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ENVIRONMENT DIRECTORATE
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Working Party on Climate, Investment and Development

Draft project outline: supporting coastal adaptation to manage the consequences of rising sea levels

The OECD's 2017/18 Programme of Work and Budget includes an item on "Risk management, contingent liabilities and infrastructure resilience". Initial proposals for work under this heading [ENV/EPOC/WPCID(2017)4] were discussed by the Working Party on Climate, Investment and Development at its meeting on 2-3 May 2017. Building on feedback received from country delegates, this note develops the project proposal "Analysing the distribution of climate-related risks" to be undertaken in 2017/18.

Action required: Delegates are invited to provide input on the following questions by posting on the WPCID Clearspace on 13 November 2017:
- Suggest potential case studies for this research
- Provide comments on the overall research framework
- Indicate if they are in a position to provide financial or in-kind support for this project

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Note from the Secretariat

This framework note develops the project proposal "Analysing the distribution of climate-related risks" [ENV/EPOC/WPCID(2017)4] to be undertaken in 2017/18. The aim of this project is to understand who bears the risks from rising sea levels and the policy implications that result from this. In particular, the project will analyse how current policy frameworks may generate excessive or misallocated risks relating to flooding, erosion and submergence. It will then examine potential transition paths for improving the allocations of these risks under a changing climate. Work in this biennium will be based on local case studies, which will be used to provide a comparative international analysis of the relevant policy issues and emerging good practices. This project phase will draw out the emerging policy recommendations for action by national governments. The work could be extended to cover additional countries and/or climate risks in subsequent bienniums.

This framing document outlines the objectives, key research questions and method of investigation. It also includes an overview of the recent literature on the range of future damages associated with sea-level rise, challenges around implementing coastal adaptation, and an initial scan of how the issue of sea-level rise is addressed in national adaptation plans.

Project description

1. The challenge of coastal adaptation in OECD countries

1. Recent projections propose that global mean sea-level rise (SLR) could go beyond 2 metres by 2100 (Oppenheimer and Alley, 2016[1]). While there remains uncertainty around the pace and upper limits of SLR over the course of the century, it is certain that climate change will lead to potentially severe adverse impacts on many coastal communities (Hallegatte et al., 2013[2]). Rising sea levels will increase flood risk, both from recurrent major flooding due to storm surges and from more frequent "nuisance flooding" associated with daily tidal shifts. SLR will also increase erosion and potentially permanently inundate some areas (Nicholls and Cazenave, 2010[3]). These increased risks will lead to rising costs, and without adaptation these costs may eventually become unmanageable (Hinkel et al., 2014[4]). Decisions are currently being made throughout the world about where and what to build, rebuild, abandon or expand in coastal areas, and new developments and critical infrastructure are currently being built that will be subject

to increased flooding within its economic lifespan. While many of the most extreme events will be felt in the future, current risks from extreme weather are significant and adaptation needs to happen now.

2. Small island developing states and low-lying developing countries face the most severe challenges from SLR, but OECD countries also need to adapt to these changes. Development continues to occur in places known to be at high risk and there are already examples of coastal communities relocating to lower-risk areas. The damage from recent extreme events, such as hurricane Sandy, illustrate that areas where resilience may have been assumed to be high can still be vulnerable to the types of extreme weather that may be exacerbated by climate change.

3. The allocation of risks from SLR is mediated by institutional and legal arrangements. In the case of residential property, for example, changes in the risk profile of coastal property will be borne by homeowners in the first instance, through higher insurance premiums, or uninsured losses for those unable or unwilling to purchase insurance. At the limit, homeowners may lose the total value of their property as a result of submergence or coastal erosion. However, policy interventions to subsidise insurance or provide ex-post disaster relief (such as grants, tax deductions or subsidised loans) shifts some of this cost to taxpayers in lower-risk areas.

4. There are three widely accepted adaptation responses to reduce coastal flood and erosion risk (Bijlsma, 1997[5]), which are to protect, by defending against rising seas; accommodate, by reducing the consequences of rising seas; or retreat, by accepting the loss of land. Decisions about which response to choose will entail trade-offs around economic costs, impacts on ecosystems and distribution of risks. For instance, using public funds to protect a portion of a coastline will have different implications than restricting new development through zoning laws or raising insurance premiums for existing development. The appropriate choices will depend upon local context, and there will often be a need to make difficult decisions between different objectives and interests. The scope for making decisions will be constrained by the legacy of past development choices and the existence of policy misalignments.

5. Adaptation does not remove all risks, but instead aims to reduce overall risks to a tolerable level and allocate those risks to the parties best able to bear them (OECD, 2013[6]). These are subjective terms, but previous OECD analysis has identified relevant criteria (OECD, 2013[7]; Hall and Borgomeo, 2013[8]):

- The costs of risk reduction should be justified by the expected benefits, or conversely the increase in risk caused by coastal development should be justified by the benefits;
- Adaptation decisions should aim to incorporate flexibility and consider potential outcomes over a long time-horizon, for example through the use of adaptation pathways;
- A broad range of measures should be considered, including the use of soft-measures and nature-based solutions;
- Risks should be allocated to those who are best able to manage them;
- Those affected by changes in risk should have input into the decisions.

6. Adapting to SLR is complex because of the need to make decisions in the presence of incomplete information, cumulative uncertainties[1], long time scales, conflicting values and varying incentives. Sophisticated modelling techniques and simplified heuristics have been developed to guide the process of decision-making under uncertainty (OECD, 2015[9]). However, in a contentious policy area like this, genuinely "win-win" or "no regrets" options may be elusive (Preston et al., 2015[10]). In addition, the incidence of climate related risks and the distributional impacts of different adaptation policies can politically sensitive, further complicating decision-making.

7. National governments have a significant role to play in supporting SLR adaptation. Information on risks, capacity for adaptation and coordination can be facilitated by national action. There may be a need to examine and correct relevant policies, such as those governing insurance markets, that are no longer fit for purpose. In some cases, national governments have direct financial exposure, with public sector assets or legal requirements to provide compensation in the event of losses. Even without legal or policy frameworks, there is often an implicit expectation that national governments will take some responsibility risks. These create a contingent financial liability for the government, as well as political risks (Hall et al., 2012[11]).

8. This project will use case study analysis to identify and analyse the challenges and trade-offs relevant to adapting to rising sea levels. This is intended to provide insights relevant to governments as they seek to revise national adaptation plans and other relevant strategies. It will also shed light on the wider debate about the extent to which adaptation planning is being translated into implementation (Wise et al., 2014[12]).

2. Project objectives

9. Based on diverse case studies of specific regions at risk from SLR, this project has three objectives. First, to identify who bears the risks from sea-level rise. Second, to analyse the implications of this for coastal adaptation. Third, to identify what national governments can do to support adaptation to SLR.

10. The good practices identified in this project will support OECD member countries in developing and implementing effective, efficient and equitable policy responses to the challenge of rising sea levels. More generally, this project intends to strengthen links between the relevant communities of expertise, leveraging the OECD's networks working on climate change adaptation, governance of disaster risk management and financial management of extreme events.

[1] There is a "Knightian" uncertainty around SLR, that is, in some cases the probability of high-end adverse events is unknowable. This is due to the cumulative effects of multiple uncertainties, such as: the extent to which climate change will occur, how much and how effective mitigation efforts will be, the pace and structure of demographic and economic change in coastal areas, and technological uncertainties that will affect both the extent of change and the possibility of adaptation for reducing damages (Colgan, 2016[31])

3. Key research questions

11. The following questions provide a framework to gather information and formulate recommendations on SLR policy responses:

- What are the characteristics of the assets and communities that are exposed to SLR and how does this affect their incentive and ability to adapt?
- How do legal and institutional arrangements influence the ultimate distribution of risks from sea level rise?
- How do different adaptation policies (protect, accommodate, retreat) change the distribution of risks and costs from rising seas?
- What can national governments do to enable and encourage SLR adaptation?

4. Approach

12. This project will leverage the OECD's adaptation experience, build on existing OECD recommendations on reforming risk governance (OECD, 2014[13]) as well as draw on OECD expertise on managing water risk in a changing climate (OECD, 2013[6]) and the role of flood insurance (OECD, 2016[14]). The key research questions will be answered using the following approaches (subject to the availability of resources):

- Desk research
- 2-4 case studies of different localities
  - Existing GIS modelling of the impacts and distributional consequences of SLR impacts, for example by overlaying climate risk with socio-economic characteristics
  - Interviews with government officials, experts and other key stakeholders such as civil society groups (virtually and during the field visit(s))
  - Interviews with private sector actors, such as lenders, insurers and property developers
- Expert meeting to be held in Paris in Q2 2018

13. Potential future work includes an analysis of decision-making in the coastal zone through an adaptation lens. This could include the economic tools and assumptions used to assess trade-offs between economic, ecological and social goals in different contexts, with the potential to inform a "toolkit" for coastal adaptation.

5. Timeline and deliverables

Phases	Planned deliverables	Timeline
1: Mapping, framework development, case study selection	Consultation with internal experts, country officials (via WPCID) and external researchers. Selection of case studies	November 2017
2: Understanding how current policy frameworks may generate excessive or misallocated risks, and the associated opportunities and constraints affecting adaptation to SLR	Local case studies • Desk research • Interviews with government officials and other key stakeholders (e.g. insurers) at the local level • Interviews with national (and/or state level) policymakers and stakeholders • Field visits (subject to resources)	November 2017-April 2018
	Draft discussion note for WPCID on: • Background information on the selected case studies • Annotated outline for a first draft of the report on project within Phase 2 programme *[developed from the framework outlined in Phase 1]*.	Feb 2018
	Expert workshop to discuss emerging findings from the case studies and potential policy recommendations	Q2 2018
	First draft case study reports, including analysis of: • Incidence of risks relating to SLR across scales (homeowners, local/national/state governments, private sector) • Analysis of key interests in coastal adaptation decision-making • Impact of relevant national policies (e.g. adaptation plans, planning regulations, disaster compensation) on incentives faced by key stakeholders and their adaptive capacity • Potential transitional impacts of current policy misalignments, such as impacts on asset prices • Recommendations for how adaptation policy could help to achieve these institutional reforms • Areas for future work	October 2018 (or before)
3. Synthesis and policy recommendations	Draft final project report, including summaries of the case studies, policy recommendations and checklist for action	November 2018

Selection of case studies

14. This project will analyse how current policy frameworks may generate excessive or misallocated risks relating to flooding, erosion and submergence. The aim of these case studies is both to generate initial insights on these issues, while also refining the approach so that it can be applied more broadly in 2019/20.

15. Subject to interest and resources, there is the potential to expand the scope of the project by increasing the number of the number of case studies or conducting deeper analysis for particular case studies through: 1) modelling the distributional costs of different adaptation options; and, 2) analysing the socio-economic implications of these costs.

1. Scope

16. Local areas are the case study focus, defined as the unit of governance in a given country that is responsible for making decisions about approaches to reduce coastal risk. To narrow the scope when examining the distribution of risks and associated costs, the case studies focus on managing sea-level induced risks to coastal housing. Specially, the case studies are examining risks from storm surges, nuisance flooding, and erosion.

17. As context for each case study, national policies should be examined in relation to the coastal zone. The "coastal zone", in terms of management boundaries, has different definitions in different jurisdictions. For the purpose of this analysis, it is defined as the area at the interface between the ocean and land.

2. Selection of Case Studies

18. Countries should select a local area that meets the following criteria:

- The area has completed a SLR vulnerability assessment within the last decade.
- The area has implemented an adaptation response (protect, accommodate, retreat, or a combined approach) aimed at reducing SLR risks. Alternatively, a counter-example is also possible, where different adaptation responses where considered but none were implemented.
- The case should be suitable for tracing the processes of priority setting and decision-making, with a special focus on potential challenges.
- The case should provide insights into the factors (e.g. liability regimes, insurance structure) that affect the distribution of potential damages from SLR, as well as the distribution of costs for different adaptation scenarios
- Availability of suitable partners and government buy-in in the work

3. Approach and methods

19. The case studies will be based on a review of existing literature, interviews with key informants (e.g. government officials, insurers, etc.), and use of existing quantitative

analysis. The aim is to use these cases to identify the aspects of national policy that support, or hinder, adaptation at the local level. The results will be compared across different policy contexts.

20. A key component of this analysis is an understanding the potential damage arising from SLR, and the factors (e.g. liability regimes) that affect the distribution of these potential costs. This phase of the project will make use of existing quantitative analysis to compare different case studies where suitable data are already available.

21. The common structure below will be used for each case study:

4. Report structure and key questions

4.1. *Case study background*

This section should describe in general terms the geographic and demographic characteristics of the focus area, as well as the country's overall exposure to SLR and overall approach to coastal adaptation. For example, does the country have a comprehensive national adaptation plan that includes provisions for SLR risk? Does the country have a high proportion of fortified coastlines? Does the country, or area, have a recent history of costly coastal flooding?

4.2. *Broad policy context for the case study*

This section should identify national and/or state policy frameworks that are important for facilitating adaptation to SLR impacts, as local decisions take place in an environment both shaped and constrained by national/state policies.

The driver for the policy scan is to understand what mechanisms affect the distribution of SLR risks between actors, and the scope for action at the local level. Table 1 lists the topics and questions that will be relevant to this issue.

Table 1. Policy context questions

Policy Lever	Key Questions
Climate information	• What information is available on exposure to flood risk? Is it regularly updated?
Infrastructure	• How are responsibilities allocated for the construction, maintenance and funding of coastal defences?
Regulatory	• How are responsibilities allocated for land-use planning decisions? Building codes? Design standards? • What are the main polices in place that regulates the location and construction of developments/prevents development in hazardous zones? How are they enforced?
Legal	• What is the legal framework around property rights and/or has there been any legal action around climate-change related damages?
Financial	• Is insurance available for the three kinds of coastal impacts? Is the coverage private, public, or a combination of the two? Mandatory or optional? • Are premiums priced to reflect flood risk? • Is compensation from the state or national government available after an event for coastal areas? • Is the availability of compensation linked to any conditions? If so, what are they?

4.3. *Risks and vulnerabilities from rising sea levels*

This section should identify the area's vulnerability to SLR, and should include the following information:

- Risks from SLR
  - Climate projections relevant to the area
  - Experience of previous events
  - Risk Map identifying areas impacted by SLR hazard, up to 2100. The SLR scenario that has been adopted in the area for planning purposes should be used.
- Socio-economic profile and its evolution over time
  - Cadastral data for the area at risk (value and ownership of assets)
  - If possible, census data of median household income for assets at risk
  - Projected changes to 2100 (e.g. population trends)

This section should also include an assessment of how the costs associated with SLR risk are distributed, drawing from the information gathered in the policy scan. For example, what is the uptake of insurance against risks? What does this imply for the distribution of potential losses between property owners, insurers and the public sector?

4.4. *Approach to managing the risks from rising sea levels*

This section should be guided by the following questions:

- What triggered the process of developing a response to the risks of rising sea levels?
- Which approaches were considered to reduce the risks for SLR? Were nature-based solutions considered?
- Which, if any, decision-support tools used to evaluate different approaches (e.g. cost-effectiveness analysis, cost-benefit analysis, multi-criteria analysis)? Did the process aim to determine an acceptable level of risk? If so, how was this set?
- What were the main constraints faced in choosing between options? How were these addressed?
- Who were the key stakeholders engaged and how? Were there conflicts between groups and, if so, how were these addressed?
- How were the adaptation measures funded?

4.5. *Conclusions and lessons learned*

This section should summarise the outcome of the analysis, with a focus on answering the key research questions. This section should also identify any challenges in implementation and lessons learned. The implications of these lessons for how national governments can support coastal adaptation should be identified.

5. Output and format

22. The insights from the case study analysis should be written up in to a paper of 8 000 - 10 000 words (approximately 15-20 pages of A4, including figures). The case studies will be released as an OECD publication, alongside a synthesis paper that draws out the key findings from this research.

Background material

1. The costs of sea-level rise

23. The direction of change in global sea-levels is unambiguous, but there is a need to prepare for a range of potential future increases. Modelling shows the significant scale of economic impacts that may arise from rising sea levels. Pioneering studies in the 1990s, including Yohe et al (1995[15]) and Fankhauser (1995[16]), explored global costs of climate impacts and coastal protection. Since then, the increasing sophistication of spatial analysis tools and improved data mean that sea-level rise (SLR) cost estimates are the most advanced and well covered of all climate change impacts (Hunt and Watkiss, 2011[17]). However, while substantial research efforts are directed towards quantifying projections, there remains deep uncertainty around the rate and ultimate peak of sea-level rise (Hinkel et al., 2014[4]) (Wilby and Keenan, 2012[18]).

24. There are now regionally disaggregated estimates of the evolution of sea levels over time. The main economic model that underpins much recent multi-country analysis in this area, DIVA, is capable of generating estimates of how the number of people and assets exposed to flood risk will change over time. It also captures the loss of land, impacts on wetlands and salinity intrusion in deltas and estuaries (Hinkel and Klein, 2009[19]). The only adaptation option modelled for flooding is the construction of sea walls and beach nourishment to combat erosion.

25. Existing models are not directly comparable, as they use different assumptions and have varying scope (see Table 0.1) Nonetheless, consistent themes from these analyses are that there will be a sharp increase in people and assets at risk and expected annual losses over time due to continuing development in coastal zones and rising sea levels.

Table 0.1. Selected estimates of the economic impacts of SLR

	Geographical scope	SLR scenario(s)	Time horizon	Key findings
(Hallegatte et al., 2013[2])	136 largest port cities globally	20cm, 40cm in 2050 (relative to 2005)	2070	Average annual losses from flooding would increase from USD 6 billion (2005) to USD 1 trillion (2050) with socio-economic changes and climate. Improving flood defences to maintain current standards of protection would limit losses to USD 60-63 billion per year
(Ciscar et al., 2014[20])	Europe	30cm in 2080	2080	Annual welfare loss of EUR 42 billion per year without public adaptation, reduced to EUR 1.6 billion with adaptation. Adaptation costs estimated at EUR 2.5 billion per year by the 2080s
(Hinkel et al., 2014[4])	Global	Median 34 - 74cm in 2100 (relative to 1985-2005)	2100	Average annual losses of 0.3– 9.3% of global GDP in 2100 without adaptation and 0.2–4.6% of global population affected each year
(OECD., 2015[21])	Global	17 - 27 cm in 2050 (relative to 1980-1999)	2060	Damages equivalent to 0.2% of global GDP by 2060 from SLR

26. Adaptation has the potential to substantially, and cost-effectively reduce the damages caused by SLR. In principle, there are three broad adaptation responses[2] to reduce coastal flood risk (Bijlsma, 1997[5]), which are:

- Protect: defend against rising seas through the installation of hard defences (such as sea walls) or soft measures, such as sand replenishment
- Accommodate: reduce the consequences of rising seas through changes in land use, revisions of building standards, or insurance for when risks materialise
- Retreat: accept the loss of land

27. Current models consider a subset of potential adaptation options, in particular the use of sea walls to restrain flood risk (protect). This has two implications: first, combining hard defences with "softer" measures, such as improved building codes, has the potential to reduce damages yet further. The second is that it may be overly optimistic, in that there may be physical, ecological or institutional barriers that prevent building higher and higher defences in certain areas.

28. These results are based on the assumption that the impacts of SLR lead to gradual changes in asset values. A further caveat is that development decisions are made with perfect foresight, such that fixed assets are depreciated by the time that erosion occurs, or exposure to flood risk become excessive. In other words, buildings are designed so that they have no value by the time that they fall into the sea. Development is modelled as moving inland, displacing agricultural land in the process. As a result, the financial losses incurred arise from the loss of value of agricultural land and otherwise there is a smooth process of adjustment.

1.1. *Who bears the risks of sea-level rise?*

29. There are two types of costs associated with SLR: the costs of potential damages, or risks, and the costs of implementing an adaptation response, such as protect, accommodate, or retreat. In general, the most effective way to adapt to SLR would be to align the costs of adaptation with the potential costs saved from reduced damages, creating a strong incentive for all actors to adapt. In reality, the risks and costs of climate change are often not aligned.

30. In principle, these impacts will be capitalised into asset values, such as house prices. For example, some research in the United States has found that differences in insurance premiums between similar properties are reflected into house prices (Bin, Kruse and Landry, 2008[22]). However, the effects on house prices will be driven by potential buyers' expectations about the future risk profile (and therefore insurance costs), rather than necessarily the actual risks. Factors such as uncertainty about the future amount of SLR may mean that these expectations are not well aligned. These expectations may shift suddenly in response to events such as the release of updated flood maps or the occurrence of an extreme event.

31. Changes in asset values will have second-order impacts beyond the property owner. Financial institutions are exposed to the risk of default on their loans if property owners are unable to insure or sell their properties. Local governments will also be affected by changes. For example, a study undertaken in New York City found that

[2] Responses are not mutually exclusive and can be combined for a given area.

reductions in property prices caused by updated flood risk mapping could reduce property taxes by USD 22 million per year (Dixon et al., 2017[23]). Restrictions on new development can likewise constrain coastal authorities' ability to raise new revenues.

32. In addition to these distributional effects relating to climate impacts, the allocation of costs for protecting, accommodating or retreating from SLR will depend on policy choices. Insofar as property owners bear the cost of climate impacts, they also have an incentive to invest to reduce those impacts. However, the existence of potential market failures and collective action problems means that reliance on individual action may not be optimal. As such, many countries have regulations affecting what homeowners can and must do in response to SLR.

2. Challenges to coastal adaptation

33. In light of the increasing costs, governments need to prevent the accumulation of new risks, while supporting an equitable and efficient transition for the people and assets that are currently located in high-risk areas. While it is well studied that proactive adaptation is more cost effective then responding after an event, it is becoming more widely noted that adaptation is not occurring at the rate or the scale that it should be (Eisenack et al., 2014[24]) (Mills et al., 2016[25]).

34. This slow implementation has spurred research into the bottlenecks which prevent adaptation research from being translated into action. Some commonly cited barriers in the adaptation literature include:

- lack of financial and human capacity (EEA, 2014[26])
- limited availability and/or access to information (Eisenack et al., 2014[24])
- unclear responsibilities across scales of Government (EEA, 2014[26]) (Abel et al., 2011[27]) (Verschuuren and Mcdonald, 2012[28])
- misaligned incentives (Wong et al., 2014[2]; Tol, Klein and Nicholls, 2008[24]).

However, much of the literature on barriers to adaptation is descriptive, and does not examine why barriers exist, how they interact with each other and how they can be overcome (Eisenack et al., 2014[24]).

35. The political economy of adapting to sea level rise is challenging, as decision makers have different incentives, values and beliefs. For example, the decision of a household to not purchase flood insurance may be influenced by the expectation that the government will pay for eventual potential damages (OECD, 2016[14]). A government may be reluctant to invest in expensive protective measures as ex-ante investments are not visible to the electorate, while the costs are immediate (OECD, 2014[13]), which could undermine their chances of re-election. The table below gives examples of some of the obstacles faced by different agents involved in SLR adaptation.

Table 0.2. Political Economy obstacles to SLR policy implementation

Agent	Example of political economy obstacle
National government	Political cycles can disincentivise long-term investments in SLR adaptation as their benefits may be less visible in the short run, or not visible at all within the time of a government's mandate.
Local authorities	Without repercussions for providing building permits in risk-prone areas, local governments may be inclined to respond to the preferences of their electorate and grant building permits in risk prone areas.
Private Insurance	Low willingness-to-pay for flood insurance can decrease the pool of insured and drive up premiums, further decreasing membership and potentially rendering a risk uninsurable
Private Developers	If property prices do not reflect risk, and coastal property is highly valued, there will be a strong incentive to continue to invest and build in coastal areas
Individuals	If governments are obliged to assist homeowners in post-disaster recovery and reconstruction, regardless of their insurance take-up prior to the shock, it undermines individual homeowner incentives to invest in ex-ante risk reduction or transfer measures are undermined.

Source: Adapted from (OECD, 2014[13]); (OECD, 2016[14])

3. The role of national governments

36. Decisions to reduce coastal risk are often taken at the local level, whether it is the decision of a local government to invest in a sea wall or a small business buying flood insurance. However, these decisions take place in an environment both shaped and constrained by national policies. The enabling environment for adaptation, which includes climate risk information, institutional structures, and provision of resources, is distinct from adaptation responses themselves, which is the practical steps taken to protect, accommodate or retreat from flood and erosion risk (Wilby and Keenan, 2012[18]). Therefore while national governments do not necessarily make final decisions about adaptation, they have an important role to play in insuring the relevant actors have the correct incentives and tools to adapt. In addition, national governments are often responsible for after-the-fact disaster compensation, leaving the broader tax base to bear the costs if no preventative actions are taken.

37. National adaptation plans and strategies (NAPs) are the primary instrument used by most OECD countries use to coordinate and communicate their response to climate impacts. Currently, 29 of the OECD's 35 member countries have developed official national strategies or plans. Most of the remaining OECD countries are developing national strategies.

38. There is no set format for NAPs in OECD countries. Nonetheless, they tend to be broadly similar in their approach and format, following the example set by Finland in 2005 (Mullan et al., 2013[29]). They are important both as a means of shaping policy, and also as a source of information for comparing country approaches. Below is an initial scan of these documents to identify how OECD countries are approaching this topic. Given that NAPs vary in the level of detail provided, and how recently they have been completed, the information below is only intended to be indicative. More detailed analysis at the national level will be required to complement the local case studies.

Understanding the risks

39. Thirty OECD countries have coastlines, and of these, most have identified SLR as an area of vulnerability in their adaptation plans. The level of vulnerability ranges and is based on different factors, including geographic conditions and type of development. In some cases, sea level rise is predicted to have little to no impact on human settlements. In others, low-lying deltas are highly developed and already fortified by a series of coastal protections.

40. Very few adaptation plans quantify the magnitude of risk from SLR, with many references to level of uncertainty surrounding predictions. An exception to this is the UK plan, which specifically details that "…about 270 residential and 470 non-residential properties may be lost to coastal erosion by 2030…" (DEFRA, 2013[30]). Almost all plans have reference to continued monitoring of emerging risks in coastal zones.

41. A key priority in most plans is increased scientific knowledge production and dissemination. For example, in 2013 Spain established "AdapteCCa", a national platform that shares information on impacts, vulnerabilities and adaptation options. Other plans either have reference to established systems for generating knowledge on the impact of SLR, or increased funding for the study of climate change impacts.

Managing the risks

42. There is a variety of approaches to coastal management in OECD countries, which means responsibility for coastal adaptation tends to be mixed across sectors and levels. For example, in the Netherlands, the coastal strip is public property and the national government is responsible for coastal defence. In Germany and Italy, state or regional governments are responsible for the coast, and different areas have different levels of protection. In Canada and Australia coastal protection measures are usually decided and implemented by local governments.

43. Despite differences in management approaches there are many common themes in addressing SLR. A focus across many adaptation plans is some form of support for lower levels of government to consider climate change in land-use plans. Many national adaptation plans reference guiding frameworks and decision-support tools for coastal management decisions. In addition, most strategies prioritize mainstreaming adaptation into existing coastal policies. For example, Greece focuses on existing Coastal Zone Management policies, Poland includes a focus on including SLR projections in future development plans, and Japan includes SLR in coastal infrastructure upgrades. Finally, some plans include earmarked funding for coastal adaptation projects. This ranges from set funds for innovative implementation pilot projects to annual funding for coastal protection maintenance and upgrades.

Evaluating Implementation

44. Very few countries are evaluating the success of their coastal adaptation options, which makes it difficult to measure progress in implementation. A 2014 EEA self-assessment survey found that only four countries considered themselves in the "monitoring and evaluation stage" of adaptation planning, with the remainder of EU countries surveyed being either in an implementation stage or still working on formulating policies (EEA, 2014[26]).

45. While adaptation plans vary and do not cover the full range of what countries are doing, they do give a strong sense of what kind of actions are being prioritized. In general, policies are none-binding, low-regret, and very few countries look at reforming existing institutional arrangements.

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