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Stuttgart Research Center for Interdisciplinary Risk and Innovation Studies

Integrating local knowledge and technical expertise in water research: Experiences from the Río Lurín catchment, Peru

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iEMSs 2020, session A1
Sept 15, 2020

University of Stuttgart

HOMAS HORIZONTES EN MEDIO AMBIENTE Y SALUD

KIT Karlsruher Institut für Technologie

PUCP

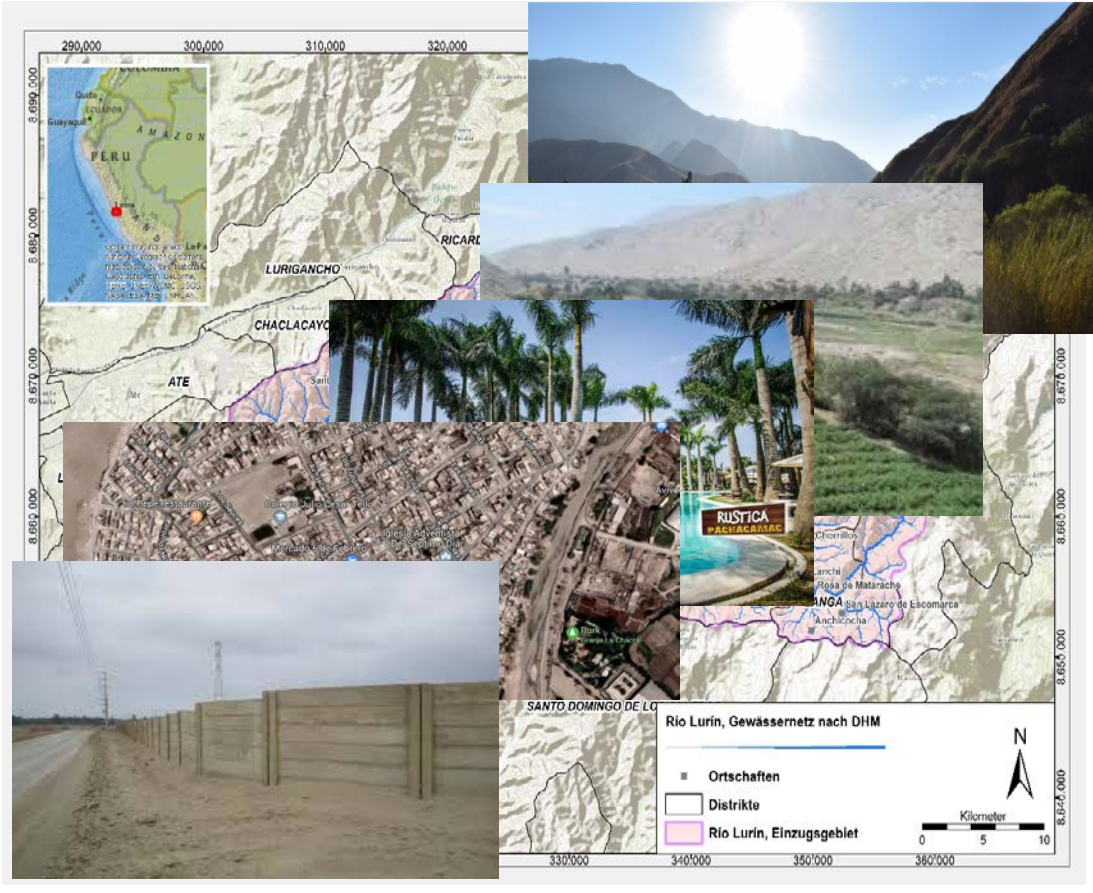
FORO CIUDADES PARA LA VIDA

TZW Technologiezentrum Wasser

Case: Water management in the Río Lurín catchment, Peru

- (Latent) water use conflicts
- Upper and lower catchment are heterogenous: climatic zones, ecosystems, precipitation, water resources, population, economy, water use patterns & governance and management structures...

➢ A typical complex environmental management issue



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WATER AS A GLOBAL RESOURCE

Policy interaction (PI) modeling to design policy mixes

Conceptual modeling using a semi-quantitative systems analysis

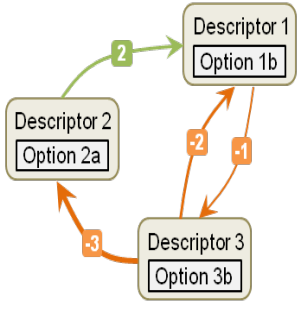
New application of **cross-impact balances CIB** (Weimer-Jehle 2006)

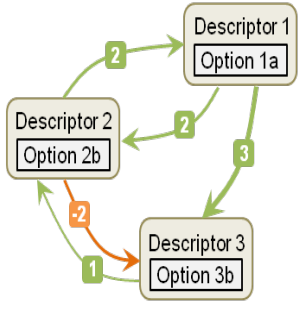
iEMSs session E3
Sept 14, 16:40 CEDT

Methodology in 5 steps

1. Identify **central goals** of different water users
2. Define **alternative policies** to reach these goals
3. Assess **impacts** between alternative policies (pairwise)
4. Identify & analyze **policy mixes** (multi-goal optimization)
5. **Transfer** of results to local strategic planning processes

Target → / ↓ Source	D1		D2		D3	
	1a	1b	2a	2b	3a	3b
Descriptor 1						
Option 1a			-1	2	-3	3
Option 1b			0	0	2	-1
Descriptor 2						
Option 2a	-2	2			0	0
Option 2b	2	-2			3	-2
Descriptor 3						
Option 3a	-1	1	0	0		
Option 3b	0	-2	-3	1		





Focus: Reflecting our experience of integrating local knowledge and technical expertise

Current **practice** and **claim** in integrated resources management: „Adding context, depth, and accuracy to environmental modelling thus enhancing the models and their data for complex decision-making and policy formulation" (Cuddy/ Foran 2020, iEMSs2020 introduction into session A1).

Epistemic uncertainty & **Pluralism**

How to create synergies across knowledge systems?

- **Our questions:** If, how and why do assessments of policy interactions diverge between local actors and technical experts? How can both perspectives be meaningfully integrated, i.e. compiled, combined or synthesized?

1+2: Identifying water users‘ objectives and defining alternative policies by consulting local actors (LA) and technical experts (TE)

Background: stakeholder mapping

Secondary analysis of interviews with LA (n=33)

Interviews with TE (n=7)

Literature & policy documents

1st list of central water users, their objectives and alternative policies

One-day workshop in Lurín

LA n=30

TE n=7

1st catalogue defining central objectives and alternative policies

Desk research on side measures, conditions, non-intended effects, and critique of policies

Additions and corrections during CIB interviews

TE n=10

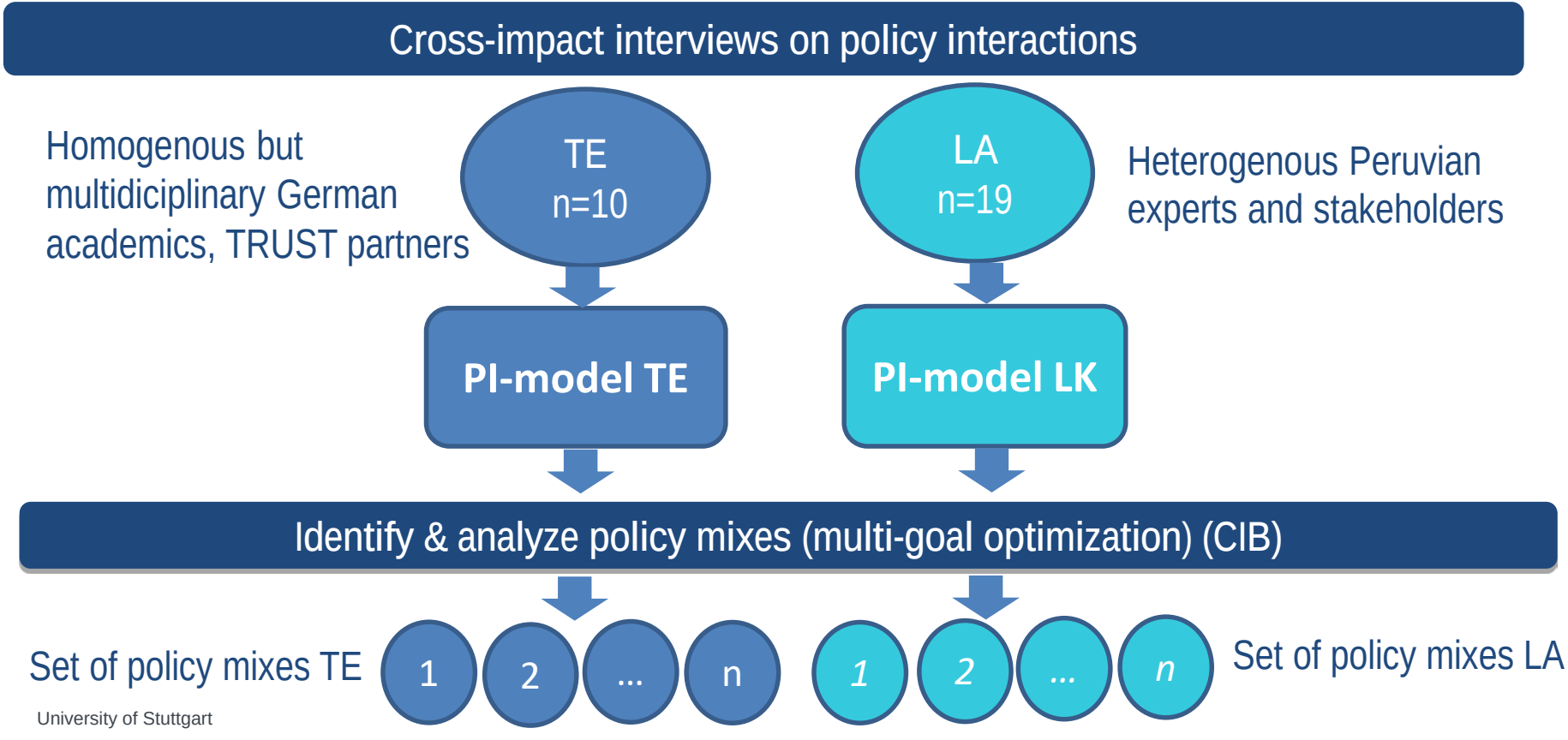
LA n=19

Final catalogue defining 14 central objectives and in total n= 47 alternative policies

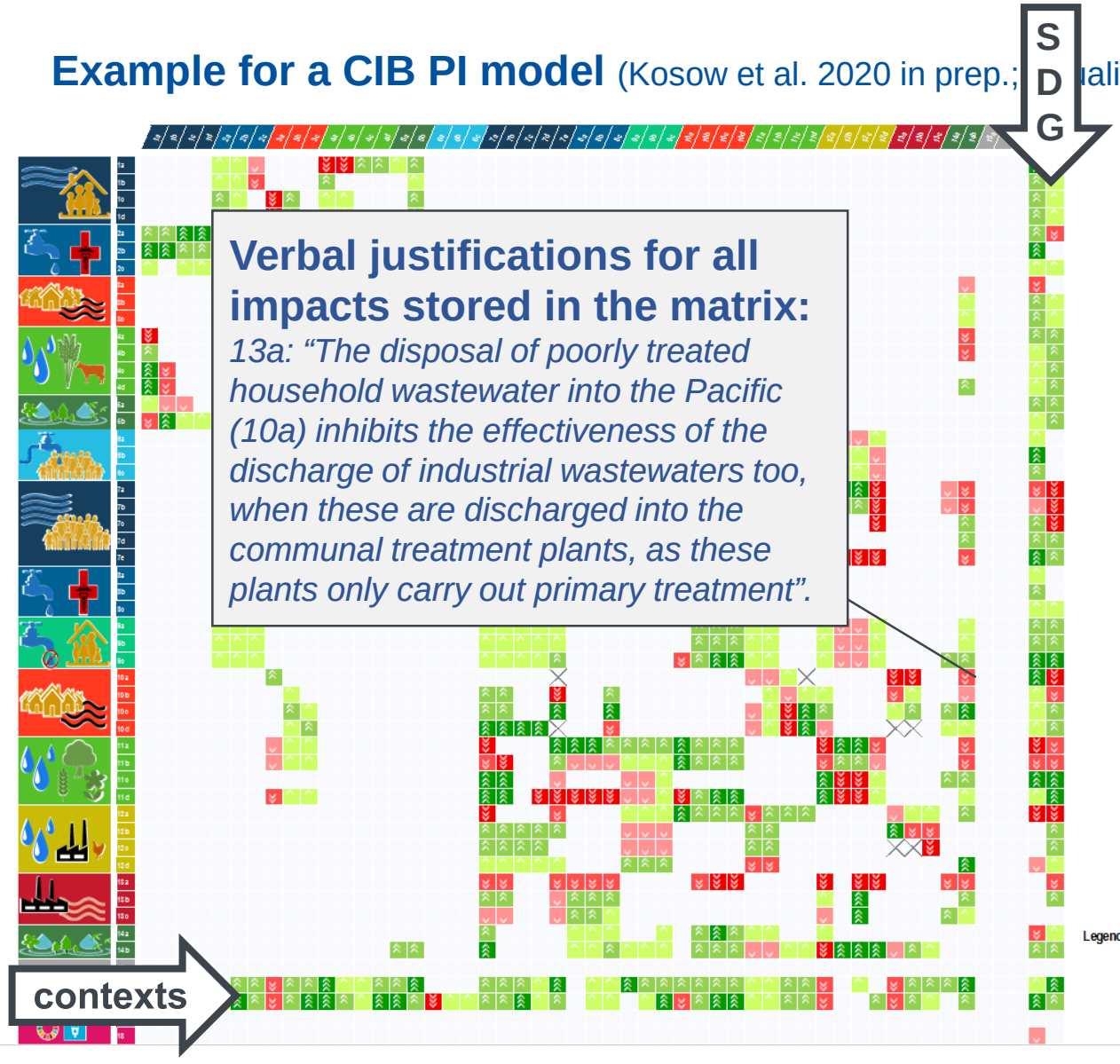
3+4 Building and analyzing two PI-models: LA and TE

Assessing impacts on **effectiveness** of policies

Impact scale: -3 to +3, 0= no impact (Weimer-Jehle 2006) extended by cancelling impacts – 99 (Nielsson et al. 2016)



Example for a CIB PI model (Kosow et al. 2020 in prep.; visualization inspired by Weitz et al. 2019)



Verbal justifications for all impacts stored in the matrix:

13a: "The disposal of poorly treated household wastewater into the Pacific (10a) inhibits the effectiveness of the discharge of industrial wastewaters too, when these are discharged into the communal treatment plants, as these plants only carry out primary treatment".

14 objectives with in total n= 47 policies

Matrix with different sectors:

- upper vs. lower catchment part
- SDG performance (passive)
- contexts (governance, climate change scenarios) (active)

Similarites and differences between both models

Dissent analysis (1490 cells coded non 0 in at least one matrix)

➔ Agreement regarding ca. ¾ of impact assessments: identical: 39% (max +/-1 scale point: 33,5%)

- weak divergence (impact strength): 18,6%
- medium divergence (impact or not?): 38,0%
- strong (sign) divergence: 4,4%

➔ Main type of divergence: medium divergence

➔ Strong divergence unequally distributed across model sectors: highest for SDG performance of policies

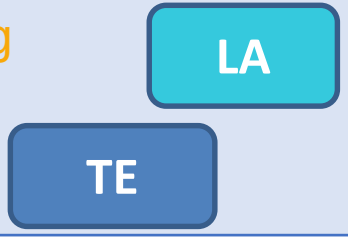
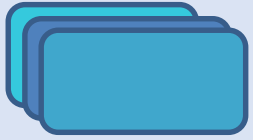
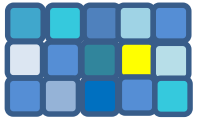
Qualitative content analysis: Reasons

Medium divergence:
Missing data, but also blind spots and uncertainties

Strong divergence:
Reference to different knowledge systems: academic, natural and engineering sciences vs. local (political and cultural) context and experience (LK)

Ensemble analysis: diverging policy mixes ➔ integration on level of results difficult

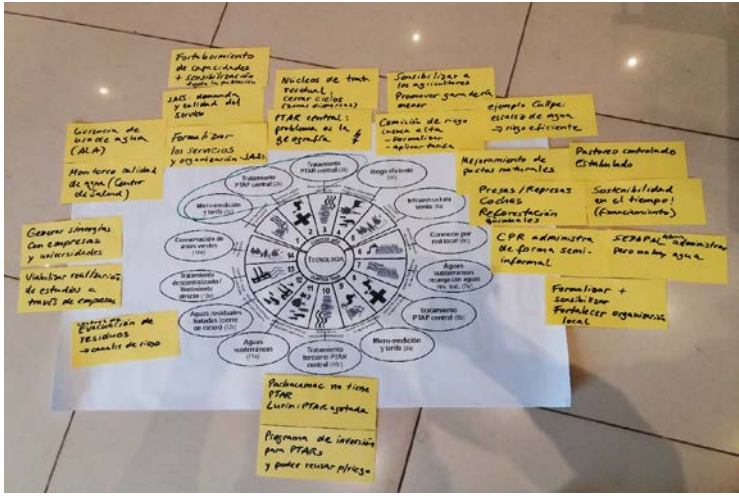
Different approaches to integrate model LA and model TE imply different advantages and disadvantages (forms of integration based on Prehofer et al. 2020, see A1)

Approach	Main +	Main -
A Compiling 	Integration effort low LA model: high local legitimacy TE model: high scientific legitimacy Different conceptual models and effects on resulting policy mixes made explicit	Interpretation effort for users very high: How to understand and what to do with two sets of diverging policy mixes? LA model: lower scientific legitimacy TE model: lower local legitimacy
B (Re-)combining (selecting & omitting) 	Connecting effort medium, results in one PI model, one set of policy mixes	Difficult justification of selection of "most legitimate" impact assessments; loss of information judged less legitimate; low transparency
C Summing/ averaging 	Connecting effort low, results in one "average" PI model, one set of policy mixes; LA and TE equally considered (high legitimacy)	Tracing back policy mixes to individual impact logics is more difficult than in A and B; apparent consensus - divergences accessible via verbal justifications only
D Synthesizing 	Results in one PI model, one set of policy mixes; LK and TE considered and put into relation regarding each impact assessment; complementary knowledge well represented and mutually supported	Connecting effort very high; Bias in integrating individual impacts or requires group exercise including TE *and* LK to improve reliability and knowledge co-production; Dealing with contradictory knowledge requires transparent integration rules

5 Transfer of the sum matrix and its derived policy mixes

„Responsible (Re)use“

„Measure and recharge“



Climate change scenario: less rainfall and runoff

Conclusion and future research

- **Two conceptual PI-models** (CIB based) to design policy mixes for water management in Lurín, consulting technical experts (TE) as well as local actors (LA)
- **Dissent analysis** showed that TE and LA agree partly, but also considerably diverge regarding policy interactions. The two PI models resulted in rather diverging sets of deduced policy mixes
- **Qualitative content analysis** of impact statements revealed that divergence was in part due to technical reasons as missing data but also to the actors' references to different knowledge systems (e.g. academic knowledge vs. local experience)
- CIB proved very helpful to **reveal** the considerable **differences** between the two models, i.e. to make them **accessible and understandable** (cf. Schweizer et al. 2018)
- **Different forms of integrating** both perspectives have advantages and disadvantages
- **Joint procedures including TE and LA** for „combining" and „synthesizing" still need to be developed
- Need to deal with aspects of **language** and **intercultural communication** (CIB is a technical language)

Thank you very much for your attention!

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