UNDERSTANDING AND TACKLING SLOW ONSET IMPACTS: L&D PERSPECTIVES ON CC-INDUCED SEA LEVEL RISE AND SALINIZATION

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Issues: Slow Onset Hazards – Sea Level Rise and Salinization

SEA LEVEL RISE

Gradual rise in water along the coastal zone
Indicator: Net rise in sea level with respect to baseline [cm]

Effect on Surge height (in combination with rise in temperature)
Indicator: Surge height difference with respect to BAU

Modulation of wave propagation
Indicator: Frequency of waves inundating areas inhabited by coastal population

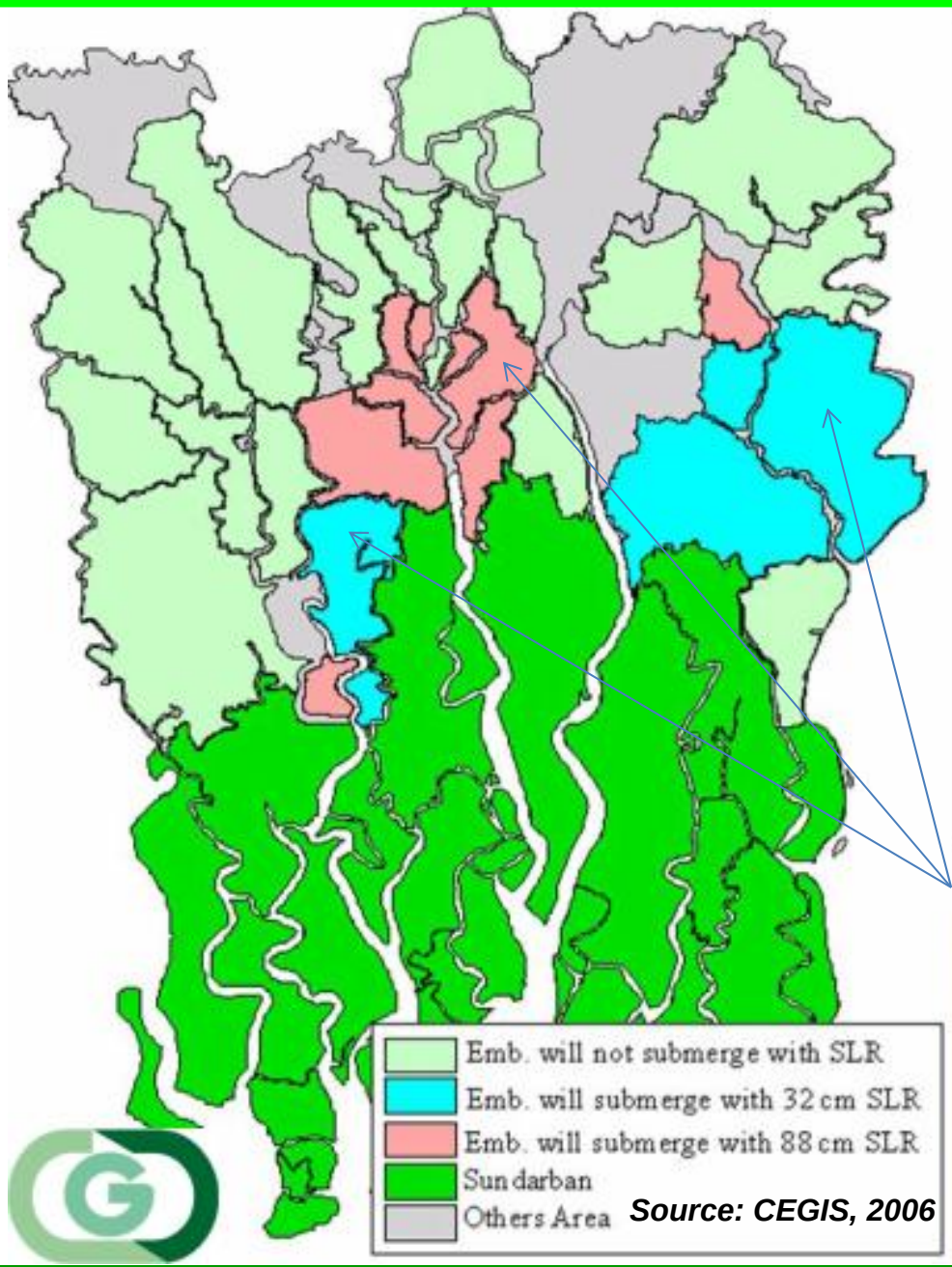
Issues: Slow Onset hazards – Sea Level Rise and Salinization *(contd.)*

SALINIZATION

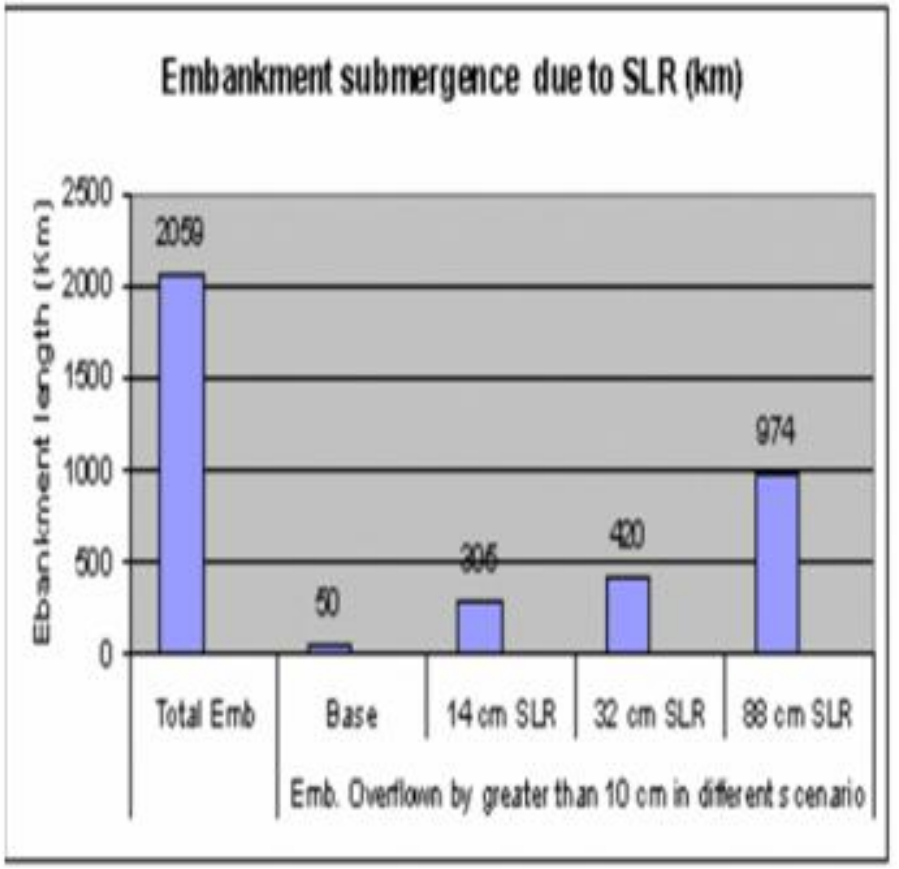
Ingress through the surface water system
Indicator: Movement of isohaline line

Salinization through capillary actions
Indicator: Soil salinity up to the (crop) root zone [EC; dS/m or Micromhos]

Long-term Salinization of aquifer system
Indicator: Drinking water unsuitable for human and animal consumption



Source: CEGIS, 2006



Areas under protection will also be submerged in Bangladesh due to SLR.

CEGIS

SLR: Gradual rise in water along the coastal zone

Indicator: Net rise in sea level with respect to baseline [cm]

Potential Impacts	Possible adaptation	Implications
Inundation of (unprotected low-lying lands	Build protection infrastructure & maintain	Financial issue unless it is permanent loss of lands (loss of sovereign right to land)
	Pump out trapped water	Associated costs
Potential loss of tourism	Keep investing on protective measures	Associated costs
	Alternative use of tourism infrastructure	Accept loss (financial, employment?)

Gradual rise in water along the coastal zone *(Contd.)*

Indicator: Net rise in sea level with respect to baseline [cm]

Potential Impacts	Possible adaptation	Implications
Potential loss of agriculture-based livelihoods	Resort to alternative crop varieties	Associated costs
	Relocate in search of alternative livelihoods	Associated costs (skills, cost of relocation, …)
Loss of homestead + dwelling	Raise plinth height of the homestead, alternative design of the dwelling unit	Associated costs Skills enhancement training
Damage to non-saline elements in the ecosystem	Protective measures with appropriate infrastructure	Associated costs Irreversible costs

Effect on Surge height (in combination with rise in temperature)

Indicator: Surge height difference with respect to BAU

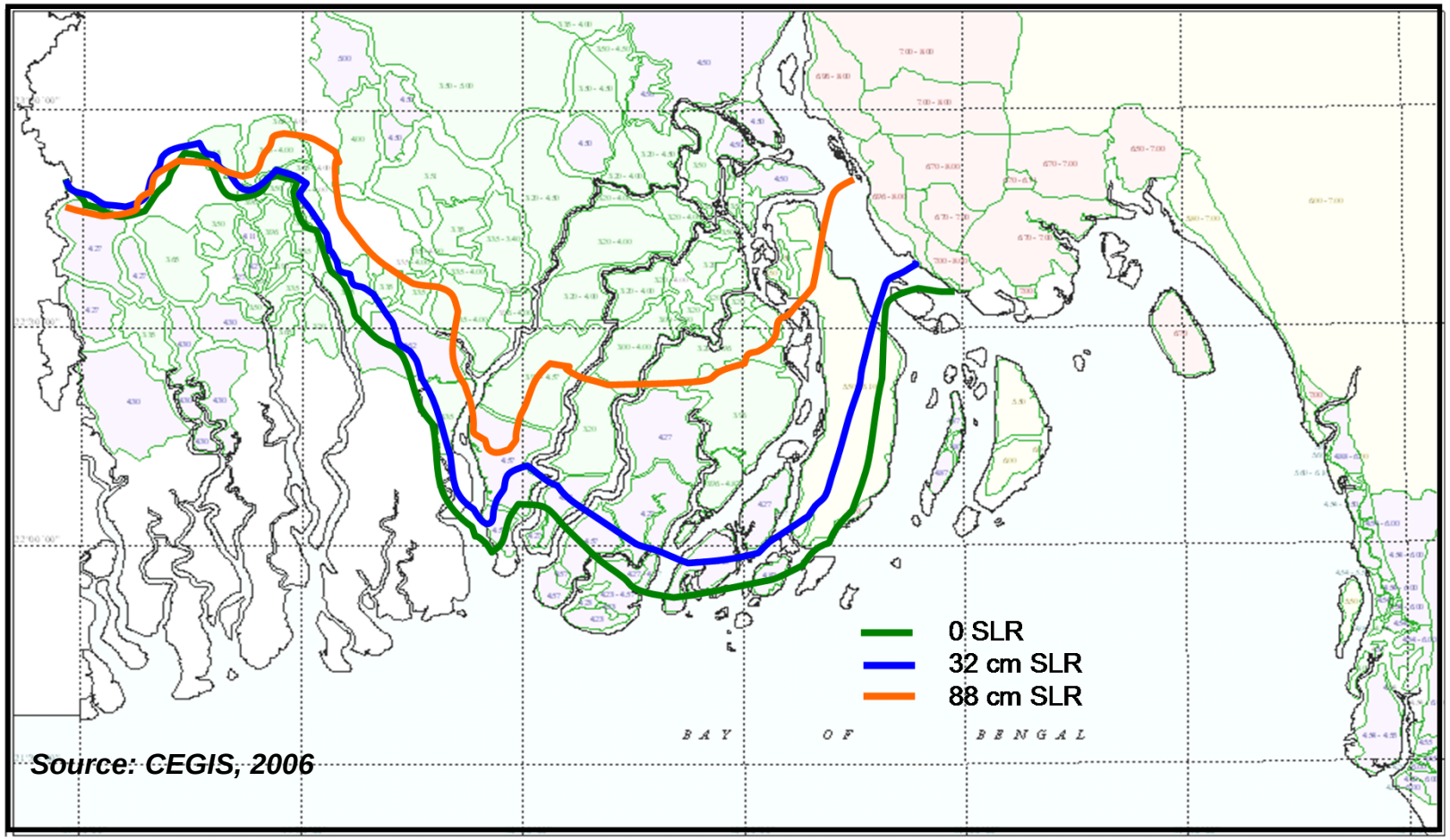
Potential Impacts	*Possible adaptation*	*Implications*
Stronger storm surge	Embankment/ polderization (or increase design height/ change design criteria of infrastructure)	Associated costs Can potentially kill many people
	Facilitate drainage in areas which are within embankment	Associated costs Water logging
Associated salinization	Stop overtopping, breach of embankment	Loss of productive resources, loss of livelihoods, disease burden
	Technological fix: tidal river management	Associated cost, social implications

Modulation of wave interaction

Indicator: Frequency of waves inundating areas that are inhabited by coastal population

Potential Impacts	*Possible adaptation*	*Implications*
Lands become unusable for BAU practices (due to salinization)	Protection of low-lying lands,	Loss of livelihoods Food insecurity, malnutrition Damage to culturally, socially important areas/ infrastructure
	raise land elevation through TRM technique	Associated costs
Dwelling becomes difficult under saline inundated conditions	Dwelling units need to be elevated, placed upon stilts	Forced out-migration Associated costs

Salinity Ingress in Bangladesh



Ingress of 5 ppt isohaline front along coastal river systems

Salinization: Ingress through the surface water system

Indicator: Movement of isohaline line

Potential impacts	*Possible adaptation*	*Implications*
Water unsuitable for irrigation	Develop & use saline tolerant crop varieties	R&D costs Extension costs
	Change cropping pattern	Incur loss of production
	Resort to irrigation using deep aquifer	Cost of irrigation leading to cost of production (loss of gain)
	Desalinize and irrigate	Accept cost burden
Industries requiring process water cannot produce economic products	Relocation of industries	Cost of relocation
	Stop loss making industries, transform (?)	Bear loss Provide SSN support Facilitate out-migration of workers who had lost job

Ingress through the surface water system (*contd.*)

Indicator: Movement of isohaline line

Potential impacts	*Possible adaptation*	*Implications*
Salinization of productive land (especially when surface salinity will be spread by means of wave interactions)	Stop agricultural activities, use land for other forms of ag-related activities	Investment for acquiring additional skills Food security (?)
	Pay insurance premium and keep doing the risky business!	Cost incurred (benefit minimized), uncertainties
	Develop & use saline tolerant crop varieties	R&D costs Extension costs
Forest vegetation declining	Increase influx of freshwater to push the isohaline line	Associated costs incurred
	R&D for saline tolerant forest species, extension	Associated costs incurred

Salinization through capillary actions

Indicator: Soil salinity up to the (crop) root zone [EC; dS/m or Micromhos]

Potential impacts	*Possible adaptation*	*Implications*
Soil surface becoming saline	Alternative crop variety development and extension	R&D costs, extension costs
	Change in cropping pattern	Incur loss of production
	Facilitate alternative livelihoods	Cost of building capacity, skills enhancement
	Keep disturbing the capillary	Cost of employing physical labour

Salinization through capillary actions (*contd.*)

Indicator: Soil salinity up to the (crop) root zone [EC; dS/m or Micromhos]

Potential impacts	*Possible adaptation*	*Implications*
Loss of livestock due to lack of natural grazing (cpr)	Try alternative feed	Associated costs
	Relocate livestock rearing activities	Cost of relocation
Homestead vegetation declined	Hanging vegetable gardens	Innovation with little cost, however scale of production is rather low
	Grow salinity-suitable species	Investments to be made

Long-term Salinization of aquifer system

Indicator: Drinking water unsuitable for human and animal consumption

Potential Impacts	*Possible adaptation*	*Implications*
Unavailability of drinking water	Desalinization	Cost of technology
	Keep drinking and accept risk (?)	Health hazard Premature neonatal death
	Use bottled water/ commercially available water	Choice and costs Livelihoods lost

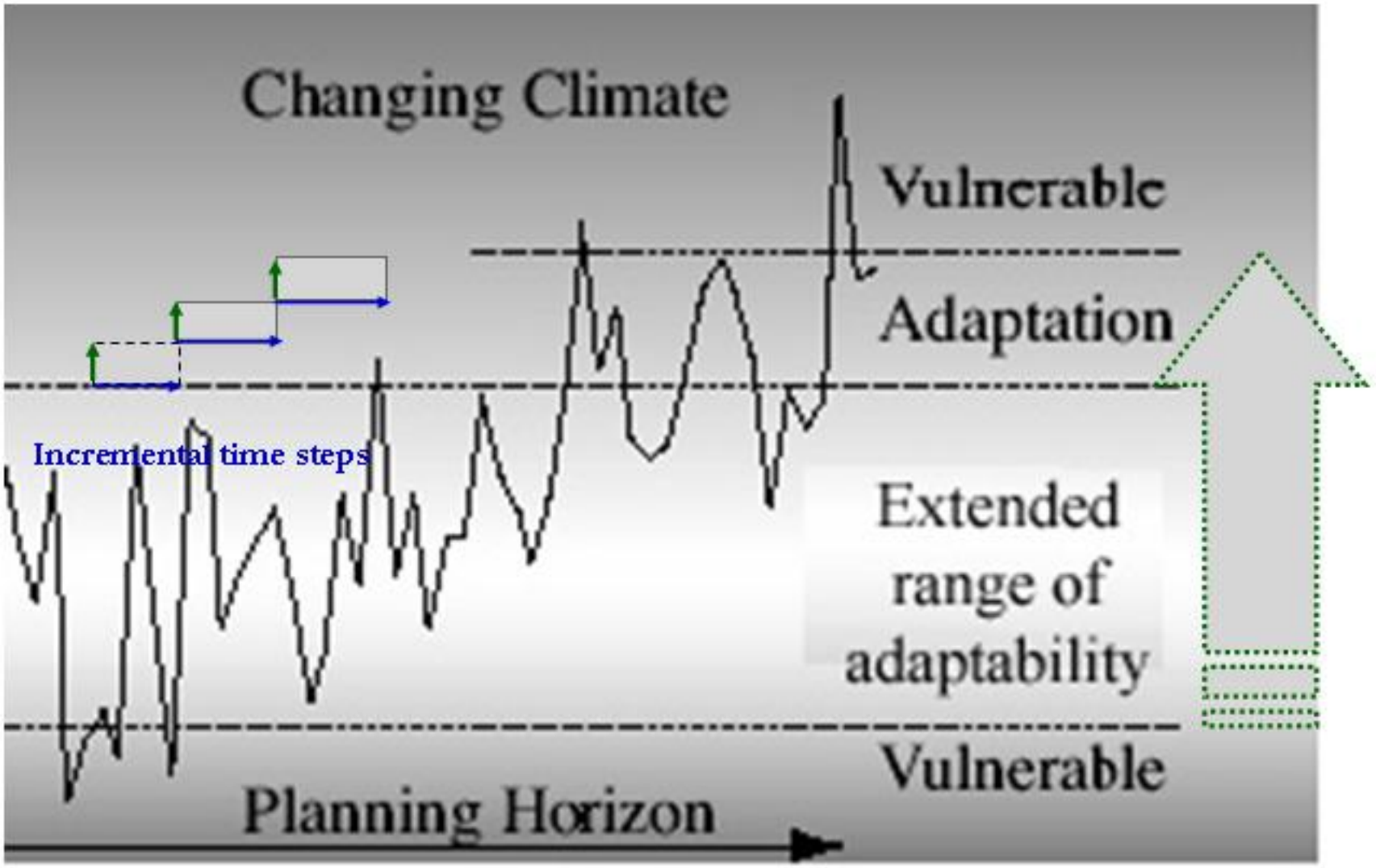
In many of the cases with slow onset hazards, it is possible to facilitate adaptation.

Time is in our favour. Nothing is completely lost yet.

Awareness at both affected people's and decision-making levels, skills and capacity of the affected population, financial flow, etc. are critical towards adapting to almost entirely adapt with minimal loss and damage.

However, loss of lives and national sovereignty in case of low-lying coastal land being inundated by SLR cannot be accounted for.

Similarly, social and cultural values lost cannot be paid back.


Changing Climate
Vulnerable
Adaptation
Incremental time steps
Extended
range of
adaptability
Vulnerable
Planning Horizon

With slow onset hazard events, if the system related vulnerabilities are well defined, it would be possible to consider adaptation measures incrementally, enabling people to avoid being subject to abrupt changes and shocks.

However, losses in terms of lives and sovereign rights on land cannot be completely addressed.

Let us utilize the time [t=1 to t=n] which is still available and incrementally bring changes.

THANK YOU VERY MUCH