Planning strategic adaptation pathways to manage future coastal flood risk

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Future sea level rise will exacerbate coastal flooding globally. Adaptation pathways provide a dynamic plan under conditions of uncertainty to take short-term actions, whilst keeping future options open to make adjustments as conditions change.

BACKGROUND

Long-term adaptation planning is challenged by uncertainty and contested stakeholder priorities. Adaptation pathways enable coastal managers to anticipate change and take action before coastal flood impacts become unacceptable.

Two promising model-based approaches to support decision-making under conditions of uncertainty include robust decision making (RDM) and dynamic adaptive policy pathways (DAPP). Both approaches have the potential to provide complementary information to support adaptation pathways [1].

RESEARCH QUESTION

This research aims to:

- Explore the benefits of a combined RDM and DAPP approach in coastal flood risk management;
- Investigate the feasibility of using largely open source data and programming tools to plan adaptation pathways.

MAIN FINDINGS SO FAR

The key findings so far are that:

- A combined RDM and DAPP approach can provide multi-dimensional descriptions of adaptation tipping points for adaptation pathways planning, taking into consideration various hazard, exposure and vulnerability risk factors (Fig. 1.).
- Increasingly open source data, programming and tools can be utilised in a combined RDM and DAPP approach, however, the current research method relies upon commercial GIS software (ArcGIS) to analyse spatial data.

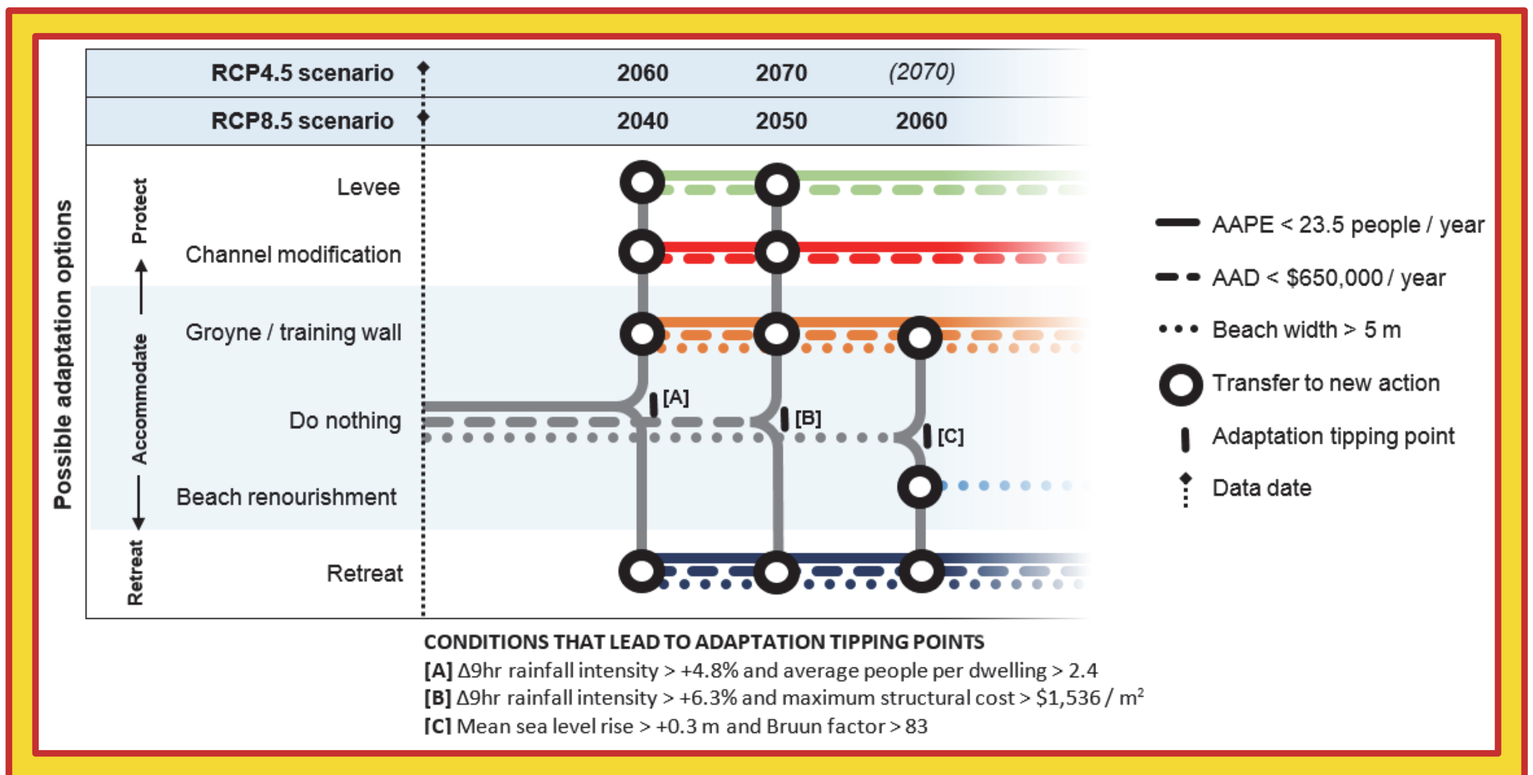

Fig. 1. Beginning of an adaptation pathway generated using a hypothetical case study in Kingston Beach, Tasmania. The objectives of the pathways are to (1) keep the average annual people exposed (AAPE) to flooding at less than 1.1 times the current risk; (2) keep average annual damage (AAD) to property from flooding at less than 1.1 times the current risk; (3) maintain an average beach width of 5 m. Moving from left to right, under a RCP8.5 scenario the AAPE objective begins to be missed from 2040, meaning that a new policy needs to have been implemented (e.g. levee, channel modification, groyne / training wall or retreat) [2].

NEXT STEPS

Model-based tools are useful for assessing measurable impacts, such as damage to infrastructure. Further research is needed to integrate values-based approaches in adaptation pathway planning to account for non-measurable impacts. Values-based approaches explore what people value about their everyday lives and places that they live. Such insights could be used in a combined RDM and DAPP approach to shape the adaptation objectives, risk tolerance, options and change monitoring systems [3].

FURTHER INFORMATION

For further information about this research, please contact Tim Ramm at timothy.ramm@utas.edu.au

END-USER STATEMENT

"Understanding the consequences of adaption options is crucial for justifying change to the community and governments" Luke Roberts, Department of Premier and Cabinet

OTHER RESOURCES

[1] Kwakkel, J.H. et al, 2016. Comparing robust decision making and dynamic adaptive policy pathways for model-based decision support under deep uncertainty. Environ. Model. Softw. 86: 168-183.

[2] Ramm, T.D. et al, 2018. Describing adaptation tipping points in coastal flood risk management. Comput. Environ. Urban. Syst., 69: 74-86.

[3] Ramm, T.D. et al, 2018 Strategic adaptation pathway planning to manage sea-level rise and changing coastal flood risk. Environ. Sci. Policy. 87: 92-101.

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