Extreme events, slow onset events and economic and non-economic losses

Archana Patankar

APN Climate Adaptation Framework

Workshop on Climate Adaptation, Disaster Risk Reduction and Loss + Damage

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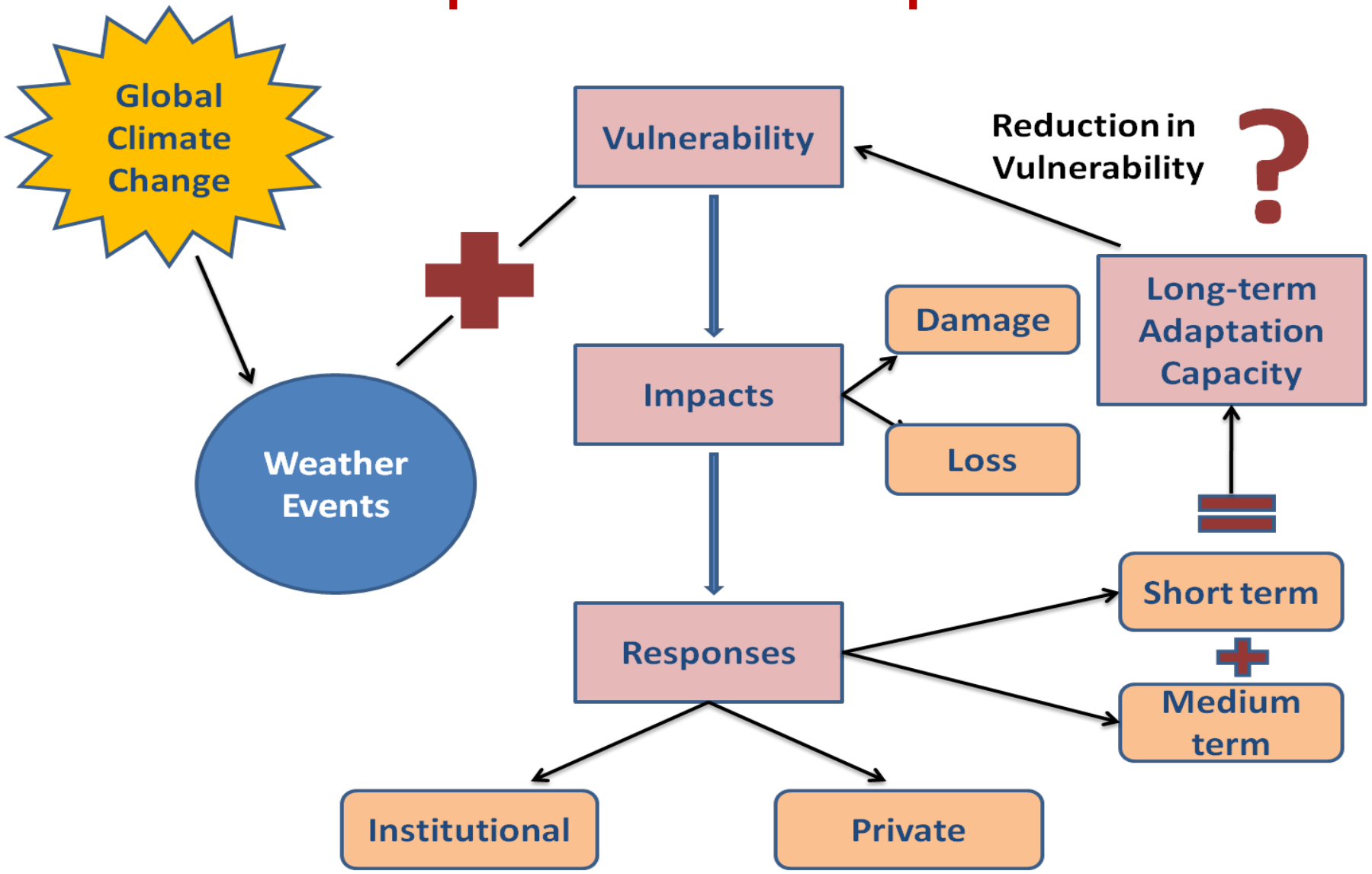
Outline

- Extreme and slow onset events
- Link between events, impacts, response and adaptation
- Impact assessment methodologies
- Loss + Damage assessment
- Economic losses – L + D
- Non-economic losses
- Implications for adaptation

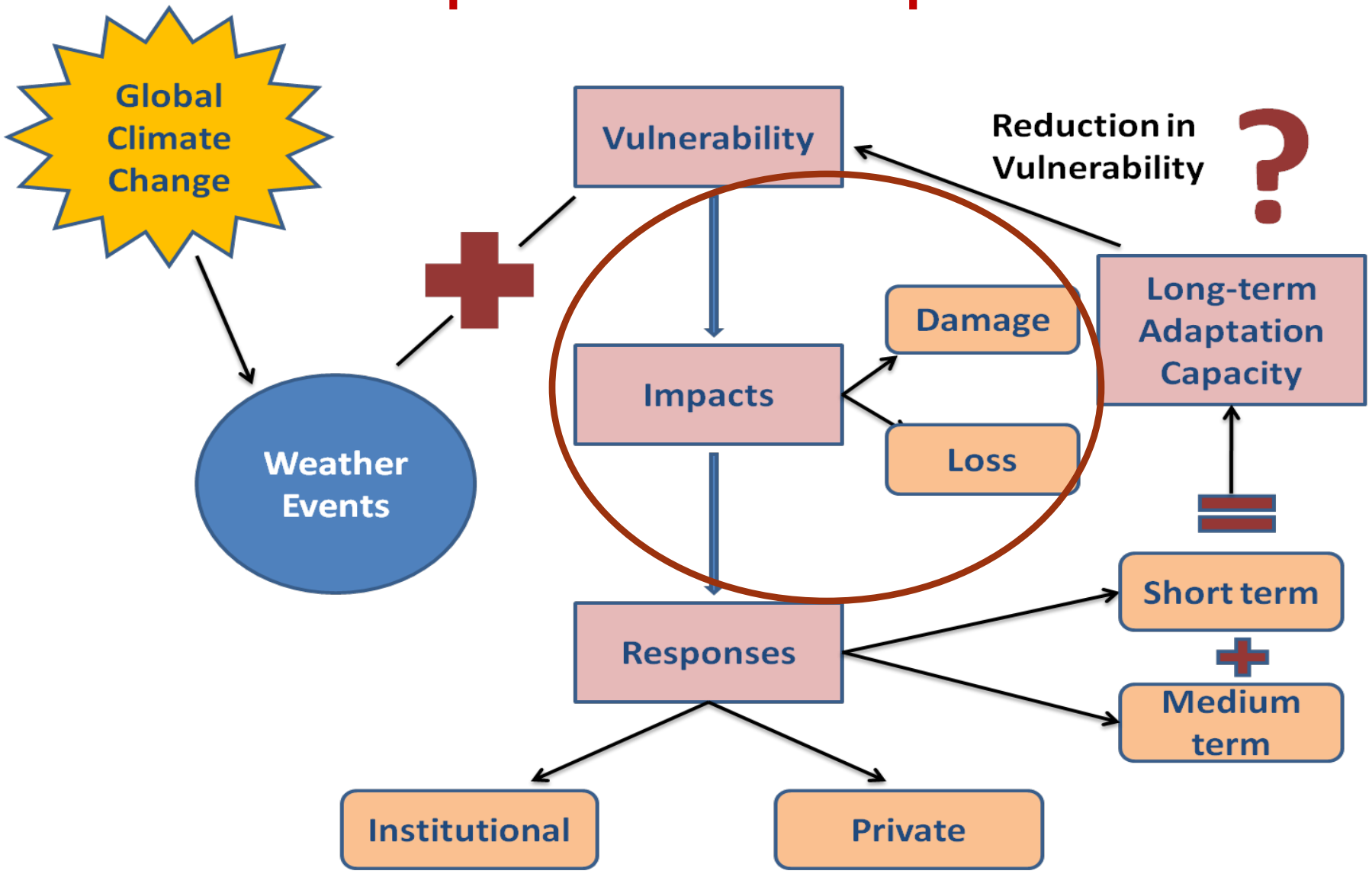
Extreme and slow onset events

- Extreme weather events
  - Heavy precipitation, droughts, floods, extreme heat waves
  - Low probability high consequence events
  - Short term response – major emphasis on rescue and relief
  - Important to capture medium to long-term alteration of the development trajectory
- Slow onset events
  - Sea level rise, increasing temperatures, glacial retreat, salinization, loss of biodiversity, desertification, etc.
  - High probability low consequence events
  - Short to medium term response – adaptation to changes becomes increasingly difficult – retreat might be the last option
  - Important to capture recurrent costs of response and public and private adaptation strategies

Link between events, impacts, response and adaptation



Link between events, impacts, response and adaptation



Impact assessment methodologies

- What is being assessed?
  - direct and/or indirect impacts
  - Measurable and non-measurable impacts
- What is the scale at which assessment is done?
  - Macro / Meso / Micro
- Data sources
  - Insurance database
  - Official assessment
  - Sample surveys in affected areas

Impacts to be considered

Physical	Economic		Financial	Technical	Environmental	Social
	Stock	Flow				
Loss of life and injuries Damage to property Damage to physical infrastructure Loss of land, crops, livestock	Damage to physical capital Loss of inventory	Reduction in income generation Effect on investment Reduction in consumption Effect on production Effect on employment generation	Loss of financial capital Effect on public revenue and expenditure Effect on private revenue and expenditure	Disruption of essential supplies like water, electricity Disruption of communi-cation services	Air or water pollution Land degradation	Displacement or relocation Loss of assets Loss of livelihoods Poor quality of life Conflicts Psychophysical and psychosocial changes

Loss + Damage

- L + D as one of the most important issues emerging in global CC negotiations
- L + D from the perspective of impact assessment
- Important at recovery and reconstruction stage
- Issues to be addressed
  - Methodology for assessment
  - Types of data inputs
  - Infrastructure and resources required for assessment

Economic losses – L + D

- Damage estimation
  - Physical assets and infrastructure – public and private
  - Replacement / depreciation /repair value to be considered
  - Damage to be identified
    - Sector-specific – agriculture, small industries
    - Region-specific – rural or urban areas, coastal cities, arid regions
  - Important issues
    - Data sources
    - Scale

Official damage assessment example

Item	Amount in INR million
Health	
MCGM Medical Colleges	4.73
Peripheral Hospitals	11.46
Muni Properties & Buildings	8.28
Water Supply System	251.81
Utilities	
Abttoir	35.45
Education	1.30
Garden	1.86
Roads	1911.36
Waste Management	
Sewerage Operations	13.67
Solid Waste	90.44
Strom Water Drains	144.90
Total Cost	**2475.27 (US$ 55 million)**

Source: Patankar et al., 2012, Project funded by the APN under ARCP

Damage assessment at micro scale

Estimates of losses among the surveyed households (in INR)

	K East	H East	F North	F South	L Ward	P North
	(Figures in bracket as % of average household monthly income)					
Average Income loss due to floods	10474 (69.8)	8543 (57.0)	5164 (25.8)	8323 (41.6)	22578 (112.9)	14894 (74.5)
Average Amount spent on repair/rebuilding of house/premises	22270 (148.5)	26191 (174.6)	34335 (171.7)	42967 (214.8)	22457 (112.3)	27118 (135.6)
Losses due to damage to household appliances (TV, refrigerator, music system, desktop, laptop, washing machine, stove)	13190 (87.9)	15469 (103.1)	13442 (67.2)	10081 (50.4)	11325 (56.6)	23923 (119.6)
Losses on account of damage to household assets (Furniture and utensils)	9735 (64.9)	11061 (73.7)	11756 (58.8)	6602 (33.0)	7121 (35.6)	10417 (52.1)
Losses due to damages to vehicles (Car, Motorcycle, Bicycle)	12974 (86.5)	9153 (61.0)	11833 (59.2)	1250 (6.3)	5478 (27.4)	7232 (36.2)
Source: Authors' calculations based on primary data, Patankar et al., 2012						

Damage assessment at micro scale

Cost of repairs/replacement in commercial & industrial establishments (in INR)

	K East	H East	F North	F South	L Ward	P North
Losses on account of damage to premises (Ground fences, walls, doors and windows)	39928	16262	28052	5302	32529	40869
Losses on account of damages to equipments (machine tools, wiring, heating, AC)	10410	12883	15824	-	3633	3776
Losses due to damages to materials (Machine tools, inventory, raw material, finished products)	25183	21760	112571	8544	5368	2285
Source: Authors' calculations based on primary data, Patankar et al., 2012						

Economic losses – L + D Contd...

- Estimation of loss
  - Effect on economic flows like loss of income, production, inventory, increased operating costs, loss of tax revenue
  - Disruption of services
  - Migration from affected areas leading to economic losses
  - Important Issues
    - Use of proxy variables
    - Short-term losses and medium to long-term impacts
    - Cascading higher order impacts on the macroeconomy

Loss estimation - examples

Costs incurred on account of floods for businesses (in INR)

	K East	H East	F North	F South	L Ward	P North
Disinfecting premises	29938	12351	30485	12063	77933	30060
Clearing debris and damaged items	8581	6938	5938	4000	28200	39906
Loss of income due to business interruption	18158	11488	15024	5765	43308	32833
Increased alternative operating costs	10396	8537	7167	5896	21000	26929
Loss due to suspended production	104809	22313	252500	128619	14450	85000
Emergency expenses during floods	47500	101000	12000	24200	186667	75000
Source: Authors' calculations based on primary data, Patankar et al. 2012						

Loss estimation - examples

Major problems faced during July 2005 floods

Problem	% among surveyed households (n=1168)	% among surveyed commercials & small industries (n=792)
House/office flooded with water	70	82
Non-availability of local transportation	87	82
Price rise of essential commodities	67	65
Non-availability of food and other household supplies	62	-
Non-availability of raw materials	-	56
Disruption in communication services	61	66
Disruption of electricity	83	88
Non-availability of clean drinking water	75	79
House flooded with sewerage/garbage	80	-
Non-availability of fuel	51	46.5

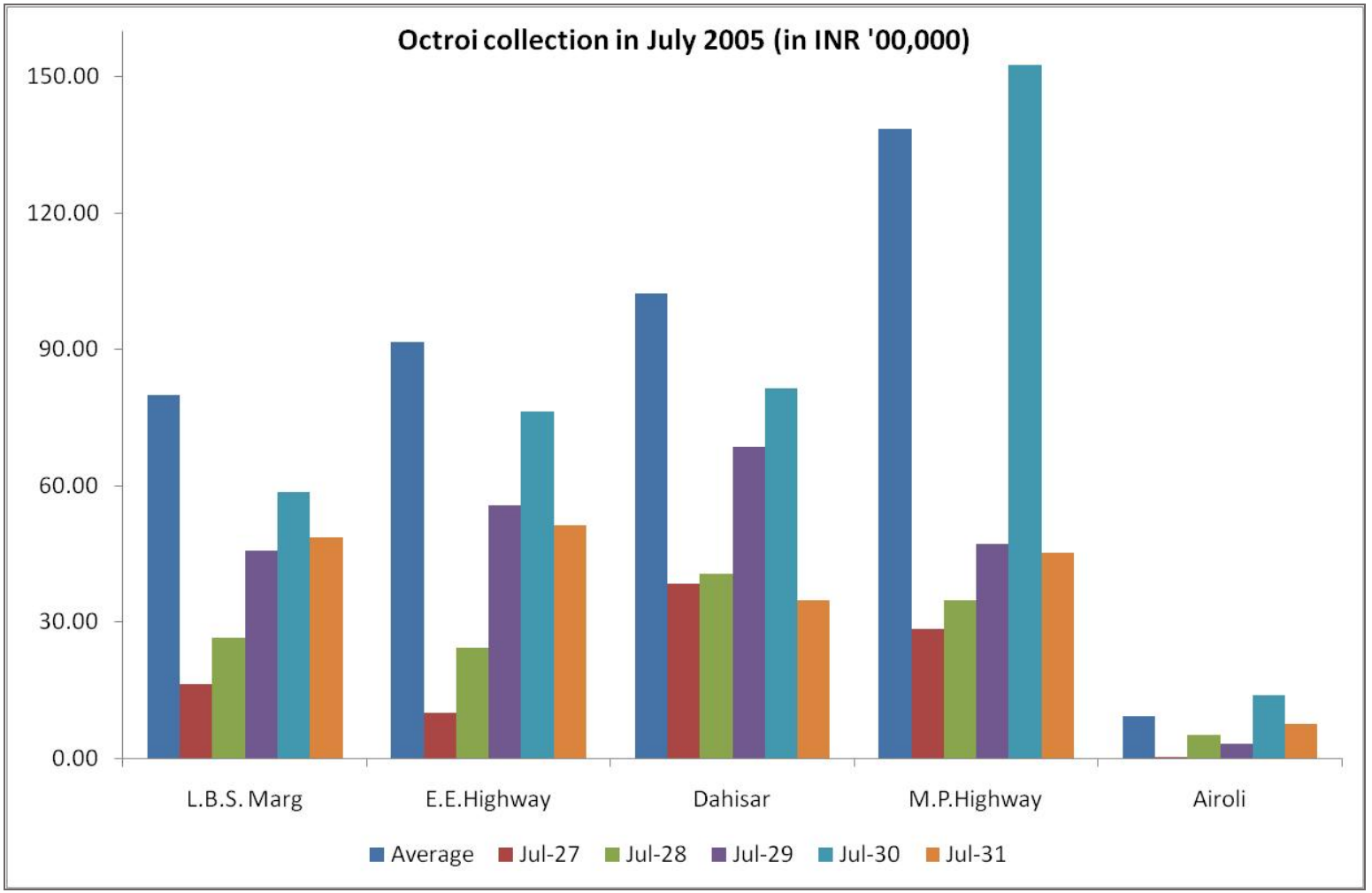
How do we estimate these losses???

Loss estimation – use of proxies

Variable	Data sources
Octroi collections for days when flooding events occurred	Transport department, MCGM
Electricity availability and usage	Electricity utilities, State load dispatch centre
Water availability and usage	MCGM water supply department
Time and cost associated with recovery of electricity and water services	Electricity utilities and MCGM water supply dept.
Petrol/diesel/kerosene consumption	Oil marketing companies
Ticket sales for BEST buses and railways	BEST, Railways
Daily hospital admissions and OPD cases for respiratory and water borne ailments	KEM and Epidemiology Cell, MCGM

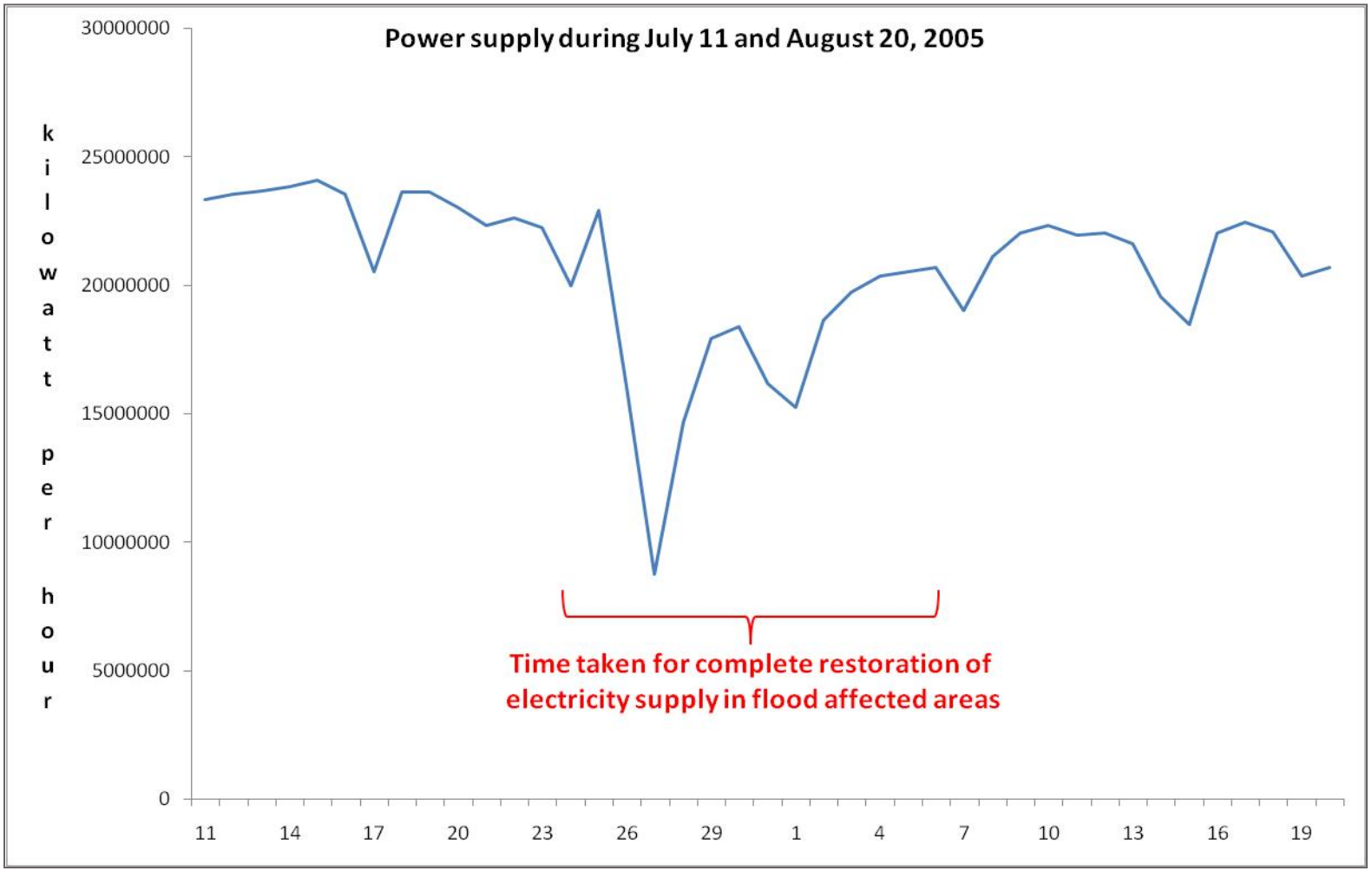
Loss estimation - examples

Octroi collections (proxy for shortages of essential supplies)



Loss estimation - examples

Disruption of power supply



Non-economic losses

- Estimation of non-economic, non-marketable loss
  - Health impacts
  - Social and cultural impacts
  - Conflicts arising out of e.g. retreat and relocation
  - Psychological effects of loss of assets, livelihood and displacement
  - Issues
    - What is to be measured
    - Methodology to put monetary values on non-market losses
    - Use of proxy variables

Implications for adaptation

- Link between impact assessment and adaptation – what are we adapting to?
- Normally response measures target direct and tangible damage and loss
- Insurance coverage also largely concentrates on measurable damage
- Traditional measurement techniques focusing on quantifiable impacts would underestimate the total losses at the aggregate level
- In terms of human and social consequences of weather events, non-economic losses might be much more significant
- Measuring L + D is absolutely critical from the perspective of improving the design and implementation of adaptation interventions