick manufacturers in Banda Aceh.

Currently almost all brick construction uses traditional wood-fired bricks. However, several initiatives have been established that use more efficient brick kilning technologies or substitute other materials for bricks. These initiatives may eventually change fuelwood consumption rates in the brick industry, however no changes in techniques for making wood-fired bricks can be expected in the short term.

Concrete housing

Some participants in the rehabilitation and reconstruction programme are using concrete blocks and slabs as the main building material. The local perception of concrete is that it is inferior to bricks; a reputation earned in the past when the quality of locally made concrete blocks was commonly quite poor. Well-made concrete structures have several advantages over bricks:

- ❑ the basic components of concrete construction, cement and gravel, are readily available. The properties of this material are well known and fairly uniform. The basic building materials can be sourced at most locations and readily transported to remote areas;
- ❑ concrete usually has better strength properties and is more durable than locally made clay bricks;

⁸ Estimates of average brick usage have been derived from a UNDP study of brick demand and supply [UNDP (2006)].

⁹ See Appendix 2 for detailed volume calculations.

- ❑ the costs of concrete construction are usually less than brick construction.
- ❑ concrete blocks and slabs can be made on site. Local expertise and capacity for manufacturing concrete blocks already exists and the skills are easily learned and transferable. Furthermore there is no significant limitation on concrete block/slab manufacturing capacity when compared to bricks; and
- ❑ while bricks are generally preferred over concrete, the appearance and structural properties of concrete buildings is equal to or better than buildings made from local brick.

The basic design of concrete houses is usually similar to brick houses. A frame is built out of pillars and beams and then concrete blocks or slabs are used to fill in the frame. When the concrete walls are plastered with a layer of mortar the building is virtually indistinguishable from traditional brick construction. Wood usage is commonly lower in concrete buildings than brick buildings and is usually restricted to ring beams, windows, doors, and roofing trusses.

Assuming a standard 36 m² house, the main bulk construction material needs for building a standard-sized concrete-block house are estimated to be:

- ❑ 9.82 m³ of concrete
- ❑ 0.99 m³ of sawn timber
- ❑ 0.46 m³ of plywood

Wooden housing

Along with brick, wood is the most commonly used construction material in NAD Province. Brick houses are usually preferred to wooden houses, but this preference is not universal. For example, timber is the preferred building material in Nias and Simeulue for cultural and historical reasons and, even in mainland NAD Province, a significant proportion of people prefer timber for a variety of reasons.

In a wooden house, virtually all the main structural elements from the floors, walls and roof frames are constructed from wood products. Typically, a wooden house will have a frame constructed of dimension lumber, with floors and walls constructed from planking or plywood. The advantages of wood as a construction material are well known:

- ❑ Indonesia produces large volumes of construction lumber and it is normally readily available;
- ❑ wood is a cheap and versatile building material;
- ❑ skills required to construct in wood are readily available locally; and
- ❑ wood is generally preferred in flood-prone areas, because it is most suited for the construction of raised houses.

Assuming a standard 36 m² house, the main bulk construction material needs for building a standard-sized timber house are estimated to be:

- ❑ 3.96 m³ of concrete
- ❑ 3.64 m³ of sawn timber
- ❑ 0.46 m³ of plywood

Current material usage in houses

Survey estimates of the types of houses that were built in 2005 as part of the reconstruction programme are presented in Table 3 [UN HABITAT (2005b)].

TABLE 3: Reconstruction House Types					
Type of House	31 October 2005		31 December 2005		Weighted Average of Surveys
	Houses completed	Frequency %	Houses completed	Frequency %	Frequency %
Brick	4 050	67.5	12 012	79	75.7
Wood	1 800	30.0	1 673	11	16.4
Concrete	150	2.5	1 521	10	7.9
Total	6 000	100.0	15 206	100.0	100.0

The table indicates that brick is the most common building material used for house construction. The use of wood and concrete construction materials is low relative to brick.

Known market drivers can explain current building material usage patterns. Brick is the preferred building material for housing and, to date, there has been sufficient capacity to meet requirements. The low usage of timber matches known supply constraints, consumer resistance to timber construction, and difficulties in procurement. Concrete house construction is a relatively new phenomenon, but its use is increasing because of concrete's ability to substitute for brick, price and quality advantages over brick, increasing production capacity, and growing consumer acceptance.

Civil building material needs

The amount of building materials required for reconstruction of civil buildings has been assessed using data provided in the UNDP construction boom report [UNDP (2006)]. The UNDP report provides building requirement estimates for brick buildings only, but estimates for constructing civil buildings in wood and concrete block¹⁰ have been derived (refer Table 4).

Table 4: Building material requirements for civil buildings									
Type of Civil Building	Average building material requirements for different types of civil buildings								
	Brick building			Wooden building			Concrete building		
	Brick	Wood	Concrete	Brick	Wood	Concrete	Brick	Wood	Concrete
	Units	m³		Units	m³		Units	m³	
Health	10 000	1.45	3.96	0	4.10	3.96	0	1.45	9.82
Schools	200 000	29.00	79.20	0	82.00	79.20	0	29.00	196.40
Religious	100 000	14.50	39.60	0	41.00	39.60	0	14.50	98.20
Government	50 000	7.25	19.80	0	20.50	19.80	0	7.25	49.10
Markets	50 000	7.25	19.80	0	20.50	19.80	0	7.25	49.10

¹⁰ The wood and concrete material requirements for different types of civil buildings have been obtained by multiplying the average materials content of a house by the ratio of the number bricks in the civil building to that in a standard house (10 000 bricks). For example, an average market is assumed to use five times the volume of building materials as a standard house.

Boat building material needs

The timber volumes required for fishing fleet reconstruction are estimated to be 10 000 m³. The estimate is based on communications with an FAO boat-building expert¹¹. The general assumptions for boat building wood requirements are as follows:

- the total number of boats destroyed or severely damaged in the tsunami is estimated to be 5 000 to 7 000;
- the actual number of boats built in reconstruction is likely to be less than those destroyed and is estimated to be approximately 4 000;
- the average volume of timber needed to build a boat is estimated to be 2.5 m³; This equates to approximately 10 000 m³ for the total boat reconstruction programme; and
- the total volume of wood required for boat building represents approximately 2 to 3 percent of the total wood requirements for reconstruction.

While the volume required for boat building is relatively small, there are significant issues relating to boat building wood supplies:

- boat building has very specialist needs in terms of timber. Only a small number of species are suitable for boat building and only the best quality timber is suitable. Timber must be defect free, sapwood free, straight grained and properly dried;
- only a small proportion of total timber produced at any time is suitable for boat building.

The FAO boat-building expert observed that unsuitable timber has been used for a significant proportion of boats built in Aceh since the tsunami. The most pressing problem is related to the use of “wet” timber that twists out of shape as it subsequently dries, making the boat susceptible to leakage. In addition, widespread use of defective and sub-standard timbers has compromised the reliability and longevity of many of the boats built in the reconstruction programme. FAO estimates that up to 25 percent of boats built in some regions are not fit for fishing.

From FAO’s discussions with stakeholders, the inappropriate use of timber appears to be the result of several factors:

- a lack of knowledge about timber requirements for boat building;
- shortages of timber of correct species and timber qualities. Demand is so high that organizations have accepted inferior timber for their boat construction programmes; and
- general increases in the price of sawn timber making high quality timber unaffordable.

¹¹ Personal communications with Michael Savins, FAO Master Boat Builder.

Methodology for estimating total reconstruction wood demand

The following assumptions (as per FAO's revised assessment) were made in estimating wood demand for reconstruction:

1. Buildings and infrastructure damaged or destroyed by the Aceh tsunami and Nias earthquake will be rebuilt and repaired, including:
 - new permanent housing totaling between 80 000 and 100 000 units (Table 2);
 - between 50 000 and 70 000 houses will require repairs (Table 2); and
 - replacement and repair of damaged civil buildings and infrastructure (Table 4).
2. Average volumes of wood, brick and concrete building materials used in constructing an "average house and civil buildings", as described previously, were used for estimation of average building materials usage. A contingency of 20 percent was added to total wood usage to account for losses during the construction process.
3. Three wood construction scenarios are modeled:
 - i. the first scenario models the continuation of current building material usage trends;
 - ii. the second scenario models a high proportion of timber usage; and
 - iii. the third scenario models a low proportion of timber usage.

The scenario assumptions have been applied to houses and public buildings, but not to infrastructure or boats. These scenarios have been used to estimate the likely upper and lower bounds of wood demand:

- a. The "*Current trend*" scenario assumes that the current (low) use of timber is maintained. The current usage scenario assumes the following:
 - i. 16.4 percent of houses with wooden floors, walls and roof trusses;
 - ii. 75.7 percent of houses with brick walls, cement floors and wooden roof trusses; and
 - iii. 7.9 percent cement block/slab walls, cement floor and wooden roof trusses.
- b. The "*High level of wood construction scenario*" assumes that timber usage will increase. The high timber usage scenario assumes the following:
 - i. 60 percent of houses with wooden floors, walls and roof trusses;
 - ii. 20 percent of houses with brick walls, cement floors and wooden roof trusses; and
 - iii. 20 percent cement block/slab walls, cement floor and wooden roof trusses.
- c. The "*High level of concrete block construction*" scenario assumes timber usage stays approximately the same as currently (20 percent) and concrete block and slab construction becomes the main building material. The high concrete block usage scenario assumes the following:

- i. 20 percent of houses with wooden floors, walls and roof trusses;
 - ii. 20 percent of houses with brick walls, cement floors and wooden roof trusses; and
 - iii. 60 percent cement block/slab walls, cement floors and wooden roof trusses.
4. It is estimated that timber demand for bridge building will be 10 m³ per bridge. No estimate of cement requirements for bridges has been made.
5. Timber requirements for road construction have not been included in the estimate of wood demand.
6. The calculation of timber needs is derived by multiplying the average timber content of new buildings and structures (i.e. timber required to build a new building) by damage level factors. The damage level factors are described below:
 - 100 percent damage - requires 100 percent of the average timber content of the structure;
 - 75-100 percent damage - requires 75 percent of the average timber content of the structure;
 - 50-75 percent damage - requires 50 percent of the average timber content of the structure;
 - 25-50 percent damage - requires 25 percent of the average timber content of the structure: and
 - <25 percent damage - requires 10 percent of the average timber content of the structure.

Total wood demand estimates

Summary of the numbers of damaged structures, new structures required and repairs

Estimates of the number of structures by damage level are shown in Table 5.

Type of structure	Level of damage (% damage to structure)						Numbers of repairs and new structures	
	Number	<25%	>25%	>50%	>75%	100%	New	Repairs
	Houses	140 880	20 022	13 960	10 998	17 230	78 670	95 900
Health Facilities	810	122	86	59	63	480	543	267
Schools	1 917	426	251	253	232	755	987	930
Religious Buildings	3 235	771	466	307	458	1 234	1 692	1 543
Government Buildings	1 669	252	124	104	145	1 044	1 189	480
Markets/Kiosks	1 490	177	61	54	123	1 077	1 199	291

Total numbers of new and repaired structures have been derived by assuming that all structures sustaining 75 percent or more damage will be replaced.

Total reconstruction wood demand

Estimated materials requirements by three alternative scenarios for houses, civil building and infrastructure are provided in Table 6.

Table 6: Estimated total reconstruction materials needs for reconstruction (buildings and infrastructure)			
Type of construction material	Building material usage scenario		
	Current trend 75.7% brick buildings 16.4 wood buildings 7.9% concrete buildings	High wood use 20% brick buildings 60% wood buildings 20% concrete buildings	High concrete use 20% brick buildings 20% wood buildings 60% concrete buildings
Bricks (units)	1 084 000 000	286 000 000	286 000 000
Concrete (m ³)	633 000	735 000	1 070 000
Sawn Timber (m ³)	285 000	491 000	302 000
Plywood (m ³)	82,000	82,000	82 000
Fuelwood for brick kilning (m ³)	813 000	215 000	215 000
See Appendix 3 and Appendix 4 for detailed information on wood usage by materials usage scenario, type of building and region.			

In the early stages of the reconstruction programme, estimates of wood demand ranged from as little as 350 000 m³ up to 3 000 000 m³ for timber only. Over time, various estimates of wood requirements have converged.

- FAO's current estimates of combined volume requirements for sawn timber and plywood range between 367 000 m³ and 573 000 m³ for all building and infrastructure reconstruction, depending on assumptions about construction materials preferences;
- BRR estimates of combined sawn timber and plywood requirements, from its logistics planning study, are approximately 870 000 m³ for all building and infrastructural reconstruction; and
- Dinas Kehutanan estimates of combined sawn timber and plywood requirements are 450 000 m³. The Dinas Kehutanan wood requirements estimate applies only to housing construction.

Wood demand estimates indicated in this report are higher than earlier FAO estimates¹². This is mainly due to the addition of wood demand estimates for Nias reconstruction.

¹² Assessment of timber demand and supply for post-tsunami reconstruction in Indonesia; G. Kuru, 26 April 2005; available at www.fao.org/forestry/site/tsunami/en

Annual wood demand for reconstruction

The estimated demand for wood to fulfil reconstruction needs, assuming that 18 percent of building and infrastructure reconstruction has been completed in 2005 and that half of the remaining 82 percent will be completed in 2006 and the remainder (41 percent) will be completed in 2007, is shown in Table 7 [UN HABITAT (2005b)].

Table 7: Estimated building materials usage and needs for reconstruction in 2005, 2006 and 2007			
Type of construction material	Building materials usage scenario		
	Current Trend 75.7% brick buildings 16.4 wood buildings 7.9% concrete buildings	High Wood Use 20% brick buildings 60% wood buildings 20% concrete buildings	High Concrete Use 20% brick buildings 20% wood buildings 60% concrete buildings
Estimate of actual building material usage in 2005			
Bricks (units)	195 120 000	The current trend represents the estimated quantity of building materials used in 2005.	
Concrete (m ³)	113 940		
Sawn Timber (m ³)	51 300		
Plywood (m ³)	14 760		
Estimate of future annual building material usage for 2006 and 2007			
Bricks (units)	444 440 000	45 440 000	45 440 000
Concrete (m ³)	259 530	310 530	478 030
Sawn Timber (m ³)	116 850	219 850	125 350
Plywood (m ³)	33 620	33 620	33 620

Reconstruction wood demand is the wood requirement in addition to pre-Tsunami annual wood consumption in Aceh. Pre-tsunami wood demand was estimated in earlier FAO reports to be approximately 70 000 m³ of sawn timber and 61 000 m³ of plywood [Kuru (2005)].

It is expected that 2005 building materials usage trends are unlikely to continue in 2006 and 2007. The main reason for this expectation is that the traditional wood-fired brick sector appears to be approaching full production capacity. The continuation of traditional brick as the dominant building material will require doubling the current capacity of the brick manufacturing sector, which seems unlikely using current manufacturing techniques. Installing new technologies for brick preparation and kilning could improve brick manufacturing output and this is likely to have the additional benefit of using less fuel wood.

It is anticipated that wood usage will increase between 200-400 percent in 2006 and 2007, compared with volumes used in 2005. Wood is used in varying quantities in almost all building construction in the reconstruction programme. A further reduction in the proportion of wood used has been discussed in various forums, but there does not appear to be an alternative construction material available in large quantities and at competitive prices that can directly substitute for wood, regardless of building scenario. Wood is potentially available in large quantities both nationally and internationally. Consequently, meeting timber volume requirements is contingent on improving procurement and logistic capabilities of the organizations involved in reconstruction.

Nonetheless, increased use of alternative materials (other than wood and bricks) seems a very likely scenario. Concrete is the obvious leading candidate: the components of concrete (cement and aggregate) are widely available and cheap, they are readily transportable, without the administrative complications of timber procurement, and easy to use. In addition, there are a host of other alternative building materials – in addition the concrete – that are potentially available, including metal, plastic, and natural materials-based products.

Large-scale changes in building material usage are possible – and probably essential – to avert shortages in supplies of traditional bricks. The change may take the form of bricks manufactured using new technologies, increases in the use of wood products, or increases in concrete and other alternative building materials.

Timber prices

There is clear evidence of rapid price inflation in wood products in NAD Province. The results of informal monitoring of prices through discussions with several timber merchants since March 2005 are presented in Table 8.

Product	Price estimates for 2004	Price as at March 2005	Price as at February 2006
Class I	Rp 2.8 million/m ³	Rp 3.5 million/m ³	Rp 4.5 million/m ³
Class II	Rp 2.2 million/m ³	Rp 3.0 million/m ³	Rp 3.7 million/m ³
Class III	Rp 1.6 million/m ³	Rp 2.2 million/m ³	Rp 2.6 million/m ³

The table shows that there has been significant inflation in the price of timber products in NAD province between the time of the tsunami and February 2006.

Visits to timber yards reveal that the quality of wood being sold is deteriorating. It has been observed that both overall quality, and the quality of timber in each class, have declined. The decline in quality of graded timber is a type of hidden inflation, because higher grades must now be purchased (at higher prices) to achieve the same quality of product.

The increase in prices appears to be due to rapidly growing demand and shortfalls in supplies.

Wood supplies in NAD Province

NAD Province wood supply overview

NAD Province has significant forestry resources. Forestry statistics provided by Dinas Kehutanan for 2006 state that there are 4 173 330 hectares of government-managed forestlands in NAD Province, including 2 895 900 hectares allocated as non-production forests, 638 580 hectares allocated to permanent production forests¹³, and 638 850 hectares allocated for conversion to other land uses such as agriculture. The areas of forest by type and production status are shown in the Table 9¹⁴.

Classification	Description	Area (ha.)	Status
Hutan Suaka Alam	National park	1 051 400	Non-production
Hutan Lindung	Reserve forest within production forest estate	1 844 500	
Hutan Produksi Tetap	Permanent production forest	601 280	Production forest
Hutan Produksi Terbatas	Permanent production forest with limits ¹⁵	37 300	
Hutan Produksi Konversi	Production forest to be converted to other land uses	638 850	
Total		4 173 330	

Concession licenses have been issued for most of the permanent production forest area for sustainable forest management of natural forests and plantation forests, and to a significant proportion of conversion forests. The areas under forest concession licenses as of 2006 are shown in Table 10¹⁶.

Forest license type	Description	Area (ha.)	Production area (ha.)
IUPHHK	License to manage natural forest on a sustainable basis under Government silvicultural and harvesting guidelines.	581 549	404 611
HTI	License to convert natural forests to forest plantations and to manage plantation forest.	247 265	N/A
IUPHHK = Izin Usaha Pemanfaatan Hasil Hutan Kayu/Forest Timber Product Exploitation Permit HTI = Hutan Tanaman Industri/Industrial Plantation Forest			

While there are significant production forestry resources in NAD Province, and despite the licenses issued, there is currently only a relatively small volume of wood that can be harvested legally in the Province. There are several reasons for this:

- in 2001, the Governor of NAD Province declared a moratorium on all logging in IUPHHK forests. The stated reasons for declaring the moratorium were concerns about security and illegal logging activities;

¹³ Permanent production forest includes natural and plantation forests.

¹⁴ These forest area statistics are as at February 2006, and were provided by Dinas Kehutanan.

¹⁵ Hutan Produksi Terbatas usually refers to forest on steep land where production is controlled, e.g. limits on minimum tree diameter sizes and volume extracted per hectare.

- security concerns have also halted logging and forest management activities in HTI forest plantations; and
- legal logging activities continued in forest conversion areas until September 2005 when they were suspended.

Logging operations continue under special conversion licenses issued by Dinas Kehutanan NAD, but the expected volume from these sources is expected to be less than 50 000 m³ roundwood per year¹⁷.

In addition to commercial production forests, wood can also be supplied from other sources such as tree crop plantations (e.g., oil palms, coconut palms), village gardens and public forests. Immediately following the tsunami, FAO identified waste wood and tsunami debris as alternative wood sources, although very little of these resources will be utilizable now, more than one year after the tsunami.

Natural production forest resources in NAD Province

The Ministry of Forestry and Dinas Kehutanan NAD have recently reissued eight harvesting licenses in IUPHHK forests to enable harvesting to re-commence during 2006. However, as at February 2006, none of these concessions were producing logs. The concessions holding valid reissued licenses are shown in Table 11¹⁸.

Company	License area (ha.)	Forest area (ha.)	Annual production area (ha.)	Annual target volume (m³)
PT. Aceh Inti Timber Co. Ltd	80 804	48 938	2 166	94 699
PT. Alas Aceh Perkasa Timber	56 500	51 669	1 614	48 000
PT. RGM Lestari d/h PT. Bayben W	96 500	58 144	2 838	74 016
PT. Kruing Sakti	115 000	89 799	3 286	125 000
PT. Lamuri Timber	44 400	42 215	1 813	59 139
PT. Wira Lanao Ltd	55 925	39 591	1 670	63 125
PT. Kopentren Najmussalam	30 000	26 709	717	26 296
PT. Gruti	102 420	47 546	2 624	135 900
Total	581 549	404 611	16 728	626 175

The total annual allowable cut from the production forests (IUPHHK) is estimated to be approximately 625 000 m³ of roundwood per year. This volume of logs equates to approximately 312 500 m³ of processed wood products.

It is anticipated that between six and twelve months will be required before IUPHHK forests can be brought into full production:

- typically harvest-planning processes (RKT) take a minimum of 6 months to complete. The Ministry of Forestry may, however, choose to implement streamlined procedures that would shorten the requisite planning timelines.

¹⁷ Source: Workshop for Wood Supply, jointly hosted by NAD Dinas Kehutanan and FAO, held at the offices of Dinas Kehutanan NAD in Banda Aceh on 28 June 2005.

¹⁸ Direktorat Jenderal Bina Produksi Kehutanan, Departmen Kehutanan provided all production forest information as at 23 February 2006.

- limited logging could probably commence relatively quickly. Full scale harvesting operations in all operational areas will require development and upgrading of roads and other infrastructure, and the procurement and deployment of harvesting and transport equipment. Reactivation of IUPHHK operations would take several months and attaining full production would realistically take approximately 6 months, or more.

As of end of February 2006, only one IUPHHK concessionaire (PT. Kopentren Najmussalam) had confirmed to the Ministry of Forestry that it would commence production. NAD concessionaires are reportedly concerned that wood products generated from their industries will be unacceptable to participants in the reconstruction programme. Concessionaires are therefore unwilling to invest in the requisite machinery and plant to restart logging and wood processing because of this market uncertainty.

According to the Ministry of Forestry, concessionaires in NAD Province will be required to process the wood from NAD forest concessions within NAD Province, and then will be encouraged to supply building materials to the reconstruction programme. However, it should be noted that the Ministry of Forestry has, at present, no legal authority to require that production from NAD Province forests be used specifically for the reconstruction programme.

Consequently, it seems unrealistic to expect that IUPHHK production will provide significant volumes of timber from production forests for the NAD Province and Nias reconstruction programme in 2006. **Therefore, it will be essential to source timber from other sources to meet most of the needs for the NAD Province and Nias reconstruction programme during 2006, and perhaps 2007.**

Forest plantations in NAD Province

Company	Group	Licensed area (ha.)	Planted area (ha.)
PT. Aceh Nusa Indrapuri		110 000	29 946
PT. Aceh Swaka Wana Nusa Prima		7 050	
PT. Rimba Penyangga Utama		6 150	
PT. Rimba Timur Sentosa	Raja Garuda Mas	6 250	
PT. Rimba Wawasan Permai		5 200	
PT. Tusam Hutani Lestari	Nusantara Energi	97 300	23 706
PT. Gunung Medang Utama Raya Timber		7 300	
PT. Mandum Payah Tamita		8 015	
Total		247 265	53 652

Approximately 54 000 hectares of forest plantations have been established in NAD Province¹⁹. The two main plantation species are *Acacia mangium* and *Pinus merkusii*.

¹⁹ Source for license areas: Personal communication, Dinas Kehutanan (2005)
Source for planted areas: Barr (2000)

During field trips, areas of forest plantations were viewed from the roadside and many of these areas contained mature pine of good size and form that would be suitable for production of sawn timber. However, most of these plantations of large mature trees appear to be part of conservation reserves and not available for production purposes. Most of the plantations in NAD province are pulp plantations, which will yield small volumes of construction quality sawn timber, but mostly logs suitable only for chipping.

Another potential use of plantation wood is as fuelwood for brick manufacturing. This would be mainly be a short-term measure to meet potential fuelwood shortages and may require subsidization to increase economic attractiveness.

Dinas Kehutanan NAD could not provide information on the area age-class distribution of the forest plantations, or on likely yields. Estimates of standing stock and potential sawlog volume are as follows:

Plantation area: 53 652 hectares

Standing stock: 3 500 000 m³

Fuelwood volume: 3 250 000 m³

Sawlog volume: 250 000 m³

These estimates of volume are based on an average plantation age of 6.5 years (age range of 5-8 years), a mean annual increment of 10 m³/ha/year, and a ratio of sawlog to fuelwood/chip log volume of 1:12 (7 percent). These estimates are conservative, but not unrealistic based on the experiences of pulp and paper companies in other locations throughout Indonesia.

Other sources of wood supplies in NAD Province²⁰

An earlier report of the consultant²¹ identified five potential sources of wood supply other than production forests:

1. **Conversion forests** are defined as forests managed as part of the Government estate and targeted for conversion to forest plantation or agricultural uses. Conversion forests include approximately 247 000 hectares of HTI conversion forest for plantation development and 639 000 hectares of land targeted for conversion to non-forestry uses. The potential volume from these forests is large, but the current Ministry of Forestry policy is that these forests should remain within the natural forest estate with only limited conversion for community plantation development. The total volume of logs derived from this resource is estimated to be only 50 000 m³ per year.
2. **Public forests** are defined as land that falls outside the Government managed forest estate, but that is planted with various trees, including bamboo, from which timber is the main product. There are 317 444 hectares of public forests in NAD Province –[Baden Pusat Statistik (2003)]. Statistics do not differentiate between

²⁰ Source for conversion forests: Personal communication, Dinas Kehutanan (2005). Source for all other forests: Baden Pusat Statistik (2003).

²¹ Kuru, April 2005.

tree plantations and bamboo groves. The volume of wood and wood products that can be sourced from these forests is not known.

3. **Village garden trees** are trees grown in home gardens and village areas, often producing fruit, fodder or shade, from which timber is a secondary product. There are a variety of village trees that are utilized for their timber including *Artocarpus heterophyllus* (jackfruit or nangka), *Casuarina equisetifolia*, *Swietenia macrophylla* and bamboo.
4. **Plantation crops** from which timber is a secondary product. The main types of plantation crops in NAD Province with potential to generate wood products are rubber trees and coconut palms. The potential volumes from plantation crops are difficult to assess, but an estimate of 10 000 m³ is not unrealistic, most of which is likely to be sourced from coconut.
5. **Tsunami debris**, including intact and broken trees, logs and processed wood products.

In the time elapsed since the tsunami, the role that alternative wood supplies are playing in the reconstruction has become relatively clear.

- Due to supply shortfalls and high prices, the public is utilizing easily accessible trees of all types for timber. Significant volumes of low quality, alternative species prevalent in timber yards are evidence of this trend. Discussions with timber merchants suggest perhaps half of current locally-produced volumes come from public forests and village gardens. If this anecdotal evidence is correct, then approximately 50 000 m³ of timber would have come from these sources in 2005. However, there is significant doubt about the long-term sustainability of this resource.
- There is some use of coconut wood for beam and pillar construction and there is opportunity to promote further use of coconut. NAD Province has a large resource of mature coconut plantations and use of coconut wood is supported by both Dinas Kehutanan and the Ministry of Forestry. Processing coconut is more difficult than many species because it is dense and hard and the timber requires treatment. The major challenge would be to deploy processing capacity that can produce large volumes of sawn and treated timber from this resource.
- Assessments of damage to the agricultural sector by FAO consultants, estimated that approximately 25 000-30 000 hectares of rubber plantations existed in NAD Province, of which substantial areas were mature or over mature. Use of rubber wood is unlikely, as the utilization of the timber requires a highly developed and efficient supply chain²².
- Accessible waste wood and tsunami debris has been utilized in the last year. A significant volume of debris around large towns and cities has been collected

²² Rubber wood logs need to be processed and sap stain treated within 24 hours of felling. Furthermore, rubber is highly sought after for furniture manufacture and other high end uses and its use as construction timber would be highly wasteful.

and utilized for brick kilning. There are indications that most of the accessible debris has been used or disposed of.

- Large volumes of waste wood and tsunami debris still appear to exist in remote rural areas, especially on the west coast of NAD Province. The large majority of un-utilized wood debris has either spoiled or cannot be economically harvested for kilning because of its remote location, and access and labour constraints. There may still be a case for harvesting fuelwood in remote areas to alleviate the environmental impacts of brick kilning. However, this can only realistically be done on a large-scale with heavy machinery, using professional contractors, and within a structured and efficient logistics framework.

Sawmill capacity in NAD Province

Sawmills are presently the only primary wood processing facilities that are actively operating in NAD province. A pulp mill and a plywood mill have both been mothballed for several years and currently are not producing processed product.

Dinas Kehutanan NAD has provided an unpublished list of businesses holding primary forest products processing licenses. A summary of the licenses issued by Kabupaten is shown in Table 13.

No.	Kabupaten	Licensed capacity (m ³ logs/year)
I	ACEH BESAR	20,840
II	PIDIE	10,700
III	BIREUN	900
IV	ACEH TENGAH	5,600
V.	ACEH UTARA	3,650
VI.	ACEH TIMUR	5,450
VII.	ACEH TAMIANG	9,300
VIII.	ACEH TENGGARA	21,532
IX.	GAYO LUES	1,500
X.	ACEH JAYA	5,700
XI.	ACEH BARAT	3,300
XII.	NAGAN RAYA	9,400
XIII.	ACEH BARAT DAYA	6,700
XIV.	SIMEULUE	8,200
XV.	ACEH SELATAN	5,300
XVI.	ACEH SINGKIL	69,300
	TOTAL CAPACITY	187,372

The total capacity of legally issued milling licenses in Banda Aceh is 187 000 m³ of logs – equivalent of approximately 93 000 m³ of sawn timber. It is anticipated that actual legal sawmilling capacity may be an over-estimate for several reasons:

- ❑ licenses specify the maximum production allowable and the actual production of the mills is often less than the licensed quantity;
- ❑ not all licenses may be activated; and
- ❑ licenses were issued in 2005, but the legal log supply has reduced dramatically in the past 6 months, with the closing of conversion forest harvesting operations resulting in the closure of some mills.

Even at full capacity, there is currently a lack of wood processing capacity in NAD Province to meet the needs of the reconstruction programme. At full capacity, the sawmilling industry could supply “normal” annual timber consumption of 70 000 m³ of sawn timber, with a residual of only 23 000 m³ being available to meet reconstruction requirements of 117 000-220 000 m³ per year in 2006 and 2007. This implies an annual sawn timber deficit during the reconstruction programme of 93 000-178 000 m³.

The current licensed sawmill capacity in NAD provides only 30 percent of the processing capacity required to process 626 175 m³ of logs that should be expected to come from concession areas if the concession areas were reactivated. In practice, concessionaires would be expected to create their own processing capacity. It would likely take a minimum of one year to create sufficient capacity to process 626 175 m³ of logs through reactivation of closed mills and creation of new processing capacity.

If logging concessions in NAD Province were reopened soon, most of the harvested logs would have to be sent outside of the province to be processed since local processing capacity is insufficient. The issues of processing NAD logs in other provinces include:

- ❑ increased costs of transporting logs to other provinces;
- ❑ difficulties in separating legally produced logs from the illegal trade of logs to other provinces; and
- ❑ loss of revenues and employment to the province.

Timber treatment requirements in NAD Province

Increasing local supplies of timber from plantations and other alternative sources will require the creation of timber treatment capacity. Major local species such as *Pinus merkusii*, coconut, rubber wood and many species of community trees require treatment to be durable enough for construction purposes.

Dipping/immersion plants for chromated copper boron (CCB) and chromated copper fluoride (CCF) treatment²³ are relatively cheap and easy to establish. Dipping allows limited penetration of the CCB and CCF preservative chemical into the timber and will usually provide adequate protection against termites and borers to internal timbers that are used above ground and protected from wetting and leaching. Examples of suitable usage of CCB and CCF dip treated timber include roofing timber and internal wall frames.

²³ CCB and CCF are currently the only chemical treatments that can be applied to timber in Indonesia.

Pressure treatment plants can provide a higher level of protection than dipping. Pressure treated CCB and CCF timber would be suitable for external and above ground uses, with moderate levels of leaching such as external wallboards as well as for internal uses such as internal wall frames and roof trusses. Pressure treatment plants have the drawback of being more expensive, slower, and with lower capacity than dipping plants.

A table of potential wood supplies in NAD province is shown in Table 14.

Summary of wood supplies in NAD Province

Resource	Production forest area (ha.)	Maximum annual volume: sawlogs	Maximum annual volume: sawn timber
IUPHHK	404 611	626 175	313 000
Hutan Konversi to community plantations	638 850	50 000	25,000
HTI Plantations	53 652	100 000	50 000
Coconut		20 000	10 000
Village forests ²⁴		20 000	10 000
Total		816 175	408 000

However, actual current timber supply in NAD province for reconstruction is restricted to:

- harvesting in Hutan Konversi areas (25 000 m³ sawn timber/year);
- Village/Public forests (10 000 m³ sawn timber/year); and
- illegal logging activities (unknown volume from this source).²⁵

An additional constraint is that maximum capacity of the sawmill sector in NAD province is only 187 000 m³ of logs, equivalent to producing 93 000 m³ of sawn timber. There is currently no plywood production in Aceh. Additionally, timber treatment facilities will be required if timber from plantations, coconut and other alternative species are to be used in the reconstruction programme. The required timber treatment capacity for this purpose is estimated to be up to 70 000 m³ of sawn timber.

Wood supplies from outside NAD Province

At least over the short term, it seems evident that wood for reconstruction will need to be sourced from outside of NAD Province – from either other Indonesian provinces or imported from other countries.

²⁴ It is anticipated that this resource is being rapidly depleted and will not provide large volumes in the long term.

²⁵ The high demand for timber for reconstruction and the immediate lack of the domestically produced supplies is likely to encourage illegal logging of timber within Aceh unless either timber supplies can be found from outside the province to meet the shortfall or there is increased use is made of timber substitutes.

Wood supplies from other provinces in Indonesia²⁶

Total roundwood production in Indonesia is estimated at approximately 60 million m³ per year. However, the official legal production of roundwood is significantly less than this total. The main sources of sawn timber in Indonesia are North Sumatra, Riau and Jambi in central Sumatra, Kalimantan and Papua. In principle, there should be ample wood supply to meet requirements of the reconstruction programme.

No hard data has been obtained on volumes of timber currently being purchased from Indonesian provinces for the reconstruction programme. However, it is obvious that timber is brought into NAD and Nias from other provinces through several supply routes. Many NGOs purchase through local merchants, some of which are procuring timber from other provinces. Other NGO's are procuring wood from other provinces through agents, most of whom appear to be based in Medan. No NGOs are believed to be buying directly from timber industries in other provinces, however BRR is negotiating directly with mills to supply its construction programme.

Current constraints on supply of domestic timber from outside NAD province include:

- timber supply in North Sumatra is tightening and it appears that timber is difficult to purchase there. This tightening of supply coincides with increases in policing of timber transport and several high profile arrests of timber traders.
- timber supply in Riau and Jambi is also tightening and it appears that timber is difficult to procure from these provinces. The main cause of timber shortages in central Sumatra appears to be severe wood supply shortages in the pulp and paper sector. High pulp prices combined with dwindling supplies mean that demand for logs in the pulp sector is creating shortages of logs for sawn timber production.
- Large volumes of sawn timber are available in Kalimantan and Papua. However, procurement from industries in these regions requires expertise in local wood procurement and also requires buyers to commit to forward ordering of large volumes of timber. Large-scale forward ordering is necessary, because mills need to pay upfront the costs of production and distribution.

Wood supplies from imports

Overview of timber importing

The global volume of imported wood available for reconstruction is virtually unlimited and well in excess of reconstruction demand. The main supply sources to date have been Malaysia (plantation grown *Acacia mangium*), USA (mixed softwood species), and Australia and New Zealand (*Pinus radiata*).

²⁶ Estimates for national production are drawn from several sources. See Kuru (2005) for full list of sources.

Procedures for importing timber for reconstruction were clarified in February 2006 in a letter from the Minister of Forestry [MOF (2006)]. In issuing the letter, the Minister tacitly indicated that timber importing for humanitarian purposes in NAD and Nias is allowed, provided importers meet the requirements for customs declaration and transport documentation.

Timber imports from outside Indonesia only commenced in December 2005 after many aborted procurement attempts. As at February 2006, several organizations have imported small volumes of timber. These organizations include World Wildlife Fund, British Red Cross, Aceh Reconstruction Consortium, GXG Asia Sdn BDH, and OXFAM. The International Federation of Red Cross Organizations (IFRC) has plans to commence a large timber import programme of 20 000 m³ for the temporary housing project.

To date, all imported timber has arrived via the Port of Medan (Belawan Port). This timber has then been trans-shipped by road and barge to its final destinations. No significant barriers to importing have been encountered, although small administrative problems have sporadically occurred. Generally the problems have been associated with officials unaware of the requirements for imported timber and have been quickly resolved through consultation between the importers, BRR and the relevant agencies.

In many cases, NGOs find it easier to import timber than buy from domestic suppliers. Reasons for ease of importing include:

- overseas suppliers are better equipped to respond to NGO tender procedures than domestic companies;
- imported timber can be bought in large quantities, according to simple and transparent grading rules. Usually only one species is being purchased at one time and the timber is of known durability and structural performance. This is generally not the case with domestic timber; and
- buying local timbers requires a good knowledge of numerous local tropical species and their properties. Buying treated imported timber removes the complexities of species-based durability.

However, procurement of imported timber still requires knowledge of timber and expertise in wood procurement. Buyers also generally need to commit to forward ordering of large volumes of timber.

It is recommended that all softwood imports be suitably chemically treated to provide resistance to fungal and insect attacks. The requirement for treatment of softwood species is not universal, but non-treatment of imported softwoods needs to be considered on a case-by-case basis.

Strategic Issues for wood supplies for the reconstruction programme

Wood supply-demand balance in NAD Province

The key aspects of the wood supply-demand equation in NAD Province can be summed up as follows:

- ❑ demand for building materials is currently in excess of local supply;
- ❑ supply lines are tenuous and fragile.
- ❑ wood demand exceeds the legal supply capacity in Aceh due to the construction boom and declining supplies of legal timber;
- ❑ expansion of local timber supplies is possible, but large increases in supplies are not realistic until 2007;
- ❑ lack of wood products, especially sawn timber, is constraining the construction programme;
- ❑ immediate lack of wood supplies is likely to encourage illegal logging of timber within Aceh;
- ❑ to date, wood has proved to be difficult to procure from outside of NAD and Nias, both from other Indonesian provinces and imported from other countries. Lack of expertise and experience among NGOs/development assistance agencies in timber procurement has contributed significantly to the problem
- ❑ brick production in NAD appears to have reached full capacity;
- ❑ concrete is the most readily available building supply and seems to be the building material where capacity can increase most easily and most rapidly.

Nonetheless, while progress is slow, the reconstruction programme is progressing and a significant number of buildings are being built and repaired. Unfortunately, many NGO/development assistance agency construction programmes appear to be foundering and difficulty in procuring sufficient building materials appears to be one of the root causes of the malaise. However, even if several programmes fail, there are still sufficient NGO/development assistance agency commitments to the reconstruction programme for all building needs to be met.

Procurement difficulties are being experienced at a time when the reconstruction programme is still in its early phases. Wood supply shortages were being experienced in 2005 when only 12 000 houses had been built. The target for the 2006 programme is for an additional 80 000 houses to be built, which is a seven-fold increase in material requirements.

It is highly unlikely that the reconstruction will founder completely because the factors creating supply difficulties will ease over time and many organizations will improve their procurement performance. The main concern is that targets set for reconstruction could be compromised and that the reconstruction programme may take significantly longer to complete.

Current constraints on wood supplies for reconstruction

1. Lack of easily accessible wood supplies

There are significant problems in accessing timber from within NAD Province as well as from other provinces in Indonesia and abroad. Supply problems mainly relate to very weak supply chains from areas where timber is available to NAD province.

2. Lack of processing capacity in NAD Province

The current log processing capacity in NAD province is insufficient to meet the timber needs of the province during the reconstruction period. There is an estimated annual sawn timber deficit (total requirements above local processing capacity) of between 93 000 to 196 850 m³ for 2006 and 2007. The sawmilling industry provides only 30 percent of the processing capacity required to process projected increased volumes of logs that would be available if concession areas were reactivated.

3. Transportation issues

Transport infrastructure problems were highlighted in two previous FAO reports as potential constraints on reconstruction because of difficulties in delivering materials and supplies.

It is clear that transportation and logistics problems have constrained the reconstruction programme. Roads and transport infrastructure were significantly damaged by the tsunami and remain unsuitable for large volumes of heavy traffic. There are continuing problems in NAD Province with road deterioration and bridge collapses. One of the consequences is that the reconstruction programme is unevenly spread and is most developed wherever there are good roads and access.

However, there have been significant developments in the area of transport infrastructure redevelopment these should alleviate some of the transport problems in the future:

- UNWFP Supply Services are implementing a programme of port development in NAD province aimed specifically at enabling material deliveries to strategic locations throughout NAD Province and Nias;
- commercial services have commenced for delivery of timber and other building materials between selected ports in NAD Province and Nias; and
- a roading programme has commenced to upgrade road links on the west coast, however, this will take a number of years to complete.

4. Administrative constraints

Administrative procedures for buying and transporting wood are more complex in Indonesia than in many other countries. NGOs/development assistance agencies have found the procedures difficult to understand and this has hindered their wood

procurement activities. This is largely the result of NGOs/development assistance agencies having inexperienced staff who have limited knowledge of Indonesian administrative procedures for timber procurement.

The Government of Indonesia institutions have been supportive of the reconstruction process. Emergency regulations have reduced and simplified compliance procedures. BRR has set up divisions to assist NGOs/development assistance agencies in areas of importing and anti-corruption.

However, supply strategies are dependent on the relevant institutions, NGOs and agencies continuing to work together in achieving objectives of the rehabilitation programme.

5. Procurement practices

Timber procurement is more problematic than procurement of other building materials. The materials are highly variable in structural performance and durability and procurement requires a good working knowledge of species attributes and grading systems. The trade is governed by complex regulations. The trading structures and supply chains in Indonesia are less developed than in many countries.

Many of the timber supply difficulties are a direct result of inexperience in timber procurement and inappropriate procurement practices. There are numerous examples where procurement procedures have failed to supply timber of the right quantity and quality and within the required timeframe:

- many organizations continue to rely on local timber merchants and sawmills to supply all their timber needs when in many cases the local capacity to supply is clearly insufficient;
- many organizations commit to delivery timelines in tenders that cannot be met by timber suppliers. Large orders, both domestic and international, require a lead-time of 10-12 weeks whereas the expectation in many cases has been delivery times in days;
- many organizations prepare tenders that are too small. Any order for timber from outside of NAD province should be at least 500 m³;
- many organizations prepare tender documents that are too complex and inflexible;
- many organizations prepare timber specifications with unusual timber dimensions. Wherever possible, tenders should specify standard sizes for the target supply source; and
- many organizations prepare tenders that specify non-standard timber industry terms of trade. Large domestic orders should include a facility to pay a deposit. Large international orders should require payment via letter of credit.

Recommendations regarding wood supplies

Recommendations have been prepared with regard to wood supply. These include a mix of actions addressing::

- Short-term needs for procurement of sufficient wood and other building materials to meet building needs so that reconstruction can proceed unhindered by supply shortages.
- Long-term needs for planning and implementation of sustainable forest management and timber industry activities in NAD province.. FAO recommends against lifting the logging ban in natural forests (and also significantly increasing wood production from HTI and IPK lands) in NAD Province until sound forest management plans and effective monitoring and control systems are in place [FAO (2005)].

The key recommendations are:

- develop a reconstruction timber supply strategy to facilitate access to wood supplies to support reconstruction. The reconstruction timber supply strategy needs to focus on meeting timber requirements specifically for the reconstruction programme over the period from 2006, 2007. It needs to include an analysis of potential timber supply sources including local NAD province, other provinces and imports. The strategy formation should be led by Badan Rehabilitasi dan Rekonstruksi (BRR) and involve all relevant Government of Indonesia institutions including the Ministry of Forestry and Dinas Kehutanan.
- policy formation regarding wood supply for reconstruction should be coordinated by BRR in its role as coordinator of the reconstruction programme and should involve all relevant Government of Indonesia institutions including BRR, Ministry of Forestry and Dinas Kehutanan.
- improve the capacity and performance of NGOs and development assistance agencies in timber procurement through awareness campaigns, training programmes and extension services. The implementation of communications, training and extension services is an activity that could be implemented through a coordinated effort led by BRR but in conjunction with Dinas Kehutanan.and Ministry of Forestry.
- increase the investment of organizations in expertise and services for procurement of legal timber. This should be primarily the responsibility of individual Government agencies, NGOs and development assistance agencies.
- support initiatives such as the proposed BRR timber help desk/timber advisory facility to assist with procurement and identify and resolve problems. BRR is currently working to increase its capacity in this area and this could be supported by the work of FAO and other technical agencies.

- implement programmes and initiatives that create closer coordination between NGOs, development assistance agencies, BRR, Dinas Kehutanan, Ministry of Forestry, and timber industry groups.
- reduce the quantity of traditional wood-fired bricks being produced, because this building material is particularly damaging to the environment. This is a strategic decision that needs to be addressed by individual NGO/development assistance agencies.

The implementation of a reconstruction timber supply strategy should not be done in isolation of long-term industry development in NAD province. Therefore, the following recommendations are made regarding the rehabilitation of the wood production and processing sector in NAD Province:

- create an integrated forest sector plan for NAD Province that addresses both the wood supply needs of the reconstruction programme and the long-term forest management objectives of NAD province. The NAD Provincial Government, Ministry of Forestry and Dinas Kehutanan should develop this plan collaboratively but involve BRR to ensure the needs of the reconstruction programme are suitably addressed.
- create a wood industry development plan for NAD province that addresses wood processing options, secondary wood processing options, and coordination of wood supply with wood industry development. BRR and the respective line Ministries, the Ministry of Forestry and Dinas Kehutanan, could develop this plan collaboratively.
- implement monitoring and control programmes to ensure forest production and wood processing industries are based on sustainable and legal production. The responsibility for monitoring reconstruction materials supply lies with BRR although BRR assigns the task to other organizations. The responsibility for timber monitoring and control activities under “normal” (i.e. non-tsunami conditions) lies with the Ministry of Forestry and Dinas Kehutanan.

TECHNICAL INFORMATION DOCUMENTS PRODUCED

Overview of technical documents

One of the aims of the FAO forestry assistance programme is to facilitate supply of timber through the provision of technical advice. In line with this aim, several documents have been prepared to clarify technical issues relating to wood supply including:

- Information Note - Timber Procurement
- Information Note - Timber Usage
- Information Note - Timber Legality
- List of timber suppliers.

Additional information notes have been prepared to describe administrative procedures for importing timbers, and administrative requirements for transporting both domestically produced and imported timber.

The documents went through a thorough preparatory and review process including:

- initial preparation of draft documents;
- presentation of draft documents in several forums to Government of Indonesia, UN Agencies and NGO's. Feedback was obtained and incorporated in draft documents;
- focused consultation with interested parties within selected NGOs;
- peer review by technical divisions within FAO;
- peer review by project national staff; and
- editing and preparation of formatted documents by FAO publications staff in Banda Aceh.

The documents are presently in final draft form and awaiting final clearance and publication. The documents will be published in hardcopy and also distributed through the FAO website.

Information Note - Timber Usage

The *Information Note - Timber Usage* was prepared to assist in proper specification of wood products in ordering timber, so that the timber procured is fit for purpose.

A lack of suitable local standards for timber usage, especially timber grading rules for construction purposes, was identified as a major technical problem for participants in the reconstruction programme. Grading rules specify required strength and durability properties as well as structural and morphological attributes of timber required to attain those properties. Current local standards do not provide sufficient information that is generally needed for procurement from a wide range of local, national and international sources. For instance:

- the Minister of Resettlement and Infrastructure has issued a decree concerning technical specification for homes [MRI 2002]. The decree deals with building design and not with properties of timber materials utilized in construction.
- the Minister of Public Works has prepared a building code for the Aceh and Nias reconstruction programme. The building code deals with building design, but not with properties of timber materials utilized in construction[DPU (2002)].
- the local timber grading system classifies timbers into 3 usage classes. These grading rules are appropriate for people experienced in local timber trading. However, the rules probably don't provide people inexperienced in local timber trading with a level of detail necessary for efficient timber procurement purposes, and are especially inadequate for procurement from other provinces and international procurement.

The Information Note - Timber Usage provides information on timber usage with regard to:

- timber grading;
- use of local timber species;
- strength and durability classification;
- durability classification;
- specification of standard timber dimensions;
- visual grading guidelines;
- summary of grading requirements for structural timbers;
- allowable timber treatments in Indonesia; and
- classification of treatments by level of protection and hazard levels.

Information Note - Timber Procurement

The *Information Note - Timber Procurement* was prepared to facilitate procurement of timber. Wood procurement as defined here includes preparation of specifications and bills of quantity, timber ordering and purchasing, and distribution and delivery. The rationales for preparing timber procurement guidelines were that:

1. wood product specifications define product attributes (both required and prohibited) to ensure that the product supplied is fit for purpose;
2. accurate wood product specifications facilitate the exchange of goods and services through the elimination of technical barriers to trade. Clear product specifications help buyers locate products in the market and simplify the process of procurement; and
3. clear and appropriate procedures for timber procurement ensure that the correct products are purchased, that goods are handled appropriately, and are delivered on time and in the best possible condition.

The *Information Note - Timber Procurement* provides information or recommendations on timber procurement with regard to:

- ❑ timber procurement planning;
- ❑ formulation of timber legality policy;
- ❑ transport documentation requirements for domestically-produced wood;
- ❑ timber importing procedures;
- ❑ transport documentation requirements for imported wood;
- ❑ preparation of specifications and bills of quantities;
- ❑ specification of timber dimensions; and
- ❑ specification of timber imports from selected countries.

Information Note - Timber Legality

The *Information Note - Timber Legality* was prepared to clarify what constitutes legal timber in the Indonesian context. The guidelines are based around a legality standard prepared by The Nature Conservancy (TNC) in 2004 [TNC (2004)].

The *Information Note - Timber Legality* should help buyers to differentiate between legally- and illegally-produced Indonesian timber products. Mills can also be audited and monitored against the TNC standard.

The *Information Note - Timber Legality* provides information on timber legality with regard to:

- ❑ overview of timber legality in Indonesia;
- ❑ definition of levels of legal compliance;
- ❑ description of legality principles;
- ❑ description of legality criteria; and
- ❑ legality guidance notes.

Summary of timber importing procedures

FAO is currently preparing detailed technical information on procedures for customs clearance. In summary:

1. the importer submits a letter (in English or Bahasa Indonesia) with the following information to *Tim Terpadu* (a division of BRR) requesting a *Letter of Recommendation* (this letter confirms that the purpose of use for the imported goods is humanitarian related):
 - ❑ type, quantity, purpose/usage, location(s) at which goods will be used;
 - ❑ letter of donation OR Statement that the money to buy the goods was from the donor;
 - ❑ phytosanitary certificate from port of loading;
 - ❑ bill of lading;
 - ❑ Standard of Quality documents:
 - i. packing list;

- ii. invoice;
 - iii. specification of timber dimensions, grades and treatments; and
 - schedule for the transportation of the donated goods from the port of origin into Aceh.
2. BRR will issue the *Letter of Recommendation* along with a *Form of Monitoring*. The *Letter of Recommendation* is required for customs clearance. The *Form of Monitoring* is required to accompany all imported timber from port of entry into Aceh.
 3. all importing agencies are required to complete a *Pemberitahuan Impor Barang* (PIB - Customs declaration form). This is presented to the Customs Office along with:
 - shipping Manifest;
 - Invoice;
 - packing list;
 - bill of lading/airway bill;
 - phytosanitary certificate from port of loading; and
 - Recommendation Letter from BRR
 4. the Customs Office will issue a *Surat Persetujuan Pengeluaran Barang* (SPPB), i.e. a letter of agreement authorizing release of goods from Customs.
 5. a Forestry Officer will assess the timber prior to release.
 6. goods are then released.

Summary of transportation documentation requirements for domestically produced timber

Transportation of domestically produced timber in Indonesia is subject to control by the Ministry of Forestry. FAO is currently preparing detailed technical information on procedures for transport documentation of domestically produced timber, but the basic requirements are summarized below:

1. '*Surat Keterangan Sahnya Hasil Hutan*' (SKSHH) is a document used to certify the legality of domestically produced timber during transport. A copy of the SKSHH document must accompany the goods from the source through to the destination;
2. SKSHH is obtained from either the District Forestry Service or Provincial Forestry Service in the District or City at source. It is the supplier's responsibility to obtain a SKSHH. There are no costs involved in obtaining a SKSHH.
3. SKSHH are required when transporting domestically produced:
 - logs between forest areas and wood processing plants;

- ❑ sawn timber, wood chips/pulp and wood panels (veneer, and plywood, block board, laminated veneer lumber, medium density fiberboard) between wood processing plants; and
 - ❑ sawn timber, wood chips/pulp and wood panels from warehouses and storage facilities to another District/City.
4. SKSHH are not required for transportation of:
 - ❑ processed wood products from warehouses and storage facilities to the end user or local merchants within a District/City. However the goods must be accompanied with an invoice from the supplying company; or
 - ❑ transportation of moldings, dowel, doors, windows, furniture and other finished wood products. However the goods must be accompanied with an invoice from the supplying company.
 5. It is the supplier's responsibility to apply for a SKSHH and ensure the delivery of the goods according to the requirements of the law.

Summary of transportation documentation requirements for imported timber

FAO is currently preparing detailed technical information on procedures for transport documentation of imported timber. In summary:

1. SKSHH is not required for imported wood products.
2. a copy of the invoice must accompany the goods from the source through to the destination, as proof of ownership.
3. BRR requires that the BRR "Letter of Recommendation" accompany the goods as part of the conditions for issuance of the letter. The letter shall act as a supporting document to clearance of the goods with the police and other authorities.
4. it is also recommended that a declaratory statement/letter from the receiving party accompany the goods to provide further supporting documentation regarding the status of the goods.

APPENDICES

Appendix 1 – Summary of work carried out

Consultancy activities

The main activities of the consultancy were:

- assessment of timber demand and supply for post–tsunami reconstruction in Indonesia including:
 - assessment of timber demand for post-tsunami reconstruction in affected areas;
 - assessment of the potential for salvaging wood for construction from affected areas and inputs or other support required to facilitate salvage;
 - assessment of the potential for meeting timber demand from domestic sources, taking into consideration any policy or institutional factors that might affect availability;
 - assessment of the need or relative merits of importing wood from outside Indonesia;
 - preparation of recommendations on how to best meet demand for various industrial wood products needed for reconstruction and steps that could be taken to minimize the risk of unsustainable forest harvesting; and
 - preparation of policy recommendations.

- provision of technical advice and assistance to Government of Indonesia institutions and other stakeholders in the area of wood supply through:
 - preparation of technical information on solid wood products (grades, treatments and dimensions) for use in domestic and international procurement, and to help ensure only legal timber is purchased from domestic sources and from overseas;
 - examination of potential wood supply sources within the country;
 - examination of potential wood supply sources outside the country;
 - provision of technical assistance to Government of Indonesia to support initiatives facilitating procurement of wood supplies, domestic timber transport, and timber importation;
 - organization of, and participation in, workshops, discussion groups and meetings with Government of Indonesia officials, donors, and NGOs, and national and international organizations assisting with reconstruction, to present information and discuss wood supply issues.

Consultancy achievements

Consultancy outputs included preparation of reports and technical documents, organization and participation in workshops, and provision of advice to Government of Indonesia institutions, NGOs and UN Agencies.

The consultancy has not involved high profile provision of wood supplies or wood distribution services. Rather the outputs of consultancy have been in the form of policy and technical information, which has stimulated discussion and debate between stakeholders. The main tangible achievements have been through indirectly influencing rehabilitation policy and project operations. Examples of ways that FAO's wood supply programme has contributed to policy decisions and operations regarding wood supply include:

- establishing base information for more accurate assessments of wood needs for reconstruction. This information is being used as the basis for wood supply policy within BRR and other organizations;
- highlighting the need/rationale for a coordinated logistics and port infrastructure programme for reconstruction, which has subsequently been implemented by World Food Programme Supply Services; and
- assisting procurement operations through the provision of technical information. The draft technical notes that have been distributed for discussion are being regularly used by NGOs as a technical resource. Publishing the formal technical notes will further reinforce the impact of the draft documents.

1. Reports prepared

- *FAO Assessment Of Timber Demand And Supply For Post-Tsunami Reconstruction In Indonesia, A Technical Report Prepared by the Food and Agricultural Organization of the United Nations, 26 April 2005.*
- *End of Mission Report, George Kuru, Wood Supply Expert, 4 June – 3 July 2005.*

2. Technical documents prepared

- *Wood Usage Technical Note (in publication).*
- *Wood Procurement Technical Note (in publication).*
- *Wood Legality Technical Note (in publication).*
- Lists of timber suppliers.

3. Participation in workshops and technical presentations

- Organization of 2 major workshops
 - *Workshop for Wood Supply, jointly hosted by NAD Dinas Kehutanan and FAO, held at the offices of Dinas Kehutanan NAD in Banda Aceh. 28 June 2005.*
 - *Disampaikan pada acara Wood Industry Workshop: Kerjasama Badan Rehabilitasi dan Rekonstruksi NAD-Nias dengan, Food Agriculture of Organization (FAO). Jakarta, 2 Agustus 2005.*

- Presentation on wood supply to the *Green Aceh* Workshop, 30 June – 1 July 2005
- Three formal presentations made to *Shelter Working Group* in Banda Aceh on 8 March 2005, 27 June 2005 and 13 February 2006. The *Shelter Working Group* was established by the UN to facilitate coordination among UN agencies and others working to address shelter needs for reconstruction in Aceh and Nias.
- Presentation of wood supply study results to Dinas Kehutanan NAD, 16 February 2006.
- Presentation of wood supply study results to the Ministry of Forestry, 23 February 2006.
- Attendance and participation in the Shelter, Timber, Environmental and Logistics Working Groups.

4. Provision of technical advice on request

- Provision of assistance to BRR in preparation of proposals for a Task Force on Wood, Forestry and Environment.
- Provision of advice to OCHA and WFP Supply Services on timber treatment and timber importing.
- Provision of advice to NGOs and UN Agencies on numerous occasions regarding timber use, timber procurement, timber importing and transport.

Appendix 2 – Derivation of average timber usage in house construction

Wood Volume Estimates for Housing							
Description	Timber Dimensions		Length	No. of Pieces	Timber Volume for Standard House		
	Width	Thickness			Sawn Timber	Plywood	Total
	mm		m	m ³			
Foundation piles	100	50	1	25	0.1250	0.0000	0.1250
Floor - Ring beam	100	100	6	4	0.2400	0.0000	0.2400
Floor - Main beams	100	50	6	5	0.1500	0.0000	0.1500
Floor - Planks	200	20	6	30	0.7200	0.0000	0.7200
External walls - Top ring beam	100	100	6	4	0.2400	0.0000	0.2400
External walls - Uprights	100	50	2.2	22	0.2420	0.0000	0.2420
External walls - Bracing/Dwangs	100	50	1	24	0.1200	0.0000	0.1200
External walls - Planks	200	20	6	44	1.0560	0.0000	1.0560
Internal walls - Uprights	75	50	2.2	7	0.0578	0.0000	0.0578
Internal walls - Bracing/Dwangs	75	50	1	9	0.0338	0.0000	0.0338
Internal walls - Plywood	2200	8	10	1	0.0000	0.1760	0.1760
Ceiling - Main beams	75	50	6	6	0.1350	0.0000	0.1350
Ceiling - Plywood	6000	8	6	1	0.0000	0.2880	0.2880
Roof - Main trusses	100	50	4	12	0.2400	0.0000	0.2400
Roof - Trusses bracing	100	50	2	12	0.1200	0.0000	0.1200
Roof - Center beam	200	20	6	1	0.0240	0.0000	0.0240
Roof - Wind bracing	75	20	7	13	0.1365	0.0000	0.1365
Total					3.6400	0.4640	3.9790
Source: Wood volume estimates have been derived with reference to several alternative designs provided by several NGO's.							

Appendix 3 – Building material demand by wood usage scenario and type of structure

Wood demand estimates for housing, civil building and infrastructure construction were developed under three scenarios for wood usage scenarios – *Current trend scenario*, *High level of wood construction scenario*, and *High level of concrete block construction scenario* outlined on pages 25-26.

Scenario 1 – Current trends						
Type of structure	Total Timber Usage (m³)	Sawn Timber (m³)	Plywood (m³)	Bricks (units)	Concrete (m³)	Fuelwood (m³)
Houses	241 662	182 676	58 986	776 558 609	453 722	582 419
Health	27 826	21 034	6 792	89 416 200	52 243	67 062
Schools	27 343	20 669	6 674	87 863 711	51 336	65 898
Religious	22 664	17 132	5 532	72 827 212	42 551	54 620
Government	14 858	11 231	3 626	47 743 590	27 895	35 808
Markets	2 893	2 187	706	9 296 221	5 432	6 972
Bridges	19 697	19 697				
Boats	10 000	10 000				
Total	366 941	284 626	82 316	1 083 705 543	633 179	812 779

Scenario 2 – High level of wooden construction						
Type of structure	Total Timber Usage (m³)	Sawn Timber (m³)	Plywood (m³)	Bricks (units)	Concrete (m³)	Fuelwood (m³)
Houses	389 818	330 832	58 986	205 167 400	526 460	153 876
Health	44 885	38 093	6 792	23 623 831	60 619	17 718
Schools	44 106	37 432	6 674	23 213 662	59 566	17 410

Religious	36 558	31 026	5 532	19 241 007	49 372	14 431
Government	23 966	20 340	3 626	12 613 894	32 367	9 460
Markets	4 667	3 960	706	2 456,069	6 302	1 842
Bridges	19 697	19 697				
Boats	10 000	10 000				
Total	573 697	491 381	82 316	286 315 863	734 687	214 737

Scenario 3 – High level of concrete construction						
Type of structure	Total Timber Usage (m³)	Sawn Timber (m³)	Plywood (m³)	Bricks (units)	Concrete (m³)	Fuelwood (m³)
Houses	253 895	194 909	58 986	205 167 400	766 916	153 876
Health	29 234	22 443	6 792	23 623 831	88 306	17 718
Schools	28 727	22 053	6 674	23 213 662	86 773	17 410
Religious	23 811	18 279	5 532	19 241 007	71 923	14 431
Government	15 610	11 983	3 626	12 613 894	47 151	9 460
Markets	3 039	2 333	706	2 456 069	9 181	1 842
Bridges	19 697	19 697				
Boats	10 000	10 000				
Total	384 013	301 697	82 316	286 315 863	1 070 249	214 737

**Appendix 4 – Building Material Demand by District, Wood Usage Scenario and Type of Structure
(Excluding boats)**

Scenario 1 – Current trends						
District	Total Timber Usage (m³)	Sawn Timber (m³)	Plywood (m³)	Bricks (units)	Concrete (m³)	Fuelwood (m³)
ACEH BARAT	43 122	34 061	9 061	119 288 060	69 697	89 466
ACEH BARAT DAYA	3 127	2 382	745	9 808 828	5 731	7 357
ACEH BESAR	63 935	48 540	15 395	202 673 503	118 416	152 005
ACEH JAYA	34 869	26 525	8 344	109 852 055	64 183	82 389
ACEH SELATAN	4 637	3 548	1 089	14 336 066	8 376	10 752
ACEH SINGKIL	1 704	1 299	405	5 336 472	3 118	4 002
ACEH TAMIANG	98	74	24	313 398	183	235
ACEH TIMUR	2 226	1 785	440	5 798 242	3 388	4 349
ACEH UTARA	18 109	13 810	4 299	56 592 185	33 065	42 444
BANDA ACEH	61 326	47 877	13 449	177 058 894	103 451	132 794
BIREUEN	14 080	10 832	3 247	42 753 089	24 979	32 065
KOTA LANGSA	118	89	29	379 636	222	285
LHOKSEUMAWE	3 654	2 792	862	11 347 052	6 630	8 510
NAGAN RAYA	6 228	4 770	1 458	19 192 221	11 213	14 394
PIDIE	21 912	16 791	5 121	67 425 233	39 395	50 569
SABANG	1 454	1 109	345	4 546 921	2 657	3 410
SIMEULUE	25 383	19 659	5 724	75 353 294	44 027	56 515
NIAS	50 960	38 681	12 279	161 650 398	94 448	121 238
TOTAL	356 941	274 626	82 316	1 083 705 543	633 179	812 779

Scenario 2 – High level of wooden construction						
District	Total Timber Usage (m³)	Sawn Timber (m³)	Plywood (m³)	Bricks (units)	Concrete (m³)	Fuelwood (m³)
ACEH BARAT	65 880	56 820	9 061	31 516 000	80 870	23 637
ACEH BARAT DAYA	4 999	4 254	745	2 591 500	6 650	1 944
ACEH BESAR	102 602	87 207	15 395	53 546 500	137 400	40 160
ACEH JAYA	55 827	47 483	8 344	29 023 000	74 473	21 767
ACEH SELATAN	7 372	6 284	1 089	3 787 600	9 719	2 841
ACEH SINGKIL	2 722	2 317	405	1 409 900	3 618	1 057
ACEH TAMIANG	157	134	24	82 800	212	62
ACEH TIMUR	3 332	2 892	440	1 531 900	3 931	1 149
ACEH UTARA	28 906	24 607	4 299	14 951 700	38 366	11 214
BANDA ACEH	95 107	81 658	13 449	46 779 100	120 035	35 084
BIREUEN	22 236	18 989	3 247	11 295 400	28 984	8 472
KOTA LANGSA	191	162	29	100 300	257	75
LHOKSEUMAWE	5 819	4 957	862	2 997 900	7 693	2 248
NAGAN RAYA	9 889	8 431	1 458	5 070 600	13 011	3 803
PIDIE	34 776	29 655	5 121	17 813 800	45 710	13 360
SABANG	2 322	1 977	345	1 201 300	3 083	901
SIMEULUE	39 759	34 035	5 724	19 908 400	51 085	14 931
NIAS	81 801	69 522	12 279	42 708 163	109 589	32 031
TOTAL	563 697	481 381	82 316	286 315 863	734 687	214 737

Scenario 3 – High level of concrete construction						
District	Total Timber Usage (m³)	Sawn Timber (m³)	Plywood (m³)	Bricks	Concrete (m³)	Fuelwood (m³)
ACEH BARAT	45 001	35 940	9 061	31 516 000	117 807	23 637
ACEH BARAT DAYA	3 282	2 537	745	2 591 500	9 687	1 944
ACEH BESAR	67 127	51 733	15 395	53 546 500	200 157	40 160
ACEH JAYA	36 599	28 255	8 344	29 023 000	108 488	21 767
ACEH SELATAN	4 863	3 774	1 089	3 787 600	14 158	2 841
ACEH SINGKIL	1 788	1 383	405	1 409 900	5 270	1 057
ACEH TAMIANG	102	79	24	82 800	310	62
ACEH TIMUR	2 317	1 877	440	1 531 900	5 726	1 149
ACEH UTARA	19 000	14 702	4 299	14 951 700	55 889	11 214
BANDA ACEH	64 116	50 667	13 449	46 779 100	174 860	35 084
BIREUEN	14 753	11 506	3 247	11 295 400	42 222	8 472
KOTA LANGSA	124	95	29	100 300	375	75
LHOKSEUMAWE	3 832	2 971	862	2 997 900	11 206	2 248
NAGAN RAYA	6 530	5 072	1 458	5 070 600	18 954	3 803
PIDIE	22 975	17 853	5 121	17 813 800	66 588	13 360
SABANG	1 526	1 181	345	1 201 300	4 490	901
SIMEULUE	26 570	20 846	5 724	19 908 400	74 418	14 931
NIAS	53 506	41 228	12 279	42 708 163	159 643	32 031
TOTAL	374 013	291 697	82 316	286 315 863	1 070 249	214 737

Appendix 5 – International Organization for Migration needs assessment - buildings

Damage to housing

No	DISTRICT	Villages	Number	<25%	>25%	>50%	>75%	100%
1	ACEH BARAT	156	15 689	2 933	931	946	2 153	8 726
2	ACEH BARAT DAYA	77	3 234	1 013	1 065	583	346	227
3	ACEH BESAR	120	21 057	948	504	876	1 438	17 291
4	ACEH JAYA	75	10 592	0	0	0	1 282	9 310
5	ACEH SELATAN	138	4 284	1 678	1 234	755	336	281
6	ACEH SINGKIL	47	1 895	711	783	256	86	59
7	ACEH TAMIANG	207	278	269	9	0	0	0
8	ACEH TIMUR	429	791	187	70	125	90	319
9	ACEH UTARA	715	9 130	3 336	619	252	633	4 290
10	BANDA ACEH	55	21 631	1 717	1 207	1 037	2 087	15 583
11	BIREUEN	94	6 531	1 264	1 159	433	1 305	2 370
12	KOTA LANGSA	50	107	34	38	24	3	8
13	LHOKSEUMAWE	67	1 992	778	337	291	186	400
14	NAGAN RAYA	69	2 785	417	445	408	249	1 266
15	PIDIE	110	8 585	606	1 611	884	1 204	4 280
16	SABANG	16	430	14	27	38	50	301
17	SIMEULUE	71	7 869	1 117	921	1 090	2 782	1 959
	TOTAL	2 496	116 880	17 022	10 960	7 998	14 230	66 670
Classification Criteria								
%	Damaged meaning							
100%	Structure is unusable, cannot be repaired							
Greater than 75%	Major structural damage, unsafe for use, but repairable within 1 month							
Greater than 50%	Significant structural damage, unsafe for use, will require more than a week to repair							
Greater than 25%	Some structural damage, safe for limited use, repairable in a week							
Less than 25%	Minor structural damage and safe for use							

Damage to health facilities

No	DISTRICT	Villages	Number	<25%	>25%	>50%	>75%	100%
1	ACEH BARAT	110	85	18	3	4	5	55
2	ACEH BARAT DAYA	4	3	2	0	0	0	1
3	ACEH BESAR	173	165	3	1	4	1	156
4	ACEH JAYA	80	74	0	0	0	3	71
5	ACEH SELATAN	11	11	4	2	1	1	3
6	ACEH SINGKIL	3	3	2	1	0	0	0
7	ACEH TAMIANG	1	1	1	0	0	0	0
8	ACEH TIMUR	7	9	1	1	0	0	7
9	ACEH UTARA	73	69	31	8	7	6	17
10	BANDA ACEH	75	97	11	4	8	8	66
11	BIREUEN	30	52	8	25	4	1	14
12	KOTA LANGSA	1	1	0	1	0	0	0
13	LHOKSEUMAWE	7	4	1	0	0	1	2
14	NAGAN RAYA	7	7	2	0	0	0	5
15	PIDIE	60	52	2	3	7	8	32
16	SABANG	4	4	0	1	0	0	3
17	SIMEULUE	57	56	8	8	4	9	27
	TOTAL	703	693	94	58	39	43	459
Classification Criteria								
%	Damaged meaning							
100%	Structure is unusable, cannot be repaired							
Greater than 75%	Major structural damage, unsafe for use, but repairable within 1 month							
Greater than 50%	Significant structural damage, unsafe for use, will require more than a week to repair							
Greater than 25%	Some structural damage, safe for limited use, repairable in a week							
Less than 25%	Minor structural damage and safe for use							

Damage to schools

No	DISTRICT	Villages	Number	<25%	>25%	>50%	>75%	100%
1	ACEH BARAT	156	174	44	17	13	15	85
2	ACEH BARAT DAYA	77	9	5	3	1	0	0
3	ACEH BESAR	120	181	14	6	9	10	142
4	ACEH JAYA	75	117	0	0	3	2	112
5	ACEH SELATAN	138	32	6	10	4	10	2
6	ACEH SINGKIL	47	29	9	16	4	0	0
7	ACEH TAMIANG	207	1	1	0	0	0	0
8	ACEH TIMUR	429	10	5	1	0	2	2
9	ACEH UTARA	715	174	110	19	8	10	27
10	BANDA ACEH	55	327	60	13	34	30	190
11	BIREUEN	94	115	7	72	11	13	12
12	KOTA LANGSA	50	1	0	0	0	0	1
13	LHOKSEUMAWE	67	108	4	2	101	0	1
14	NAGAN RAYA	69	51	23	5	3	2	18
15	PIDIE	110	204	57	16	10	53	68
16	SABANG	16	6	3	0	2	0	1
17	SIMEULUE	71	123	17	10	7	42	47
	TOTAL	2 496	1 662	365	190	210	189	708
Classification Criteria								
%	Damaged meaning							
100%	Structure is unusable, cannot be repaired							
Greater than 75%	Major structural damage, unsafe for use, but repairable within 1 month							
Greater than 50%	Significant structural damage, unsafe for use, will require more than a week to repair							
Greater than 25%	Some structural damage, safe for limited use, repairable in a week							
Less than 25%	Minor structural damage and safe for use							

Damage to religious buildings

No	DISTRICT	Villages	Number	<25%	>25%	>50%	>75%	100%
1	ACEH BARAT	331	335	56	41	14	107	117
2	ACEH BARAT DAYA	33	39	13	11	7	2	6
3	ACEH BESAR	247	313	30	21	18	16	228
4	ACEH JAYA	149	171	1	0	3	10	157
5	ACEH SELATAN	108	122	24	47	35	14	2
6	ACEH SINGKIL	64	77	23	40	14	0	0
7	ACEH TAMIANG	9	9	6	3	0	0	0
8	ACEH TIMUR	29	29	15	2	3	2	7
9	ACEH UTARA	306	339	205	48	24	18	44
10	BANDA ACEH	121	213	70	11	11	12	109
11	BIREUEN	124	156	38	31	18	29	40
12	KOTA LANGSA	0	0	0	0	0	0	
13	LHOKSEUMAWE	21	21	7	5	1	5	3
14	NAGAN RAYA	83	107	42	5	9	6	45
15	PIDIE	125	162	38	24	13	25	62
16	SABANG	13	14	1	0	2	0	11
17	SIMEULUE	147	473	45	20	24	101	283
	TOTAL	1 910	2 580	614	309	196	347	1 114
Classification Criteria								
%	Damaged meaning							
100%	Structure is unusable, cannot be repaired							
Greater than 75%	Major structural damage, unsafe for use, but repairable within 1 month							
Greater than 50%	Significant structural damage, unsafe for use, will require more than a week to repair							
Greater than 25%	Some structural damage, safe for limited use, repairable in a week							
Less than 25%	Minor structural damage and safe for use							

Damage to government buildings

No	DISTRICT	Villages	Number	<25%	>25%	>50%	>75%	100%
1	ACEH BARAT	216	213	63	12	6	15	117
2	ACEH BARAT DAYA	13	13	2	2	4	5	0
3	ACEH BESAR	335	335	14	9	5	18	289
4	ACEH JAYA	126	125	0	0	2	0	123
5	ACEH SELATAN	16	18	4	5	6	2	1
6	ACEH SINGKIL	9	8	4	1	2	1	0
7	ACEH TAMIANG	2	2	0	2	0	0	0
8	ACEH TIMUR	8	8	3	0	1	0	4
9	ACEH UTARA	60	67	25	5	7	8	22
10	BANDA ACEH	113	153	24	14	9	13	93
11	BIREUEN	32	29	3	0	3	5	18
12	LHOKSEUMAWE	11	9	4	0	0	2	3
13	NAGAN RAYA	28	29	15	0	1	0	13
14	PIDIE	62	63	9	5	1	17	31
15	SABANG	15	15	2	1	0	0	12
16	SIMEULUE	125	325	18	6	14	16	271
	TOTAL	1 171	1 412	190	62	61	102	997
Classification Criteria								
%	Damaged meaning							
100%	Structure is unusable, cannot be repaired							
Greater than 75%	Major structural damage, unsafe for use, but repairable within 1 month							
Greater than 50%	Significant structural damage, unsafe for use, will require more than a week to repair							
Greater than 25%	Some structural damage, safe for limited use, repairable in a week							
Less than 25%	Minor structural damage and safe for use							

Damage to markets and commercial structures

No	DISTRICT	Villages	Number	<25%	>25%	>50%	>75%	100%
1	ACEH BARAT	63	270	22	10	9	13	216
2	ACEH BARAT DAYA	3	3	2	0	0	0	1
3	ACEH BESAR	51	167	7	0	0	1	159
4	ACEH JAYA	43	186	0	0	2	42	142
5	ACEH SELATAN	2	2	0	0	0	2	0
6	ACEH SINGKIL	1	1	1	0	0	0	0
7	ACEH TIMUR	8	9	0	0	3	1	5
8	ACEH UTARA	41	350	90	1	3	3	253
9	BANDA ACEH	17	72	1	2	0	7	62
10	BIREUEN	40	243	18	14	18	23	170
11	LHOKSEUMAWE	1	4	4	0	0	0	0
12	NAGAN RAYA	6	6	1	0	2	1	2
13	PIDIE	10	54	13	16	4	2	19
14	SABANG	8	25	0	0	0	3	22
15	SIMEULUE	7	24	0	0	0	12	12
	TOTAL	301	1 416	159	43	41	110	1 063
Classification Criteria								
%	Damaged meaning							
100%	Structure is unusable, cannot be repaired							
Greater than 75%	Major structural damage, unsafe for use but repairable within 1 month							
Greater than 50%	Significant structural damage, unsafe for use, will require more than a week to repair							
Greater than 25%	Some structural damage, safe for limited use, repairable in a week							
Less than 25%	Minor structural damage and safe for use							

Appendix 6 – International Organization for Migration needs assessment - infrastructure

Damage to arterial roads

No	DISTRICT	Villages	Distance in m	<25%	>25%	>50%	>75%	100%
1	ACEH BARAT	156	52 057	14 425	2 005	8 525	7 300	19 802
2	ACEH BARAT DAYA	77	0	0	0	0	0	0
3	ACEH BESAR	120	40 309	7 004	5 705	2 000	6 000	19 600
4	ACEH JAYA	75	132 800	28 000	5 100	32 200	1 400	66 100
5	ACEH SELATAN	138	265	200	0	15	0	0
6	ACEH SINGKIL	46	0	0	0	0	0	0
7	ACEH TAMIANG	207	0	0	0	0	0	0
8	ACEH TIMUR	429	16 335	3 865	2 300	7 400	500	2 270
9	ACEH UTARA	709	7 000	2 500	500	0	3 500	500
10	BANDA ACEH	55	500	500	0	0	0	0
11	BIREUEN	94	4 800	2 000	0	1 800	1 000	0
12	KOTA LANGSA	50	0	0	0	0	0	0
13	LHOKSEUMAWE	67	6 600	0	2 000	4 500	100	0
14	NAGAN RAYA	69	279 990	3 250	3 300	0	270 200	3 240
15	PIDIE	99	8 570	200	530	0	2 990	4 850
16	SABANG	16	8 000	0	3 000	1 000	1 000	3 000
17	SIMEULUE	71	46 258	16 250	16 458	2 500	5 200	0
	TOTAL	2 478	603 484	78 194	40 898	59 940	299 190	119 362
Classification Criteria								
%	Damaged meaning							
100%	Structure is unusable, cannot be repaired.							
Greater than 75%	Major structural damage, unsafe for use, but repairable within 1 month							
Greater than 50%	Significant structural damage, unsafe for use, will require more than a week to repair							
Greater than 25%	Some structural damage, safe for limited use, repairable in a week							
Less than 25%	Minor structural damage and safe for use.							

Damage to city roads

No	DISTRICT	Villages	Distance in m	<25%	>25%	>50%	>75%	100%
1	ACEH BARAT	156	67 374	3 574	4 400	10 300	27 100	22 000
2	ACEH BARAT DAYA	77	1 250	0	0	100	1 100	50
3	ACEH BESAR	120	111 908	30 705	1 001	600	15 800	63 802
4	ACEH JAYA	75	58 675	1 520	11 400	7 140	1 005	37 610
5	ACEH SELATAN	138	300	0	300	0	0	0
6	ACEH SINGKIL	46	5 430	850	1 530	2 550	0	500
7	ACEH TAMIANG	207	0	0	0	0	0	0
8	ACEH TIMUR	429	1 200	0	100	500	0	600
9	ACEH UTARA	709	48 100	13 675	1 725	10 200	9 600	12 900
10	BANDA ACEH	55	27 125	8 850	5 500	0	5 175	7 600
11	BIREUEN	94	26 945	5 300	3 870	7 800	5 750	4 225
12	KOTA LANGSA	50	0	0	0	0	0	0
13	LHOKSEUMAWE	67	8 700	0	2 300	2 000	4 400	0
14	NAGAN RAYA	69	231 565	5 005	3 400	5 500	211 500	6 160
15	PIDIE	99	50 756	1 492	3 272	10 055	14 490	21 447
16	SABANG	16	0	0	0	0	0	0
17	SIMEULUE	71	14 708	1 846	1 030	6 804	1 920	3 108
	TOTAL	2 478	654 036	72 817	39 828	63 549	297 840	180 002
Classification Criteria								
%	Damaged meaning							
100%	Structure is unusable, cannot be repaired.							
Greater than 75%	Major structural damage, unsafe for use, but repairable within 1 month							
Greater than 50%	Significant structural damage, unsafe for use, will require more than a week to repair							
Greater than 25%	Some structural damage, safe for limited use, repairable in a week							
Less than 25%	Minor structural damage and safe for use.							

Damage to neighborhood roads

No	DISTRICT	Villages	Distance in m	<25%	>25%	>50%	>75%	100%
1	ACEH BARAT	156	318 264	39 589	31 550	45 300	46 325	155 500
2	ACEH BARAT DAYA	77	7 270	1 520	1 700	1 500	2 150	400
3	ACEH BESAR	120	295 171	26 110	20 300	31 125	89 285	128 351
4	ACEH JAYA	75	169 760	51 160	48 000	28 850	9 900	31 850
5	ACEH SELATAN	138	6 517	500	4 950	800	200	67
6	ACEH SINGKIL	46	1 225	0	550	0	675	0
7	ACEH TAMIANG	207	0	0	0	0	0	0
8	ACEH TIMUR	429	15 151	1 601	640	3 710	2 600	6 600
9	ACEH UTARA	709	73 357	14 987	18 470	16 484	14 471	8 945
10	BANDA ACEH	55	178 655	20 500	14 600	15 245	28 355	99 955
11	BIREUEN	94	140 082	25 050	31 300	16 400	59 982	7 350
12	KOTA LANGSA	50	200	0	100	0	100	0
13	LHOKSEUMAWE	67	15 544	1 300	2 550	6 009	5 685	0
14	NAGAN RAYA	69	16 650	9 200	2 650	3 250	1 050	500
15	PIDIE	99	56 358	5 015	5 168	9 762	21 189	15 224
16	SABANG	16	7 400	200	1 000	0	4 200	2 000
17	SIMEULUE	71	59 259	24 205	16 175	9 235	6 710	2 934
	TOTAL	2 478	1 360 863	220 937	199 703	187 670	292 877	459 676
Classification Criteria								
%	Damaged meaning							
100%	Structure is unusable, cannot be repaired.							
Greater than 75%	Major structural damage, unsafe for use, but repairable within 1 month							
Greater than 50%	Significant structural damage, unsafe for use, will require more than a week to repair							
Greater than 25%	Some structural damage, safe for limited use, repairable in a week							
Less than 25%	Minor structural damage and safe for use.							

Damage to bridges

No	DISTRICT	Villages	Number	<25%	>25%	>50%	>75%	100%
1	ACEH BARAT	156	678	15	19	18	165	461
2	ACEH BARAT DAYA	77	9	0	1	0	3	5
3	ACEH BESAR	120	114	21	2	7	15	69
4	ACEH JAYA	75	84	6	6	3	17	52
5	ACEH SELATAN	138	24	1	2	6	4	11
6	ACEH SINGKIL	46	9	1	3	3	0	2
7	ACEH TAMIANG	207	0	0	0	0	0	0
8	ACEH TIMUR	429	52	4	2	4	11	31
9	ACEH UTARA	709	92	15	28	8	15	26
10	BANDA ACEH	55	641	14	5	2	4	616
11	BIREUEN	94	96	5	7	12	11	61
12	KOTA LANGSA	50	0	0	0	0	0	0
13	LHOKSEUMAWE	67	23	10	0	0	7	6
14	NAGAN RAYA	69	47	20	2	1	6	18
15	PIDIE	99	138	15	8	3	96	16
16	SABANG	16	7	2	0	1	3	1
17	SIMEULUE	71	253	18	26	21	54	134
	TOTAL	2 478	2 267	147	111	89	411	1 509
Classification Criteria								
%	Damaged meaning							
100%	Structure is unusable, cannot be repaired.							
Greater than 75%	Major structural damage, unsafe for use, but repairable within 1 month							
Greater than 50%	Significant structural damage, unsafe for use, will require more than a week to repair							
Greater than 25%	Some structural damage, safe for limited use, repairable in a week							
Less than 25%	Minor structural damage and safe for use.							

Appendix 7 - Housing commitments

Housing Milestone Data - Aceh and Nias Compiled by BRR and UN-HABITAT Date: 31st January 2006				
Organization	House Construction Commitment	Houses Finished as at 31.12.05	Repair/ Rehab Commitment	Transitional/ Temporary Commitment
TOTAL	161 738	12 568	18 350	26 285
ACTED	341	100	0	0
ACTED (permanent) Meulaboh	130	75	0	0
ACTED (transitional) NIAS	380	60	0	380
ADB	11 000	0	5 000	0
Al Imdaad	60	60	0	0
Alisei	33	16	0	0
AMDA	300	0	0	0
APBN P - BRR	3 500	0	0	0
Arab Saudi	1 304	0	0	0
Army TNI	443	443	0	0
ATLAS LOGISTIQUE	330	40	0	0
Australia RC	2 250	0	0	0
BMA	52	0	0	0
British Red Cross	4 000	0	0	0
Build Change	11	0	0	0
Canadian Red Cross	5 000	0	0	0
CARDI NRC	504	79	65	0
Care International	8 000	117	300	0
Caritas Austria & Germany	985	514	0	0
Caritas Czech Republic/SOA	206	0	0	0
Caritas Germany	505	65	0	0
Caritas Switzerland	2 000	0	0	0
Catholic Relief Service	6 000	450	0	400
CHF International	1 000	0	0	10
China RC	314	0	0	0
Codia Medan	52	0	0	0
Concern	1 285	4	0	155
CORDAID	1 081	6	0	0
Cut Anita	2	0	0	0
CWS	270	33	0	0
Emeg. Architect	528	21	0	0
FIG-Indonesia	295	1	0	0
Forestry Innovation Investment Ltd	10	10	0	0
French RC	317	0	0	0
G.V.C (Italy)	75	0	0	0
GenAssist/Percik	500	56	0	5
German Agro Action	150	1	0	0
German RC	1 527	0	0	0

Gitec/Mamamia/KfW	800	0	0	0
GOUNG PASE	10	0	0	0
Grunhelm	300	22	0	0
GTZ (incl.GTZ Amurt)	30	30	14	0
GTZ Emergency Project (new barracks)	396	396	0	0
GTZ Emergency Project (permanent)	43	43	0	0
Habitat for Humanity	7 500	459	0	0
Help EV	206	231	0	0
Help EV	660	0	20	0
HIVOS Netherlands	200	0	0	0
HIVOS Netherlands/GAA	256	0	0	0
HIVOS Netherlands/SINTESA	340	0	0	0
Ibu Presiden	50	0	0	0
IFRC/Red Cross (subtotal of Red Crosses)	21 777	8	0	20 000
International Blue Crescent Relief	304	152	0	0
IOM	11 000	3 000	0	960
Islamic Relief	2000	354	0	0
Istambul Raya Turki/PKPU	250	0	0	0
Italian Cooperation	386	90	0	0
Japan RC	1 500	8	0	0
Jenggala/Medco Group	70	0	0	0
Jesuit Refugee Service	320	150	0	500
JRK	112	0	0	0
KfW	4 500	4	2 000	32
KKSP	634	0	0	0
KMS	161	0	0	0
KUWAIT	168	0	0	0
LDSC	50	50	0	50
LION	100	0	0	0
Malteser	431	89	0	0
MDTF	6 800	0	10 000	0
Mercy Corps	0	105	0	0
Mercy Malaysia	231	231	14	0
Mercy USA	97	0	4	0
Muslim Aid	555	22	0	3 000
NCA	0	0	0	0
Netherlands RC	2 890	0	0	0
Obor Berkat	1 189	415	0	0
OIKOS	80	80	0	0
Oxfam	2 109	366	N/A	0
PASKA	120	0	0	0
Peduli Bangsa	230	50	0	0
Pemda Jatim	1 000	0	0	0
PEMDA SULAWESI SELATAN	150	0	0	0
Perumnas	401	0	0	0
PMI	901	0	0	0
Premiere Urgence	162	52	0	0

PU Provinsi/Perkim	133	8	0	0
Re ACT (IAI &URDI)	104	0	0	27
Realestate Indonesia (REI)	1 000	0	0	0
RSCC	55	0	0	0
SAB-SAS	66	0	0	0
Salvation Army	473	0	0	0
Samaritan Purse	3 000	500	0	0
Sarah	41	0	0	0
Save the Children	3 000	400	0	0
SERASIH	700	200	0	0
Sorop Timis	200	0	0	0
SOS	308	0	0	0
Spanish RC	1 632	0	0	0
Swiss RC	246	0	0	0
Terre des Hommes Germany	732	0	0	0
Terre des Hommes Italy	50	2	0	0
Terre des Hommes Netherlands	618	0	0	0
THW	155	0	0	0
Turkish RC	1 200	0	0	0
UN-HABITAT	3 977	115	883	0
UNHCR	3 500	100	0	0
UPC/UPLink	3 300	1 700	0	659
World Relief and Norlink	505	81	50	0
World Vision Indonesia	4 066	83	0	97
Y.Sayang Aceh	200	0	0	0
Yakkum Emergency Unit	90	141	0	0
YAS. BUDHA TZU CHI	3 700	360	0	0
Yayasan Berkati Indonesia	274	46	0	0
Yayasan Sosial Kreasi	70	0	0	0
YEL/Caritas	1 430	0	0	0
Zero to One Foundation/Red Cross Australia	254	150	0	0
Zero to One Foundation/United in Diversity	239	114	0	0
Zoe's Ark Foundation (ZAF)/CHS	211	10	0	10

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