

Measuring (Economic) Losses

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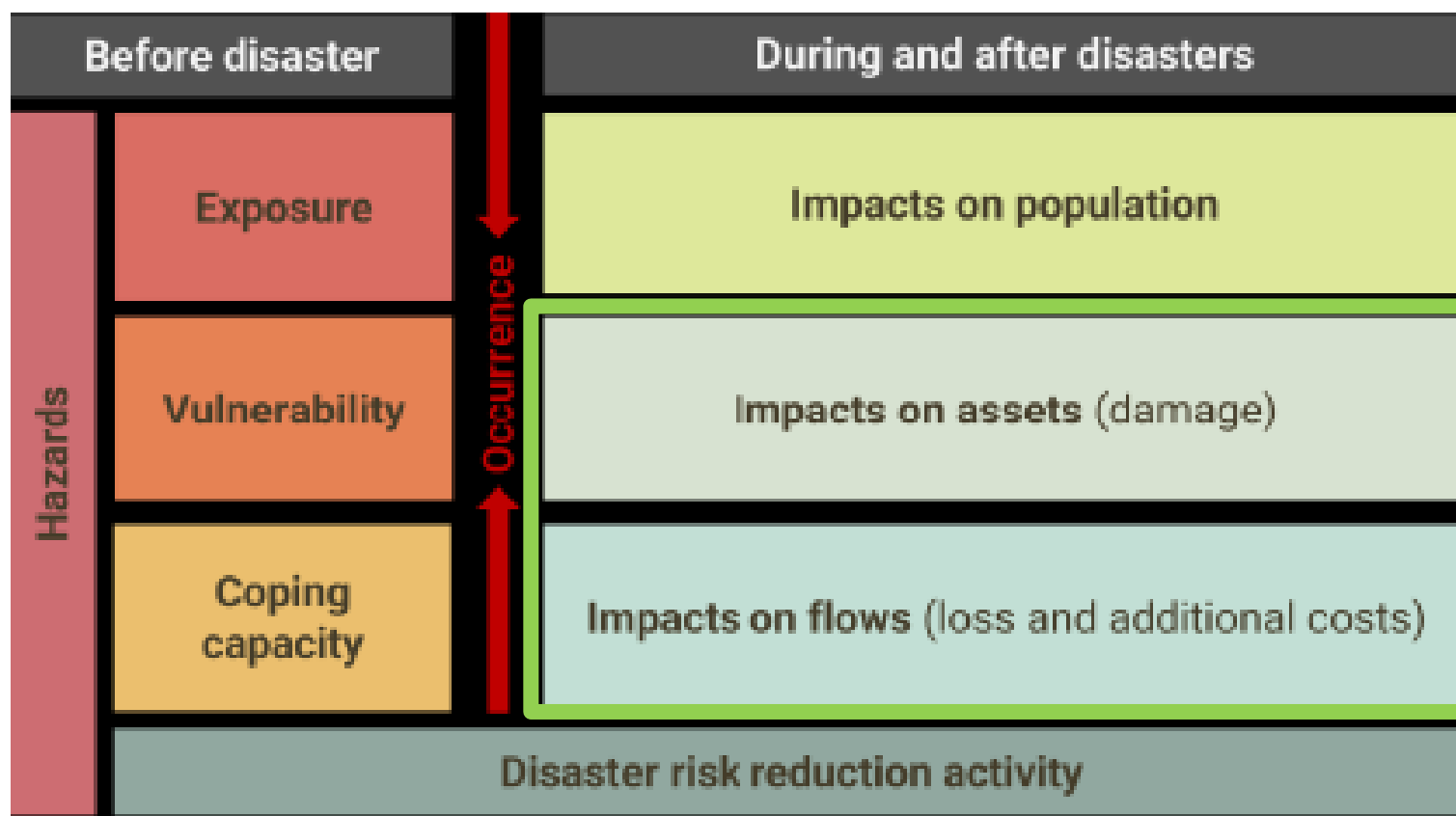
With thanks to colleagues at various UN teams

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Components of disaster related statistics

The proposed update:



Let's again start with some concepts

Impacts from hazardous events and disasters

Impacts on populations (covered yesterday)

Impacts on assets (e.g., destruction on dwellings and infrastructure; damage to crops and machinery, damage to ecosystem assets)

Impacts on flows (e.g., economic losses due to decreased economic activities; reductions to ecosystem services)

A note on terminology

- * In the SDGs and other documents, the term direct economic losses was used.
- * In general, this is the same as impacts on assets
- * Sometimes you may also see indirect economic losses
- * Again this lines up largely with impacts on flows

A note on data needs

- * Measuring losses in monetary term is data intensive
- * In most cases, the starting point will be data in physical terms (e.g., number of dwellings damaged, acres of agricultural land flooded)
- * Need to have high quality and granular data on assets prior to disaster occurring (more on this later).

Some details on impacts on assets

- * Impacts on assets (damages)— largely similar scope as SNA
- * *Fixed assets* such as dwellings, buildings, transport infrastructure, water/irrigation systems, machinery, equipment, other structures,
- * *Inventories* such as stocks of final and semi-finished goods, raw materials, spare parts,
- * *Valuables* such as precious metals and stones, paintings, sculptures or other art objects
- * *Non-produced assets* such as environmental and ecosystem assets (SEEA)
- * *Consumer durables* such as vehicles, furniture, and electrical goods acquired by households.

Some details on impacts on flows

- * Impacts on flows (losses and additional costs)
 - * Losses: goods that go unproduced and services that go unprovided during a period running from the time the disaster occurs until full recovery and reconstruction is achieved.
 - * Examples: reduction of future harvests due of the flooding of farmland; a decline in industrial production due to damage to plant or lack of raw materials or inputs such as electricity.
 - * Additional costs: outlays required to produce goods and provide services as a result of the disaster.
 - * Example: hospital buys more medicine after a disaster instead of adding a new building; gov. reduces education spending to buy more emergency food

Data needs

- * Scale of damage/destruction before any repair
- * Pre-disaster data collected on “exposure” may give jump start on field/remote surveying
- * Baseline data important (to compare with post-disaster survey)
- * More disaggregated data can allow for better calculations (e.g., by sector)



Different complexities in valuation

Relatively easier

Relatively harder

Impacts on assets such as buildings, roads, etc.

Impacts on agricultural, forestry, and fishery products

Impacts on ecosystem assets, including green infrastructure

Losses and additional costs

Methodology for damages

- * Scope is stock of physical assets
- * Replacement cost
 - * Costs of repairing/rebuilding/replacing asset
 - * Estimation based on average cost assumptions often necessary
 - * NOTE: Replacement value $\neq$ Market value

$$\begin{array}{|c|} \hline \text{Number of units lost} \\ \hline \end{array} \times \begin{array}{|c|} \hline \text{Average cost for a} \\ \text{new unit} \\ \hline \end{array} = \begin{array}{|c|} \hline \text{Damages} \\ \hline \end{array}$$

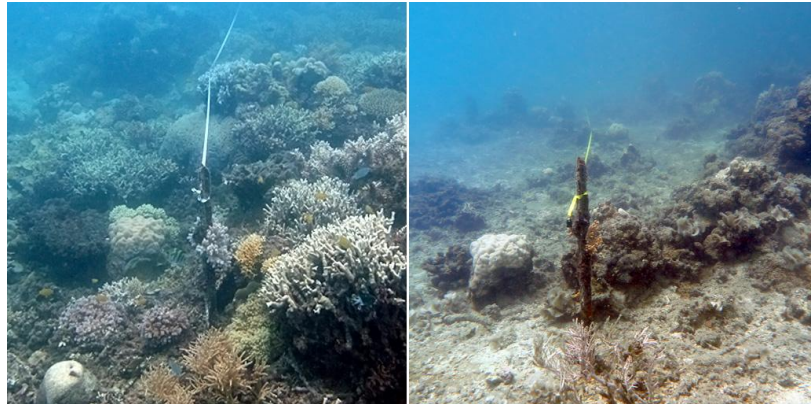
Assets may be improved during replacement

- * “Building back better”
- * Not reflective of the true cost of the disaster
- * But ARE reflective of investment in disaster and risk reduction
- * Differential between estimated and actual costs



Environmental and ecosystem assets pose unique challenges

- * Valuation methodologies can be trickier, depending on the asset
- * Fisheries and forests can be treated similar to agriculture (particularly aquaculture and cultivated forests—we will come back to agriculture later and in our exercise)
- * What about loss of a mangrove forests/swamps or a damaged reef?



Source: AIMS LTMP

Environmental and ecosystem assets pose unique challenges

General structure of the physical asset account for environmental assets (*physical units*)

	Mineral and energy resources	Land (including forest land)	Soil resources	Timber resources		Aquatic resources		Water resources
				Cultivated	Natural	Cultivated	Natural	
Opening stock of resources	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Additions to stock of resources								
Growth in stock	na	Yes*	Soil formation Soil deposition	Growth	Natural growth	Growth	Natural growth	Precipitation Return flows
Discoveries of new stock	Yes	na	na	na	na	na	Yes*	Yes*
Upward reappraisals	Yes	Yes	Yes*	Yes*	Yes*	Yes*	Yes	Yes*
Reclassifications	Yes	Yes	Yes	Yes	Yes	Yes	Yes	na
<i>Total additions to stock</i>								
Reductions in stock of resources								
Extractions	Extractions	na	Soil extraction	Removals	Removals	Harvest	Gross catch	Abstraction
Normal reductions in stock	na	na	Erosion	Natural losses	Natural losses	Normal losses	Normal losses	Evaporation Evapotranspiration
Catastrophic losses	Yes*	Yes*	Yes*	Yes	Yes	Yes	Yes	Yes*
Downward reappraisals	Yes	Yes	Yes*	Yes*	Yes*	Yes*	Yes	Yes*
Reclassifications	Yes	Yes	Yes	Yes	Yes	Yes	Yes	na
<i>Total reductions in stock</i>								
Closing stock of resources	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Environmental and ecosystem assets pose unique challenges

	Terrestrial									
	T1 Tropical-subtropical forests				T2 Temperate-boreal forests and woodlands				...	
	Tropical-subtropical lowland rainforests	Tropical-subtropical dry forests and scrubs	Tropical-subtropical montane rainforests	Tropical heath forests	Boreal and temperate high montane forests and woodlands	Deciduous temperate forests	...	Temperate pyric sclerophyll forests and woodlands	...	...
	T1.1	T1.2	T1.3	T1.4	T2.1	T2.2	...	T2.6	...	...
Opening value										
Ecosystem enhancement										
Ecosystem degradation										
Ecosystem conversions										
Additions										
Reductions										
Other changes in volume of ecosystem assets										
Catastrophic losses										
Reappraisals										
Revaluations										
Net change in value										
Closing value										

Methodology for losses and additional costs

- * What would the impacted area have “looked like” without the disaster (without the loss of the assets)?
 - * Assets are often part of a supply chain
 - * Input-output relationships (forward/backward linkages)
 - * Need to understand linkages of the asset and duration of loss
 - * Coping capacity (ability to recover from shocks) influences assumption on duration of loss
- * Requires assumptions and econometric modeling
 - * Boundary of impact?
 - * Return to baseline?
- * Recommended that producers prices prior to the disaster are used to estimate the monetary value of lost production of goods and services.

Challenge of GDP measures post-Disaster

- * GDP change alone may send mixed or incorrect signal
 - * Rebuilding that increases construction sector expenditures
 - * Following Superstorm Sandy in US, US Department of Commerce estimated a gain of over 200,000 construction jobs
 - * Disruption impacts decrease GDP
 - * Overall signal ambiguous



A few details about agricultural losses (based on FAO methodology)



Review of concepts

* **Damage vs. Loss**

- * Damage is defined as the replacement/repair cost of totally or partially destroyed physical assets and stocks in the disaster-affected area.
- * Loss refers to changes in economic flows arising from the disaster (i.e. declines in output in crops, livestock, fisheries, aquaculture and forestry).

* **Production vs. Assets**

- * Each subsector is presented in terms of its production and its assets.
 - * The production component consists of both inputs and outputs;
 - * The assets component consists of facilities, machinery, tools, and key infrastructure related to agricultural production.

Computing impacts

$$\text{Impact to Agriculture} = \text{DL (C)} + \text{DL (L)} + \text{DL (FO)} + \text{DL (AQ)} + \text{DL (FI)}$$

Where:

- * DL (C): Direct damage and loss to crops
- * DL (L): Direct damage and loss to livestock (more details later)
- * DL (FO): Direct damage and loss to forestry
- * DL (AQ): Direct damage and loss to aquaculture
- * DL (FI): Direct damage and loss to fisheries.

Computing damages and losses to livestock

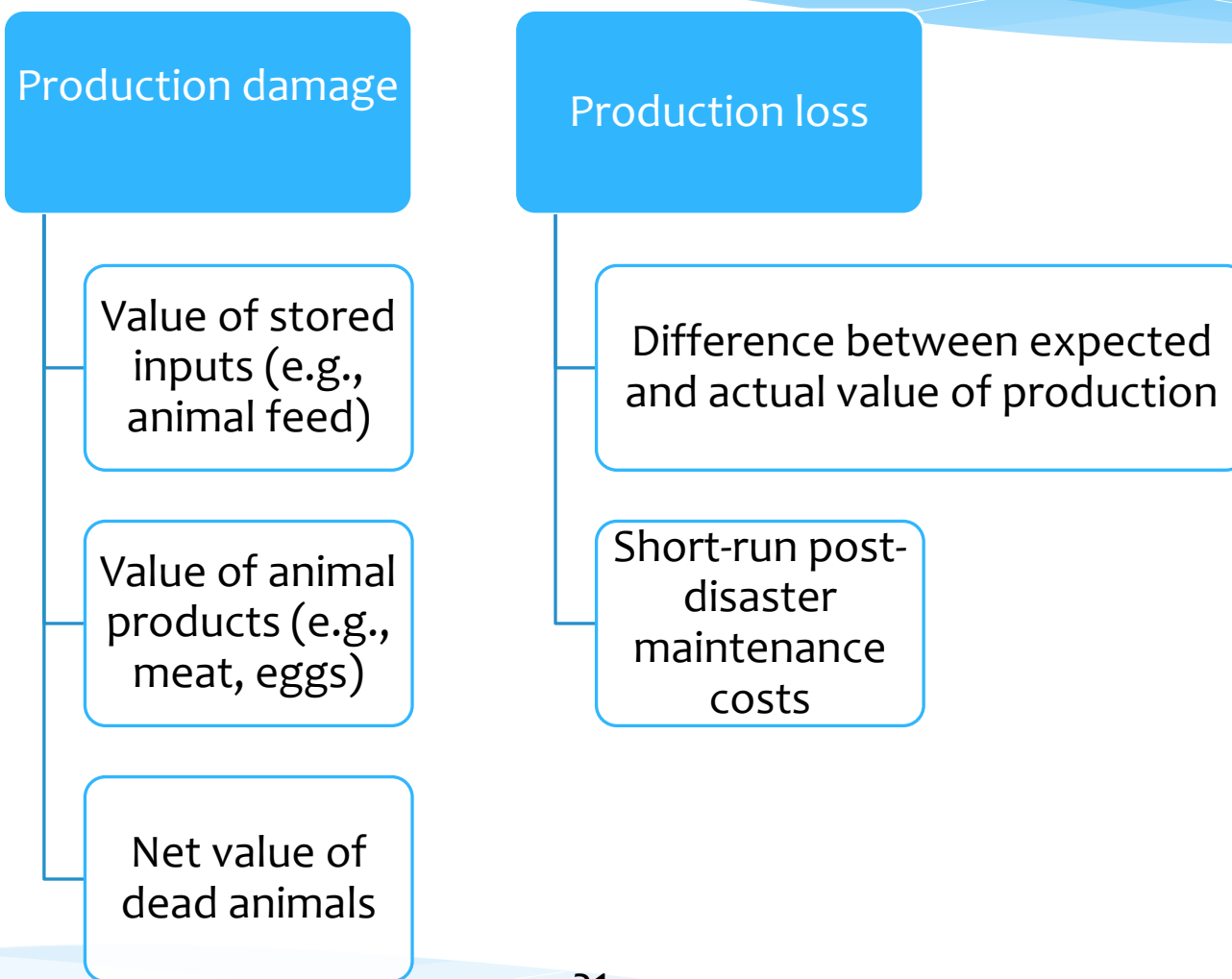
Livestock damages and losses

Production
damage

Production
loss

Asset damage
(complete and partial;
Repair/replacement
cost of partially/fully
destroyed)

Computing damages and losses to livestock



Thank You!



A short exercise to calculate impacts

