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SUSTAINABLE WATER AND WASTEWATER MANAGEMENT IN URBAN GROWTH CENTRES COPING WITH CLIMATE CHANGE – SCENARIOS FOR LIMA 2040

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The LiWa-Project (Lima-water):

- Research project (application-oriented)
- Funding by the German Ministry BMBF
- 6 German, 4 Peruvian Partners
- duration 2008 - 2013
- Workpackages:
 1. **Scenario development** ("Lima 2040")
 2. Water catchment modelling
 3. **Water system simulator** ("LiWatool")
 4. Evaluation of water prices
 5. **Participatory approach to engage stakeholders**
 6. Training and Capacity Building

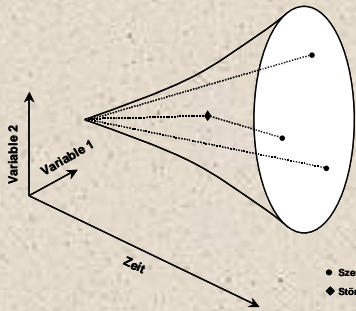
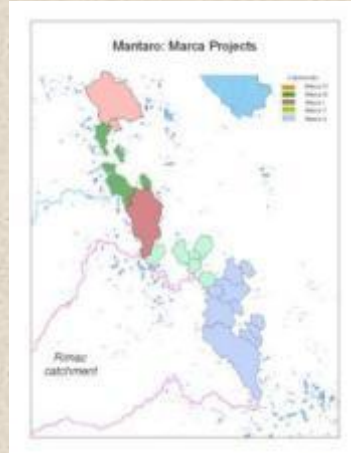




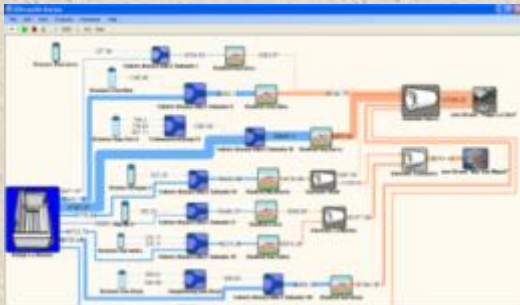
Situation in Lima:

- 8 Mio. inhabitants
- 1 Mio. not connected to the public water network
- one of the driest cities in the world (precipitation 9 mm/year)
- water supply: high dependence on rainfall in the Andean region
- sensitive to climate change and glacier melting
- water reserves: 282 Mill. m³ (Santiago de Chile: 900 Mill. m³, Sao Paulo: 2073 Mill. m³)
- network water losses: 36 %
- uncontrolled urban planning
- weak institutional framework
- unclear responsibilities and lack of cooperation between main actors (regulators, operator, municipality,...)





● Szenario A, B, C
◆ Störereignis



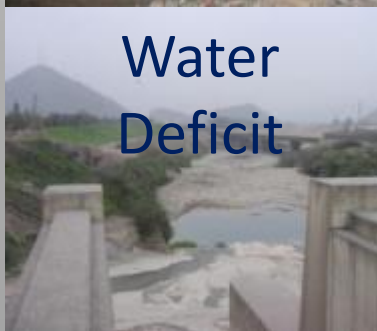
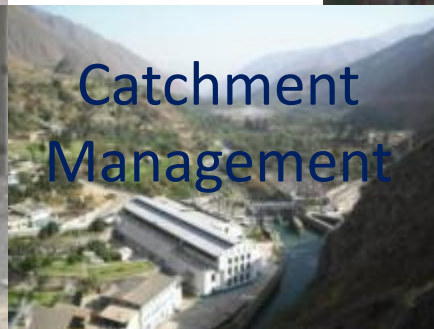
LiWa Project objectives and results:

- Development of integrated **Scenarios** for the Lima water sector in 2040
- **Modelling** of the water catchment considering climate change effects
- **Planning tools** for simulation of the entire water cycle of the megacity
- **Water tariff** concepts
- **Participatory approach** involving stakeholders to discuss and design adaptation strategies
- **Capacity building**, providing knowledge and capabilities to manage future problems

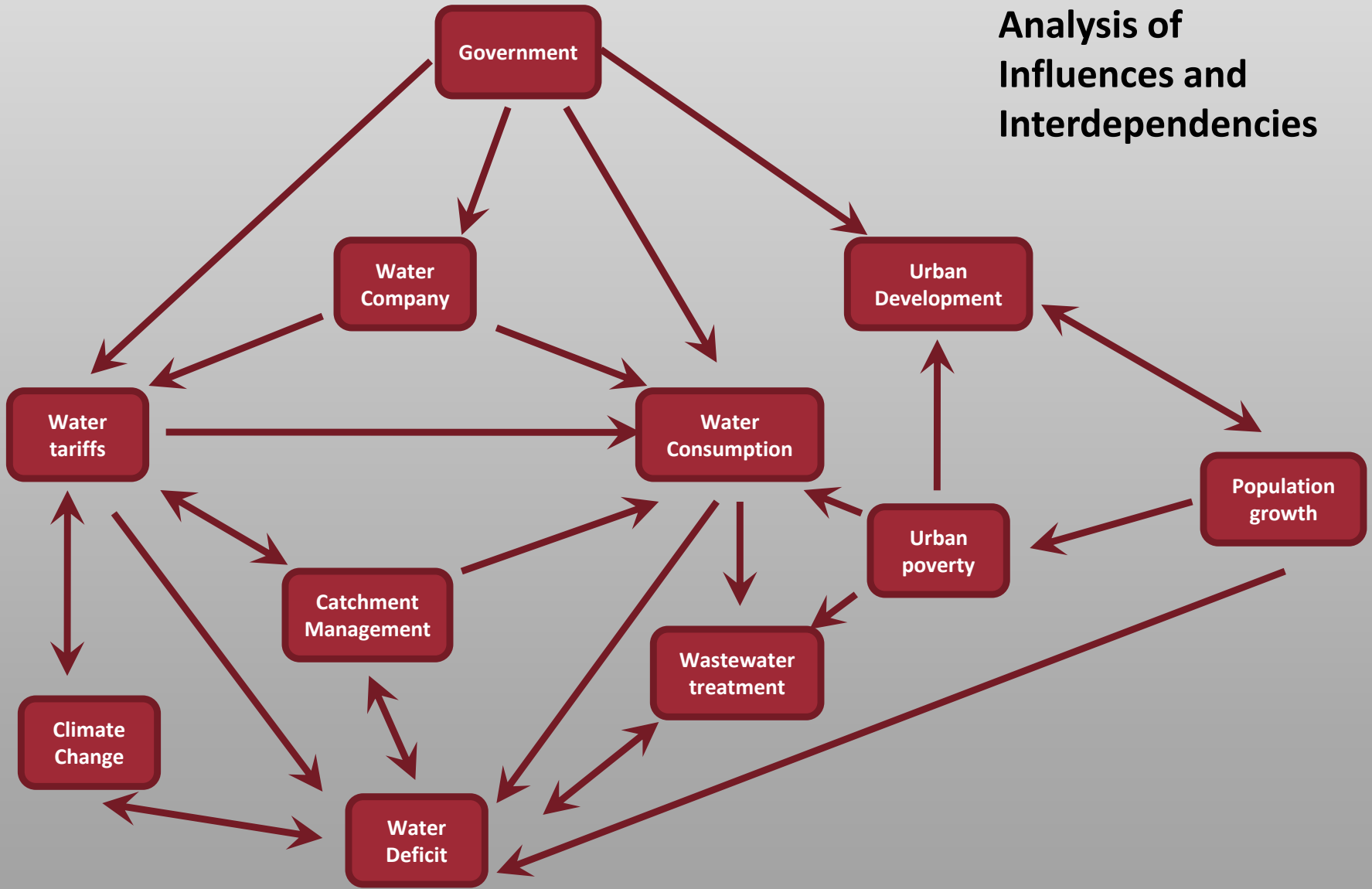
Integrated Scenario Development

- Scenarios are “...an internally **consistent view** of what the future might turn out to be - not a forecast, but one possible future outcome” (Porter 1985).
- Why Scenarios for the water sector?
 - The future is **not predictable**, cannot be forecast
 - The water system has a **strong complexity**
 - The future development depends not only on technological, but on **political, social and institutional changes (human decisions)**
 - **Uncertainty** of climate change impacts and the variability in selecting and implementing mitigation and adaptation measures
 - **Strategies and implemented measures** have to be **robust** for any changes in the future

Variables describing the water sector in Lima ("descriptors"):



Analysis of Influences and Interdependencies





Water Governance

Scenario III:
"Climate change - a mastered challenge"

Scenario II:
"Development without climate change stress"

Scenario I:
"Precaution and overshoot: Lima faces water surplus"



Scenario VI:
"The tragedy of isolated measures: Investment program in adverse environment"

Climate Change



Scenario V:
"Climate change stress meets governance-disaster"

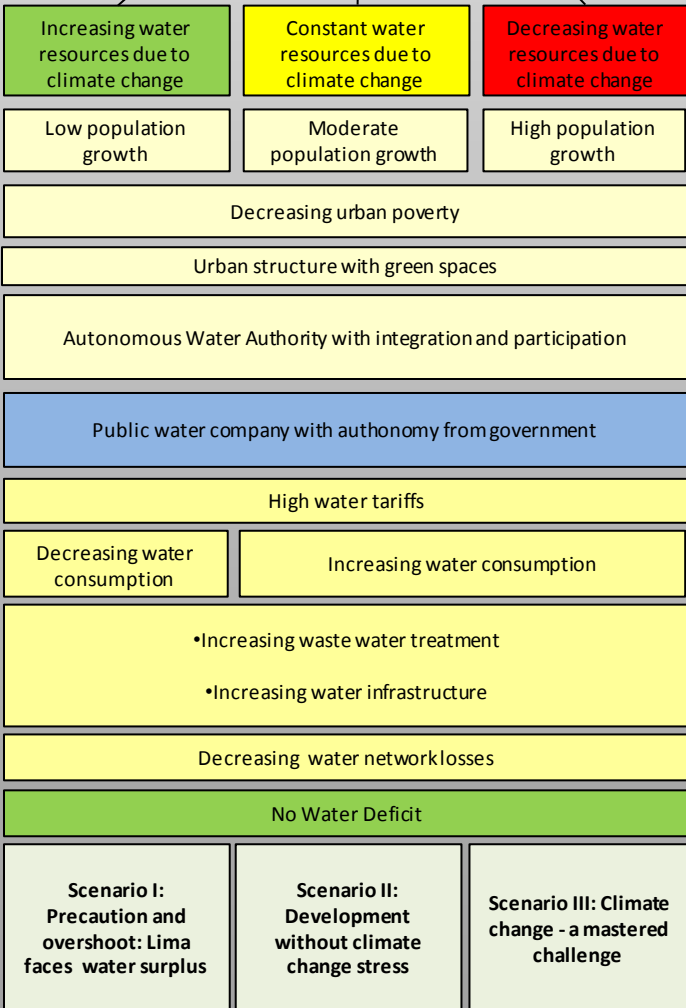
Scenario IV:
"Lucky escape: an unprepared society remains free from climate change stress"



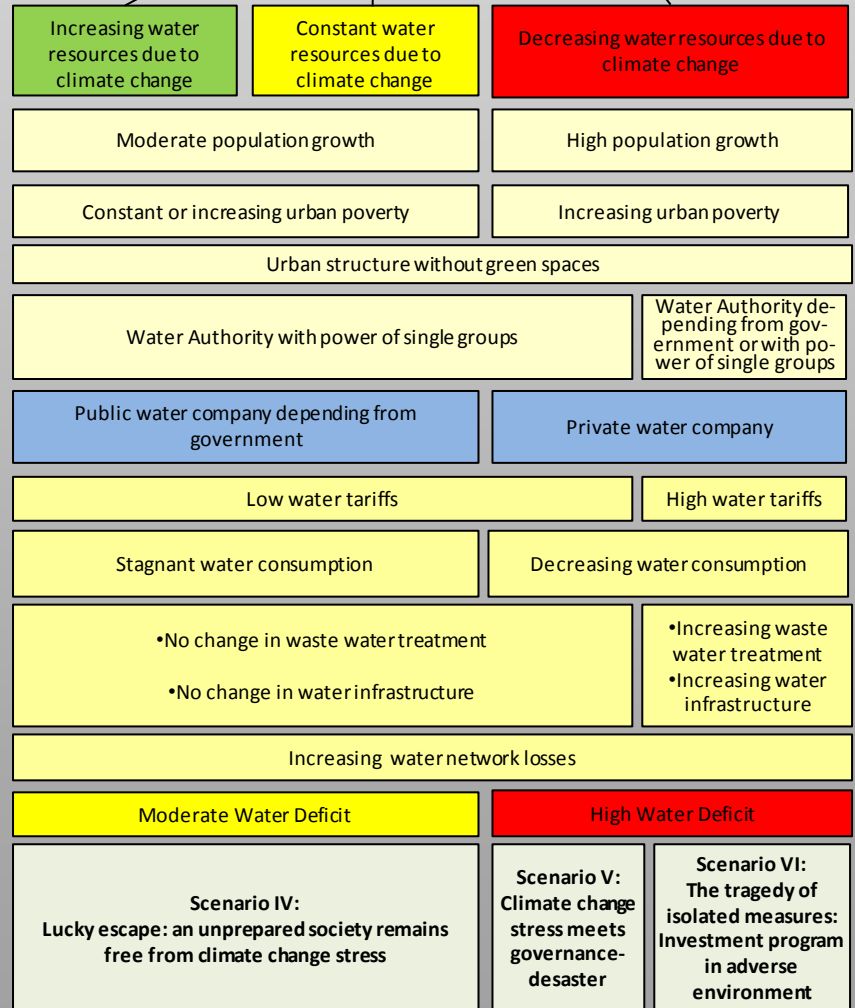
green= no water deficit
yellow=moderate water deficit
red=high water deficit

Lima 2040

Government with decision making power and vision



Government without decision-making power and without vision



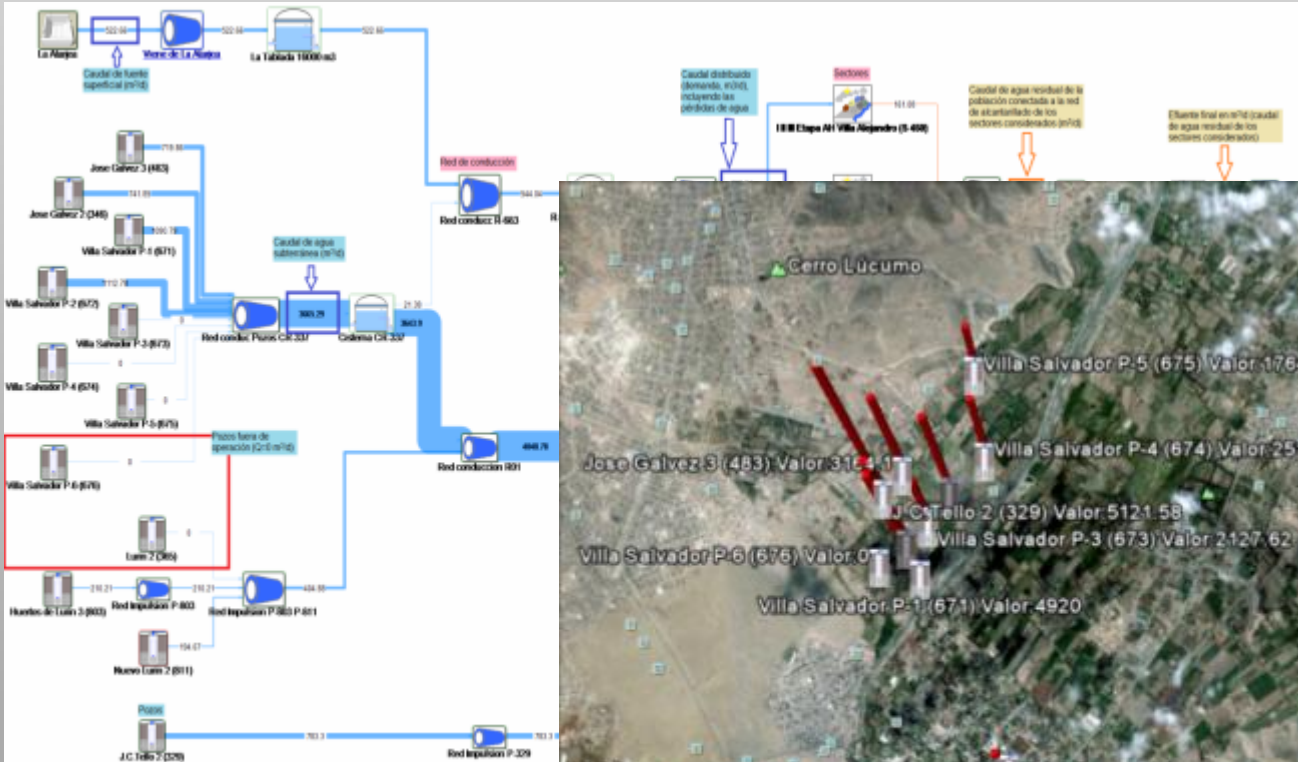
Application of Scenarios

I. Performance-Matrix (robustness of measures):

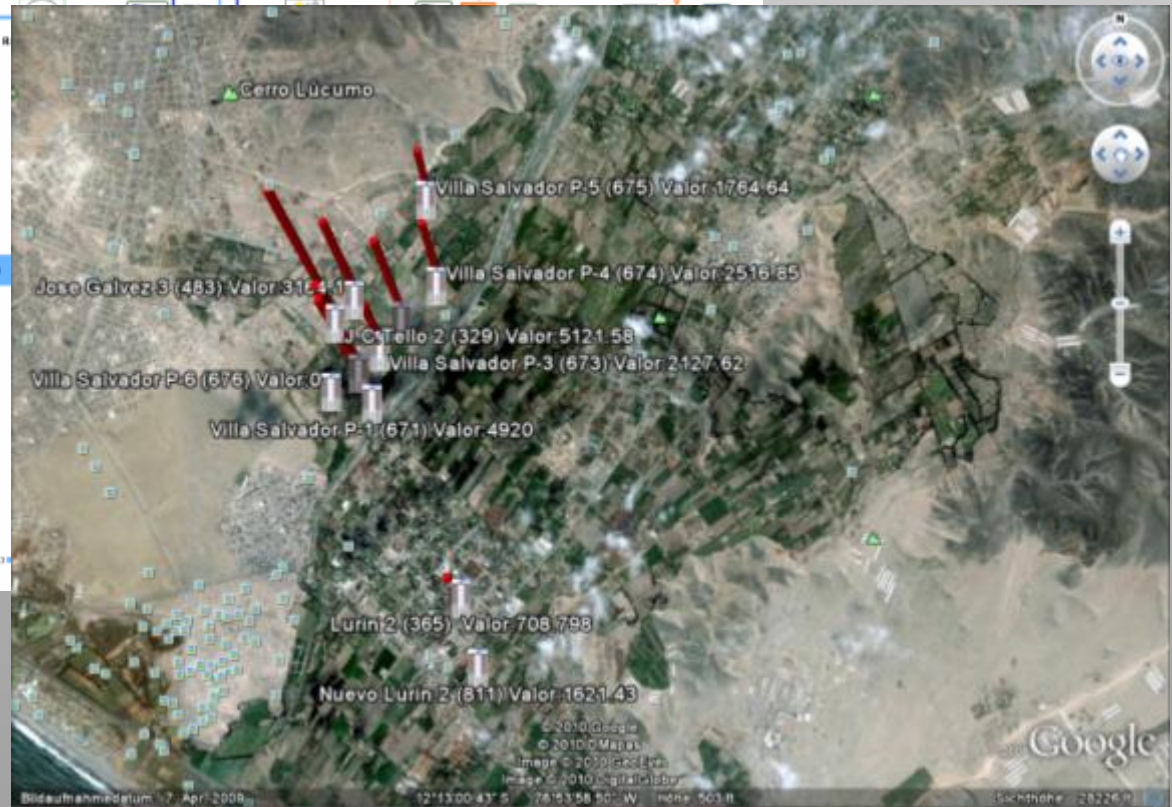
	Measure A	Measure B	Measure C	...
Scenario I	W- Volume W- Quality Costs	NOT FEASIBLE	NOT FEASIBLE	
Scenario II	W- Volume W- Quality Costs	W- Volume W- Quality Costs	W- Volume W- Quality Costs	...
Scenario III	W- Volume W- Quality Costs	W- Volume W- Quality Costs	W- Volume W- Quality Costs	...
...

Application of Scenarios

II. Simulation and visualization:



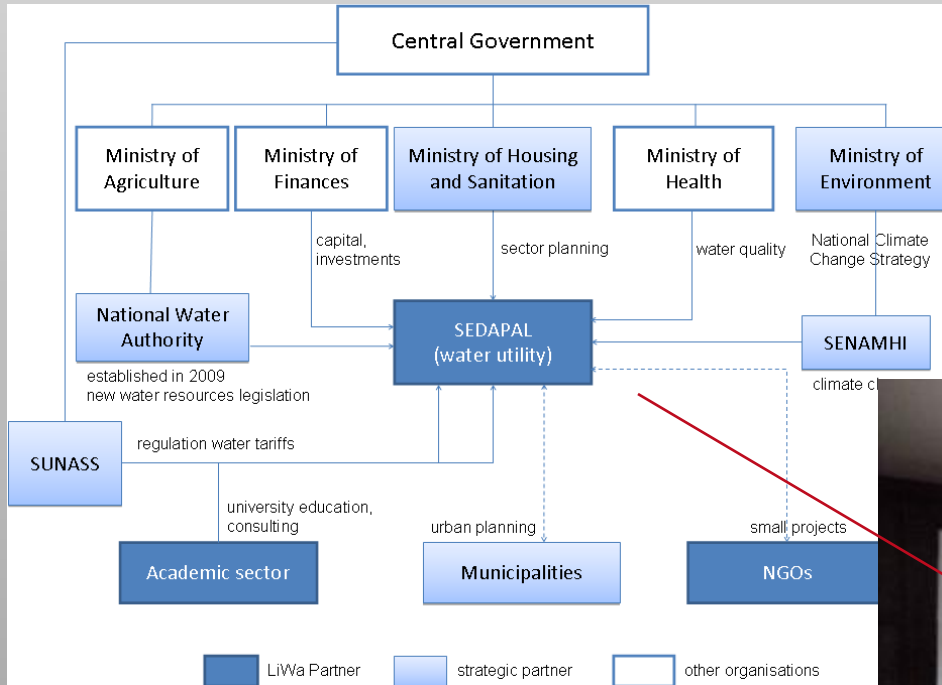
„LiWatool“



Google Earth

Application of Scenarios

III. Stakeholder Platform for communication and cooperation:





Thank you very much!

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