

Impacts of the Tsunami on Fisheries, Aquaculture and Coastal Livelihoods in Indonesia¹

(As of 21st March 2005)

Affected areas

Over 110,000 people lost their lives in Indonesia, and an estimated 700,000 people have been displaced.

A preliminary assessment² on the estimated damages to fisheries, aquaculture and coastal livelihoods in Northern Sumatra has been made jointly by Bappenas, MMAF and the donor agencies. This assessment was based on the initial findings of a MMAF survey, satellite imageries, reports received from local government offices, ongoing needs assessments and estimates by MMAF staff and experts familiar with the physical features of the area and fisheries sector activities in the locality³. An aerial survey was conducted jointly by the Ministry of Agriculture (MOA) and FAO on 11th January 2005 covering the affected areas in Aceh. The survey covered a total of 517km coastline (eastern 275 km, western 242). More recent data have been provided by the FAO tsunami response team (12 Feb 2005). The provinces of Aceh and Nias Island in North Sumatra have been the most severely impacted areas. Satellite images from UNOSAT

(<http://unosat.web.cern.ch/unosat/asp/charter.asp?id=55>)

show the main areas affected by the tsunami in North Sumatra.

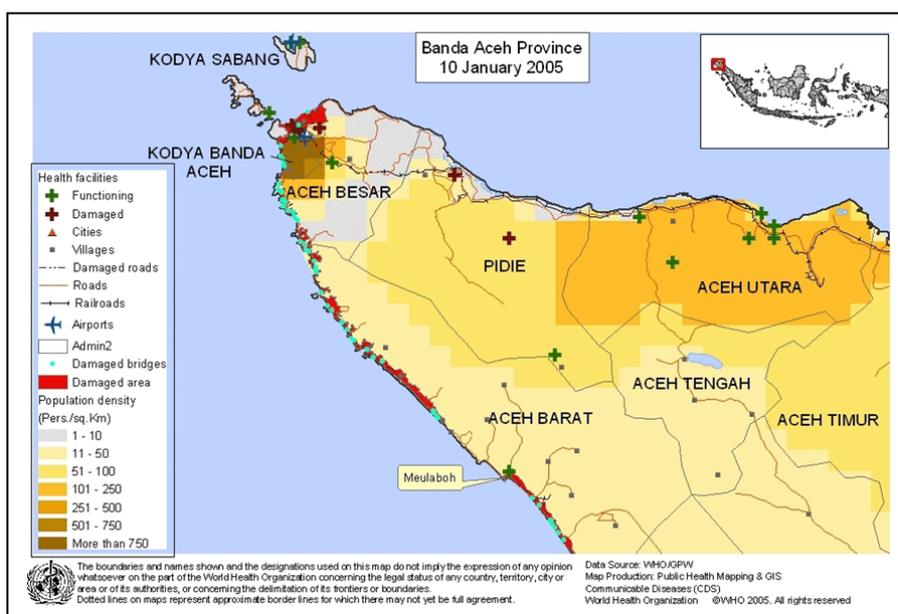


Figure 1: Affected areas in North Sumatra

Source: http://www.who.int/hac/crises/international/asia_tsunami/sitrep/13/en/

¹ **Disclaimer:** This report has been jointly developed by staff from NACA, FAO, SEAFDEC and BOBP-IGO for internal use. Every possible effort has been made, considering the circumstances, to verify the information. The report is considered appropriate at the time of its preparation. It will be updated as necessary in light of further knowledge gained at subsequent stages of the evolution of the situation. The organizations concerned make no warranty, express or implied, as to the accuracy, reliability or content of the material, text and any graphics in this document. They also decline all responsibility for updating the material and assume no responsibility for errors and omissions in the material provided in the document.

² **Data in this report** has been drawn from a number of different sources. Where the original data source is known it has been duly attributed, but in many cases figures have been taken from other reports which do not cite an original sources. As a result it has not been possible to provide all data sources.

³ **CONSRN** Regional Workshop on Rehabilitation of Fisheries and Aquaculture in Coastal Communities of tsunami affected countries in Asia (Bangkok 28th Feb-1st Mar 2005). Indonesia country report

Fisheries Pre-Tsunami⁴

Aceh and Nias (North Sumatra) used to have a vibrant fisheries sector with an annual output 158,578 tons in 2003, comprising 133,976 tons of fish from marine capture fishery and 24,602 tons harvested from aquaculture. Total value of the produce was estimated at Rp1.59 trillion. The fisheries sector accounted for 3 % of Aceh GDP. The province had only one medium size fish-canning facility, and most of the fish caught and harvested in the province were consumed locally or exported unprocessed to overseas or other parts of the country. The fisheries sector also played an important role in the economy and provided employment to 89,300 persons, or 16% of the total coastal population of 558,641 in the disaster affected areas of Aceh Province and Nias island. There were about 58,000 full-time fishers (Statistik Perikanan).

Among the 18 kabupatens/regions affected by the tsunami, there are five kabupatens/kotas where coastal population is relatively high: Simeulue (93% of total population), Kota Sabang (87%), Aceh Selatan (35%), Nias (24%) and Aceh Jaya (23%). Most members of the fishing communities were artisanal fishers fishing inshore waters. This explains the large number of “canoes”/smaller craft (almost 15,000) as opposed to boats with an inboard motor that can fish further offshore (about 5,600 units).

The infrastructure and facilities developed to support the fisheries sector in the disaster affected area included two large fish ports in Banda Aceh and Nias, 49 units of small fish ports, and a large number of community-managed fish landing facilities. The Ministry of Marine Affairs and Fisheries (MMAF) manage an aquaculture training center, a demonstration hatchery, fisheries laboratories and a training vessel. Each district has a number of field service offices (Dinas) established by local government.

Table 1: Full time and Part time Fishers in Aceh and Nias, North Sumatra

Province	Districts	Full time Fishers	Part Time (major) Fishers	Total
Aceh	South Aceh	5,735	5,060	10795
	West Aceh	3,309	1,288	4597
	Aceh Besar	9,834	2,067	11901
	Kota Banda Aceh	803	732	1535
	Kota Sabang	806	120	926
	Pidie	1,616	6,208	7824
	Bireuen	8,540	2,131	10671
	North Aceh	1,941	2,206	4147
	East Aceh	1,679	6,611	8290
	Kota Langsa	4,928	1,883	6811
	Aceh Tamiang	3,734	916	4650
	Simeulue	2,484	828	3312
	Aceh Singkil	1,050	693	1743
	Aceh Barat Daya	2,910	811	3721
	Aceh Jaya	2,209	907	3116
	Nagan Raya	350	836	1186
	Lhok Seumawe	1,475	1,291	2766
Nias	Nias Island	4,686	1,355	6041
Total		58,089	35,943	94,032

Source: Fisheries Statistic (DKP). Podes as quoted in Kompas (December 29, 2004) and Bappenas presentation (December 2004)

⁴ Text predominantly, but not exclusively, based on the Joint Gov of Indonesia and World Bank report “Preliminary Damage and Loss Assessment | CGI January 2005” and Statistik Perikanan (MMAF), (December 29 2004)

Fisheries Post-Tsunami

The fisheries sector has been heavily affected by the disaster. A large number of fisher people have been killed (an estimated 15-20% of the fisher people in the 18 kabupatens), and it is thought that more than 45 government fisheries staff lost their lives. It is estimated that almost two thirds of fishing boats and gear in the affected area were fully or partially destroyed along with many engines. On the East Coast of Aceh for example, it has been estimated that at least 2,073 inboard engines have been lost⁵. The extent of damage and losses in different kabupatens varies depending on their location, but some summary figures for Aceh and Nias Islands are provided in Table 2.

Regarding physical infrastructure such as fishing ports and harbors, reports from the regions indicate that the greatest damage was to kabupatens in the northern part of Aceh, both on the western and eastern coasts. Overall, it is estimated that 55% of the fishing harbours/ports were damaged (valued at Rp103 billion). In Sabang however (the northernmost island of Aceh), it is reported that none of the ports were damaged.

Table 2: Summary of fisheries-sector damage

State /Province	District	Village			Landing centers (damaged)	Number Of fishers ⁶	Human losses (missing) ⁷	Fishing vessel			
		Total	Fishing village	Village affected				Mechanised		Non-mechanised	
								Total	Lost /damaged	Total	Lost /damaged
Aceh	172			1,550		42,149 – 58,000	~9,000	700	490	700	490
Nias Is.											
Total				1,550	(55%)		94,081				1,290

Financial impacts on fisheries

As shown in Table 3, total direct damage to the capture fisheries sector is estimated at Rp 614,380 billion (about half of the total assets in the affected area), with a further 3,807 billion indirect damage estimated from a lack of fishing⁸. A summary of financial damages is provided in the table below.

⁵ Estimate of the number of inboard engines of Chinese manufacture lost.

⁶ Number of fishers recorded in Nanggroe Aceh Darussalam

Capture Fisheries Statistics of Indonesia, 2002, Department of Marine Affairs and Fisheries, Directorate General of Capture Fisheries, Jakarta 2004

⁷ Figures based on around 15% of total 58,000 full-time fishermen

⁸ NB these estimates of direct loss are based on landed values of catches, and do not therefore represent the true indirect losses as they do not measure impacts on value-added i.e. by not fishing, fishing-related expenses will not have been incurred.

Table 3: Estimated Direct Damage and Indirect Losses to Fisheries Sector in North Sumatra

Description	Assets	Direct Damage		Indirect Loss
	(IDR million)	(IDR million)	(%)	(IDR million)
Fishing Harbours	189,064	144,800	77	0
i. Type C (PPP) (2 units)				
ii. Type D (PPI-APBN) (12 units)				
iii. Type D (PPI-APBD) (37 units)				
iv. Community (253 units)				
MMAF Assets ⁹	62,702	21,407	34	0
Fishing Boats	495,778	286,220	58	0
i. Boat with inboard (6,566 units)				
ii. Canoe with outboard (4,117 units)				
iii. Boat without motor (10,772 units)				
Fishing Equipment	246,135	161,953	66	0
i. Bagan (787 units)				
ii. Seine (2,671 units)				
iii. Net (10,532 units)				
iv. Long line (2,022 units)				
Fishing Production	0	0	0	3,807,011
Grand Total	993,679	614,380	62	3,807,011

Source: ADB

Aquaculture pre-tsunami

Some background data on aquaculture production in the wider region are provided in the tables below.

Table 4: Aquaculture Production by type of culture in Sumatra for 2002 (mt)

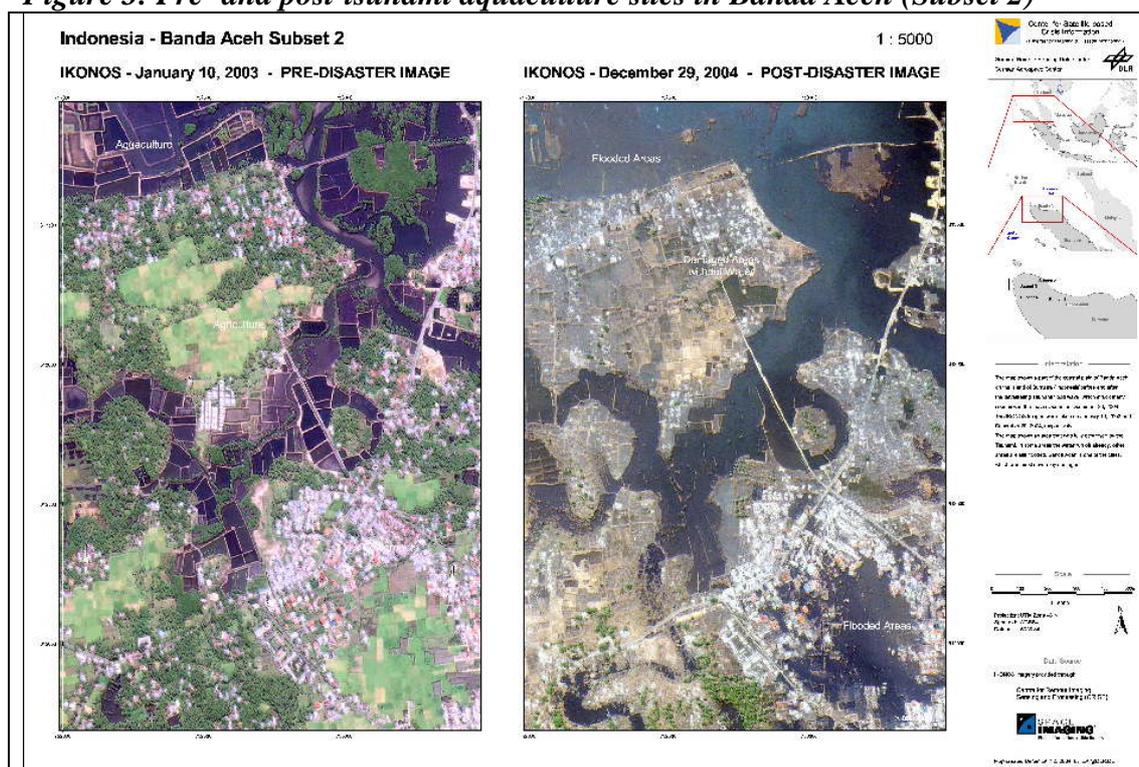
Districts	Total	Marine culture	Brackishwater pond	Freshwater pond	Cage	Floating cage net	Paddy field
Nangro Aceh Darussalam	27,449	--	22,292	2,764	180	--	2,213
North Sumatra	43,960	489	22,651	10,718	379	3,497	6,226
West Sumatra	27,922	--	--	17,141	4,562	4,401	1,818
Riau	26,491	7,095	1,050	15,974	2,362	--	10
Jambi	6,208	--	1,452	2,263	1,159	1,308	26
South Sumatra	35,703	--	14,377	11,368	5,769	--	4,189
Banka Belitung	315	77	121	115	--	2	--
Bengkulu	4,341	--	722	1,767	381	--	1,471
Lampung	34,122	136	23,610	8,934	130	299	1,013
Total	206,511	7,797	86,275	71,044	14,922	9,507	16,966

Table 5: Aquaculture Production by type of culture in Sumatra for 2002 (Rp.1,000,000)

Districts	Total	Marine culture	Brackishwater pond	Freshwater pond	Cage	Floating cage net	Paddy field
Nangro Aceh Darussalam	481,016	--	403,478	39,825	1,888	--	35,825
North Sumatra	1,511,881	32,885	1,246,324	146,267	2,806	25,075	58,523
West Sumatra	322,214	--	--	230,904	38,607	33,022	19,681
Riau	676,382	426,436	46,139	179,087	24,630	--	90
Jambi	119,877	--	47,406	53,265	8,951	10,092	163
South Sumatra	1,075,889	--	909,258	126,452	370	--	39,809
Banka Belitung	13,745	6,713	6,005	1,012	--	15	--
Bengkulu	79,905	--	32,898	22,169	4,037	--	20,801
Lampung	1,023,659	14,230	895,868	101,560	909	1,803	9,289
Total	5,325,168	480,264	3,587,375	900,543	102,717	70,807	184,181

⁹ Ministry of Marine Affairs and Fisheries (MMAF)

Figure 3: Pre- and post-tsunami aquaculture sites in Banda Aceh (Subset 2)



(Source: UNOSAT)

A total of 47,957 hectares of aquaculture production in 8 districts of Aceh province are recorded as damaged based on MOA data, a ground survey team data and aerial survey data. Aquaculture sites affected culture a range of marine finfish (milkfish, seabass, mullet etc.) and crustacea (crabs, shrimps, etc.).

Table 6: Areas and extent of damage to aquaculture in Aceh

Province	Districts	Damaged Areas (ha)	Level of Damage
Aceh	Aceh Timur	3,721	No information
	Aceh Utara	1,749	Sedimentation
	Bireuen	3,382	Heavy
	Pidie	3,575	Heavy
	Aceh Besar	13,860	East coast – Heavy; West Coast – Very Heavy
	Aceh Jaya	8,800	Very Heavy (sedimentation, lost of boundary, partly eroded)
	Aceh Barat	4,950	Very Heavy (sedimentation, water logging, eroded, lost of boundary)
	Nagan Raja	7,920	Very Heavy (sedimentation, water logging, eroded, lost of boundary)
Total		47,957¹⁰	

Source: MOA, Indonesia and FAO

In addition, the Regional Centre for Brackishwater Development (BBAP) in Ujung Batee – NAD, located in Aceh Besar district, is reportedly 80% destroyed. The activities in the Centre were spread over 2 villages in Masjid Raya subdistrict. The facilities in Durung village covered an area of 3.55 ha. One kilometre away is Neheun village with a bigger spread of facilities i.e. 6.28 ha.

¹⁰ Note this figure does not correlate with areas specified in Table 8 and Table which are used for estimation of lost value of production

There were also 17 private shrimp hatcheries with varying scales of production, from small to medium. They were producing some 200 million PL a year. They have all been heavily damaged.

Although only employing only a small number of people (35), Aceh also provided a large proportion of the wild caught *Penaeus monodon* broodstock for hatcheries throughout Indonesia. It lost all its tiger prawn (*Penaeus monodon*), milkfish and grouper broodstock (worth close to Rp 8.5 billion). A fuller assessment of broodstock supply and demand is to be made with FAO assistance, but it is unclear how many of the collectors survived, or what impact the interruption of these broodstock will have on the provision of fry for the shrimp farms throughout Indonesia.

Financial impacts on aquaculture

The damage to the brackish water culture ponds was relatively dispersed in most areas of Aceh. Even in the areas where the tsunami was not significant (such as in the southern part of Aceh), floods has partially damaged the infrastructure between 10% to 100% depending on District (Table 7). Overall damage has been estimated at Rp. 466 billion¹¹ but it is not clear if this figure is based on the area recorded as damaged in Table 6 (47,957 ha in eight districts). Indeed the area of damage is uncertain given that figures provided in Table 6 are higher for some districts than the total area of production stated in Table 8. Nevertheless, the financial impacts could be higher depending on the percentage of standing stock lost, given the figures in the tables below, which show an annual production of Rp 810 billion from an area of 36,597 ha (from a larger number of districts).

Table 7: Damage estimate to Brackish water culture by province

Kabupaten	Brackish Water Culture
Simeulue	100%
Aceh Singkil	30%
Aceh Selatan	30%
Aceh Barat Daya	30%
Aceh Tamiang	10%
Aceh Timur	30%
Nagan Raya	30%
Aceh Barat	100%
Aceh Jaya	100%
Aceh Besar	100%
Pidie	50%
Aceh Utara	40%
Biereun	50%
Kota Banda Aceh	100%
Kota Sabang	100%
Lhok Seumawe	40%
Langsa	10%
Nias	90%

¹¹ Joint Gov of Indonesia and World Bank report op. cit.

Table 8: Brackishwater pond culture by area and production in NAD province, 2003

No.	District	Area (ha)	Production (t)				Production Value (x Rp. 1000)	Production Value (US\$)
			Shrimp	Milkfish	Others	Total		
1	South Aceh	25	5.3	3.6	7.3	16.2	517,400	57,488.9
2	West Aceh	289	55.5	36.1	74.2	165.8	2,800,650	311,183.3
3	Aceh Besar	1,006	716.9	220.5	895.6	1,833.0	30,534,400	3,392,711.1
4	Kota Banda Aceh	724	667.6	424.6	809.5	1,901.7	59,969,300	6,663,255.6
5	Kota Sabang	28	-	514.0	-	514.0	4,549,000	505,444.4
6	Pidie	5,056	788.4	648.6	928.2	2,365.2	59,798,740	6,644,304.4
7	Bireuen	5,146	2,254.2	1,127.3	2,723.6	6,105.1	200,926,020	22,325,113.3
8	North Aceh	10,520	1,485.5	1,058.2	3,055.6	5,599.3	149,187,032	16,576,336.9
9	East Aceh	7,822	2,288.0	1,081.0	2,733.0	6,102.0	219,113,500	24,345,944.4
10	Kota Langsa	2,122	-	-	-	-	-	-
11	Aceh Tamiang	3,858	-	-	-	-	-	-
	Total	36,597¹²	8,261	5,113	11,227	24,602	727,396,042	80,821,782

Table 9: Rehabilitation of brackishwater pond irrigation in NAD province

No.	District	Brackishwater Area (ha)	Brackishwater Area Irrigated (ha)			Production Value (x Rp. 1000)	Production Value (US\$)
			FSSP	SPL	APBN		
1	South Aceh	25	-	-	-	-	-
2	West Aceh	289	-	-	-	-	-
3	Aceh Besar	1,006	-	-	-	-	-
4	Kota Banda Aceh	724	-	-	-	-	-
5	Kota Sabang	28	-	-	-	-	-
6	Pidie	5,056	-	950	100	11,846,000	1,316,222
7	Bireuen	5,147	-	-	50	200,000	22,222
8	North Aceh	10,520	3,000	900	700	49,544,000	5,504,889
9	East Aceh	7,822	1,000	400	750	21,314,000	2,368,222
10	Kota Langsa	2,122	-	-	-	-	-
11	Aceh Tamiang	3,858	-	-	100	1,000,000	111,111
	Total	36,597	4,000	2,250	1,700	83,904,000	9,322,667

Note: FSSP: Fisheries Support Services Program
 SPL: Sub Program Loan
 APBN: National Allocated Budget for Development

Additional financial damage to aquaculture facilities is estimated as shown in Table 10.

Table 10: Estimated financial losses (US\$) for aquaculture in North Sumatra provinces.

Province	Hatcheries	Government facilities ¹³
Aceh	6,233,329	1,790,444

Source: DGA (MMAF)

¹² Note does not correlate with figures on areas affected in Table 6

¹³ These losses consist of fish and shrimp pond structures, water channels, irrigation canals, building, housing and training facilities, equipment, library collections, and others.

Government assistance programs

In addition to the provision of relief aid, the government along with its partners has developed strategies for rehabilitation and reconstruction. These include:-

Restore private assets:

- Build up assets of coastal community members and households
- Introduce appropriate new technologies
- Give communities a leading role in management of resource and implementation of activities

Rebuild public goods:

- Improve support services
- Create efficient and transparent regulatory mechanisms; and
- Rehabilitate and protect environmental resources with community ownership
- Joint assessments are underway with field teams having started work.

The rehabilitation and reconstruction plan needs to follow a phased approach:

1. Initially for the rehabilitation phase the focus would be on restarting economic activity: getting the affected people back to work to provide employment and cash. At the same time there is a need to start more detailed assessments and planning to define what new facilities and needs have to be addressed and how. This phase is expected to start straight away and last for about two years – 2005-2006.
2. Secondly the reconstruction phase will start to strengthen and build the sector hopefully back to pre-tsunami conditions but perhaps even going beyond by also avoiding some of the weaknesses from before. This will mean strengthening market and community support services; ensuring value-added activities and alternative livelihoods benefit local coastal communities, and that environmental rehabilitation is sustained and protected to the benefit of all. Reconstruction will have begun by the end of the first year and last for about five years – 2005-2009.

Detailed activities and estimates of costs

Estimated costs have been prepared for rehabilitation and recovery work under MAFF (Table 11). Sources of funding have yet to be identified.

There bulk of funding is for restarting and sustaining productive activities both in capture fisheries (both on the East and West coasts) and in brackish water aquaculture (mainly on the East coast), but also significantly on rehabilitating and managing the natural resource base. Costs are highest in the first 3 years but are also sustained after that, in view of the depth of the impact of fishing communities and the long-term aspects of environmental rehabilitation. The overall cost of rehabilitation and reconstruction Rp 2.4 trillion (around US\$260 million) is in line with the overall damage and growth in GDP necessary for the sector.

Table 11. Summary of MMAF costs for rehabilitation and reconstruction (in Rp billion)

Area of work	Year and cost					Total
	2005	2006	2007	2008	2009	
	<i>Rehabilitation</i>		<i>Reconstruction</i>			
Development of capture fishery	169	133	207	156	112	777
Development of aquaculture	264	201	195	146	146	952
Coastal and small island management and livelihoods	152	25	12	7	9	205
Habitat and ecosystem rehabilitation	0	125	100	75	50	350
Capacity building and marketing	2	6	3	1	1	13
Marine and fisheries surveillance	8	15	12	5	5	45
Marine fisheries research	2	9	7	2	1	21
Fish quarantine	1	2	2	2	2	9
Fisheries Education and Training Centre	5	8	7	5	5	30
	603	524	545	397	330	2,400

Figures are estimates

key information resources

- Aquaculture statistics from Directorate General for Aquaculture, Indonesia
- Ministry of Agriculture, Indonesia and FAO Joint Survey in Tsunami Affected Area (power point presentation)
- UNOSAT (Satellite images) <http://unosat.web.cern.ch/unosat/asp/charter.asp?id=55>
- World Health Organization (WHO) website http://www.who.int/hac/crises/international/asia_tsunami/sitrep/13/en/
- Preliminary joint needs assessment: <http://www.adb.org/tsunami/ind-damage.asp>

Information gaps

- Information on losses subject to further verification.