Post-Disaster Recovery & Reconstruction from an International Development Perspective: Impact & Challenges for Land & Geospatial Professionals

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"Recovery from Disaster"

What is The World Bank Group?
Comprised of five agencies

186 members	International Bank for **Reconstruction** & Development	1944 THE WORLD BANK IBRD • IDA | WORLD BANK GROUP
169 members	International Development Association	1960 IFC International Finance Corporation
182 members (To interact with private sector)	International Finance Corporation	1956 MIGA Multilateral Investment Guarantee Agency
	Multilateral Investment Guarantee Agency	1988 ICSID International Centre for Settlement of Investment Disputes
	International Center for the Settlement of Investment Disputes	1966

Over 10,000 employees

Over 5,000 consultants

120 country offices

Our "Two-Speed" World – High Speed vs Low Speed

80% of humanity live below US$10.00 a day or where 70% of humanity do not have clear legally & spatially defined land or property rights ….”

Source: Childress, M., Bell, K.C. & Cheehai, T., 2014, *Spatial Innovation & Good Practices in Land Administration Forum*, Report of the Joint World Bank-FIG Forum held March 28, 2014, Washington D.C., Coordinates, May 2014**.**

Source: Boston Wikipedia (unknown)

Source: various (Metro Manila)

Source: NYC - depositphoto.com

Source: various, incl. “The Guardian” (Kabul)

Recurrent Themes

- Coordination – stakeholders, govt, actors
- Community participation & public awareness
- Capacity
- Preparation is key to resilience
- SDI should be part of resilience
- Land Records – need to be disaster-proof
- Build back better – respect rights of survivors, heirs & vulnerable groups
- Owners, renters & landless
- Governance
- Social (including gender), cultural, religious & heritage, IP issues
- Law of the land; other laws (religious)
- Environmental

Disaster Context

Disasters

- In the last 30 years, ***>80% of deaths from disasters in LIC & MIC.***
- ***Disasters' impact on GDP is 20 times higher in LIC & MIC than in HIC***.

(WB, GFDRR, 2016)

Global Cost of Disasters

- The bill from natural & weather disasters is nearly **US$ 200 bn per year** - now **4 times higher than 1980s**.
- Disasters cost nearly **US$ 4 trillion over past 30 years**; about **2/3 due to extreme storms, floods and drought**; > **2.5mn dead.**

(WB, Nov. 2013)

Preparation & resilience

- Building disaster-resilient infrastructure & early warning systems, is costly, but typically **yields benefits 4-36 times higher than initial outlay.**

(WB, Nov. 2013)

Disaster Management Cycle – "Geospatial" Roles

Prevention & Mitigation

- Hazard risk analysis
- Simulation & modelling
- Risk mapping
- Building & asset inventory
- Public awareness raising
- Training & capacity building

Recovery Reconstruction Rehabilitation

- Coordination
- Damage assessment review /revised
- M&E
- Governance
- Law & order
- Tenure security, Housing
- Spatial Planning
- Transport & infrastructure
- Utilities
- Comms
- Agriculture
- Livelihoods

Relief – Humanitarian

- Coordination, Planning
- Emergency aid - Search and rescue, Evacuation & shelters, Medical, Food, water, Rubble and debris removal
- Damage assessment - advanced
- Logistics, Delivery of aid

Preparation

- Needs assessment
- Planning – response, evac, comms, med. etc.
- Stockpiling resources location
- Logistics planning

Prediction & Warning

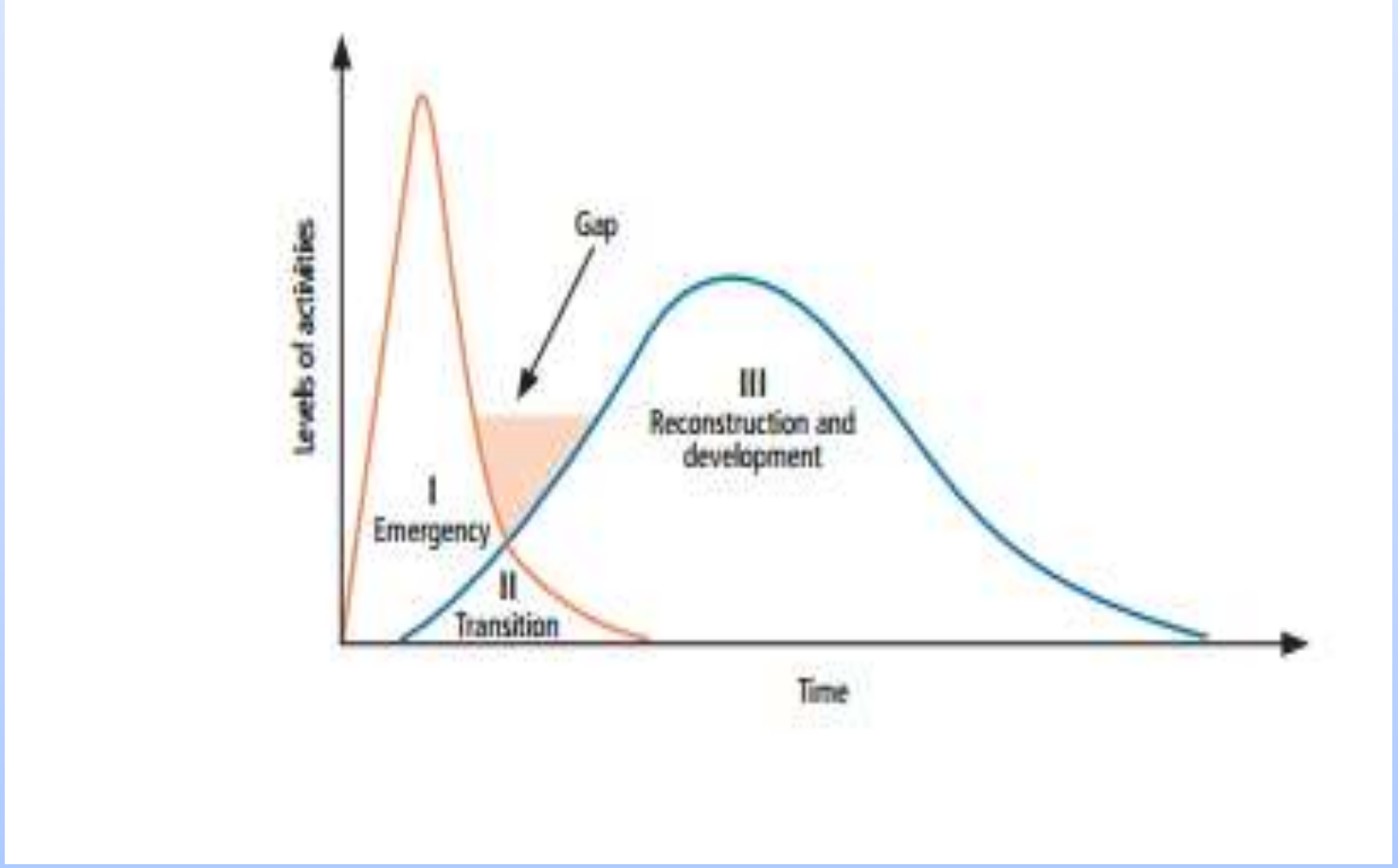
- Monitoring
- Forecasting
- Early warning
- Exercising

Response – Emergency - Humanitarian

- Coordination
- Situation Analysis – Appreciation
- Crisis maps
- Emergency aid - Search and rescue, Evacuation & shelters, Medical, Food, water
- Emergency resources dispatch
- Early damage assessment

The Gap between Relief and Recovery

Source: WB, GFDRR, 2012, "Haiti Reconstruction Notes"



Stakeholders & Actors –often different agendas

Stakeholders

❖Victims/survivors, absentee owners, local population and communities

Government

❖Government – local, provincial/state, national

❖Military

❖Emergency services

❖Coordination authority/ies

Actors

- Donors
- Humanitarian and Relief Agencies – Emergency & other phases
- NGOs/CSOs
- Media
- Celebrities
- Special Envoys & dignitaries

Actors – by Sector (Aceh)

Source: World Bank, 2008 (Masyrafah, H., & Mckeon, J. Joint WB - Brookings Institute Publication)

Number of actors by sector	NGOs	BRR	Donors	Number of actors
Social sector				
Education	143	1	17	161
Health	135	1	16	152
Community, culture & religion	97	1	5	103
Infrastructure and housing				
Housing	107	1	12	120
Transport	19	1	14	34
Communications	3	1	5	9
Energy	8	1	1	10
Water & sanitation	57	1	6	64
Flood control, irrigation works	8	1	5	14
Other Infrastructure	11	1	10	21
Productive sectors				
Agriculture & livestock	64	1	4	69
Fisheries	55	1	9	65
Enterprise	109	1	32	142
Cross-sectoral				
Environment	17	1	8	26
Governance & admin	27	1	10	38
Bank & finance	7	1	0	8
Total*	**435**	**1**	**27**	**463***

**Actors can have a presence across multiple sectors, and totals are therefore not cumulative*

Some Options for Managing Reconstruction

Option 1: Create a new institution to manage reconstruction and recovery– used in **Indonesia - Aceh (BRR) and Sri Lanka after the 2004 Tsunami** – used because existing institutions lacked capacity to undertake new projects plus provide normal service delivery.

Option 2: Strengthen and Coordinate Existing Line Ministries so they can lead reconstruction on a sector-by-sector basis. It requires an agreed master plan and relies upon govt budget to channel funds for reconstruction – this is actually the **US FEMA approach**.

Option 3: Hybrid Model – use existing govt structures strengthened by a temporary agency tasked with increasing the speed of reconstruction. It is a combination of Options 2 and 3 and was used in Liberia.

Haiti approach: Establish an Interim Recovery Commission - for 18 months and then establish a special institution (Option 1) – but it reverted to existing govt structures.

Source: WB, GFDRR, 2012"Haiti Reconstruction Notes"

Indonesia: Aceh and North Sumatra, Tsunami, Dec 26, 2004

- **Magnitude of earthquake 9.1-9.3** with epicenter of W. coast of Sumatra
- While estimates vary, **≈170,000 (ranges from 130-230,000) killed**
- **>30,000 injured**
- **≈500,000 homeless in Aceh and 300,000 in N. Sumatra**
- **≈ 250,000 homes destroyed or damaged**
- **≈ 300,000 land parcels directly affected** (160,000 urban, 140,000 rural).
- **≈ 600,000 livelihoods lost**
- **≈ 53,000 land parcels perm. destroyed** -erosion or permanent submersion.
- **Devastation to >1,000 communities along > 800 kilometers** of the northern coastal areas of the major island of Sumatra & smaller offshore islands
- **Second off-shore earthquake Mar 28, 2005 magnitude 8.6** struck the sea bed between the islands of Simeulue in Aceh and Nias in N Sumatra – **1,346 killed on Nias and Simeulue, tens of thousands displaced**

Tsunami-affected Geographical Area

World Bank Assessment, 2005

Aceh, Tsunami, Dec 2004

Banda Aceh, before & after tsunami

(Digital Globe, Jun 23, 2004; Dec 28, 2005)

Loss of Physical evidence of Land Tenure
Lampuk District, Aceh

Aceh - Another Factor – 30 Year Civil War

Building Back Better:
Banda Aceh, Dec 2004 & 2014 (AFP Getty)

Aceh disaster (cont)

- Few **land renters**
- **Women** previously not issued titles although many women owners
- **National Land Agency (BPN):** Close to 1/3 of staff killed; 6 of the 9 BPN offices destroyed or severely damaged.
- **Land records** destroyed - 80%
- Evidence of ownership destroyed/lost – physical, human
- High proportion of the **legal, physical & human evidence of land ownership & property rights destroyed/lost**.
- Cost ≈US$4.4Bn; extra ≈ US$1.5Bn **build back better** (possibly US$7-9.9 Bn?)
- **Civil War,** ongoing 30 years, killed ≈15,000
- **Truce agreement 8/2015** - provided land allocation for GAM soldiers
- **Inflation** reached 41% - "Dutch Disease"
- Progress - **"build back better"** – judged successful.
- **No private sector surveying/mapping**

Reconstruction of Aceh Land Administration System (RALAS) focus:

- **Govt of Indonesia:** RALAS Implementation – through BPN
- **MDF through World Bank:** RALAS Project (US$28.5 million).
- **MDF:** RALAS Monitoring Team (2005-late 2009).
- **UNDP:** Training of 700 NGO/CSO facilitators, Public Awareness Raising.
- **Japan:** Restoration of Land Records (100 tonnes).
- **Australia:** Support for producing large proportion of Community Land Maps (in about 400 communities).
- **European Union:** Satellite imagery & Technical Assistance (€500,000).
- **Large number of CSOs and NGOs:** Supported Community Land Mapping & Advocacy on Land Rights.
- **Govt of Indonesia:** Land allocation program (both for housing tsunami affected population & others).
- **Other World Bank Support:** TA, studies/reviews Gender, Impact, social; training, supervision and fiduciary oversight

Some impacts of the RALAS interventions

BEFORE	AFTER
< 50,000 Titles held by owners	222,000+ titles issued (& grew to 300,000+ post-project)
<50,000 land parcels registered	275,000+ land parcels registered (& grew to 300,000+)
N/A	700 CSO facilitors trained for CLM 310,000+ parcels mapped under CLM
Gender **not** recorded in register No Joint titling	Gender recorded Joint Titling
Low-level of awareness of formal land rights	High-level of public awareness of rights & benefits
5,000 mortgages	# mortgages (impacts to be measured in longer term)
Weak institutional capacity	Strengthened institutional capacity
 	120,000 houses built on land parcels mapped by CLM
	Village-level conflict resolution was very effective
	Land grabbing & alienation averted
	Trained 6 Provincial court officials & 50 Shariah court judges on inheritance & guardianship

Legal /Policy Outputs

- Dissemination of **guidelines on inheritance** in accordance with Syariah law

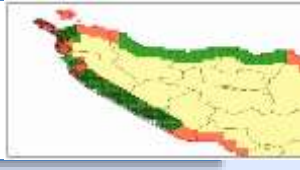
- **PERPU: Treatment of mortgages** of properties already destroyed by tsunami (presidential decree, PERPU, issued in Sep 2007) and protection of pre-tsunami property rights

- **Waiver of taxes, fees and charges** for land titles issued in the tsunami affected areas (MOF regulation of Oct 2005)

- **Surveying regulations** widely disseminated

- **CDA (RALAS) Manual** –prepared - issued as decree Jul 2005, later revised

Geospatial Data – Challenges in Aceh



What was needed:

- Damage assessment & reconstruction effort requires current geospatial data – mapping, satellite imagery & aerial photography for planning, coordination, monitoring;
- **Property rights specifically required pre- & post-tsunami geospatial data for evidence of occupation**.

Challenges:

- Widespread confusion over what geospatial data existed or was being captured.
- Several ODA/govts provided immediate mapping assistance which by convention went to the Indonesian National Mapping Agency (Bakosurtanal) – that mapping was largely poorly specified & more suited for topographic mapping programming purposes rather than reconstruction.
- Bakosurtnal didn't share geospatial info with other govt agencies & civil society.

What happened around RALAS:

- Navigated around Bakosurtnal.
- Acquired new imagery & mapping, funded by EU
- For property & land tenure, focused on reconstruction of property rights, evidence of ownership prior to the tsunami was of critical importance -a mix of Quickbird (60cm) & Ikonos (1m) Imagery, pre- and post-tsunami was acquired. The scenes were ortho-rectified using precision Differential Global Positioning System (DGPS) control points. Additional resources were deployed to collect ground control for further imagery; Scrounged any pre-tsunami geospatial information.
- **Shared geospatial data** through National Land Agency (BPN).
- **Community Land Mapping** (Volunteer Geographic Information VGI) and **structured evidence** for ownership claims – submitted to BPN

Haiti: Jan 12, 2010 Earthquake

- Earthquake with a magnitude of 7.0 struck
- >230,000 people killed, ≈ 20,000 not accounted, injured ≈ 300,000
- 1.5mn homeless; mostly renters (85%); 1m+ in camps.
- Damages & losses estimated around US$8Bn or 120% GDP (WB, 2015)
- Estimated cost of re-building US$8.1 -13.9 billion (IDB, 2013)

Haiti: Some progress comments

- Progress to date slow; ≈ 65,000 still in camps or temp shelters
- Reconstruction responsibility changed several times
- **Use of Open Street Map (OSM)** – 600 volunteers created new mapbase from scratch.

OSM Effort

- WB, Google, et al provided high-resolution imagery of the affected area to the public.
- Volunteer digitizing of roads, building outlines, & other infrastructure, creating what quickly became the most detailed map of Port au Prince that had ever existed.
- Volunteers from 29 countries made about 1.2 million edits to the map, performing an estimated year of cartographic work in about 28 days.
- This effort **catalyzed a rethinking of community mapping and open data** within WB & other international institutions.

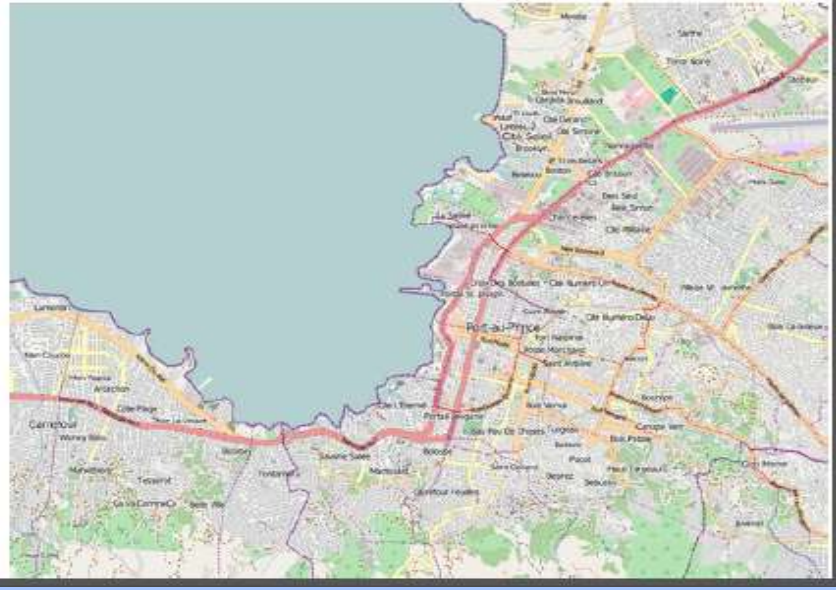
(WB, Nov 3, 2014, Marc Forni)

Haiti: OSM in Port au Prince

GFDRR Labs
Global Facility for Disaster Reduction and Recovery

OSM and Crisis Response in Haiti

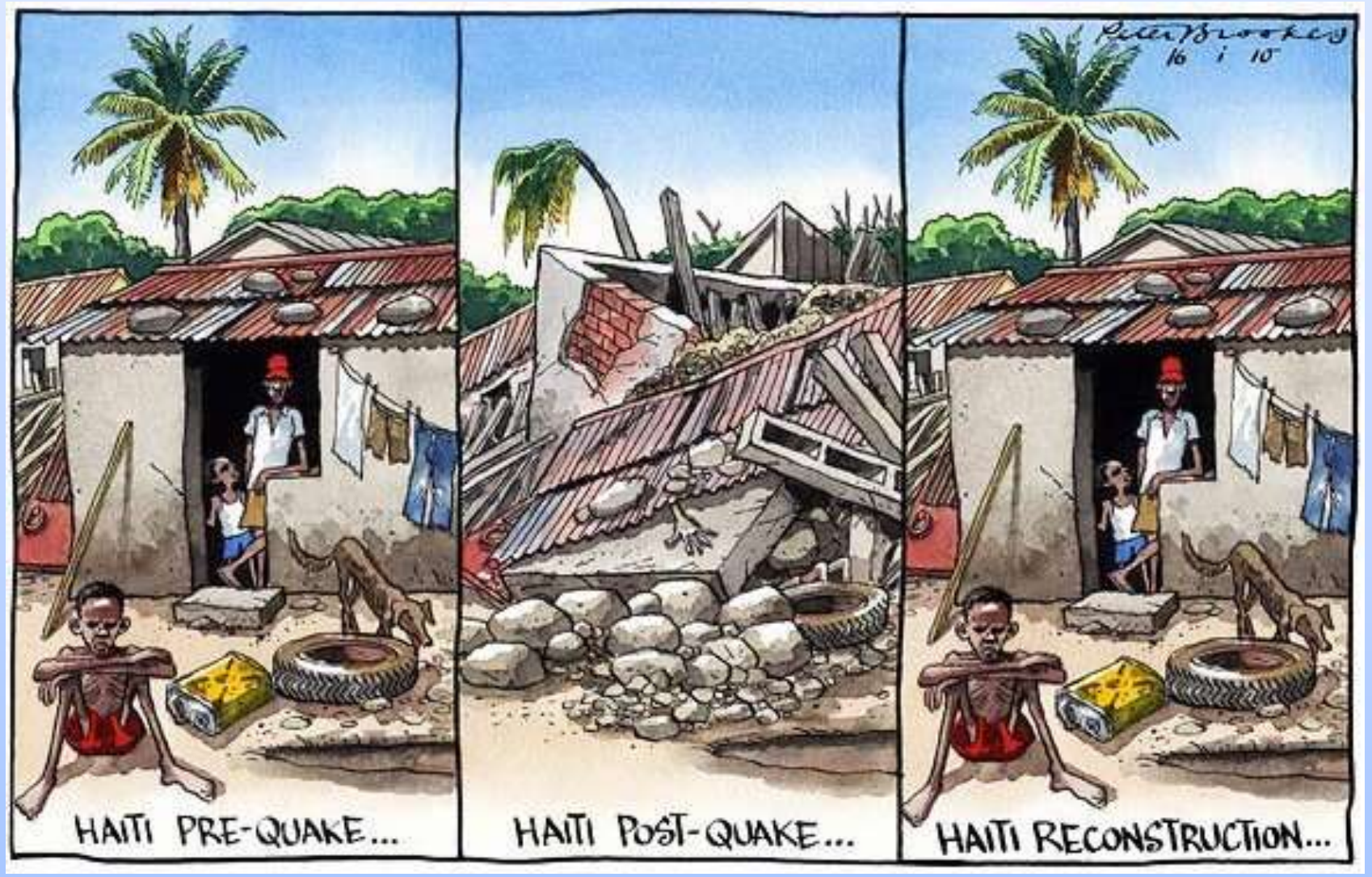
Before



28 Days Later

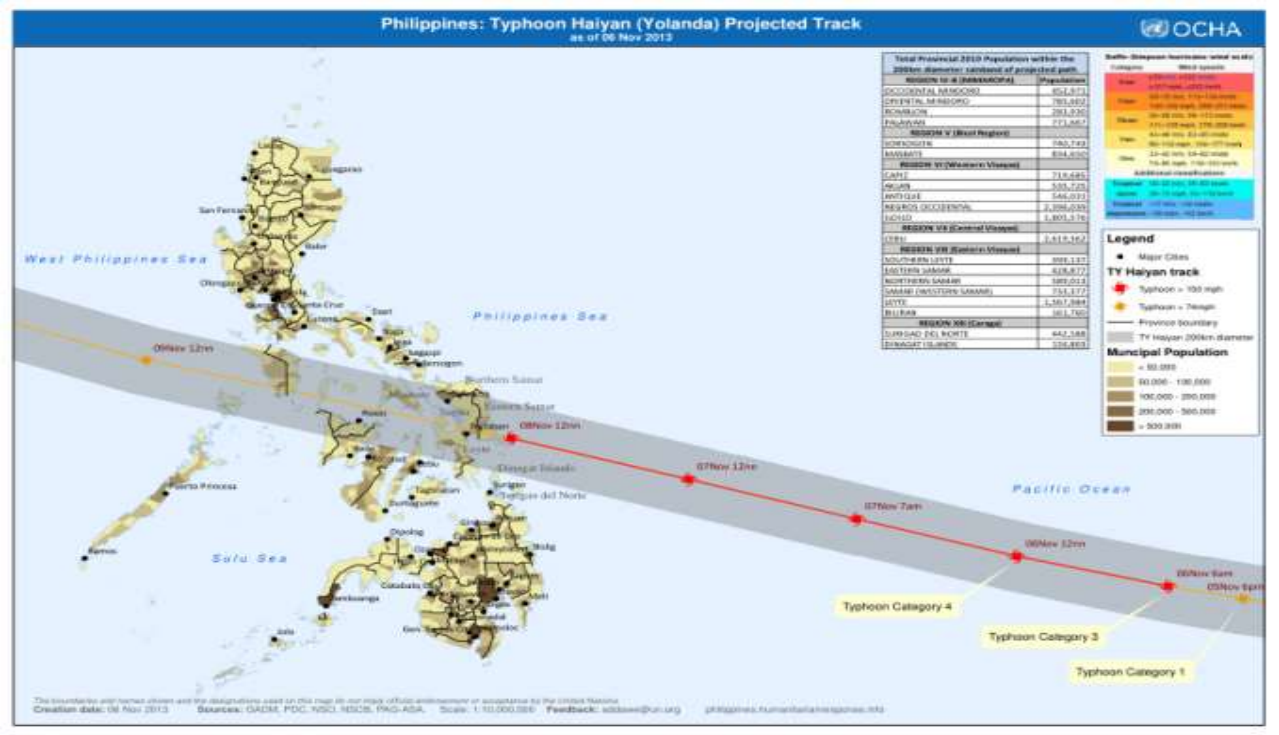
Has Haiti Built Back Better?

(BBC, RHS Geography, 2016)



Phillipines: Typhoon Haiyan (Super Typhoon Yolanda) Nov 8, 2013

- Strongest storm recorded at landfall in Philippines and deadliest typhoon to strike the country
- > **6,300 people killed**, >1,000 missing, 27,000 injured,
- 1.9 million homeless and more than 6,000,000 displaced (Visayas Region)
- Cost in damages around US$14Bn



NB.

- Extensive mapping available – topo, imagery, cadastral
- Extensive public land records, cadastral mapping & titles (DENR & LRA)

Phillipines: Typhoon Haiyan Public Land Records

Source: Philippines DENR Report Dec 9-10, 2013

ANNEX A Land Records	Damaged	Recoverable	Recovery Period and Strategy
Technical Records Section (TRS) Universe = 84,000 Survey Envelopes (SE)	90% of records transferred in ground floor are damaged and soaked in sea water composed of isolated survey records completed for ISG. 10% beyond recovery since these are mudded and washed out. All ISG'd records from Leyte and Samar. These are records for verification and encoding transferred in the ground floor: 1. All records in Samar Island Cadastre (100%) 2. All Isolated surveys or survey envelopes in Leyte province (est. 35,000) All survey plans (SP) and public land applications (PLAs) records decentralized by LMB	- 80% recoverable rate - detailed lists and number of records can only be determined during the recovery process	Depending on weather condition and availability of equipment (sun drying equipment) and personnel: 1. records drying and temporary filing = 2 months 2. Sorting of records (ISG) which may take longer considering that these are under delicate state and can be classified as poor conditions = 1-2 years 3. reconstruction = 1-2 years depending on the detailed list during the inventory and recovery process

Yolanda: Open Street Map (OSM)

OSM remote damage assessment was confirmed as unreliable due to:

- Imagery resolution
- OSM contractors - expertise
- Reliability of crowd-sourced/volunteer contributors to OSM
- Lack of guidance materials for contributors
- Media effect – adverse external influence on crowd-sourced contributor classifications

Source: American Red cross, USAID, REACH, 2014, *Groundtruthing Open Street Map: Building Damage Assessment*

Damage Classification	OSM (%)	Observed (%)	Difference	Percent under/over-represented in OSM
Destroyed	32.76	14	18.76	Over 134%
Major Damage	29.19	39.24	-10.05	Under 25%
No / Partial Damage	38.05	46.77	-8.72	Under 18%

Pacific Island Countries (PICs)

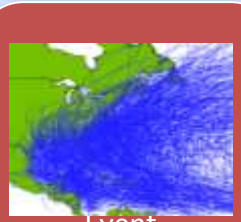
Since 1950 disasters have affected **~9.2 mn people in the Pacific region**, caused **9,811 reported deaths** & cost PICs around **US$3.2 bn in associated damage costs** (EM-DAT, **2010**) - **figures have increased**

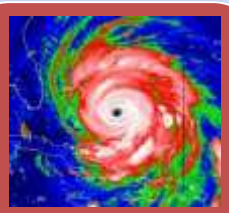
- ***Annually, PICs experience damage caused by natural disasters estimated at average of US$284 mn, or 1.7% of regional GDP*.**
- ***There is a 50 % chance that the Pacific region faces disaster losses in excess of US$1.3 bn in any 50 year period.***
- **Tonga is the most affected PIC**, in terms of national GDP, followed by Vanuatu & Federal States of Micronesia. (World Bank, GDRRR, 2013)
- **Eight Pacific Island countries** are among the 20 countries in the world with the **highest average annual disaster losses scaled by gross domestic product**. (World Bank, Policy Note, Jun 4, 2012)
- PICs comprise **20-30,000 islands** (Wiki)

Pacific Catastrophe Risk Assessment & Financing Initiative

Pacific Risk Information System (PacRIS)

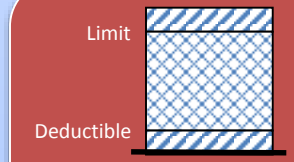
- PacRIS is a **GIS platform** designed to provide PICs (15 countries), development partners & the private sector with the data & tools needed to develop disaster risk reduction tools – to help them better understand, model, & assess their exposure to natural disasters.


Event Generation


Intensity Calculation


Exposure Information


Damage Estimation



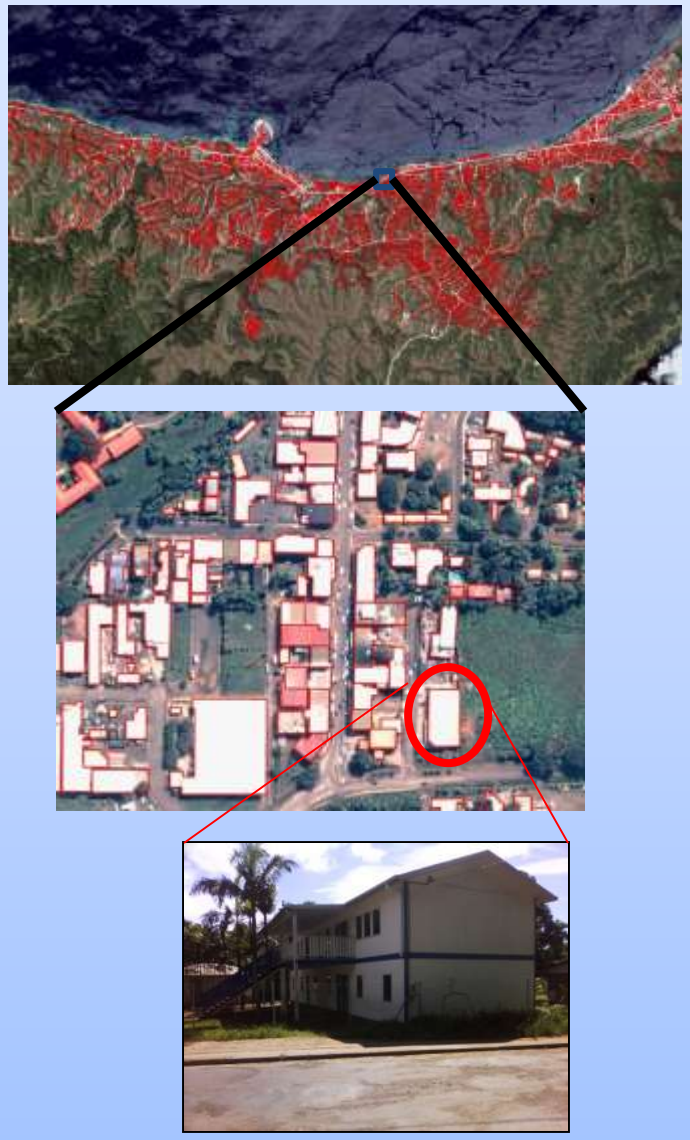
Mitigation / Policy Conditions


Loss Calculation

- PacRIS compiled by the South Pacific Applied Geoscience Commission (SOPAC), under PCRAFI. **Joint initiative** of WB, the ADB, & SOPAC -co-funded by Japan, & the Global Facility for Disaster Reduction & Recovery (GFDRR – secretariat at WB). Technical support from AIR Worldwide, New Zealand GNS, Geoscience Australia, Pacific Disaster Center (PDC), OpenGeo & GFDRR Labs.

Assembling the largest collection of geo-referenced datasets in the Pacific region

- Satellite imagery
- Administrative Boundaries
- Population Census Data
- Agricultural Census Data
- Surface Geology Maps
- Topographic Maps
- Soil Maps
- Bathymetry
- Infrastructure maps (e.g., roads, bridges, Utilities, etc.)
- Geodetic
- Fault Data
- Building Assets
  - ~80,000 bldg photographed
  - ~400,000 bldg footprints digitized
  - ~1,500,000 bldg. &assets captured from imagery



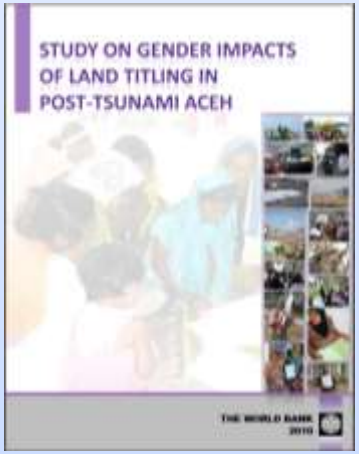
Some Key Lessons

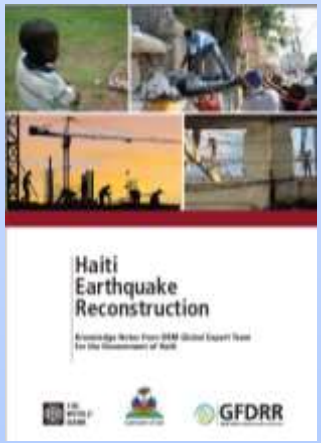
1. **Define early on the best institutional model** to lead the recovery & reconstruction effort
2. During the relief effort, **establish clarity on leadership & division of labor through the "cluster approach"** which has been successfully practiced in humanitarian relief over recent years
3. Establish **regular decision meetings** with development partners
4. Encourage development partners to contribute to a Multi-Donor Trust Fund – **pooling of funds can reduce fragmentation of aid & reduce transaction costs**
5. The govt should set up monitoring systems which **tracks the money & outputs – including where the money is spent; who is doing what & where**
6. While **core fiduciary principles should apply**, post-disaster financing is fundamentally different to regular development projects. In particular, **planning, budgeting & implementation need to be much more rapid & flexible**.

Source: WB GFDRR 2012,"Haiti Reconstruction Knowledge Notes".

7. **Property rights respected in reconstruction – FFP**
8. **Public & community participation essential.**
9. **FFP – sufficiently effective to do the job; can be incrementally improved later**
10. **Reliable, Geospatial data is vital for all stages** of disaster management incl. fiduciary & good governance – **SDI in place prior – Spatial enablement.**
11. **VGI/crowd-sourced maps** can be useful – guidelines for volunteers, validation.

Some Relevant World Bank (& Joint) Publications





NGO Professions - Global Pro-bono Humanitarian Aid

- **Doctors:** Doctors Without Borders (*Médecins Sans Frontières)* - 1971
- **Dentists:** Dentists without borders – 2003
- **Engineers:** Engineers Without Borders - 1980s
- **Lawyers:** Lawyers without borders - 2000
- **Journalists***: Reporters Without Borders (Reporters Sans Frontières)* - 1985
- **Geologists & Geosphysicians:** Geoscientists Without Borders - 2008

- **What about Land Surveyors without Borders (**Géomètres Sans Frontières)??

Can FIG lead national profesional bodies to put Surveyors, land administratrors and geospatial specialists on the pro bono humanitarian map:

MANY THANKS