Guidance on undertaking a first-pass risk screening

What is a first-pass climate change risk screening?

A first-pass climate change risk screening is a qualitative process which can be carried out without detailed local data to develop a preliminary understanding of climate change risks to your organisation. It is relatively inexpensive to conduct and helps users to assess their broad risk qualitatively by leveraging on existing national, state or local information and expert knowledge.

What can a first-pass risk screening achieve?

A first-pass risk screening can

a. provide users with a rapid starting point for understanding broader climate change risk to their organisation
b. help users understand broader uncertainties around precise timing, location and amount of climate change
c. help users to screen climate change-related hazards that can be problematic for an organisation's business operation and to identify specific risks that may arise from these hazards and that should be investigated further
d. help identify areas of operations (e.g. assets, services, geographic features) of an organisation/region/community/sector that require a more detailed risk assessment (second-pass) to enable effective adaptation planning
e. help identify which stakeholders should be involved in the next level of investigation (second-pass risk assessment)
f. provide the basis for engagement with an organisation's decision-makers to get resources and support, and to inspire the necessary leadership to act.

What are the limitations of first-pass screening?

First-pass risk screenings are useful to understand the broader climate change risk of your organisation. However, they are based on qualitative information with limited data input, which can sometimes be a concern to practitioners. They should be used to understand broader risks, and to support the appropriate scoping and framing for adaptation planning and risk assessments, rather

than for making final adaptation decisions. Identifying where adaptation planning effort is needed helps to reduce the potential for using unnecessary resources on detailed risk assessments (a second-pass or third-pass). It indicates where an organisation should focus its adaptation initiatives. Leaping into technical detail too early in the planning process can be costly and unnecessary.

Tools to support a first-pass risk screening

CoastAdapt provides a simple spreadsheet that can be used with this guidance material to record information and present the results of risk screening (*Risk assessment templates*). CoastAdapt also provides a number of national and regional data products that can be used to support first-pass screenings. These are discussed below.

How to undertake a first-pass climate change risk screening

Figure 1 shows the four-step process of the first-pass risk screening. These steps are described below.

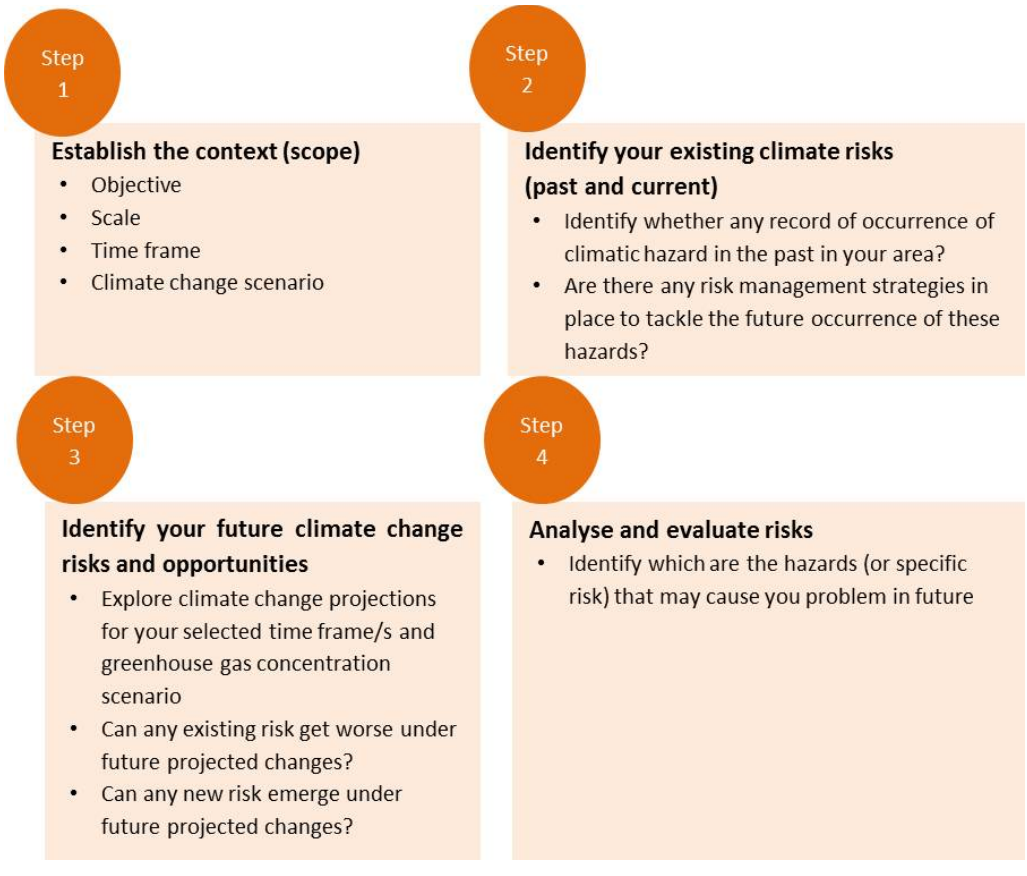

Figure 1: Processes involved in first-pass risk screening.

Step-1: Establish the context (scope)

1.1 Objective

At the onset of any risk assessment, it is crucial to understand the scope and purpose of the exercise and to be clear about which factors are included in the analysis and which are not. It is possible and often necessary to repeat risk screenings as you develop a better understanding of the scope of the climate change related issues. It is also important to consider the scale of the assessment. Is it for a large region, a local council, a particular estuary or beach, or for a specific asset such as a shopping centre?

1.2 Timeframe and climate change scenario for your risk screening

You need to specify the timeframe of your risk screening as the degree of climate change varies over time. Selection of the timeframe for your analysis depends on your objective as well as your planning horizon. Different planning horizons are suited to different timeframes (Figure 2).

Your selected timeframe will also influence the climate change scenario(s) that you select for analysis. At this early stage of planning, we recommend that a risk-averse approach should be taken by using a high greenhouse gas concentration scenario (RCP8.5) to drive your risk screening so that the full breadth of the risks can be explored (see Hinkel et al. 2015 for more detailed discussion on this). Selection of scenario/s for your risk screening will relate, in part, to the timeframe you are planning for. There is little difference between the scenarios up until about 2050, so if your planning horizon is within that timeframe, your choice of scenario is less critical. After mid-century the differences become clearer and planning for these longer time frames requires a choice of scenario. In a first-pass screening, risk-averse organisations should always start with a high greenhouse gas concentration scenario (RCP8.5) towards the end of the century to understand the full breadth of the risks that they might face.

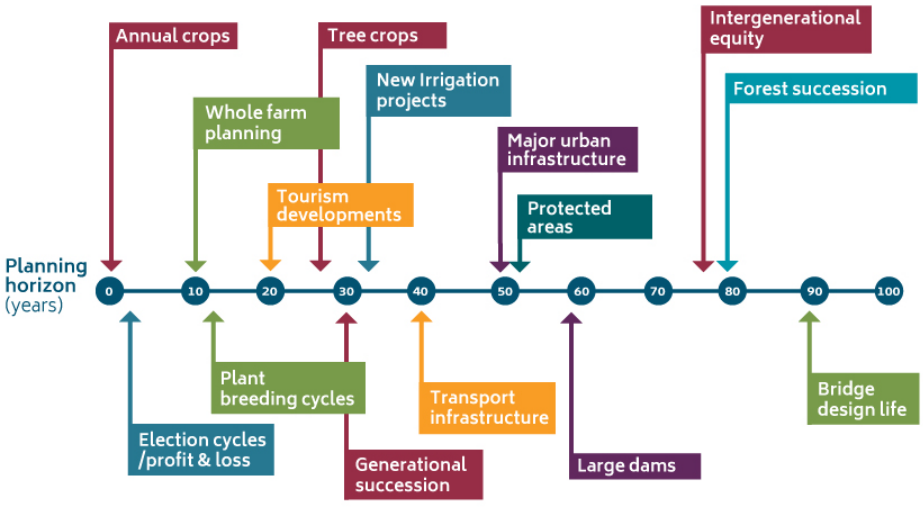

Figure 2: Typical planning horizon (years) for different sectors. Source: Jones and McInnes 2004.

CoastAdapt provides three pieces of information to help you with scenario selection:

- How to understand climate change scenarios
- How to access climate change scenarios
- How to use climate change scenarios

Climate change scenario information is available at national and state levels. The *Climate change in Australia* website provides national and regional projections for a wide range of climate variables and sea-level rise for Australia (see the case study *The Climate Change in Australia website*). Some of the states have their own climate projections (*How to access climate change scenarios*).

Step 2: Identify your existing climate risk

2.1 Is there any record of occurrence of any climatic hazard in the past in your area?

Table 1 provides some examples of climatic hazards relevant to the coastal zone. The list is not exhaustive but provides a good starting point. Reviewing the impact sheets of CoastAdapt (*Climate change impacts by sector*) can provide a broader understanding of coastal climate related risks. At this point you need to identify any known climatic hazards that have affected your geographical area in the past. Apart from local knowledge, you can also explore national data products to understand your existing climate related risks (*Data for risk assessment*). List any historical damage against each of the relevant hazards. This will help identify assets, areas or communities that have been exposed to climate related hazards in the past.

Table 1: Examples of some coastal specific climatic hazards.

Broader hazard category	Specific hazard examples
Coastal specific hazards	• Short-term beach erosion (storm related beach erosion) • Long-term shoreline recession (geomorphology) • Coastal lake or watercourse entrance instability • Storm surge inundation of beach and surrounding areas • Storm surge inundation of estuaries and surrounding areas • Tidal inundation of beach and surrounding areas • Tidal inundation of estuaries and surrounding area • Erosion within estuaries caused by tidal waters, including the interaction of those waters with catchment floodwaters • Loss of water supply, damage to infrastructure (e.g. concrete corrosion in coastal infrastructure) • Extreme winds from cyclones and coastal lows • Saltwater intrusion into groundwater
Rainfall related hazards that can affect coastal zone	• Surface water flooding (including sewer flooding) • Drought leading to a reduction in the source of water supply • Erosion induced by excessive rainfall
Heat related hazard that affects coastal zone	• Prolonged summer heatwaves • Increased number of hot days and nights
Bushfire related hazards	• Damage of properties, infrastructure and ecosystem from bush fire events

2.2 Are there any risk management strategies in place?

If you have identified that your area has experienced a certain climate related risk in the past then you should consider whether there are risk management strategies in place to tackle it in future. This will allow you to understand your residual risk (risk remaining even with mitigation options in place).

Step 3: Identify your future climate change risk

3.1 Explore climate change and sea level rise projections for your selected timeframe/s and greenhouse gas concentration scenario

Once the source of your climate change projection data is finalised, you can start listing a few key climate variables, such as temperature and sea level. Other important variables may include, but are not limited to, precipitation, extreme weather (e.g. cyclones and storms), and wind. Then, using the projection data, aim to respond to the question, "How is temperature (precipitation, sea level etc.) projected to change (decrease, increase or no change) during the different time scales (near- to mid-term, long-term) of the 21st century?"

As an example, the Climate Change in Australia website provides regional summaries of climate change through its "Regional climate change explorer" which can be used to explore regional climate change projections of different climate variables and sea levels. It provides key messages summarising future climate projection of the region as well as some high-level projection information for different climate variables and sea levels (Figure 3).

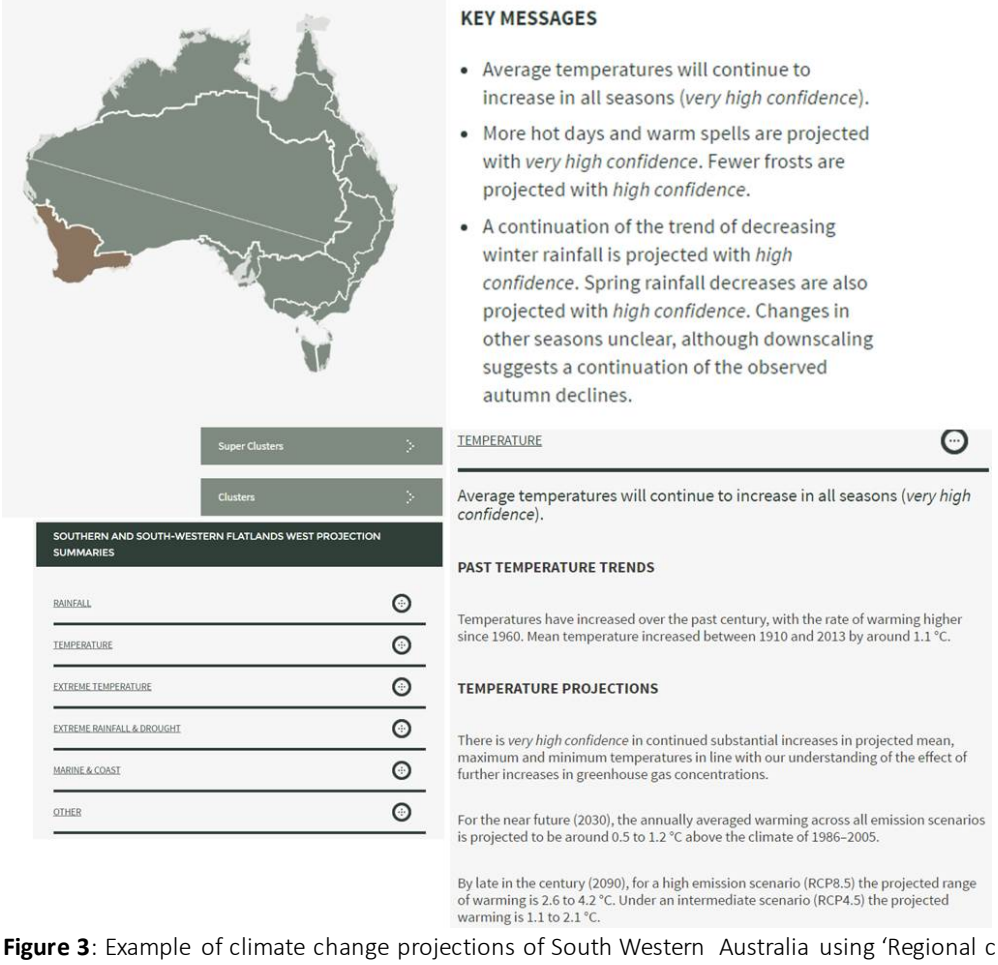

Figure 3: Example of climate change projections of South Western Australia using 'Regional climate change explorer' of Climate Change in Australia website. Source: © CSIRO and Bureau of Meteorology 2015.

CoastAdapt provides sea level rise projections under four different climate change scenarios for each coastal council around Australia (Figure 4), and maps of possible inundation using a simple bathtub modelling approach. For each coastal council around Australia three inundation maps are available (a mid and high scenario towards the end of the century and a high scenario for mid-century). Figure 5 shows an example. These maps are useful for high-level risk identification in first pass risk screening. Guidance on the use of these products is provided (*CoastAdapt Datasets 2*).

Coastal Risk Australia (Figure 6) provides maps of inundation extent for a wider range of future sea-level rise scenarios, and can also be explored for high-level risk identification. Regional and even local assessments may have been conducted by state or local government and NRM groups. It is useful to seek this information at this stage. For more information, read *Data for risk assessment* and *State specific information*. CoastAdapt also provides a guide on how to select appropriate *mapping products to understand coastal hazards*.

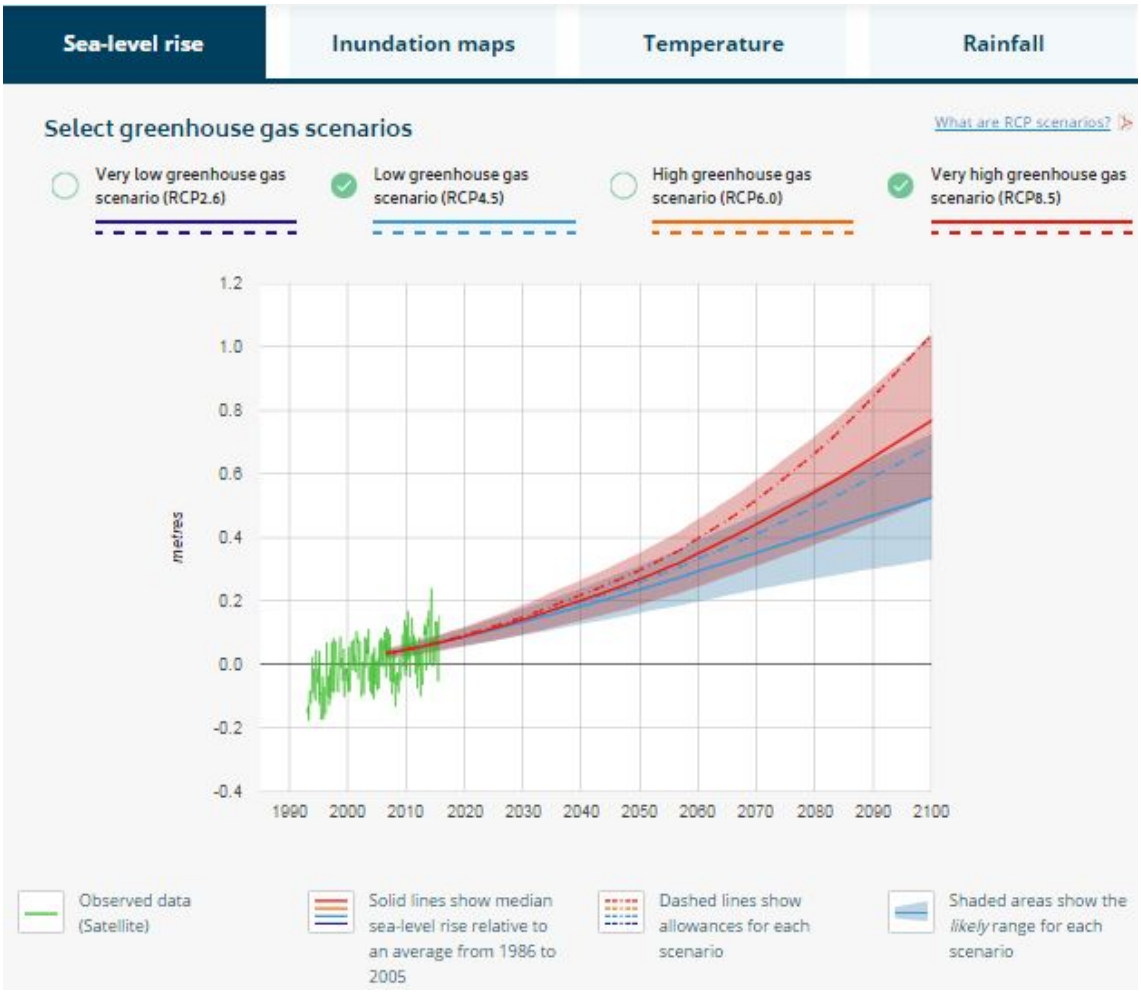

Figure 4: Example of sea level rise projection data available in CoastAdapt. Source: CoastAdapt.

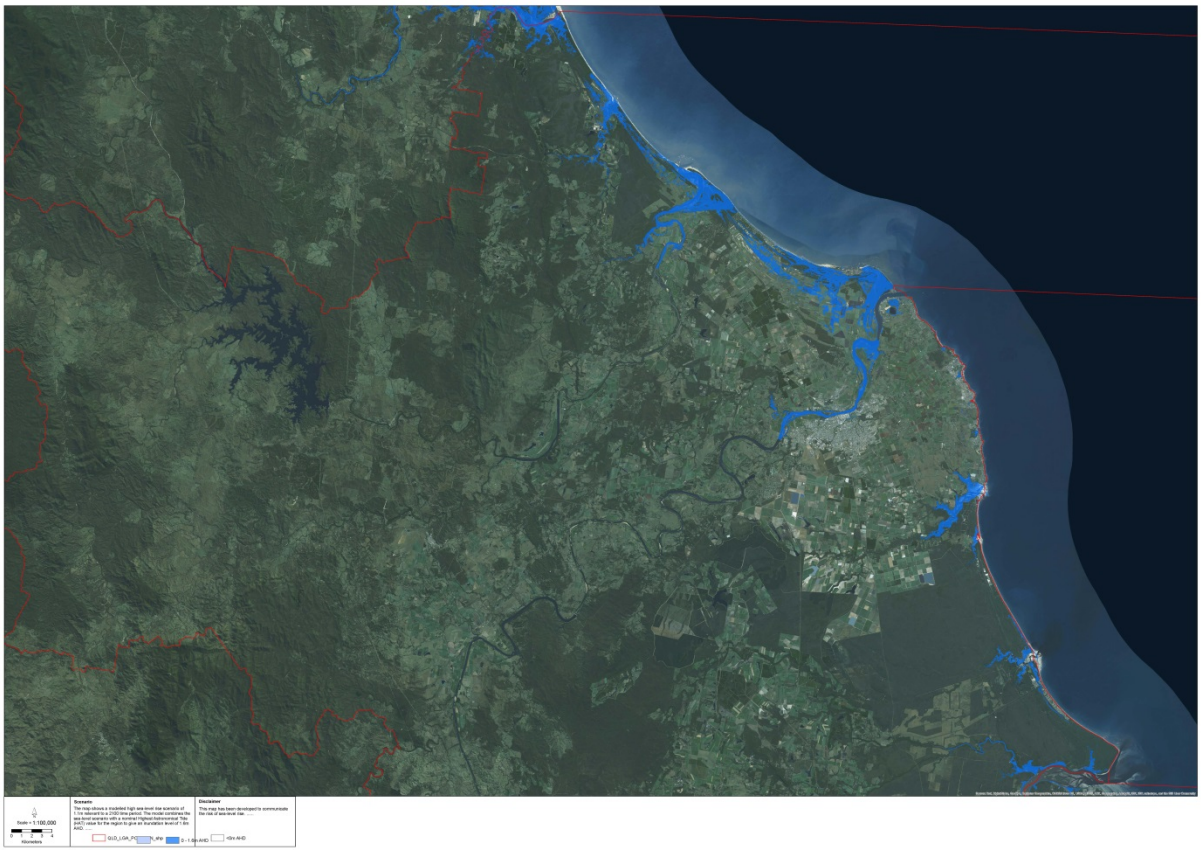

Figure 5: Example of CoastAdapt inundation maps. Blue areas are showing inundation extent in the region under high-greenhouse gas concentration scenario towards the end of the century. Source: CoastAdapt.

Figure 6: Example of national visualisation data products that you can use for your first-pass risk screening: potential at-risk areas under a certain degree of SLR using Coastal Risk Australia visualization tool. Source: Coastal Risk Australia (accessed 15 June 2016).

CoastAdapt also provides SmartLine data created by Geoscience Australia, indicating the broad erodibility of Australia's coastline (Figure 7). In general, erosion is likely to increase on highly erodible coastlines in future as sea levels rise. Therefore, if your assets are located along such a coast then they are at risk and should be investigated further. For more information on erodibility of soft shores see *Information Manual 8: Coastal sediments and beaches*.

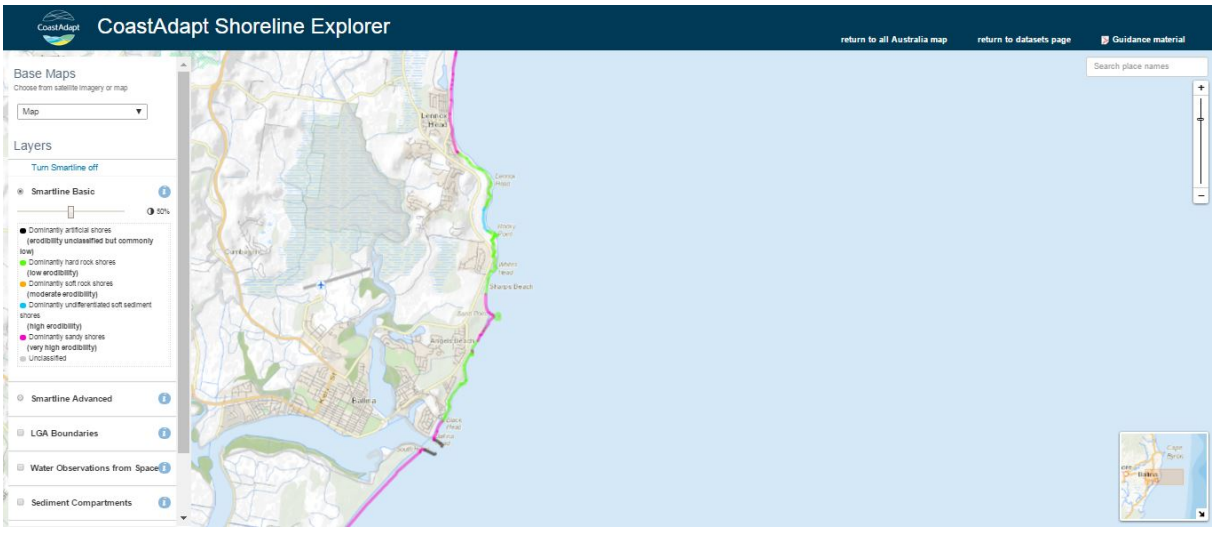

Figure 7: Example of national visualisation data products: SmartLine information showing landform types and erodibility. In this example, purple coloured line is showing highly erodible coast. See Guidelines of using SmartLine for more details. Source: CoastAdapt.

3.2 Can any existing risk get worse under future projected changes?

Qualitative understanding of the change in direction (increase, decrease or no change) of future climate variables, as well as other risk related information (inundation, erodibility of your coast) should provide a qualitative understanding of how existing risks, identified in the previous step, may change in future. As an example, if sea level is projected to increase in your planning horizon and you know of past events of coastal inundation or erosion-related problems (existing risk) then these risks may increase in future.

3.3 Can any new risk emerge under future projected changes?

If there is no previous record of a particular hazard in your area, it does not guarantee that it will not happen in future. You should consider whether the qualitative change of a given climate variable in future could give rise to new risk which has not been realised in the past. As an example, prolonged summer heatwaves may not be an issue in some coastal urban areas at present. But with rapid urbanisation combined with growth in aged population and rise in average temperature, the health risk to the people living in that area may increase in future heatwaves. Another example can be as sea level increases, the increased extent of tidal flooding could create new challenges. List any possible future damage against each of the relevant hazards. This will help you to identify assets, areas or communities that may be exposed to climate related hazards in future.

Step 4: Analyse and evaluate risk

4.1 Identify which hazards (or specific risks) may cause problems in future

By analysing the qualitative information gathered in the previous steps, you should be able to identify the most problematic hazards under the selected timeframe and climate change scenario (Figure 8) and identify a set of systems (e.g. geographical areas, business operation, assets, ecosystems etc.) potentially at risk in future.

Where to go from here

High-level understanding of future exposure can be used to prioritise any further assessment of risk and should also be communicated to relevant stakeholders as a basis for discussion around any proposals for adaptation planning. These discussions should help identify which stakeholders may need to be engaged with, if a second-pass assessment proves necessary.

The information from a first-pass assessment will support discussion with senior management and decision makers within the organisation around allocation of financial and human resources for more detailed climate change adaptation planning. It is important to scan through the entire adaptation planning cycle (C-CADS) to gain a broad understanding of possible adaptation options and the approaches to preparing a climate adaptation plan. This eventually can lead to some broad high-level adaptation decision making (e.g. which sectors need more analysis, when to revisit risks in future etc.).

If the first-pass risk assessment identifies little risk to your organisation or interests at this stage, it is possible to identify trigger points (or events, for example, the point at which certain key infrastructure installations become at risk of inundation due to sea-level rise) at which the risk assessment process should be revisited (see *Pathways approach* for more details). For guidance on risk management see step three to six of C-CADS.

Figure 8: Example of final results using the CoastAdapt first-pass risk screening excel template. Source CoastAdapt.

References:

CSIRO and Bureau of Meteorology, 2015: Climate Change in Australia. Accessed 15 June 2016. [Available online at http://www.climatechangeinaustralia.gov.au/en/].

Jones, R.N., and K.L. McInnes, 2004: A scoping study on impact and adaptation strategies for climate change in Victoria. Report to the Greenhouse unit of the Victorian department of sustainability and environment. CSIRO Atmospheric Research, Melbourne, Australia.

Hinkel, J., C. Jaeger, R.J. Nicholls, J. Lowe, O. Renn, and S. Peijun, 2015: Sea-level rise scenarios and coastal risk management. Nature Climate Change, 5(3), 188-190.

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