

# Chapter 4

## Urban and coastal planning

4.1 Chapter 2 provided a high-level overview of how warming of the climate system is projected to result in various changes, such as changes in temperature, precipitation, sea level and the frequency and intensity of extreme weather events. This chapter will consider how managing these risks through appropriate planning frameworks and decisions can support effective climate change adaptation.

### Examples of responses

4.2 In response to the threats climate change presents for coastal regions, various state governments have revised coastal planning strategies, policies and programs to help improve the resilience of coastal communities. For example:

- In New South Wales, the state government is reforming planning arrangements for coastal communities, and the object of the *Coastal Management Act 2016* (NSW) specifically notes the need to 'mitigate current and future risks from coastal hazards, taking into account the effects of climate change'.<sup>1</sup> The Government has released a draft Coastal Management State Environmental Planning Policy and a draft coastal management manual and toolkit.<sup>2</sup> In addition, between 2014 and 2016, Local Government NSW and the NSW Office of Environment and Heritage administered the Building Resilience to Climate Change grants program designed 'to address identified climate change risks and vulnerabilities facing NSW councils'.<sup>3</sup>
- In Victoria, the *Victorian Coastal Strategy 2014* outlines the Government's policy on managing coastal environments, which includes benchmark requirements to plan for sea level rise of not less than 0.8 metres by 2100 and to plan for not less than 0.2 metres over current 1 in 100 year flood levels by 2040 for urban infill areas.<sup>4</sup> A ministerial direction and planning practice note specifically address planning to manage coastal hazards and the coastal

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1 *Coastal Management Act 2016* (NSW), s. 3(f).

2 Office of Environment and Heritage (NSW), 'Coastal reforms', [www.environment.nsw.gov.au/coasts/coastreforms.htm](http://www.environment.nsw.gov.au/coasts/coastreforms.htm) (accessed 21 February 2018).

3 Local Government NSW, 'Building Resilience to Climate Change', [www.lgnsw.org.au/policy/climate-change/building-resilience](http://www.lgnsw.org.au/policy/climate-change/building-resilience) (accessed 3 April 2018). An example of a project funded by the program is outlined in Institute of Public Works Engineering Australasia and Northern Beaches Council, *Submission 14*, p. 2.

4 Victorian Coastal Council, *Victorian Coastal Strategy 2014*, [www.vcc.vic.gov.au/assets/media/menu\\_files/VCS\\_2014.pdf](http://www.vcc.vic.gov.au/assets/media/menu_files/VCS_2014.pdf) (accessed 21 February 2018), p. 52.

impacts of climate change.<sup>5</sup> Evidence given by multiple Victorian local governments indicated that their planning activities are based on the 0.8 metres by 2100 and 0.2 metres by 2040 sea level rise scenarios.<sup>6</sup>

- In Queensland, the state government and the Local Government Association of Queensland (LGAQ) have developed programs to improve how local governments manage climate change. The Queensland Climate Resilient Councils program seeks to strengthen internal council decision-making processes to improve climate change responses. The QCoast2100 grants program provides assistance to identify vulnerabilities and risks associated with future coastal hazards.<sup>7</sup>
- In Western Australia, the state government issued the WA Coastal Zone Strategy in August 2017. On managing coastal erosion and inundation, the Strategy notes that planning policy seeks to avoid development in at-risk areas, identifies the need to consider planned retreat, envisages design approaches to accommodate risks and outlines when coastal protection works could be considered.<sup>8</sup>

#### 4.3 The Tasmanian Government provided the following evidence regarding its adaptation and resilience efforts for communities in coastal areas:

Since 2011, the Tasmanian Government has been working with communities vulnerable to coastal hazards through the Tasmanian Coastal Adaptation Pathways (TCAP) project. The key aim of TCAP is to raise awareness of coastal hazards and partner with communities to manage risks into the future.

Through TCAP, the Government has worked in partnership with councils in 11 of the communities at risk from coastal erosion and inundation including, most recently, the municipalities of Hobart City, Huon Valley, Kingborough and Glamorgan Spring Bay.

Following on from TCAP, the Government is committed to providing further guidance and support to coastal managers on understanding and managing coastal hazards to build Tasmania's climate resilience.<sup>9</sup>

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5 Department of Environment, Land, Water and Planning (Victoria), 'The coast and planning in Victoria', [www.planning.vic.gov.au/policy-and-strategy/coastal-planning-in-victoria](http://www.planning.vic.gov.au/policy-and-strategy/coastal-planning-in-victoria) (accessed 27 April 2018).

6 See *Committee Hansard*, 15 March 2018, p. 26.

7 The LGAQ explained that the program is intended to 'facilitate the identification of impacts to coastal communities (including housing, buildings and infrastructure) and the identification of response options for the short, medium and long term'. Funds available under the program total \$12 million over three years. See Local Government Association of Queensland, *Submission 11*, p. 4.

8 Western Australian Government, *WA Coastal Zone Strategy*, 2017, [www.planning.wa.gov.au/dop\\_pub\\_pdf/WA\\_Coastal\\_Zone\\_Strategy.pdf](http://www.planning.wa.gov.au/dop_pub_pdf/WA_Coastal_Zone_Strategy.pdf) (accessed 6 April 2018) p. 14.

9 Tasmanian Government, *Submission 4*, pp. 3–4.

4.4 The Environment Institute of Australia and New Zealand (EIANZ) referred to the Sydney Coastal Councils Group's mapping of areas of risk of coastal inundation. The EIANZ submitted that these maps use 'sophisticated modelling together with Councils' own information sources (e.g. LiDAR technology) to determine risk and develop consistent model planning and management responses in consultation with relevant state government agencies and the broader community'.<sup>10</sup>

4.5 At Collaroy-Narrabeen Beach in northern Sydney, which is considered to be the beach most vulnerable to erosion from coastal storms in northern Sydney and where severe storms were experienced in 2016, EIANZ note that actions to preserve and protect the beach have been undertaken. These actions include 'ensuring that development along Collaroy-Narrabeen Beach considers current and future hazards of wave impact and coastal erosion'.<sup>11</sup>

4.6 The committee was also advised of a 16-kilometre seawall being built by the Gold Coast City Council to protect its beaches.<sup>12</sup>

4.7 Public works as part of flood risk management have also been undertaken. The committee was referred to a levee constructed in Deniliquin which, for an investment of \$15.8 million, is expected to 'avoid \$85 million in flood damages in a 1 in 100 year flood'.<sup>13</sup> However, flood mitigation efforts can encounter opposition; the committee was also informed of instances where the construction of levees have been opposed on amenity or heritage grounds.<sup>14</sup>

4.8 The evidence received during this inquiry provides a sample of the climate change adaptation projects being undertaken. The committee is also aware of other examples, such as the local government projects supported by the Victorian Government intended to build community capacity and resilience in the face of climate change.<sup>15</sup>

4.9 An innovative approach to helping inform the community about the risk of rising sea levels is the Witness King Tide Program. Green Cross Australia submitted that this program centres on king tides, which are the highest tides of the year that occur twice annually due to astronomical and gravitational factors. The program uses king tides as an 'opportunity for the public to understand what sea level rise

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10 Environment Institute of Australia and New Zealand (EIANZ), *Submission 36*, p. 2.

11 EIANZ, *Submission 36*, p. 4.

12 Mr Alan Stokes, Executive Director, Australian Coastal Councils Association (ACCA), *Committee Hansard*, 15 March 2018, p. 25.

13 Floodplain Management Australia, *Submission 35*, p. 4.

14 Mr Paul Grech, Director, Land Use Planning, Floodplain Management Australia, *Committee Hansard*, 23 November 2017, p. 7.

15 For a list of these projects, see Department of Environment, Land, Water and Planning (Victoria), 'Climate change: Working with Local Government', [www.climatechange.vic.gov.au/local-government/working-with-local-government](http://www.climatechange.vic.gov.au/local-government/working-with-local-government) (accessed 4 April 2018).

projections might mean for their local community'. Green Cross Australia explained how the program operates as follows:

When king tides hit, we ask coastal communities around Australia to head out and snap pictures of local landmarks during the very high tide. These photos capture what our coastal communities may look like in the future, as global sea levels rise. Together, these images build a picture of the threat posed by sea level rise across Australia and help track the future impact of climate change. This Citizen Science program has been very successful with over 6,000 photos shared on an interactive map...<sup>16</sup>

4.10 Other resources are also available to assist individuals, businesses, communities and governments to prepare for the impacts of climate change in coastal areas. Of particular note is the CoastAdapt website developed by the National Climate Change Adaptation Research Facility (NCCARF), which highlights the risks coastal areas face from climate change and sea level rise, and provides advice regarding effective responses to those risks.<sup>17</sup> Other sources include:

- inundation risk mapping using the Google Earth engine published by digital mapping service provider NGIS;<sup>18</sup> and
- the interactive map published by the Australian Government that provides data for different locations across Australia on projected changes in sea level rise and other climate risks.<sup>19</sup>

4.11 Green Cross Australia explained that it has 'run a series of hypotheticals where we have engaged with business, industry and communities to consider the implications of storm surge in important areas around Australia and how we might respond to them'. An example that Green Cross Australia highlighted is modelling of how a hypothetical storm surge would affect Townsville. This modelling, which was undertaken with CSIRO and Townsville City Council, demonstrates 'how quickly water can move and how soon it reaches low lying homes and businesses'.<sup>20</sup>

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16 Green Cross Australia, *Submission 38*, pp. 1–2. Photos and further details about the Witness King Tide Program is at [witnesskingtides.org/](http://witnesskingtides.org/).

17 See [coastadapt.com.au/](http://coastadapt.com.au/).

18 See [www.coastalrisk.com.au/](http://www.coastalrisk.com.au/).

19 See [www.climatechangeinaustralia.gov.au/en/climate-projections/coastal-marine/marine-explorer](http://www.climatechangeinaustralia.gov.au/en/climate-projections/coastal-marine/marine-explorer).

20 Green Cross Australia, *Submission 38*, p. 2. The simulation is available at [www.greencrossaustralia.org/our-work/disaster-and-community-resilience/townsville-stormsurge-simulation.aspx](http://www.greencrossaustralia.org/our-work/disaster-and-community-resilience/townsville-stormsurge-simulation.aspx).

4.12 Mapping work undertaken elsewhere has also assisted governments to understand how low lying areas are at risk from 'more frequent and dramatic inundation and erosion'. The Tasmanian Government acknowledged that 'these events and their impacts could have serious implications for both public and private assets in vulnerable coastal areas'.<sup>21</sup>

4.13 Work undertaken by the CSIRO for local and state governments was also highlighted during this inquiry, such as the sea level rise projections commissioned by the Tasmanian Government and the City of Port Phillip.<sup>22</sup> CSIRO has also developed tools to assist decision-making, such as an integrated adaptation framework called C-FAST (City based Flood Adaptation Solutions Tool) and the Climate Risk Information and Services Platform (CRISP).<sup>23</sup>

4.14 On the latter program, CSIRO advised that it 'aims to support business-as-usual workflows in decision-making by Commonwealth agencies'.<sup>24</sup> To do this, CRISP promotes a stress-testing approach that prompts the user 'to consider a higher end change so that when they make their decision, they know it is robust to a worst-case scenario'.<sup>25</sup>

### **Land-use planning**

4.15 Evidence received from some state governments indicated that work is being undertaken to ensure planning systems are appropriate for climate change. For example, the Queensland Government explained that a recent review of the planning system to 'better integrate climate change mitigation and adaption measures into the planning framework' has resulted in the following:

- in relation to new development, all local planning schemes in Queensland are required to contain provisions to avoid or mitigate the risks of natural hazards (including floods, bushfires, inundation and erosion);
- a requirement that climate change projections (including a projected sea level rise of 0.8 metres by 2100) must now be considered when planning new development near the coastline, and that new development in erosion prone areas along the coast must be avoided; and
- the 'promotion of effective and energy efficient design and siting of buildings, the integration of transport and land use planning, and the delivery of quality urban design'.<sup>26</sup>

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21 Tasmanian Government, *Submission 4*, p. 2.

22 Tasmanian Government, *Submission 4*, p. 3; Hobsons Bay City Council, *Submission 7*, p. 3.

23 CSIRO, *Submission 45*, pp. 12, 20.

24 CSIRO, *Submission 45*, p. 20;

25 A detailed explanation of how CRISP works was provided by Dr Russell Wise from CSIRO: see *Committee Hansard*, 22 March 2018, p. 7.

26 Queensland Government, *Submission 58*, p. 4.

4.16 One of the objectives of the Western Australian Government's coastal planning policy is 'to avoid future development within areas identified to be at risk from coastal hazards during a 100 year planning timeframe'.<sup>27</sup>

4.17 Nevertheless, evidence received from several stakeholders expressed concerns with planning arrangements and indicated that divergent approaches between different states and territories are developing. For example, Regional Development Australia – South West (RDA South West) informed the committee that construction near 'high value but exposed beaches and coastline is continuing in the south west [of Western Australia] despite a general acceptance of the inevitability of sea level rises'. RDA South West continued:

Some of the infrastructure building is by local government on ground that is 1m or less above sea level. It is not expected that sea walls will be constructed, although some have [been] created as basic in-beach sea defences to mitigate against storm events. Foreshore infrastructure projects have been funded by both State and Federal Governments.

Whether this is deemed reasonable social and economic development for medium term gain is another question, but there is little doubt that the projects are publicly popular and will very likely succumb to sea level rises before the end of the century.<sup>28</sup>

4.18 The Western Australian Local Government Association (WALGA) argued that the planning system in Western Australia 'has not been altered sufficiently to take into account climate change issues'. Despite climate risks being evident across the state, WALGA expressed concern that 'to date the only genuine policy response or control adopted to ensure that the future supply of housing is appropriate to its environment in WA is the bushfire planning and building controls adopted in December 2015'. WALGA argued that local governments and landowners need greater guidance and clarity from the state government to understand the risk of coastal inundation and other potential climate change-related risks.<sup>29</sup>

4.19 The insurance company IAG argued that current planning and zoning requirements 'do not reflect the level of risk communities will face in the future'. IAG argued that a 'thorough review' is needed of planning and zoning requirements to 'ensure they are changed to reflect the range of scenarios and forecasts in risk exposure that will occur with climate change'. IAG argued that 'current land planning and zoning requirements are misaligned with insurance risk', and that this places pressure on the affordability of insurance (this is discussed further in Chapter 5).<sup>30</sup>

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27 Western Australian Government, *WA Coastal Zone Strategy*, p. 14.

28 Regional Development Australia – South West, *Submission 15*, p. 5.

29 Western Australian Local Government Association, *Submission 57*, pp. 5, 8.

30 IAG, *Submission 56*, p. 7.

4.20 The Housing Industry Association (HIA) called for what it termed 'truth in zoning' so that landowners and the housing industry can confidently make decisions about future development. Mr Michael Roberts provided the following explanation of the HIA's position:

...if land is identified as suitable for residential or urban development, it should be free from the need to undertake additional costly and exhaustive studies after the fact. Equally, land should not be zoned for residential or urban purposes if an ongoing high level of risk has been identified and the issue remains unresolved.<sup>31</sup>

4.21 The Australian Sustainable Built Environment Council (ASBEC) commented that there is a need to reconsider the current approach where planning is based on historical information, such as the use of '1 in 100 year events' as a benchmark for planning decisions. The ASBEC argued that this approach 'poses a significant impediment to climate change adaptation'. The ASBEC called on governments to make 'a greater commitment to ensuring planning systems are regularly updated'.<sup>32</sup>

4.22 Floodplain Management Australia (FMA) also commented on land use planning. It provided the following observations:

Land use planning will need to factor in future climate change related risks when determining where existing facilities such as hospitals, schools and aged care facilities should be located. Overly harsh policies will restrict the opportunities to provide these facilities, while no restrictions can generate unmanageable risks. Land use planning could also address future risks associated with climate change by encouraging redevelopment to more flood compatible uses. Land use planning is, of course, only one element of a comprehensive flood risk management strategy and needs to be considered in conjunction with other measures such as structural mitigation measures.<sup>33</sup>

4.23 The FMA also argued that differences between the approaches taken by state, territory and local governments are unhelpful and, in some cases, it again asserted that these differences were due to concerns about highlighting risks to property. The FMA submitted:

There are inconsistencies in benchmarks for sea level rise and rainfall intensity changes applied by the different State/Territory and Local Government jurisdictions in Australia. While there is, understandably, the potential for local variations the inconsistencies are often related to parochial concerns with identifying future risks to private property.

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31 Mr Michael Roberts, Executive Director, Planning and Environment, Housing Industry Association, *Committee Hansard*, 22 March 2018, p. 9.

32 Australian Sustainable Built Environment Council (ASBEC), *Submission 26*, Attachment 1, p. 31.

33 Floodplain Management Australia, *Submission 35*, p. 3.

For example, over recent years in NSW there has been a regrettable retreat from definitive policies about sea level rise predictions to be adopted for 50 and 100 year horizons. Further, a scattering of state based policies dealing with climate change across related NSW agencies such as the Office of Environment and Heritage and Department of Planning and Environment make it difficult to access and understand the totality of the State Government's direction.<sup>34</sup>

4.24 The FMA argued that these inconsistencies and the lack of a 'definitive and nationally consistent policy' on sea level rise and rainfall intensive benchmarks are 'a significant barrier to facilitating orderly and efficient planning to manage the effects of climate change into the future'.<sup>35</sup>

4.25 The HIA similarly argued that Australian, state and territory governments 'need to show more leadership' to address the uncertainties around planning for sea level rise. Mr Michael Roberts from the HIA stated:

There is currently no well-established approach to incorporating climate change issues such as sea level rise into the land use decision-making process. Planning for sea level rise needs a more sophisticated approach than has traditionally been employed to deal with other natural hazards. The long-term solutions for sea level rise cannot simply be dealt with in the same way as flooding. There is a need for a staged strategy that provides flexibility to adapt to updates in the science over time.

It should also be remembered that most current land use strategic plans only have a 25-year horizon. The strategy needs to recognise the average life of buildings and the redevelopment churn that is highly likely to occur in the coastal areas over the next 50 to 70 years. Now is not the last chance governments will get to direct built form outcomes.<sup>36</sup>

4.26 Stakeholders also called for greater coordination of various government policies. For example, the South East Councils Climate Change Alliance suggested that the *Local Government Act 1989* (Vic) should include overarching principles regarding climate risk planning and mitigation, as well as specific references linking it to the *Climate Change Act 2017* (Vic).<sup>37</sup>

4.27 Finally, other approaches to land-use planning informed by international experience could be considered. During the committee's public hearing in Melbourne, the concept of 'sponge cities' was discussed. This is where public areas in cities are planned to detain stormwater, where these areas are 'robust enough to drain and then

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34 Floodplain Management Australia, *Submission 35*, p. 2. See also Mr Paul Grech, Floodplain Management Australia, *Committee Hansard*, 23 November 2017, p. 1.

35 Floodplain Management Australia, *Submission 35*, p. 2.

36 Mr Michael Roberts, Housing Industry Association, *Committee Hansard*, 22 March 2018, p. 9.

37 Ms Dominique La Fontaine, Executive Officer, South East Councils Climate Change Alliance, *Committee Hansard*, 15 March 2018, p. 20.

be used for public open space', rather than being areas lost for permanent stormwater management. The committee was referred to examples of Copenhagen, Denmark and Hafencity in Hamburg, Germany,<sup>38</sup> although sponge city projects are also being pursued in China where 16 cities have the goal that by 2020, 80 per cent of their urban areas should absorb and reuse at least 70 per cent of rainwater.<sup>39</sup> The City of Melbourne and City of Port Phillip are examining stormwater management options based on these techniques.<sup>40</sup>

### Urban heat island effect

4.28 Evidence was received about how the design of the urban environment can mitigate other climate change-related risks, such as heat effects in urban areas. For example, the Northern Territory Government submitted that a study is underway to identify the causes of heat accumulation in the Darwin central business district and to investigate possible policy options. The Government added:

Early analysis suggests there are a range of options that could collectively reduce the average temperature across the entire CBD by up to 3°C, but localised temperature reductions could be significantly greater around options such as water features. This study has progressed to a point where cost-benefit analysis of a range of options is underway. The major benefit of implementing these options is to make the CBD a more accommodating and attractive place to live work and visit, with potential flow-on benefits in better infrastructure utilisation, and lower energy consumption because buildings and roads should remain cooler, radiate less heat, and therefore generate lower ambient temperatures so that air conditioning does not need to work as hard.<sup>41</sup>

4.29 Evidence received by the committee indicated options available to address urban heat are available and increasingly well understood. The committee was referred to strategies and projects in Melbourne to increase the amount of greenery in public areas. Witnesses representing the City of Melbourne and the City of Port Phillip explained that, given local governments have limited resources for such efforts, this work has been informed by canopy and health island mapping to ensure that hotspots requiring the most urgent attention are targeted effectively.<sup>42</sup>

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38 Mr Brett Walters, Manager, Sustainability and Transport, City of Port Phillip, *Committee Hansard*, 15 March 2018, p. 27.

39 A Biswas and K Hartley, 'China's "sponge cities" aim to re-use 70% of rainwater – here's how', *The Conversation*, <https://theconversation.com/chinas-sponge-cities-aim-to-re-use-70-of-rainwater-heres-how-83327> (accessed 26 April 2018).

40 Mr Brett Walters, City of Port Phillip; Mr Gavin Ashley, Team Leader, Climate Resilience, City of Melbourne, *Committee Hansard*, 15 March 2018, p. 27.

41 Northern Territory Government, *Submission 17*, p. 3.

42 Mr Gavin Ashley, City of Melbourne, *Committee Hansard*, 15 March 2018, p. 28; Mr Steven McKellar, Senior Project Manager, Climate Adaptation and Sustainability, City of Port Phillip, *Committee Hansard*, 15 March 2018, p. 32.

4.30 The New South Wales Government recently announced a program to plant five million new trees in Sydney by 2030 to lower urban heat. It is expected that this measure will result in the tree canopy in Sydney doubling from 16.8 per cent to 40 per cent.<sup>43</sup> The Greater Sydney Commission's Western City District Plan identifies extending the urban tree canopy as a key planning priority.<sup>44</sup>

4.31 The committee also heard how 'green' infrastructure supported by 'blue' infrastructure can help address the urban heat effect and benefit individual building owners. Hobsons Bay City Council provided the following overview of green and blue infrastructure and how these types of projects can benefit local areas:

Green infrastructure includes trees, gardens, creepers and vegetated walls and roofs throughout urban areas. For example refrigerated warehouses may benefit from green roofs to provide insulation and mitigate the [urban heat island (UHI)] effect, reducing energy costs and reducing the risk of heat stress to workers. Blue infrastructure includes using rainwater, stormwater, recycled water and other water sources to maintain the green infrastructure...These techniques to reduce the UHI effect are applicable to all projects, from large scale (e.g. major roads) to small scale (e.g. individual dwellings). These techniques need to become business as usual to reduce the risk of heat stress and associated health issues.<sup>45</sup>

4.32 The Water Services Association of Australia also noted the link between green infrastructure and blue infrastructure. It argued that the economics of providing irrigated green open space and other green infrastructure 'are favourable when using alternative water sources such as recycled water or stormwater'.<sup>46</sup>

4.33 The utilisation of green infrastructure is the focus of the New South Wales Government's draft Greener Places strategy. One of the draft strategy's aims is to 'create a healthier, more liveable and sustainable urban environment by...improving the resilience of urban areas'. The draft strategy identifies that this can be achieved through 'co-ordinated planning and design of green cover strategies including street

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43 The Hon Gladys Berejiklian MP, Premier of New South Wales, 'Tree-mendous – Sydney to get five million new trees', *Media release*, 11 April 2018, [www.nsw.gov.au/your-government/the-premier/media-releases-from-the-premier/tree-mendous-sydney-to-get-five-million-new-trees/](http://www.nsw.gov.au/your-government/the-premier/media-releases-from-the-premier/tree-mendous-sydney-to-get-five-million-new-trees/) (accessed 12 April 2018).

44 Greater Sydney Commission, *Western Sydney District Plan*, March 2018, <https://gsc-public-1.s3-ap-southeast-2.amazonaws.com/s3fs-public/western-district-plan-0318.pdf> (accessed 15 May 2018).

45 Hobsons Bay City Council, *Submission 7*, p. 3.

46 Water Services Association of Australia, *Submission 54*, p. 3. This was a key focus of the committee's 2015 inquiry into stormwater management.

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trees, green walls and roofs, canopy trees, cool pavements and water sensitive urban design'.<sup>47</sup>

4.34 Although examples of efforts to reduce urban heat are readily apparent, a common theme in evidence is that further work is required. In particular, local governments were critical of state government support for reducing the urban heat island effect. For example:

- Hobsons Bay City Council submitted that buildings and the urban environment can be designed in ways to reduce the urban heat island effect; however, there 'is currently no legislation, standards or guidelines that provide a minimum standard for managing this issue'. Furthermore, the Council argued that 'there is also a knowledge deficit, through lack of training or capacity building, to enable the design and construction sector to increase their capacity to reduce the UHI effect'.<sup>48</sup>
- WALGA submitted that local governments are attempting to address the loss of tree canopy cover through urban forest plans, however, it considers that there is a lack of 'appropriate planning mechanisms' to support local governments. In particular, WALGA criticised 'inconsistent' Western Australian government policies, the lack of revegetation requirements for new developments, and inadequate protections for existing trees, and the lack of funding for the urban forest plans. WALGA also observed that a further challenge is the 'lack of knowledge (from community, staff and councillors) regarding the benefits of an urban forest'.<sup>49</sup>

4.35 It was suggested that addressing the urban heat island effect requires reconsideration of where populations are based and how greenfield developments are planned. Professor Tor Hundloe noted that most population growth in Sydney and Brisbane is occurring inland in the western districts of these metropolitan areas. Professor Hundloe observed that the temperatures in those areas are generally several degrees Celsius higher than in urban areas closer to the coast. Professor Hundloe suggested that greater consideration needs to be given to addressing urban heat in the areas where population growth is being facilitated, such as through the provision of green space.<sup>50</sup> Recently, it has been suggested that the most vulnerable residents in cities such as Sydney are generally the most exposed to heat risks, creating a

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47 Government Architect New South Wales, *Greener Places: Establishing an urban green infrastructure policy for New South Wales*, 2017, [www.governmentarchitect.nsw.gov.au/policies/greener-places](http://www.governmentarchitect.nsw.gov.au/policies/greener-places) (accessed 15 May 2018), pp. 10, 40.

48 Hobsons Bay City Council, *Submission 7*, p. 4.

49 Western Australian Local Government Association, *Submission 57*, p. 7.

50 Professor Tor Hundloe, Chair, Climate Change Special Interest Section, EIANZ, *Committee Hansard*, 15 March 2018, p. 11.

'heat inequality' component of the social inequality already experienced between different geographical areas.<sup>51</sup>

4.36 The Western City District Plan and the Greener Places draft strategy (see paragraphs 4.30 and 4.33) indicate that this issue is receiving policymakers' attention in some parts of Australia.

4.37 The HIA also argued that public spaces in greenfield development will need to provide greenery to address urban heat. Mr Michael Roberts, a HIA representative, noted that block sizes in new developments have decreased in size, reflecting policy preferences relating to housing affordability as well as the recognition that 'large trees aren't the best cohabitant of houses'. Accordingly, it was argued that 'we need to look more towards the public realm as the space that provides vegetation cover'. Mr Roberts commented, however, that local governments have delivered 'mixed messages' about this aspect of planning, with concerns about the need to protect natural assets generally being the focus of local government policy rather than addressing climate risks or natural hazards.<sup>52</sup>

4.38 On identifying preferred areas for population growth, it was suggested that the facilitation of population growth in areas near cities that have cooler climates could be supported by the Australian Government through finance for projects such as fast rail.<sup>53</sup>

4.39 CSIRO suggested that green infrastructure 'could potentially be considered alongside built infrastructure assets managed by councils' to help reduce the impacts of extreme heat, particularly the health-related consequences. CSIRO observed that to assist these efforts, it would be useful to determine 'a value on vegetation in cities (through the benefits of reducing heating/cooling requirements, reduced hospital emissions, etc.)'. CSIRO argued that such information could enable more informed cost-benefit analyses to 'build the business case for climate adaptation'.<sup>54</sup>

4.40 Other techniques to address urban heat were noted. Professor Jon Barnett advised that the use of light coloured roofing and road surfacing materials 'is a practical solution' to reducing the urban heat island effect. Along with the use of green and blue infrastructure, Professor Barnett argued that the use of light coloured

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51 N Frost, 'Heat inequality creates "ecological enclaves" while putting Sydney's most vulnerable residents at risk', *Domain*, [www.domain.com.au/news/heat-inequality-creates-ecological-enclaves-while-putting-sydney8217s-most-vulnerable-residents-at-risk-20180508-h0zrrd/](http://www.domain.com.au/news/heat-inequality-creates-ecological-enclaves-while-putting-sydney8217s-most-vulnerable-residents-at-risk-20180508-h0zrrd/) (accessed 14 May 2018). The article reports comments made by several academics at a panel on spatial inequality and Australian cities in a warming world held recently at the University of Sydney.

52 Mr Michael Roberts, Housing Industry Association, *Committee Hansard*, 22 March 2018, p. 13.

53 Professor Tor Hundloe, EIANZ, *Committee Hansard*, 15 March 2018, p. 11.

54 CSIRO, *Submission 45*, p. 18.

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materials 'need to become business as usual to reduce the risk of heat stress and associated health issues'.<sup>55</sup>

## Coastal defences

4.41 As noted elsewhere in this report, local governments have invested in defences such as sea walls to protect properties and important natural assets.<sup>56</sup> Policies for coastal defences have also been developed—the Western Australia Government has specified that coastal protection works 'should only be considered after all options for avoiding and adapting to coastal hazards have been fully explored'. In addition, coastal protection works can only proceed if they meet certain conditions, such as the primary benefit of the works being for the public benefit (and that this public benefit and a positive return to the state is supported by a cost–benefit analysis).<sup>57</sup>

4.42 Submitters suggested that greater attention to protecting natural coastal defences is required. Lake Macquarie City Council called on the Australian Government to support programs designed to 'maintain the function of dune ecosystems as a natural defence to coastal infrastructure and private property, including ongoing community involvement in dune restoration projects'. In addition, the Council argued that the Australian Government should support the further development of remote sensing techniques and ensure data are made available 'to support high resolution monitoring of coastal recession and changes in natural coastal defence systems'.<sup>58</sup>

4.43 Hobsons Bay City Council argued that there is a need for 'research, knowledge sharing and capacity building to better understand the interface between land and water, and the suitability of techniques to protect different land uses', particularly in relation to coastal protection techniques. The Council submitted:

...long term monitoring and evaluation of different coastal protection techniques is required to determine success and understand any unintended consequences. Techniques such as mangrove trees may prove to be very successful in reducing erosion, however when applied to areas of coastal saltmarsh the mangroves may significantly change the habitat and biodiversity of an area. Only through long term monitoring and evaluation will there be the capacity for coastal managers to learn and improve their techniques for coastal protection.<sup>59</sup>

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55 Professor Jon Barnett, *Submission 6*, p. 1.

56 Such as the sea walls being constructed by the City of Gold Coast. See City of Gold Coast, 'Seawall Construction Project', [www.goldcoast.qld.gov.au/seawall-construction-projects-20762.html](http://www.goldcoast.qld.gov.au/seawall-construction-projects-20762.html) (accessed 26 April 2018).

57 Western Australian Government, *WA Coastal Zone Strategy*, pp. 14–15.

58 Lake Macquarie City Council, *Submission 29*, p. 5.

59 Hobsons Bay City Council, *Submission 7*, p. 6.

## **Planning for built areas becoming uninhabitable**

4.44 As outlined in this report, climate change presents a wide range of challenges for built infrastructure. For example, modelling has identified areas in Australia at risk of inundation due to climate change. This could result in damaged or destroyed properties, or buildings that are contaminated and deemed uninhabitable.<sup>60</sup> Other developments, such as increased frequency of bushfire weather, may result in a greater number of bushfire events.

4.45 Despite this knowledge and the use of modelling to identify the areas at greatest risk, new development is continuing to occur in those high risk areas. Individuals may also not be taking actions to protect their properties, and either do not choose, or are unable to afford, appropriate levels of insurance cover.

4.46 This section builds on the issues discussed in this report up to this point—particularly land-use planning and the information available to guide decisions—to consider the evidence received regarding appropriate responses if properties known to be at risk today are threatened in the future.

### ***Views on the need to consider planned retreat***

4.47 The NCCARF noted that whether private house owners will respond to climate change risks is influenced by 'financial capacity, support networks, and knowledge and understanding of risk'. It argued that homeowners, once well informed, might undertake building alternations, particularly if they experience an extreme event. Nevertheless, they might encounter various challenges in doing so, including 'cost, design and construction of the existing home, insurance limitations, and government restrictions'.<sup>61</sup>

4.48 Despite the ability for well-informed homeowners to take action to improve the resilience of their property, the NCCARF noted that some housing will face a greater risk than what can be offset through design, such as houses at risk due to sea level rise. In situations where owners have to consider abandoning their houses, the NCCARF envisaged that owners would 'likely...look to legal redress and/or government compensation'.<sup>62</sup>

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60 ASBEC, *Submission 26*, p. 2.

61 The National Climate Change Adaptation Research Facility (NCCARF) commented that insurance policies often do not cover repairs that improve resilience; consequently, 'homeowners must consider the value of financing any improvements themselves'. NCCARF, *Submission 28*, p. 5.

62 NCCARF, *Submission 28*, p. 5.

4.49 The potential for this outcome attracted comment from other submitters. RDA South West noted that there is a need to ensure informed decisions can be made, such as by publicising mapping of at-risk areas. It also argued that a 'framework should be developed so that infrastructure in "at risk" zones is built with a view to removal and/or planned retreat'. Beyond these actions, given what is known about climate change, RDA South West argued there is a need for individuals to take responsibility for their actions. It argued:

Construction decisions need to become the full responsibility of the investor. Anyone who builds in 'at risk' zones cannot expect government (at any level) to construct coastal defence systems to protect private investment ie there should be an assumption that protective infrastructure will not be provided at public cost.<sup>63</sup>

4.50 It also appears unlikely that state governments would be obliged to compensate existing landowners for coastal erosion. The committee has not examined this in detail, however, a report prepared by an engineering consultancy for a Western Australian local government explained that, in Western Australia:

...landowners own the rights to develop and use land as granted by land use regulations; they do not own the land itself. There is no law requiring the government (at any level) to provide protection of private property from natural hazards, nor compensation when land is lost to the sea. There are, however, several laws that allow the intervention of governments to enforce eviction if private property becomes uninhabitable, or removal of property if it constitutes a public risk. In the event of coastal erosion causing a property to "fall into the sea", and the land to disappear below the high water mark, the loss is to be borne by the property owner.<sup>64</sup>

4.51 During this inquiry, the committee became aware of preliminary work being undertaken regarding planned retreat. Councillor Richard Ellis of East Gippsland Shire Council advised that planned retreat of the commercial areas of Lakes Entrance and the prevention of future development in coastal areas have been discussed within Council. Councillor Ellis commented, however, that the costs that would be involved are 'quite remarkable'.<sup>65</sup>

4.52 Councillor Ellis added that, as a general observation, state governments do not appear to be discussing options for retreat.<sup>66</sup> A government that has, however, is the Western Australian Government. Its coastal zone strategy stipulates that planned or managed retreat 'should be used for existing development where possible', with efforts

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63 Regional Development Australia – South West, *Submission 15*, p. 5.

64 Cardno, Shire of Gingin: Draft Coastal Hazard Risk Management and Adaption Plan, January 2018, [www.gingin.wa.gov.au/Profiles/gingin/Assets/ClientData/Document-Centre/Forms\\_and\\_brochures/59917806\\_RevC\\_Gingin\\_CHRMAP\\_Draft.pdf](http://www.gingin.wa.gov.au/Profiles/gingin/Assets/ClientData/Document-Centre/Forms_and_brochures/59917806_RevC_Gingin_CHRMAP_Draft.pdf) (accessed 11 May 2018), p. 5.

65 Councillor Richard Ellis, Committee Member, ACCA, *Committee Hansard*, 15 March 2018, p. 24.

66 Councillor Richard Ellis, ACCA, *Committee Hansard*, 15 March 2018, p. 24.

to accommodate the risk through design approaches to be pursued 'where it can be demonstrated that retreat is not possible'.<sup>67</sup> Local governments in Western Australia are currently developing plans to give effect to the state government's policy.

4.53 Mr Walters from the City of Port Phillip agreed that retreat in the urban environment has 'been talked about', however, he added that it is 'very difficult to imagine' given it would 'involve acquisition of some of the most valuable land in the country'. Mr Walters also noted that local governments have not undertaken work to assess how land values might be affected due to climate change that could identify the point at which land might become less valuable due to threats about habitability—Mr Walters described this as being the 'elephant in the room'.<sup>68</sup>

4.54 Dr Russell Wise, Senior Research Scientist, CSIRO, observed that local governments would find it difficult to plan for retreat effectively, and in any case the constituents of local governments would likely find planning for retreat unpalatable. Dr Wise explained:

One of the things that's quite clear is that a lot of the people that are responsible for making these types of decisions in the local government often don't have the capabilities or the resources to undertake these kinds of assessments. One of the other issues, I think, is that there's an expectation on local government to be able to act on some of these options. So the option of retreat is not really an option that any local government could entertain.<sup>69</sup>

4.55 To give effect to the Western Australian Government's coastal planning policy, which has acknowledged that retreat will need to be considered, local governments are developing coastal hazard plans. In response to the draft plan prepared for the Shire of Gingin, a recent media article has highlighted local residents' concerns that the final plan will cause their land to have no value and that compensation might not be available despite the government deeming the land suitable for development since the 1960s.<sup>70</sup>

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67 Western Australian Government, *WA Coastal Zone Strategy*, p. 14.

68 Mr Brett Walters, City of Port Phillip, *Committee Hansard*, 15 March 2018, p. 24.

69 Dr Russell Wise, CSIRO, *Committee Hansard*, 22 March 2018, p. 5.

70 E Young, "'Valued at zero": WA coastal dwellers face financial ruin as sea rises', *The Age*, 9 May 2018, [www.theage.com.au/national/western-australia/valued-at-zero-wa-coastal-dwellers-face-financial-ruin-as-sea-rises-20180508-p4ze3z.html?csp=fb031e22c7945089732ecaf2926933e3](http://www.theage.com.au/national/western-australia/valued-at-zero-wa-coastal-dwellers-face-financial-ruin-as-sea-rises-20180508-p4ze3z.html?csp=fb031e22c7945089732ecaf2926933e3) (accessed 11 May 2018).

### *Proposals for improvement*

4.56 Several stakeholders argued that there is a need for the Australian Government to have a leadership role in guiding how to manage the risk of coastal inundation, including how the issue of retreat should be approached.

4.57 Mr Paul Grech from the FMA argued that there is a need for nationally consistent guidance on, among other things, how to manage the 'gradual and, ultimately, permanent inundation of low-lying coastal communities due to sea-level rise'. Mr Grech commented that this is 'probably the most significant' issue on which national guidance on managing climate change related flood risks is needed.<sup>71</sup>

4.58 The HIA argued that the Australian Government needs to provide 'clear leadership and direction about the necessary first step in identifying coherent response strategies' regarding expected sea level rise, including as to whether and how developed areas will be defended. In addressing this issue, the HIA argued that the Australian Government needs to:

- evaluate potential defensive measures and examine how they could be funded; and
- resolve who is responsible for managing the legal risks arising from planning decisions affecting existing individual property owners, including by determining who will bear the costs if land is rendered unbuildable or buildings are damaged or lost.<sup>72</sup>

4.59 The HIA provided the following explanation as to why national leadership is required to address these issues:

The current practice of leaving this issue to local government to solve will result in local governments in potentially affected areas attempting to address the issue on a site-by-site, development-application-by-development-application basis. This only serves to create significant uncertainty for everyone. It will be costly for those brave enough to have a go and will undoubtedly lead to a range of expensive and perverse outcomes.<sup>73</sup>

4.60 The suggestion for policy options to ensure a planned retreat in areas where the risk cannot be mitigated was also supported by the NCCARF.<sup>74</sup>

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71 Mr Paul Grech, Floodplain Management Australia, *Committee Hansard*, 23 November 2017, p. 2.

72 Mr Michael Roberts, Housing Industry Association, *Committee Hansard*, 22 March 2018, p. 10.

73 Mr Michael Roberts, Housing Industry Association, *Committee Hansard*, 22 March 2018, p. 10.

74 NCCARF, *Submission 28*, p. 5.

4.61 Finally, the ASBEC argued that improvements in Australia's planning systems and greater availability of data would support governments to 'anticipate and deal with the effects of climate change', including with respect to decision-making regarding retreat. In particular, the ASBEC argued that 'rigorous consultation' as part of the process for amending planning systems:

...would ensure that any amendments are both appropriate and strongly supported and form the basis of discussion with the community about attitudes towards accommodation, acceptance, and retreat measures as solutions to climate change.<sup>75</sup>

### **Who pays for resilience works?**

4.62 As with many public policy issues, the question of 'who pays' for actions to improve the resilience of housing, buildings and infrastructure to climate change is critical. Many types of resilience measures provide wider public benefits—accordingly, individuals and the private sector likely do not have a sufficient incentive to invest in these actions. The following evidence from Mr Michael Roberts of the HIA regarding sea walls illustrates this predicament:

...if you...need to build a sea wall, you cannot generate a return on a sea wall so there will be zero private sector incentive to build a sea wall. But at the same time, the whole area will benefit from increased resilience to storm surge. So then how do you build an economic model which incentivises investment into public infrastructure, which then creates private sector incentives?<sup>76</sup>

4.63 It was noted that identifying who is responsible for managing adaptation risks is clear in some cases, such as for roads.<sup>77</sup> There are also examples of state governments that provide councils with funding to build resilience to climate risks.<sup>78</sup>

4.64 Nevertheless, even in cases where ownership is clear and the owner has an incentive to defend their asset, others still benefit from that asset being made more resilient. This could raise questions of equity. For example, Mr Roberts from the HIA noted that the Brisbane City Council is responsible for the Port of Brisbane, however, as the Port provides significant economic benefits for a large region, Mr Roberts posed the question: 'Is it fair to lump the responsibility of defending the port wholly and solely on Brisbane City Council?' Mr Roberts concluded that there 'needs to be a

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75 ASBEC, *Submission 26*, Attachment 1, p. 31.

76 Ms Emma Herd, Chief Executive Officer, Investor Group on Climate Change (IGCC), *Committee Hansard*, 23 November 2017, p. 19.

77 Ms Emma Herd, IGCC, *Committee Hansard*, 23 November 2017, p. 19.

78 Mr Alan Stokes, ACCA, *Committee Hansard*, 15 March 2018, p. 25.

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much more sophisticated approach to this issue than we have traditionally used in dealing with other natural hazards'.<sup>79</sup>

4.65 Another issue is that efforts to improve the resilience of private property can be opposed by others. Professor Lesley Hughes provided the following evidence illustrating the potential for such an outcome:

...in the Belongil Beach-Byron Bay area we have seen where there have been considerable legal implications of sea level rise and storm surge damage there, where councils have tried to prevent individual owners sandbagging their properties, on the grounds that that has impacts on their neighbours.<sup>80</sup>

4.66 It was noted that some of these pressures will likely be addressed by the insurance market and decisions by prospective buyers not to invest in properties in at-risk areas such as flood prone regions. However, as discussed previously in this chapter, it was argued that there is a role for government to ensure suitable land-use planning policies are in place to guide appropriate development outcomes.<sup>81</sup>

4.67 Other stakeholders argued that there is a need to find alternative ways for funding investment in resilient public infrastructure.<sup>82</sup> Some state governments have publicly identified the need to address these issues. In its WA Coastal Zone Strategy, the Western Australian Government has suggested that coastal protection works that are in the public interest should be supported by:

- a financial plan covering construction costs and ongoing maintenance; and
- funding arrangements based on a user pays principle 'whereby those who benefit the most provide the greatest financial contribution'.<sup>83</sup>

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79 Mr Michael Roberts, Housing Industry Association, *Committee Hansard*, 22 March 2018, p. 10.

80 Professor Lesley Hughes, Climate Council of Australia, *Committee Hansard*, 23 November 2017, p. 32.

81 Professor Lesley Hughes, Climate Council of Australia, *Committee Hansard*, 23 November 2017, p. 32.

82 Ms Megan Motto, Chief Executive Officer, Consult Australia, *Committee Hansard*, 23 November 2017, p. 24; Ms Emma Herd, IGCC, *Committee Hansard*, 23 November 2017, p. 19.

83 Western Australian Government, *WA Coastal Zone Strategy*, p. 15.

