

4th. INTERNATIONAL CLIMATE CHANGE ADAPTATION CONFERENCE

Issue 8. Risk assessment, adaptation planning and evaluation

“AN INTEGRATED FRAMEWORK TO ANALYZE VULNERABILITY AND ADAPTIVE CAPACITY TO SEA LEVEL RISE IN BRAZIL”

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- May 10th., 2016, Rotterdam -



➤ Results integrate an international consortium involving Brazil, the UK and the US: **METROPOLE** (*Belmont Forum, Coastal Vulnerability Call*) designed to:

- ✓ evaluate local decision making processes;
- ✓ provide feedback to local policy makers and society on possible actions toward adaption to SLR.

**BELMONT
FORUM**





- Case studies: *Santos* (São Paulo, Brazil), *Selsey* (West Sussex, UK) and *Broward County* (Florida, US)

- ✓ In this study, the focus is **Santos**, the Brazilian case study
- ✓ similar procedures for Selsey and Broward County.



- Santos has a dynamic economy and hosts the Port of Santos – the most important of Brazil, which handles around 25% of Brazil's foreign trade

- ✓ therefore, Santos is a **priority area for adaptation to climate change in Brazil**





- Santos is surrounded by rich landscapes and ecosystems...



(...) but is constantly hit by landslides, floods and storm surges, with severe impacts





- In two stakeholder engagement workshops the impacts of SLR and storm surges in Santos were presented by interactive computer-based scenario simulations by using the platform CoAST (Coastal Adaptation to Sea Level Rise Tool)
 - ✓ damages to assets in 2050 and 2100 from expected 100 year storms in two scenarios:
 - no-action scenario (*1st. engagement meeting, Sep. 30th. 2015*)
 - with adaptation measures (*2nd. engagement meeting, 1st. Dec. 2015*) for two contrasting areas
 - ✓ it was also conducted surveys to define values, attitudes perceptions prior to start both meetings



- Southeastern Zone (NWZ) - *upscale neighborhoods closer to the shoreline*
- Northwestern Zone (SEZ) - *poor neighborhoods in the hillslopes and in mangrove areas.*

SE ZONE – NO ACTION SCENARIO

2050, with low SLR (0.18 m)



2050, with high SLR (0.23 m)

2100, with low SLR (0.36 m)

2100, with high SLR (0.45 m)



**DAMAGES - 100-YEAR STORM
- 2050 with low (0.18 m) SLR -**



SE ZONE, NO ACTION



DAMAGE 100-YEAR STORM - 2100 with high (0.45 m) SLR -



NW ZONE – NO ACTION SCENARIO



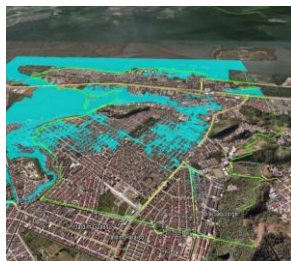
2050, with low SLR (0.18 m)



2050, with high SLR (0.23 m)



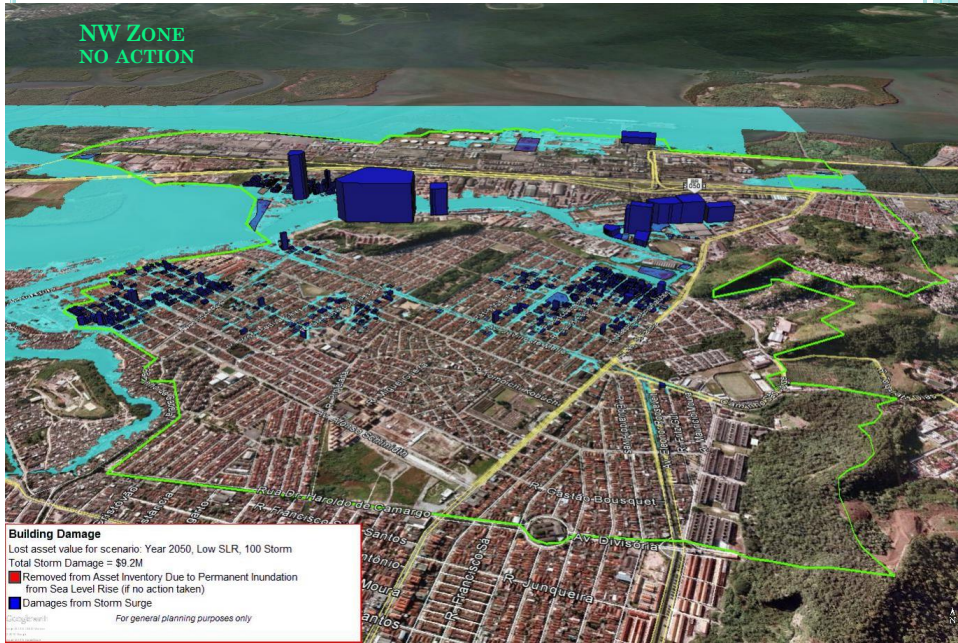
2100, with low SLR (0.36 m)



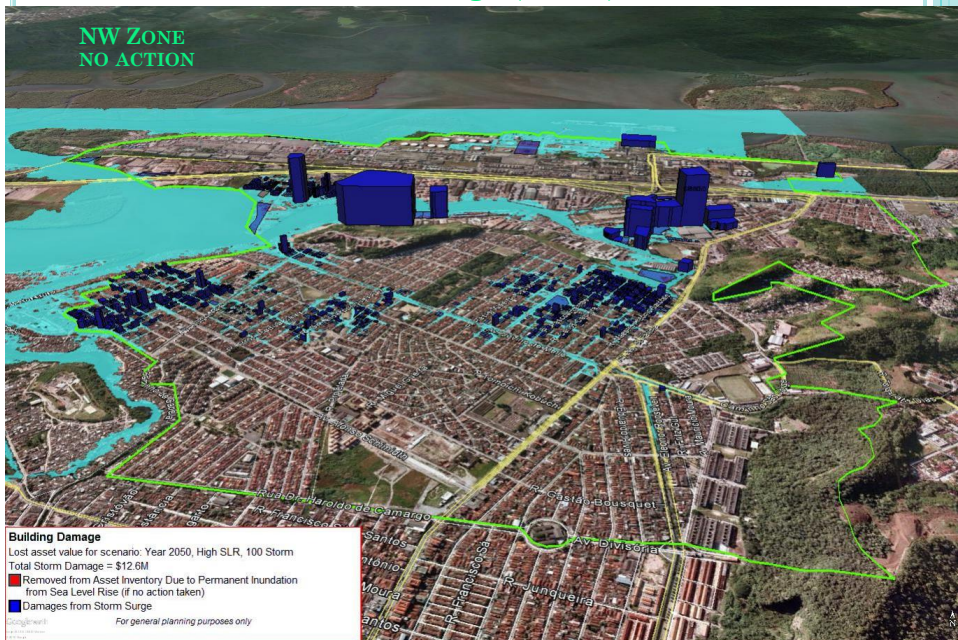
2100, with high SLR (0.45 m)



DAMAGES - 100-YEAR STORM - 2050 with low (0.18 m) SLR -



DAMAGES - 100-YEAR STORM - 2050 with high (0.23 m) SLR -



DAMAGES - 100-YEAR STORM - 2100 with low (0.36 m) SLR -



DAMAGES - 100-YEAR STORM - 2100 with high (0.45 m) SLR -





(IPCC scenario was also evaluated, not shown)

Cumulative Damages Over Time (local currency, R\$)

Year	Sea Level Rise	Southeastern Zone (Damages)	Northwestern Zone (Damages)
2010-2050	Low (0 m-0.18 m)	\$268.616.063	\$38.741.161
2010-2050	High (0 m-0.23 m)	\$304.751.652	\$49.577.392
2051-2100	Low (0.18 m-0.36 m)	\$601.477.102	\$128.192.671
2051-2100	High (0.23 m-0.45 m)	\$738.746.597	\$186.828.719
2010-2100	Low (0 m-0.36 m)	\$870.093.165	\$166.933.832
2010-2100	High (0 m-0.45 m)	\$1.043.498.249	\$236.406.111



- What the COAST Model results showed at meeting one is how much building damage/land loss we might expect ...

... IF NO ACTION IS TAKEN !!

Therefore...

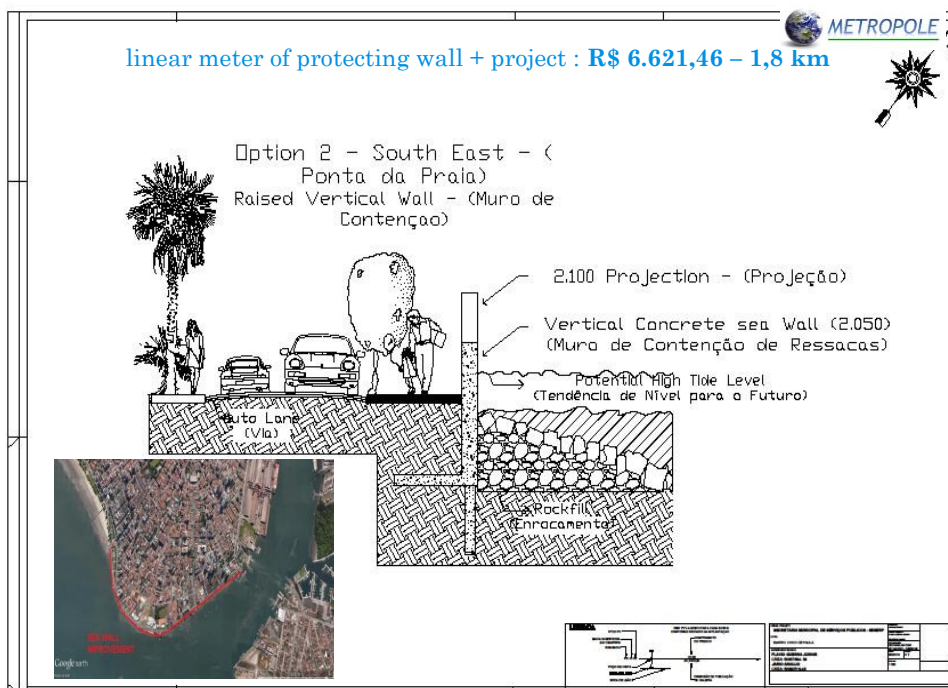


- ... in the second part of Meeting one, attendees discussed possible adaptation measures and voted to model two of them for each zone.



- For the Meeting 2, the COAST software tool run using the two actions chosen by attendees to calculate how much building damage may be avoided over time, **if such strategies are implemented.**
 - ✓ SEZ: fortification (*beach nourishment and dune restoration; structural enforcement/improvement of existent walls; water pumping in existent drainage canals and tide control gates*)
 - ✓ NWZ: fortification (*dredging works and implantation of tide control gates in rivers and drainage canals; implementation of tide control gates in rivers and drainage canals*) and accommodation (*mangrove restoration*)





METROPOLE

Local currency, R\$

	Southeastern Zone		Northwestern Zone (*)	
	Low SLR (2010-2100)	High SLR (2010-2100)	Low SLR (2010-2100)	High SLR (2010-2100)
Damages with NO adaptation	\$870.093.165	\$1.043.498.249	\$166.933.832	\$236.406.111
Damages WITH adaptation	\$0	R\$0	\$ 123.647.994	R171.429.478
Damages avoided	\$870.093.165	\$1.043.498.249	\$43.285.839	\$64.976.633
Costs	\$ 36.514.212	\$ 36.514.212	\$201.999.540	\$201.999.540
Cost /Benefit (Damages avoided /Costs)	23,83	28,58	0,21 (*)	0,32 (*)

* Partial results



- Results including adaptation measures chosen by stakeholders and civil society showed that:
 - ✓ for the SE zone the chosen measure (*fortification*) would be 100% cost effective, representing a cost-benefit rate of 28.58%
 - ✓ in the NW zone the measures (*fortification and accommodation*) were modeled only partly. They might promote some safety, but not so effective as in the SE zone, with a cost-benefit rate of 0.32%
- The partnership with the municipal/ local government will facilitate the internalization of the results and the implementation of public policies and appropriate legislation, allowing a better manage of the area.

Other results of METROPOLE at AF-2016:

- *Decision maker preferences for adaptation actions and fundings: case studies in Brazil, US and United Kingdom* (CJ Reynolds, J Kartez, LH Nunes, K Langbehn)
SC 8.5 (10 May, 15.45-17.30) - Beurs Longe
- *Understanding adptive capacity in contrasting risk management regimes* (S. Paterson)
SC 9.12 (12 May, 8.45-10.30) - Diamond Room II

METROPOLE: AN INTEGRATED FRAMEWORK TO ANALYZE LOCAL DECISION MAKING AND ADAPTIVE CAPACITY TO LARGE-SCALE ENVIRONMENTAL CHANGE: COMMUNITY CASE STUDIES IN BRAZIL, UK AND THE US





THANK YOU, DANK U

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