



POTS DAM INSTITUTE FOR
CLIMATE IMPACT RESEARCH

Impacts, adaptation and comparability: supporting decision processes in deltas

Deltas in Times of Climate Change

Session: Decision support instruments for climate adaptation policy

Prajal Pradhan, Till Sterzel, Hannah Förster and Jürgen Kropp

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Leibniz
Gemeinschaft

Content

- Introduction
- Deltas and comparability
- Sea-level rise and its impacts
- Decision support instrument: a novel approach
- Summary



Introduction

Both natural systems and socio-economic systems are affected
(Paavola and Adger 2005)



Even with reductions in greenhouse gas emissions, it is largely irreversible
(Solomon et al. 2008)

Adaptation is an important response option or strategy, along with mitigation (Smit and Pilifosova 2001).



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Barriers

- accessibility of the available knowledge
- usability by decision makers



Need

- the processing of complex scientific knowledge
- comparatively assessment of climate change impacts
- prioritization of corresponding adaptation

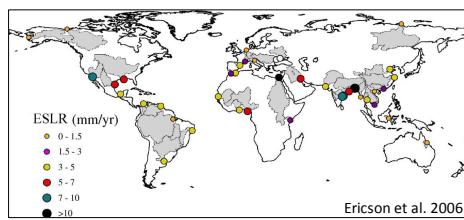
Decision support instruments regarding climate adaptation need to overcome these barriers and to address these needs



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Deltas and comparability

- type of naturally dynamic coastal systems
- important in terms of social, economic and ecological value



- major locations of population and agriculture
- sensitive to sea-level rise and other climate change impacts
- heterogeneous attributes in comparable systems (i.e. deltas)



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Selected delta regions for study



Country (4)	Delta (17)	No. of 2nd level admin units (92)
Bangladesh	Ganges-Brahmaputra	12
	Amazon	16
Brazil	Parnaíba	4
	Sao Francisco	6
China	Chang Jiang	14
	Hai Ho	4
India	Huai	4
	Huang He	3
	Liao	4
	Zhujiang	8
	Cauvery	3
	Ganges-Brahmaputra	4
	Godavari	2
	Indus	1
	Mahanadi	4
	Penner	1
	Krishna	2



based on focal countries in the ci:grasp project



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Deltas in India and Bangladesh

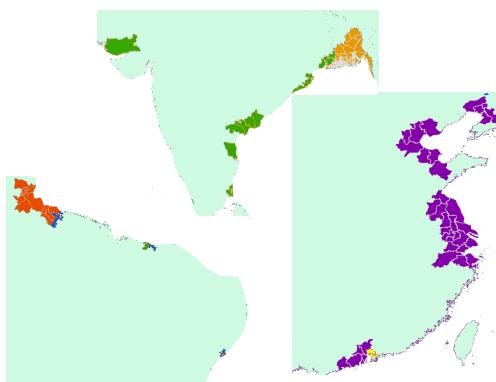
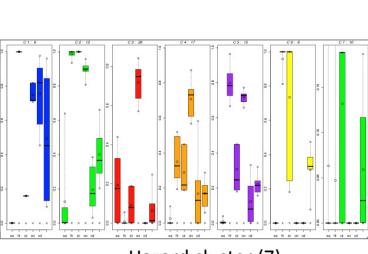
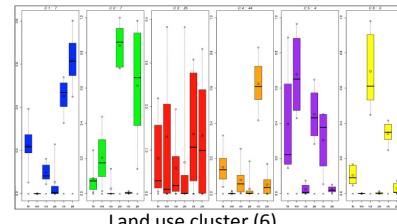
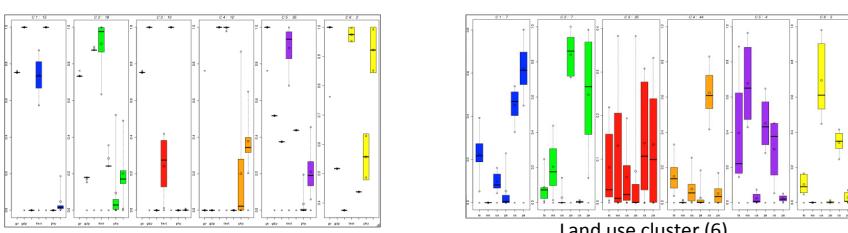
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Indicators (17) used for comparability of deltas

	Examples
Socio-economic indicators (7)	government effectiveness index
	national GDP/cap in 2008 in PPP\$ of constant 2005
	percent of agricultural GDP in 2008
	GINI Index 1992-2007
	population density admin unit level 2
Land use indicators (6)	area admin unit level 2 (m2)
	percent urban area of admin unit level 2
	protected area of admin unit level 2 in percent
	cropland area of admin unit level 2 in percent
Hazard indicators (6)	percent wetlands in admin unit level 2
	Effective sea level rise
	maximum storm surge height
	expected average number of event per 1000 years



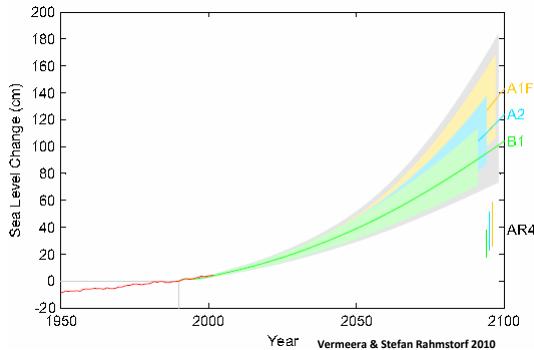
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Sea level rise and its impacts

- uncertainty
- scenario analysis
- 1 m & 2 m SLR scenarios*
- various impacts
- cause and effect relationships
- *impact chain*

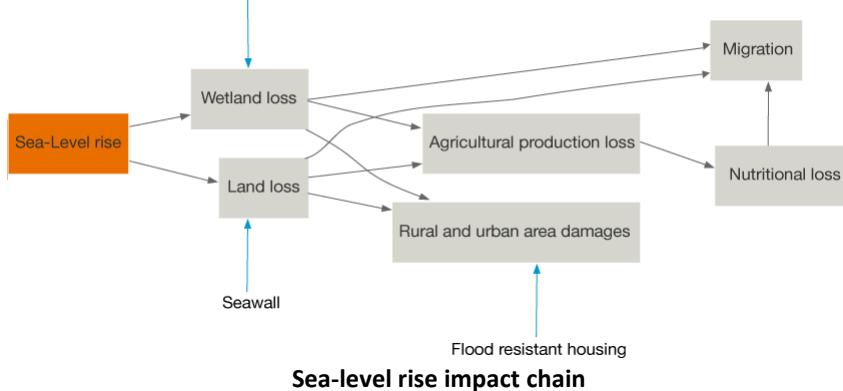


* Due to vertical resolution of appropriate DEMs

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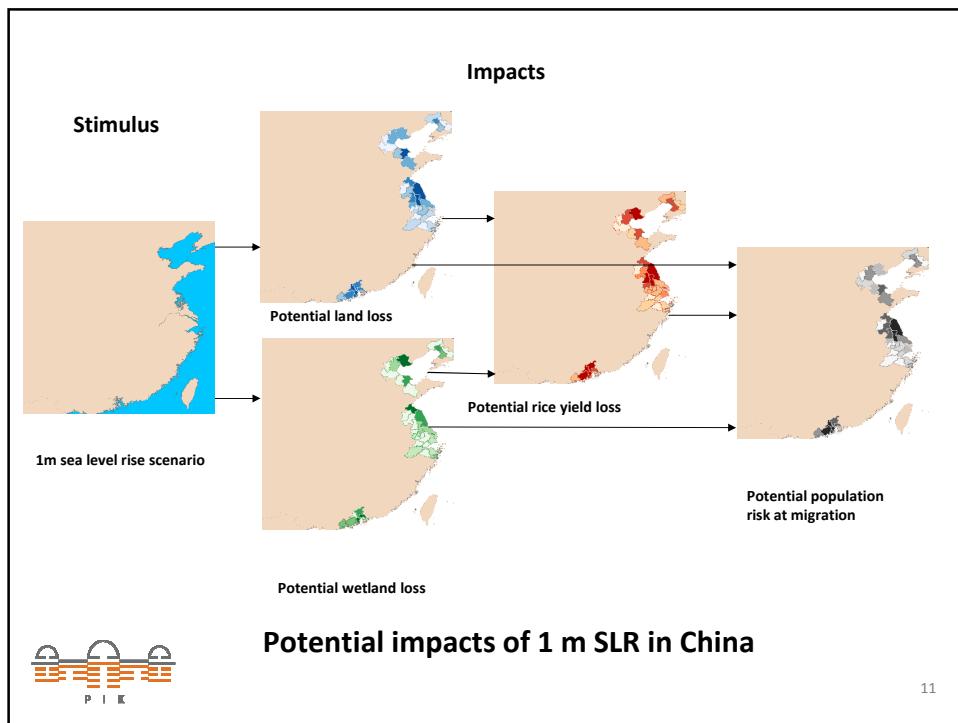
Community based adaptation through coastal afforestation



impact chain as such a structuring element to organize complex climate change content in a simpler and understandable concept



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A novel approach

prioritization of adaptations

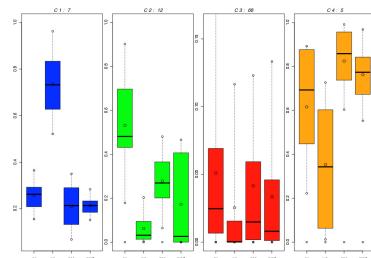
Admin level 2 Delta Land loss % Wetland loss % Population at risk % Yield loss %

Admin level 2	Delta	Land loss %	Wetland loss %	Population at risk %	Yield loss %
Cangzhou	Hai Ho	0.41	0.00	0.11	0.00
Jiaxing	Chang Jiang	0.57	0.00	0.10	0.01
Hangzhou	Chang Jiang	0.46	0.78	0.00	0.07
Binzhou	Huang He	2.76	0.00	1.18	0.12
Ningbo	Chang Jiang	0.87	3.64	0.40	0.19
Anshan	Liao	0.05	0.00	0.04	0.20
Jinzhou	Liao	0.91	0.00	0.22	0.25
Shenzhen	Zhujiang	2.73	1.64	2.14	0.37
Changzhou	Chang Jiang	0.38	0.61	0.05	0.39
Yangjiang	Zhujiang	3.34	29.17	6.00	0.57
Suzhou	Chang Jiang	3.27	0.00	0.29	0.59
Wuxi	Chang Jiang	1.18	0.00	0.05	0.63
Weifang	Huang He	5.10	0.00	5.10	0.64
Nantong	Chang Jiang	3.85	7.65	4.19	0.84
Shanghai	Chang Jiang	1.56	5.14	1.48	0.90
Huai'an	Huai	2.07	0.00	7.14	2.42
Zhoushan	Chang Jiang	7.67	7.00	2.73	2.86
Zhenjiang	Chang Jiang	5.31	0.00	2.35	3.61
Tieling	Liao	2.00	38.49	3.01	6.75
Panjin	Liao	10.03	63.35	4.62	8.08
Dongying	Huang He	23.24	70.19	17.37	9.08
Lianyungang	Huai	15.63	75.86	10.41	11.38
Tianjin	Hai Ho	5.94	13.07	3.45	11.61
Dongguan	Zhujiang	18.35	95.84	11.94	11.82
Yangzhou	Chang Jiang	12.56	0.00	8.48	12.10
Tangshan	Hai Ho	8.92	83.95	2.74	12.45
Guangzhou	Zhujiang	14.85	46.98	16.39	13.41
Jiangmen	Zhujiang	13.30	23.49	17.95	14.84
Taizhou	Chang Jiang	27.28	14.32	23.39	22.73
Foshan	Zhujiang	26.71	0.00	36.01	28.98
Zhuhai	Zhujiang	41.34	32.86	27.82	42.89
Zhongshan	Zhujiang	53.46	72.64	41.90	46.71
Yancheng	Huai	52.30	57.76	48.81	55.44

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Prioritization of adaptation

- regions with similar impacts
- focal interest of decision-makers and stakeholders
- availability of resources



1m SLR impact cluster



1m SLR impact cluster map

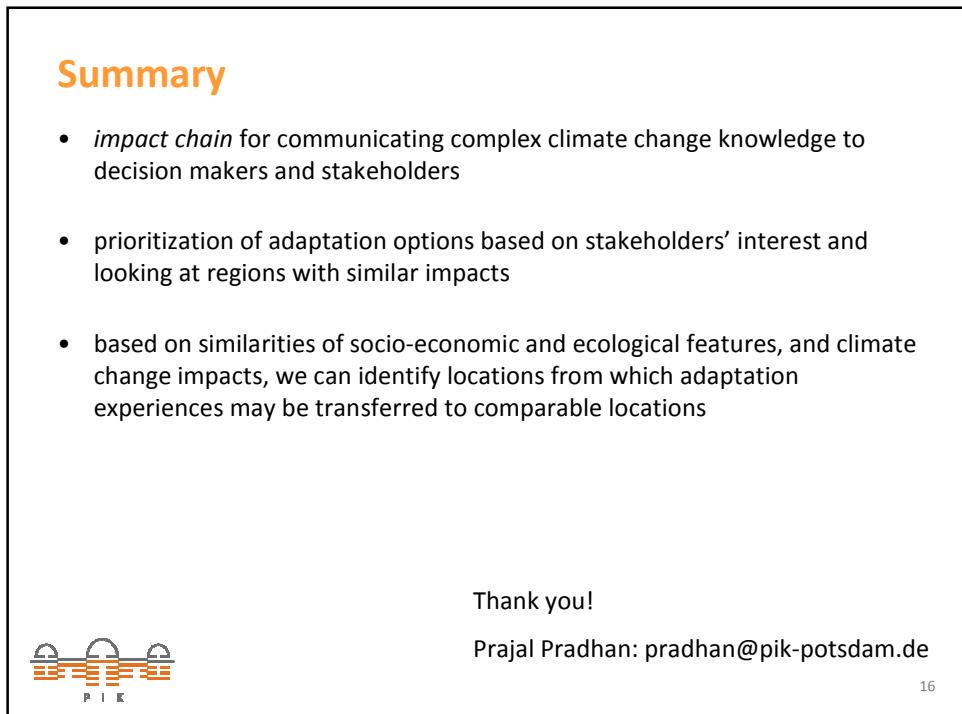
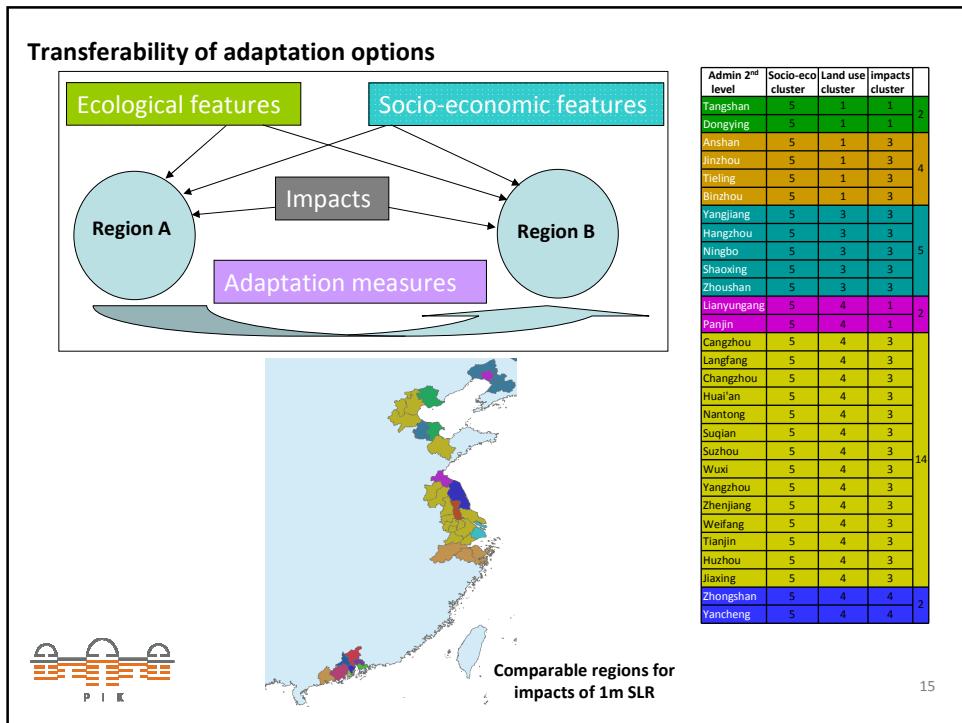
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transferability of
adaptation options



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Indicators (17) used for comparability of deltas

	Indicator	Source	Spatial resolution
Socio- economic indicators (7)	government effectiveness index	World Resources Institute	Country
	national GDP/cap in 2008 in PPP\$ of constant 2005	WDI	
	percent of agricultural GDP in 2008	WDI	
	flood mortality	Natural disaster hotspots, WB	2.5 lon x 2.5 lat
	GINI Index 1992-2007	HDI	country
	expected average annual population exposed to storm surge	UNEP/GRID	
	population density	GRUMP & GADM	Admin unit level 2
Land use indicators (6)	area (m2)	GADM	Admin unit level 2
	percent wetlands	Globcover 2.2	Admin unit level 2
	percent urban area	MODIS 500m	Admin unit level 2
	protected area in percent	WDPA 2010 (national + international)	Admin unit level 2
	cropland area in percent	http://www.geog.mcgill.ca/~nramankutty/Datasets/Datasets.html	Admin unit level 2
	pasture area in percent	http://www.geog.mcgill.ca/~nramankutty/Datasets/Datasets.html	Admin unit level 2
Hazard indicators (6)	percent wetlands	Globcover 2.2	Admin unit level 2
	flood frequency	Natural disaster hotspots, WB	2.5 lon x 2.5 lat
	Effective sea level rise	Ericson et al 2006	delta
	maximum storm surge height	DIVA database	
	expected average number of event per 1000 years	UNEP/GRID	
	population density	GRUMP & GADM	Admin unit level 2



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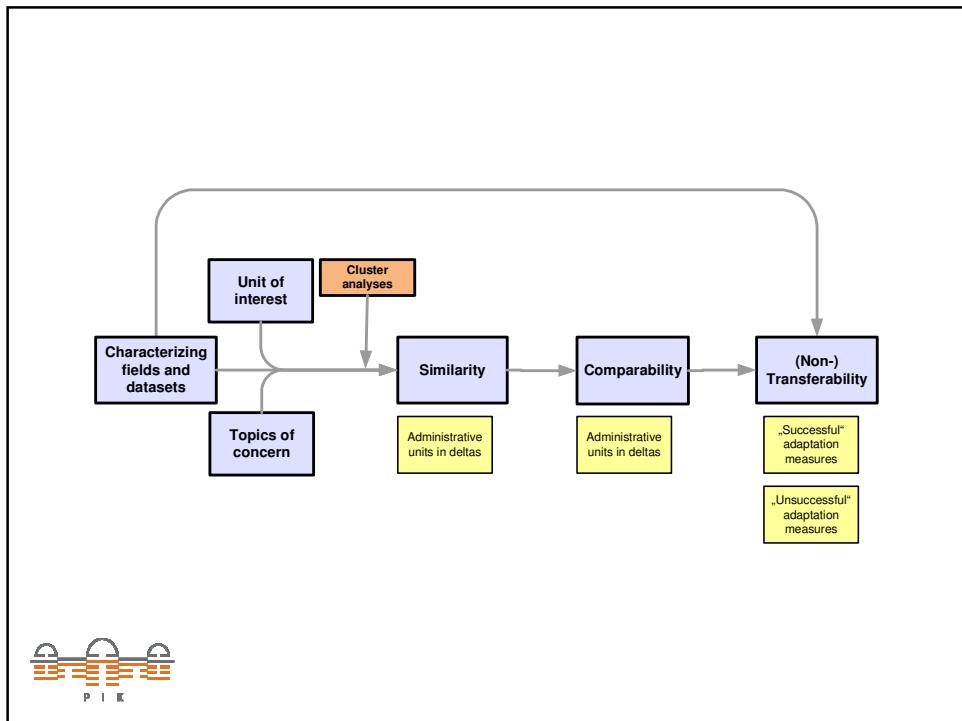
Glossary

Stimuli: Stimuli are climate-related variables that can cause impacts on human activities and the environment. Temperature, precipitation, sea level rise, etc. are examples of climate stimuli.

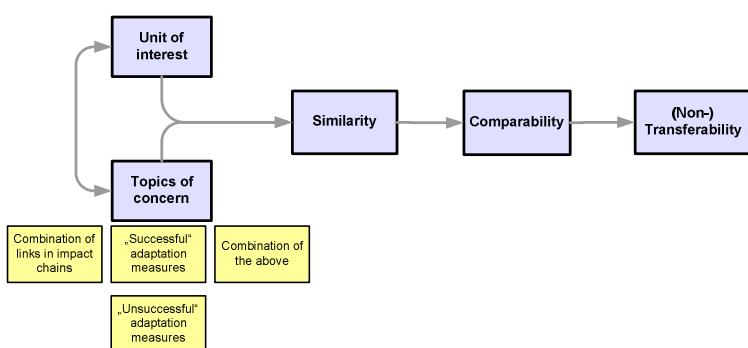
Impacts: Impacts are the effects of climate change on natural and human systems. Impacts can be distinguished into potential and residual impacts depending on the consideration of adaptation. (IPCC 2007).

Adaptation: Adaptation is adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities (IPCC 2007).





Ci:grasp context: comparability



Aim: **determine regions (e.g. admin units) to which successful adaptation measures may be transferrable to**



Ci:grasp context: Comparability - example

Aim	Assumption	Basic common mechanism	Areas in clusters comparable with respect to
Determine areas adaptation measures may (not) be transferrable to	Adaptation measures can be implemented in areas with similar dynamics	Dynamics and contexts that raise need for adaptation measures	Values of parts of the impact chains the adaptation measures address

Other fields addressed:

- Categorization and proximity of adaptation measures
- Areas with similar adaptation measures



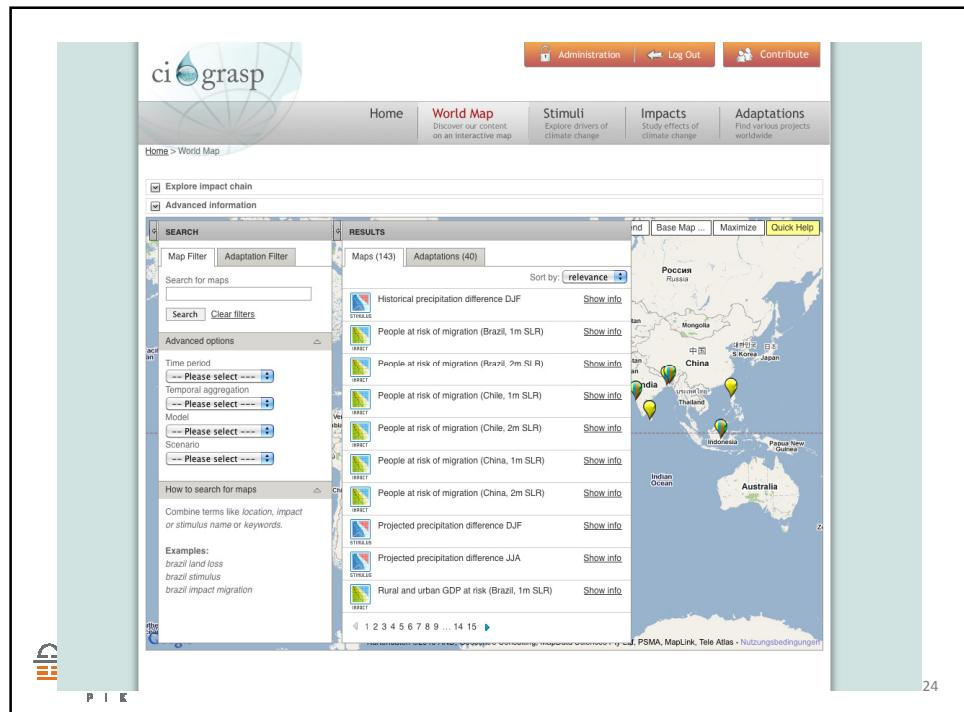
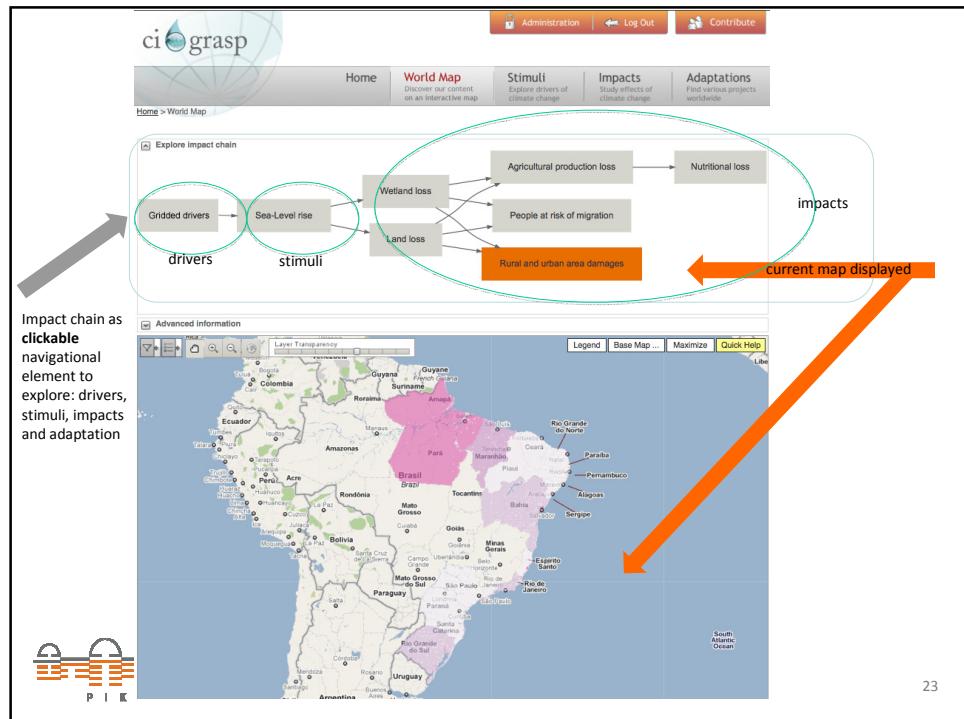
Combination of top-down and bottom-up expertise (science & practice)!

Connecting drivers, climatic stimuli, sectoral/regional impacts, and solutions via impact chains!

gtz Deutsche Gesellschaft für Internationale Zusammenarbeit

Provision of comparable impact analyses – national & sub-national, climate risk indexes!

Classification of adaptation measures, development of transferability indicator!



ci₂grasp

Home | World Map | Stimuli | Impacts | Adaptations

Administration | Log Out | Contribute

Home > World Map

Explore impact chain | Advanced information

SEARCH

Map Filter | Adaptation Filter

Search for maps:

Advanced options

How to search for maps

RESULTS

Maps (4) | Adaptations (40)

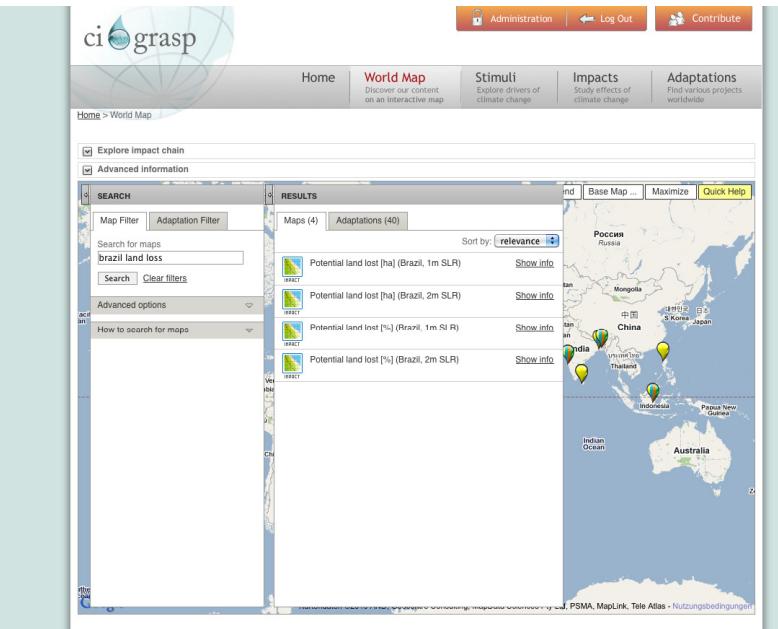
Sort by: relevance

Map/Adaptation	Description	Action
 Potential land lost (ha) (Brazil, 1m SLR)	Show info	
 Potential land lost (ha) (Brazil, 2m SLR)	Show info	
 Potential land lost [%] (Brazil, 1m SLR)	Show info	
 Potential land lost [%] (Brazil, 2m SLR)	Show info	

World Map | Base Map ... | Maximize | Quick Help

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Search for maps:

Advanced options

How to search for maps

RESULTS

Maps (143) | Adaptations (40)

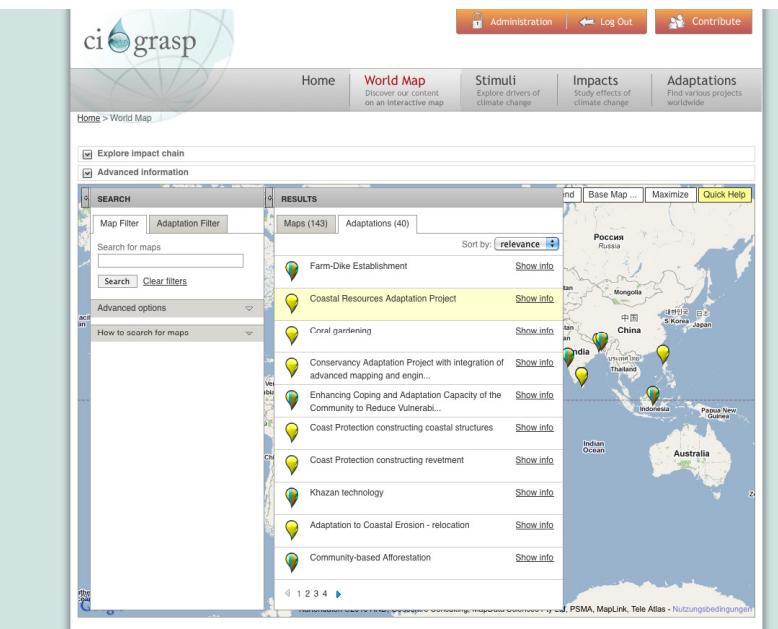
Sort by: relevance

Map/Adaptation	Description	Action
 Farm-Dike Establishment	Show info	
 Coastal Resources Adaptation Project	Show info	
 Coral gardening	Show info	
 Conservancy Adaptation Project with integration of advanced mapping and engi...	Show info	
 Enhancing Coping and Adaptation Capacity of the Community to Reduce Vulnerabi...	Show info	
 Coast Protection constructing coastal structures	Show info	
 Coast Protection constructing revetment	Show info	
 Khazan technology	Show info	
 Adaptation to Coastal Erosion - relocation	Show info	
 Community-based Afforestation	Show info	

World Map | Base Map ... | Maximize | Quick Help

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Home > World Map

Explore impact chain
 Advanced information

SEARCH

Map Filter Adaptation Filter

Search for adaptations

Advanced options

Project Type: **Building / Installing**
 Status: **implemented**
 Spatial scale: **transboundary - inv**

How to search for adaptations

Combine terms like location, impact or stimulus name or keywords.

Examples:
 brazil land loss
 brazil stimulus
 brazil impact migration

RESULTS

Maps (143) Adaptations (40)

Sort by: relevance

Historical precipitation difference DJF
 People at risk of migration (Brazil, 1m SLR)
 People at risk of migration (Brazil, 2m SLR)
 People at risk of migration (Chile, 1m SLR)
 People at risk of migration (Chile, 2m SLR)
 People at risk of migration (China, 1m SLR)
 People at risk of migration (China, 2m SLR)
 Projected precipitation difference DJF
 Projected precipitation difference JJA
 Rural and urban GDP at risk (Brazil, 1m SLR)

PSMA, MapLink, Tele Atlas - Nutzungsbedingungen

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Home > World Map

Explore impact chain
 Advanced information

Quick Help

Overview :: Searching & Browsing :: Interacting with the map

The world map is the most interactive part of the cigrasp platform. It enables you to browse climate information in a geographical context and offers three main functions:

- 1. Adaptation projects**
 The adaptation function enables you to find adaptation projects around the world. Each project is displayed by a small marker. The color of the marker indicates the sector to which the project belongs. A click on a marker will open up a bubble with general information and with a link to more detailed information about the project.
- 2. Climate maps**
 The map function enables you to browse a wide range of climate stimulus and impact maps for various topics. A click on a climate map in the result list will load and display it on top of the world map. Consult map legend and detailed map information, to better understand the information a map carries.
- 3. Impact chains**
 Impact chains display the relationships of different impacts that are caused by initial drivers (stimuli) of climate change. An impact chain will be displayed each time you select a map or a project, and gives you an idea what stimuli / impacts a map or adaptation project targets.



[Home](#)
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[Impacts](#)
[Adaptations](#)

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[Home > List of adaptations > Farm-Dike Establishment](#)
State of this project: accepted

Project details: Farm-Dike Establishment
[Go to adaptation list](#) [Print this page](#)

Building farm-dikes with flap-gates would be a cost efficient strategy to protect land from rising sea levels. It is thought that the South Kalimantan over 350,000 ha of reclaimed coastal swampland, which is currently being farmed for rice and other food crops, are at risk. Farm-dikes with flap-gates have been shown to be successful in draining off excess surface and groundwater, providing flood protection, preventing salt intrusion, and controlling water quality. Each farm-dike can be used for 50 years, after which it should be replaced with a new one, while the lifespan of a gate is 15 years.

Tagged with: [dike](#), [salt water intrusion](#)
Project location: [South Kalimantan, Indonesia](#)

Contact Information
Map data ©2010 Tele Atlas

Name: Ahmad R Saidy & Yusuf Asis, Faculty of Agriculture Lambung Mangkurat University and Environmental Research Centre
Address: Kampus Unlam Simpang Empat Jalan Ahmad Yani KM08, Banjarmasin 70714, Indonesia

Tel: 62 511 4777540
E-Mail: asaidy@unlam.ac.id

Information source
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