EUROPEAN
COMMISSION

Adaptation preparedness scoreboard:

Country fiche for Denmark

NOTE TO THE READER

Under Action 1 of the EU's Strategy on adaptation to climate change (COM(2013)216), in collaboration with the Member States, the Commission developed an 'adaptation preparedness scoreboard'. Using the scoreboard, the Commission prepared country fiches on each Member State in an iterative consultation process.[1] The country fiches assess the Member States' adaptation policy as of June 2018, including the content of NASs and plans, for the following aspects:

- Institutional structure
- Quality of national vulnerability assessments
- Knowledge creation (national observation systems in relevant sectors[2] and climate modelling), transfer and use
- Action plans:
  - Quality (incl. the basis used for assessment of adaptation options)
  - Actual implementation mechanisms
- Funding mechanisms
- Mainstreaming into sectoral policies, in particular:
  - Disaster risk reduction
  - Spatial planning
  - Environmental impact assessment (EIA) (how the Directive is transposed)
  - Insurance policy
- Transboundary cooperation
- Monitoring mechanisms in different sectors and governance levels

The fiches are based on internal work by the Commission and on targeted assistance from an external contractor. They also served as input to the assessment of Action 1 of the Strategy

[1] The first versions of the fiches, prepared in consultation with the Member States in 2014-15, were unpublished and used to fine-tune the scoreboard. The second drafts were published, after consulting the Member States, as background documents to the public consultation on this evaluation in December 2017. https://ec.europa.eu/clima/consultations/evaluation-eus-strategy-adaptation-climate-change_en The final Member State consultation on the draft fiches took place in June 2018.

[2] These relate for example to meteorology, floods, drought, sea level, coastal erosion, biodiversity, human/animal/plant health etc.

during its evaluation. Annex IX of the Commission's SWD(2018)461 on the evaluation of the Strategy presents a horizontal assessment of the 28 country fiches, while Annex X presents the list of scoreboard indicators and the methodology used in applying them.

The assessments in the country fiches (yes/no/in progress) need to be read in conjunction with the narrative that accompanies them. They assess the state of play within each EU Member State. While all effort has been made to ensure the coherence across fiches in the assessment of the same indicator, it should not be directly compared across the Member States. Two countries with a "yes" on the same indicator could have a different national situation leading to that assessment. Not all indicators have the "in progress" status, some can only be "yes" or "no".

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List of abbreviations

DEMA	Danish Emergency Management Agency
DKK	Danish Krone
DMI	Danish Meteorological Institute
EIA	Environmental Impact Assessment
EPA	Danish Environmental Protection Agency
EUR	Euros
IPCC	Intergovernmental Panel on Climate Change
KFT	Koordineringsenhed for Forskning i klimatilpasning (Coordination Unit for Research in Climate Change Adaptation)
NAS	National Adaptation Strategy
NAP	National Adaption Plan
MEF	Danish Ministry of Environment & Food
MUDP	Environmental Technology Development and Demonstration programme
SEA	Strategic Environmental Assessment

POLICY FRAMEWORK

Adaptation strategies

A1. National adaptation strategy

In Denmark, the National Adaptation Strategy (NAS) was adopted in March 2008[3]. The NAS included a description of the vulnerability of those sectors where climate change was expected to have significant consequences. The NAS focused on what would be attainable in the individual sectors within the next 10 years. It was intended that measures should be scientifically, technically and socio-economically appropriate for implementation within the given period. No revision is presently foreseen.

The NAS was based on the notion that climate adaptation is a long-term process, and that it is still uncertain what the consequences of climate change will be and how soon they will take effect. The NAS included a targeted information campaign and creation of a web portal[4] with the aim of ensuring that climate change was incorporated into planning and development, so that public authorities, businesses and citizens had the best possible basis for considering whether, how and when climate change should be considered.

A2. Adaptation strategies adopted at subnational levels

Adaptation strategies have not been adopted at the subnational level but all municipalities have adopted local adaptation action plans in line with the national adaptation plan (NAP).

Although not a formal responsibility or obligation, four of five regions have incorporated adaptation into their regional climate strategies: South Denmark[5], North Jutland,[6] Region Zealand[7] and the Capital Region[8]. Central Denmark Region leads the EU-funded project 'Coast to Coast Climate Challenge', which has a goal of formulating and implementing a coordinated adaptation strategy for the region between 2017 and 2022[9].

The NAS outlined eleven sectors (Coastal management, dikes, ports etc; Buildings and infrastructure; Water supply; Energy supply; Agriculture and forestry; Fisheries; Nature management; Land use planning; Health; Rescue preparedness; Insurance) in which climate

[3] Danish Energy Agency (2008). *Danish strategy for adaptation to a changing climate*. URL: http://www.klimatilpasning.dk/media/5322/klimatilpasningsstrategi_uk_web.pdf Date accessed: 10/05/2018
[4] Danish web platform on adaptation to climate change: http://en.klimatilpasning.dk/
[5] Region of South Denmark, 2015, Regional klima- og bæredygtighedsstrategi 2016-2019. URL: https://www.rsyd.dk/wm217286
[6] Region North Jutland, 2016, Klimahandlingsplan for Region Nordjylland. URL: http://publikationer.rn.dk/rn/363/
[7] Region Zealand, 2015, Den Fælles Regionale Klimastrategi. URL: http://www.regionsjaelland.dk/Miljo/groen-omstilling/Klimastrategi/Sider/default.aspx
[8] Denmark's Capital Region, 2011, Klimastrategi for hovedstadsregionen. URL: http://www.klimatilpasning.dk/media/1265668/regionh_klimastrategi.pdf
[9] Coast to Coast Challenge, URL: http://www.c2ccc.eu/om-c2c-cc/. Date accessed: 8 May 2018.

impacts may be significant. The relevant ministries have developed sectoral adaptation strategies for transport,[10] roads,[11] and coasts[12].

Adaptation action plans

B1. National adaptation plan

The National Adaptation Plan (NAP) was adopted in 2012. As of May 2018, no update is planned.

The Action Plan for a Climate-Proof Denmark[13] was launched in December 2012 and is the first NAP in Denmark. The NAP is based on the notion that a responsible climate policy must do more than just work to address climate change in the long term, it must also ensure necessary action is taken now to adapt our society to a climate that is already changing, and that all parts of society contribute to climate adaptation. Dealing with the climate challenge requires collaboration between authorities, organisations, private enterprises and individuals, regardless of whether the project is maintenance of existing roads, coastal protection, construction, or investments in new infrastructure.

The Government itself has a responsibility as the owner of infrastructure, buildings and land. However, the principal role for the Government is to establish an appropriate framework for local climate adaptation by, for example, adapting laws and regulations, but also by ensuring coordination and providing information. The Government requested all municipalities to develop their own adaptation action plans within two years. A solid framework for the efforts must support the specific parties involved, so that they can address the challenge in a socio-economically appropriate manner at the right time.

In the NAP, the Government commits to creating the basis for continued technological and knowledge development, so that Denmark will have a strong position on the global market for climate adaptation.

The NAP presents 64 [14] new initiatives within five general areas of initiative: an improved framework for climate adaptation; more consultation and a new knowledge base;

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[10] Danish Ministry of Transport, 2010, Transportministeriets Klimatilpasningsstrategi. URL: https://www.trm.dk/da/publikationer/2010/klimatilpasningsstrategi

[11] Grauert, M., Hildebrand, G., Krogh Kristensen, N., Mørch jensen, U., Albrechtsen, N., Hald Pedersen, L., Lund Ujvári, M. & Mollerup, M., 2013, Strategi og baggrundsrapport: strategi for klimatilpasning. Danish Road Directorate, Report 452. URL: http://www.klimatilpasning.dk/media/808629/strategi_for_klimatilpasning___baggrundsrapport.pdf

[12] Danish Environment and Food Ministry, 2016, Kystanalyse, URL: http://kysterne.kyst.dk/kystanalyse.html

[13] Danish Nature Agency, 2012, How to manage cloudburst and rain water.
Action plan for a climate-proof Denmark. Task Force for Climate Change Adaptation, URL: http://en.klimatilpasning.dk/media/590075/action_plan.pdf

[14] Danish Nature Agency, 2012, How to manage cloudburst and rain water. Action plan for a climate-proof Denmark. Task Force for Climate Change Adaptation. Available at: http://en.klimatilpasning.dk/media/590075/action_plan.pdf

strengthened collaboration and coordination; green transition; and international climate adaptation.

This fiche does not cover Greenland and the Faroe Islands[15].

B2. Adaptation plans adopted at subnational level

The NAP required all municipalities to develop an action plan for climate change by the end of 2013. The Government formally agreed with the association of Danish municipalities in 2012 that all municipalities should develop an adaptation action plan by the end of 2013.[16] To support municipalities and local-level decision makers in their work, the Danish Nature Agency issued a guidance document in 2013. All 98 Danish municipalities finalised their action plans by 2014. Each plan includes a flood risk mapping and sets the priorities for local climate adaptation measures. The content of the plans was evaluated by the Government in 2017[17], finding that although all municipalities had completed their plans, the level of detail and scope of the plans was uneven.

The Copenhagen Climate Adaptation plan[18] was adopted in 2011 in response to the extreme, water-related consequences of climate change to which the city is exposed. In July 2011, Copenhagen experienced a cloudburst and the damages were estimated to be approximately 5 to 6 million DKK. This prompted the city to develop a specific Cloudburst Management Plan in 2012.[19] The plan was used to develop 300 specific projects and a detailed management plan, which was approved in 2015 and will be implemented over the next 20 years.[20] In 2017, a storm surge plan was developed for Copenhagen[21]. Seven other local cloudburst plans were developed in 2013.

Two out of five Danish regions have carried out studies on climate impacts and risks, as the basis for regional strategic planning for adaptation. Sectors most covered include health, water management, transport, and buildings. The Capital Region of Denmark has established

[15] Information about climate change impacts and adaptation in Greenland and the Faroe Islands can be found in e.g. Danish Ministry of Energy, Utilities, and Climate, January 2018, Denmark's Seventh National Communication and Third Biennial Report under the United Nations Framework Convention on Climate Change. URL: http://unfccc.int/national_reports/biennial_reports_and_iar/submitted_biennial_reports/items/7550.php

[16] Danish Ministry of Finance, 2012, Aftale om den kommunale og regionale økonomi for 2013. URL: http://www.kl.dk/ImageVaultFiles/id_55201/cf_202/Aftale_om_kommunernes_%C3%B8konomi_for_2013.PDF

[17] Danish Ministry of Environment and Food, 2017, Evaluering af kommunal klimatilpasning. URL : http://www.klimatilpasning.dk/media/1174683/evalueringsrapport.pdf

[18] City of Copenhagen, 2011, Copenhagen Climate Adaptation Action Plan. URL: http://international.kk.dk/artikel/climate-adaptation

[19] City of Copenhagen, 2012, Cloudburst management plan 2012. Copenhagen: Technical and Environmental Administration. Available at: http://en.klimatilpasning.dk/media/665626/cph_-_cloudburst_management_plan.pdf; in Danish at: http://kk.sites.itera.dk/apps/kk_pub2/index.asp?mode=detalje&id=1018

[20] City of Copenhagen, 2015, Climate Change Adaptation and Investment Statement. URL: http://kk.sites.itera.dk/apps/kk_pub2/pdf/1499_bUxCjgovgE.pdf

[21] Copenhagen storm surge plan. URL: https://www.kk.dk/sites/default/files/edoc/7932be34-6e51-450a-bc4f-fa2c2b00c1b3/c72e0cf7-3b8f-461a-bf35-536e7e239267/Attachments/18135652-23473370-1.PDF

a cooperation organisation with the aim of supporting municipalities, water utilities and hospitals in their effort to move from plan to action within the field of adaptation[22].

Denmark currently has six signatories to the Covenant of Mayors for Climate and Energy in relation to adaptation[23].

B3. Sectoral adaptation plans

A few sectors, such as transport, roads and coastal protection,[24] have dedicated adaptation plans.

SCOREBOARD

Step A: Preparing the ground for adaptation

1. Coordination structure

1a. A central administration body officially in charge of adaptation policy making

Yes / No

The overall responsibility for coordinating the integration of adaptation policy into national legislation and planning lies with the Danish Environmental Protection Agency (EPA) within the Ministry of the Environment and Food (MEF)[25].

1b. Horizontal (i.e. sectoral) coordination mechanisms exist within the governance system, with division of responsibilities

Yes / **In progress** / No

To ensure a coordinated effort among public authorities in preparing the NAP, an organisational framework outlined in the NAS was in place from 2008 to 2011, including a horizontal inter-ministerial coordination forum on adaptation (KoK[26]). The forum had representatives of nine national ministries, the sectoral organisation for municipalities, and the Danish regions[27]. Its role was to ensure coordination of effort between authorities, and a

[22] Klikovand. Denmark's Capital Region. URL: http://www.klikovand.dk/english-resume/ Date accessed: 09/05/2018
[23] As 19 April 2018, includes: Albertslund, Copenhagen, Faaborg-Midtfyn, Næstved, Roskilde, and Solrød. See: http://www.covenantofmayors.eu/about/covenant-community/signatories.html
[24] Sørensen, P. & Sørensen, C., 2012, Guidelines for klimatilpasning i kystområder, Danish Coastal Authority. URL: http://www.masterpiece.dk/UploadetFiles/10852/36/Klimatilpasningikystområderversion2.pdf
[25] Danish EPA, Climate, URL: http://eng.mst.dk/nature-water/climate/ Date accessed: 10/05/2018
[26] In Danish: "Tværministerielle Koordinationsforum for Klimatilpasning (KoK)"
[27] Danish Energy Agency, 19 January 2009, Svar til Spørgsmål 232, Koordinationsforum for Klimatilpasning, Status for udmøntning af Regeringens klimatilpasningsstrategi 2009, Miljø- og Planlægningsudvalget (MPU) Alm. Del, URL: http://www.ft.dk/samling/20091/almdel/mpu/spm/232/svar/681815/791278/index.htm

common knowledge base and report on sectoral initiatives[28]. Parallel work groups were set-up to support the work of the coordination forum[29] along with a research coordination group, and group setting up the information portal.

With regards to the implementation phase, coordination is taking place in a more ad-hoc manner. For instance, in 2012 a Task Force on Climate Change Adaptation, set up to advise the coordination forum, evaluated climate vulnerabilities and potential impacts in Denmark. The report: 'Mapping climate change – barriers and opportunities for action'[30] addresses fourteen sectors: construction and housing, coasts and ports, transport, water, agriculture, forestry, fisheries, energy, tourism, nature, health, emergency preparedness, insurance and spatial planning. This report is used in preparing sectoral priorities and serves as a decision-making tool across sectors.

Furthermore, at the beginning of 2017, a cross-ministerial committee (Ministry of Environment & Food, Ministry of Industry, Business & Financial Affairs, Ministry of Energy, Utilities, and Climate) was set up to propose and implement new initiatives to support municipalities and property owners in establishing cost-effective and holistically planned coastal flood protection and erosion protection.31 The Government and municipalities have agreed that municipalities and property owners will take decisions and implement coastal adaptation measures with funding from the Government,[32] and in-line with the relevant risk assessment[33] and guidance documents.[34]

1c. Vertical (i.e. across levels of administration) coordination mechanisms exist within the governance system, enabling lower levels of administration to influence policy making

Yes / **In progress** / No

Vertical coordination of adaptation policy is in place at some levels and there is a specific focus on flooding.

[28] Danish Energy Agency, 19 January 2009, Notat til Spørgsmål 232, Miljø- og Planlægningsudvalget (MPU) Alm. Del, URL: http://www.ft.dk/samling/20091/almdel/mpu/spm/232/svar/681815/791279/index.htm
[29] Danish Energy Agency, 19 January 2009, Svar til Spørgsmål 232, Koordinationsforum for Klimatilpasning, Status for udmøntning af Regeringens klimatilpasningsstrategi 2008, Miljø- og Planlægningsudvalget (MPU) Alm. Del, URL: http://www.ft.dk/samling/20091/almdel/mpu/spm/232/svar/681815/791277/index.htm
[30] Danish Nature Agency, May 2012, Background report, mapping climate change, barriers and opportunities for action, Task Force on Climate Change Adaptation, ISBN 978-87-7279-609-3, URL: http://en.klimatilpasning.dk/media/600858/130206_mapping_climate_change_final.pdf
[31] Ministry of Environment & Food, Ministry of Industry, Business & Financial Affairs, Danish Ministry of Energy, Utilities, and Climate, Faktaark – Oversigt over initiativer vedr. kystbeskyttelse og klimatilpasning, URL: http://efkm.dk/media/11405/faktaark-initiativer-vedr-kystbeskyttelse-og-klimatilpasning.pdf
[32] Local Government Denmark, 1 June 2017, Aftale om kommunernes økonomi for 2018, URL: https://www.kl.dk/ImageVaultFiles/id_85280/cf_202/-konomiaftale_2018.PDF
[33] Danish Environment and Food Ministry, 2016, Kystanalyse, URL: http://kysterne.kyst.dk/kystanalyse.html
[34] Sørensen, P. & Sørensen, C., 2012, Guidelines for klimatilpasning i kystområder, Danish Coastal Authority. URL: http://www.masterpiece.dk/UploadetFiles/10852/36/Klimatilpasningikystområderversion2.pdf

Municipalities have the main planning competencies and are identified in the NAS as the level of implementation of adaptation policy. In line with the NAS, development of detailed action plans was mandated to municipalities in 2013 after the negotiation of the Financial Agreement for Municipalities 2013 between the Government and the sectoral organisation for municipalities.[35] The Government provided support through the establishment of a national task force with detailed and specific expertise in local adaptation issues, as well as a web-based mapping of risks for flooding, rain fall and storm surges in various time perspectives, modelled according to Intergovernmental Panel on Climate Change (IPCC) 2007 scenarios[36].

Furthermore, a team of subject specialists on adaptation, flooding, and erosion has been established by the Environmental Protection Agency and Coastal Authority[37]. Its purpose is to advise, guide, support, and help coordinate municipalities in implementing adaptation solutions as well as to gather information about their experience. The team offers training, workshops, seminars, and customised advice to municipalities throughout the country in order to help them implement their adaptation plans.

Previously in 2011, the Ministries of the Environment and Transport identified 10 flood prone areas according to the Danish Flood Risk Act, which relates to the Directive 2007/60/EC of the European Union on the assessment and management of flood risks. The 10 flood risk areas involved 22 municipalities, which had to prepare flood risk management plans in order to reduce the flood risk through mitigation and adaptation measures. Furthermore, the plans had to be coordinated with municipal climate adaptation plans and take into account flood-related climate impacts.

A cooperation forum also exists within which the Ministry of Transport, which works together with, amongst others, the municipalities in the Greater Copenhagen area to tackle the traffic-related challenges in the area, in particular flooding of major approach roads.

Regions have no formal responsibilities in the field of adaptation but have started tackling it through their regional climate and development plans. Two regions in particular, the Capital Region and Central Denmark, have specific coordination bodies for municipalities and other stakeholders (see Section A2 & B2). These bodies have had a clear impact on the degree to which municipalities in those regions cooperate formally with each other and with the region on adaptation projects.[38]

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[35] Danish Ministry of Finance, 2012, Aftale om den kommunale og regionale økonomi for 2013. URL: http://www.kl.dk/ImageVaultFiles/id_55201/cf_202/Aftale_om_kommunernes_%C3%B8konomi_for_2013.PDF

[36] Jensen, A., Nielsen, H.Ø. & Nielsen, M.L, 2016, Climate adaption in local governance: Institutional barriers in Danish municipalities, Aarhus University, DCE – Danish Centre for Environment and Energy, 102 pp. Scientific Report from DCE – Danish Centre for Environment and Energy No. 104 URL: http://dce2.au.dk/pub/SR104.pdf

[37] Danish Ministry of Environment and Food, Rejseholdet, URL: http://www.klimatilpasning.dk/rejseholdet.aspx Date Accessed: 10/05/2018

[38] Krausing, Jarl., Madsen, Simone., Jørgensen, Sune., 2017, Robusthed i kommunale klimatilpasningsplaner, Concito, URL: https://concito.dk/udgivelser/robusthed-kommunale-klimatilpasningsplaner

2. Stakeholders' involvement in policy development

2a. A dedicated process is in place to facilitate stakeholders' involvement in the preparation of adaptation policies

Yes / No

In general, all major public policy initiatives in Denmark are open to public consultation and stakeholder involvement. The Danish Environmental Protection Act has a provision that authorises the Minister for the Environment and Food to stipulate regulations regarding public consultation in the preparation and amendment of plans and programmes within the scope of the Act.

Publication on a web portal[39] is mandatory for all draft laws, decisions, and bills by all ministries in the Government at the time of parliamentary hearings. Relevant stakeholders are contacted directly by email. Public comments are compiled by the relevant authority in a memorandum and amendments are considered in light of the comments. All relevant hearing materials are collated on the public web portal.

While the above processes provide a general overview of stakeholder involvement, only ad-hoc examples are available specifically on how stakeholders are involved in the preparation of adaptation policies.

For instance, the Ministry of the Environment established a 'National Dialogue Forum' on adaptation in 2012, which met several times to discuss climate adaptation policy and solutions, develop the sector as a growth area for new technology and jobs, and advise the minister. Seventeen members were selected from business, universities, NGOs, municipalities, and interest organisations[40].

Following storm surges in December 2016 and January 2017, the Minister for the Environment and Food held several stakeholder meetings focusing on climate adaptation, coastal protection and erosion. Afterwards, new initiatives[41] were adopted as part of the work of a cross-ministerial committee set up at the beginning of 2017. These included, for instance, the establishment of a new flood and erosion task force to serve for a three-year period and guide municipalities in the establishment of holistically-planned solutions and the development of a central-government risk analysis tool, which will be based on previous events and guidance.

[39] Høringsportalen, URL: https://hoeringsportalen.dk/

[40] MEF, Nyt forum lægger strategi for dansk klimaindsats, URL: http://mfvm.dk/nyheder/nyhed/nyhed/nyt-forum-laegger-strategi-for-dansk-klimaindsats/

[41] For the full list of initiatives see: Ministry of Environment & Food, Ministry of Industry, Business & Financial Affairs, Danish Ministry of Energy, Utilities, and Climate, Faktaark – Oversigt over initiativer vedr. kystbeskyttelse og klimatilpasning, URL: http://efkm.dk/media/11405/faktaark-initiativer-vedr-kystbeskyttelse-og-klimatilpasning.pdf

2b. Transboundary cooperation is planned to address common challenges with relevant countries

Yes / No

International cooperation is highlighted as a priority action under the NAP. The Ministry of the Environment and Food collaborates with Germany and the Netherlands on climate adaptation of the Wadden Sea through the existing Trilateral Cooperation on the Protection of the Wadden Sea[42]. Under the guidance of this cooperation forum, the three Governments developed a common Climate Change Adaptation Strategy (CCAS) in 2014[43]. The objective of the trilateral cooperation in implementing the CCAS is to focus on activities with the highest trilateral relevance, particularly the exchange of knowledge and best practice between experts and policy makers, as well as the support of trilaterally coordinated studies and pilot projects covering sites across the entire Wadden Sea. The CCAS deals with coastal risk management, nature protection and spatial planning. A monitoring report on the CCAS was published in December 2017[44].

Through the Nordic Council of Ministers, Denmark has contributed to collaboration and knowledge-building in Nordic research networks on climate adaptation[45], through the top-level research initiative – Impact studies and adaptation to climate change ('Effektstudier og tilpasning til klimaændringer').

Denmark is also a member of the European Network of the Heads of Environment Protection Agencies (EPA) Interest Group Climate Change and Adaptation[46].

Between 2010 and2013, Denmark participated in the Baltadapt project, with the Danish Meteorological Institute (DMI) as lead partner. Funded by the Baltic Sea Region Programme 2007-2013, it had a total budget of EUR 2.86 million, of which EUR 2.1 million was ERDF co-financed and EUR 0.75 million was partners' contributions. The project developed a transnational Strategy for Adaptation to Climate Change in the Baltic Sea Region and a subsequent Action Plan, presented in 2013[47]. The project was followed by The Baltic Sea Region Climate Dialogue Platform which aims to support a shared understanding of climate

[42] Secretariat of The Trilateral Cooperation on the Protection of the Wadden Sea, URL: http://www.waddensea-secretariat.org Date accessed: 10 May 2018

[43] 12th Trilateral Governmental Conference on the Protection of the Wadden Sea, 2014, Climate Change Adaptation Strategy, URL: http://www.wing.nl/file.php/83/annex_4-climate_strategy_final.pdf

[44] Wadden Sea Board - Task Group Climate, 2017, Trilateral Climate Change Adaptation Strategy. Monitoring Report for the Trilateral Cooperation on the Protection of the Wadden Sea. Common Wadden Sea Secretariat, Wilhelmshaven, Germany, URL: http://www.waddensea-secretariat.org/sites/default/files/downloads/ccas_monitoring_report_final.pdf

[45] Nordregio, URL: http://www.nordregio.se/en/Metameny/About-Nordregio/Modules-About-Nordregio/Geographical-scope-we-cover/Norden/Addre ssing-climate-change-adaptation-at-the-Nordic-level/ Date Accessed: 09/05/2018

[46] European Network of the Heads of Environment Protection Agencies , URL: http://epanet.pbe.eea.europa.eu/european_epas Date accessed: 09/05/2018

[47] Baltadapt. URL: http://www.baltadapt.eu/index.php?option=com_content&view=article&id=91&Itemid=222 Date accessed: 09/05/2018

change challenges and promotes adaptation solutions through joint projects and actions in the Baltic Sea region.

The Danish Coastal Authority also participates in the EU funded project, Building with Nature[48], with the goal of making coasts, estuaries and catchments of the North Sea Region more adaptable and resilient through a number of "living laboratories", and by creating a joint transnational monitoring programme, using state-of-the-art analysis methods and developing improved designs and business cases.

The City of Copenhagen has entered into a cooperation agreement with New York City on transferring the ideas and results from the Climate Resilient Neighbourhood in Østerbro to a district of New York. The city has another cooperation agreement with Beijing on exchange of experience of solutions for the management of everyday rain and torrential downpours[49].

Finally, a number of Danish municipalities and stakeholders are participating in Interreg adaptation projects in the North Sea Region,[50] including in (FRAMES)[51] dealing with flood resilience, and TOPSOIL[52] dealing with soil and water resilience.

Step B: Assessing risks and vulnerabilities to climate change

3. Current and projected climate change

3a. Observation systems are in place to monitor climate change, extreme climate events and their impacts

Yes / **In progress** / No

There is an elaborate system in place for the observation of weather variables, including sea level and storm surges. Some of the data is publicly available, e.g. on the web portal[53] of the Danish Meteorological Institute (DMI). The DMI is also known globally for regional climate modelling (RCM) and is the leading national authority on regional climate projections. DMI uses Global Climate Models to monitor interactions and feedback mechanisms between atmosphere, ocean, land surface and ice on a larger scale.

DMI keeps detailed records of all weather-related events in Denmark in line with international standards. There is no clear public information on what climate-related impacts

[48] Building with Nature, URL: http://www.northsearegion.eu/building-with-nature Date accessed: 09/05/2018
[49] City of Copenhagen, 2015, Climate Change Adaptation and Investment Statement. URL: http://kk.sites.itera.dk/apps/kk_pub2/pdf/1499_bUxCjgovgE.pdf
[50] Inter-reg, North Sea Region, Cooperating on climate adaptation in the North Sea region URL: http://www.northsearegion.eu/fair/news/cooperating-on-climate-adaptation-in-the-north-sea-region/ Date accessed: 09/05/2018
[51] Inter-reg, North Sea Region, Frames, URL: http://www.northsearegion.eu/frames/ Date accessed: 09/05/2018
[52] Inter-reg, North Sea Region, Top Soil, URL: http://www.northsearegion.eu/topsoil/ Date accessed: 09/05/2018
[53] DMI: Weather: http://www.dmi.dk/vejr; Climate: http://www.dmi.dk/klima and http://research.dmi.dk/research/research-topics/climate/; Sea: http://www.dmi.dk/hav

are being tracked, though information seems to be supplied to EEA, so there must be a programme in place. The economic damage caused by the Copenhagen cloudburst of 2011 was estimated at approximately 5 to 6 million DKK.

3b. Scenarios and projections are used to assess the economic, social and environmental impacts of climate change, taking into account geographical specificities and best available science (e.g. in response to revised IPCC assessments)

Yes / In progress / No

In 2014 the Danish Meteorological Institute (DMI) prepared a report on the expected climate change in Denmark, focusing on climate change towards the end of this century. The assessment of future climate change is based on the scenarios used by the IPCC 5th Assessment Report[54]. DMI presented the results based on the most recent IPCC, BACC, European studies and the Danish CRES project where a number of climate simulations were performed with several regional and global climate models.

The Danish EPA prepared an analysis and summary of the Working Group II Contribution to the 5th Assessment Report from IPCC, with special focus on implications for Denmark, for policy makers.[55]

In 2012, the Task Force on Climate Change Adaptation prepared an analysis to map climate impacts in Denmark, as well as the opportunities and challenges they present. The report was based on the scenarios used by the IPCC 4th Assessment Report[56].

The DMI will prepare datasets and indicators (Climate Atlas)[57] based on IPCC's 5th Assessment Report. The datasets will be provided to the municipalities from the end of 2019 and will be further developed and updated up to 2021. Data will comprise projections and indicators of temperature, precipitation, extreme rainfall, sea level and storm surges.

3c. Sound climate risks/vulnerability assessments for priority vulnerable sectors are undertaken to support adaptation decision making

Yes / **In progress** / No

[54] Olesen et al., 2014, Fremtidige klimaforandringer i Danmark, Danmarks Klimacenter rapport nr. 6 2014. Danish Meteorological Institute, URL: https://www.dmi.dk/fileadmin/user_upload/Rapporter/DKC/2014/Klimaforandringer_dmi.pdf

[55] Grøndahl, Louise, Poulsen, Nanet, eds., 2014, Analyse af IPCC delrapport 2 – Effekter, klimatilpasning og sårbarhed, Danish Environmental Protection Agency, URL: http://www.klimatilpasning.dk/media/868690/analyse_af_ipcc_delrapport_2__effekter_klimatilpasning_og_s_rbarhed_fina____3_.pdf

[56] Danish Nature Agency, May 2012, Background report, mapping climate change, barriers and opportunities for action, Task Force on Climate Change Adaptation, ISBN 978-87-7279-609-3, URL: http://en.klimatilpasning.dk/media/600858/130206_mapping_climate_change_final.pdf

[57] URL: http://www.dmi.dk/nyheder/arkiv/nyheder-2017/august/ny-klima-krystalkugle-fra-dmi-skal-ruste-danskerne-mod-klimaforandringer

The 2012 report by the centrally convened Task Force on Climate Change Adaptation called 'Mapping climate change – barriers and opportunities for action' conducted a sectoral and cross-sectoral analysis of climate risks/vulnerability[58]. It analysed 14 sectors: construction and housing, coasts and ports, transport, water, agriculture, forestry, fisheries, energy, tourism, nature, health, emergency preparedness, insurance, and spatial planning. For each sector, it presented a basic analysis of important effects of climate change, relevant division of responsibilities between the authorities and private citizens, possibilities for adaptation, initiatives planned and in progress, and barriers and opportunities for future action. The report was based on the scenarios used by the IPCC 4th Assessment Report.

A detailed risk assessment regarding erosion and flooding was conducted for the entire Danish coastline by the MEF in 2016.[59] It will be used as a basis for planning the significant coastal adaptation initiatives being laid out in 2017/18. DMI estimates based on the IPCC 5th Assessment Report were used as a basis for the assessment.

3d. Climate risks/vulnerability assessments take transboundary risks into account, when relevant

Yes / **In progress** / No

The available climate risks and vulnerability assessments indicated under Indicator 3c do not take transboundary risks into account.

Nevertheless, as indicated in Indicator 2b, Denmark is involved in a range of transboundary cooperation initiatives some of which by nature consider transboundary risks as part of the vulnerability assessments conducted. These initiatives primarily focus on the Baltic Sea.

4. Knowledge gaps

4a. Work is being carried out to identify, prioritise and address the knowledge gaps

Yes / In progress / No

The Coordination Unit for Research in Climate Change Adaptation (in Danish: Koordineringsenhed for Forskning i klimatilpasning - KFT) was established under the NAS. KFT was mandated to strengthen the coordination of national research activities in the context of climate adaptation, to ensure that synergies across a broad range of different research areas were harvested. KFT was a joint endeavour of the National Environmental Research Institute at the Aarhus University, the Danish Meteorological Institute, the Geological Survey of Denmark and Greenland (GEUS), the University of Copenhagen and Denmark's Technical University. KFT reported to the inter-ministerial 'Coordination Forum

[58] Danish Nature Agency, May 2012, Background report, mapping climate change, barriers and opportunities for action, Task Force on Climate Change Adaptation, ISBN 978-87-7279-609-3, URL: http://en.klimatilpasning.dk/media/600858/130206_mapping_climate_change_final.pdf
[59] Danish Environment and Food Ministry, 2016, Kystanalyse, URL: http://kysterne.kyst.dk/kystanalyse.html

on Adaptation' and provided science-based knowledge to a national web portal on climate adaptation, at that time hosted by the Danish Ministry of Climate and Energy.

KFT aimed to collate and transfer knowledge within all Danish (and international) research areas that worked on the issue of climate adaptation, and helped coordinate information access at the science-policy interface. This activity built on strong cooperation across a wide range of scientific disciplines as well as regular interaction with both the policy-makers and other stakeholders. In addition, KFT fostered national and international networks; identified and described knowledge gaps as input for future strategic research programmes.

In 2013 the activities of KFT were transferred to a network of research activities on climate adaptation. The network meets on a yearly basis and keeps up network activities. The website is no longer active.

The Ministry of Environment and Food (MEF) has regular meetings with universities in order to highlight needs for further research on climate adaptation. Recent work is being done on adaptation knowledge regarding local level planning and coastal impacts.

The Environmental Technology Development and Demonstration Programme (MUDP) is run by the MEF. The Programme supports development, testing and demonstration of environmentally efficient technology, including applications to adaptation. Its total budget for environmental technology efforts in 2018 is about DKK 85 million.[60]

5. Knowledge transfer

5a. Adaptation relevant data and information is available to all stakeholders, including policy makers (e.g. through a dedicated website or other comparable means)

Yes / In progress / No

The Danish web-portal[61] for climate adaptation, established after the NAS in 2008, contains news, cases about climate adaptation and interactive tools. It is managed by the Ministry of Environment and Food and EPA in cooperation with a number of other governmental bodies. Different online tools are targeted at municipalities, enterprises and individuals. These tools can be used to assess risks from rising sea levels and to climate-proof buildings, among other things. Other available information includes: updated data and maps of temperatures, precipitation, sea and groundwater; articles and guidance about various sectors affected by climate changes; practical advice on climate adaptation; examples of calculations of how climate change may be included as a basis for important decisions; analysis and assessment tools for the public and decision-makers; information on financing adaptation projects; maps; an overview of municipal climate action plans; and information about the latest research and

[60] Danish Ministry of Environment and Food, MUDP - Ansøgningsrunde 2018, URL: http://ecoinnovation.dk/tilskud/soeger-du-tilskud-under-mudp/aktuelle-opslag/mudp-opslag-2018/ Date accessed: 10/05/2018

[61] Danish portal for Climate Change Adaptation, URL: http://en.klimatilpasning.dk/ Date accessed: 09/05/2018

development into climate adaptation. An English version is available with an English newsletter.

DMI has a web page aimed at the general public with climate change related information, including information on adaptation and climate data.[62] A dedicated page for research is available.[63]

5b. Capacity building activities take place; education and training materials on climate change adaptation concepts and practices are available and disseminated

Yes / In progress / No

At an earlier stage of implementation, the Danish Adaptation Strategy and Action Plan provided for capacity building at central, municipal, and citizen levels. A mobile team (2012-2013) was established as part of the Task Force on Climate Change Adaptation. This team offered guidance and facilitated collaboration between municipal authorities and other stakeholders in the field, for example, with regard to preparing the municipal climate adaptation plans.

A new mobile team of subject specialists on adaptation, flooding, and erosion has been established by the Environmental Protection Agency and Coastal Authority[64]. Its purpose is to advise, guide, support, and help coordinate municipalities in implementing adaptation solutions. The team is at the disposal of municipalities and offers training, workshops, seminars, and customised advice throughout the country at the request of municipalities.

Step C: Identifying adaptation options

6. Adaptation options' identification

6a. Adaptation options address the sectoral risks identified in 3c, the geographical specificities identified in 3b and follow best practices in similar contexts

Yes / No

The Danish adaptation policy addressed a risk assessment of 14 sectors[65]. A detailed risk and adaptation analysis was made by the Coastal Authority focusing on the effects of a future

[62] DMI, Klima, URL: http://www.dmi.dk/klima/ Date accessed: 09/05/2018
[63] DMI, Research at the Danish Meteorological Institute, URL: http://research.dmi.dk/home/ Date accessed: 09/05/2018
[64] Danish Ministry of Environment and Food, Rejseholdet, URL: http://www.klimatilpasning.dk/rejseholdet.aspx Date Accessed: 10/05/2018
[65] Danish Nature Agency, May 2012, Background report, mapping climate change, barriers and opportunities for action, Task Force on Climate Change Adaptation, ISBN 978-87-7279-609-3, URL: http://en.klimatilpasning.dk/media/600858/130206_mapping_climate_change_final.pdf

changing climate on the Danish coasts[66]. These documents have been used to develop detailed plans in conjunction with local authorities.

The Mobile Team, established in 2017, helps to ensure coherence and use of best practices in all contexts. The Team consists of experts from the Danish Coastal Authority and the Danish Environmental Protection Agency. The Team provides information on legal issues as well as solutions that include synergies in terms of nitrogen reduction in combination with recreational benefits. The Team also encourages cooperation across municipalities and brings knowledge from other ministries.

6b. The selection of priority adaptation options is based on robust methods (e.g. multi-criteria analyses, stakeholders' consultation, etc.) and consistent with existing decision-making frameworks

Yes / No

The studies and projections referred to in relation to Indicators 3b and 3c form the basis for prioritising adaptation options. Stakeholder consultations form a central part of the policy formulation process as outlined in Section 2a.

At local level, a new tool, PLASK, that calculates the socioeconomic benefits from climate adaptation, has been developed and can be found on the Government web portal[67]. The tool is now being tested in municipalities. The tool calculates the costs of damage in the project area. It is calculated for different land use types in the case of flooding. Historical values of insurance payments are combined with standard values. The tool also incorporates the long-term and short-term investment and maintenance costs of the different flooding prevention structures or solutions. Using this data, the tool executes a cost-benefit analysis to calculate the level of climate adaptation that is optimal to protect the area and discounts the values over the lifespan of the project to provide a net present value of the different solutions/projects. The tool helps users to compare climate adaptation projects better and faster. The distribution of benefits and effects, in addition to economic value, is also shown by the tool. The tool shows different options for achieving the same level of protection against flooding and what the effects are in terms of, for example, biodiversity, energy-efficiency and public health. A new version of the tool will be available in September 2018.

In line with Directive 2007/60/EC on the assessment and management of flood risks, 22 at risk municipalities had to prepare flood risk management plans in order to reduce the flood risk through mitigation and adaptation measures, with the assistance of mapping and data tools from the Government.

[66] Danish Environment and Food Ministry, 2016, Kystanalyse, URL: http://kysterne.kyst.dk/kystanalyse.html

[67] Danish Portal on Climate Change Adaptation. Beregningsværktøj, URL: http://www.klimatilpasning.dk/viden-om/%C3%B8konomi/beregningsvaerktoej.aspx Date accessed: 10/05/2018

The Copenhagen Cloudburst Management Plan is also, for example, based on a rigorous analysis of flood risks and priorities, as well as socio-economic economic assessment and cost-benefit analysis.[68]

6c. Mechanisms are in place to coordinate disaster risk management and climate change adaptation and to ensure coherence between the two policies

Yes / **In progress** /No

There is some evidence that climate impacts and projections are taken into consideration in disaster risk reduction planning. The Danish Emergency Management Agency (DEMA) assists in ensuring knowledge about climate change and extreme weather events is considered in the risk-based design of local Fire and Rescue Service, as well as planning on a local level.

The Danish web portal[69] on adaptation includes information on the link to disaster risk management[70]. The web portal provides information regarding preparedness[71].

The National Risk Profile for Denmark provides a common ground for further coordination of both risk management and climate adaptation considerations. The most recent version of the National Risk Profile was published in January 2017 and explicitly discusses the risks posed by climate change with regard to changing wind patterns, increased sea level, and more frequent extreme weather events among other risks[72].

7. Funding resources identified and allocated

7a. Funding is available to increase climate resilience in vulnerable sectors and for cross-cutting adaptation action

Yes / In progress /No

The NAS outlined funding for the development of socio-economic modelling tools for adaptation in 2008. The NAP outlined a number of funding initiatives, among others: an agreement between the Government and municipalities to increase investment in the wastewater area by DKK 2.5 billion in 2013; DKK 2.7 million for eight projects in which local collaboration partners created solutions for climate adaptation; DKK 60 million set aside for the Environmental Technology Development and Demonstration programme (MUDP) for projects in 2012, where climate adaptation and water was one of five main

[68] City of Copenhagen, 2015, Climate Change Adaptation and Investment Statement. URL: http://kk.sites.itera.dk/apps/kk_pub2/pdf/1499_bUxCjgovgE.pdf

[69] Danish Portal on Climate Change Adaptation, URL: www.klimatilpasning.dk Date accessed: 10/05/2018

[70] Danish Portal on Climate Change Adaptation , Ready and fully prepared - emergency preparedness, Danish Portal on Climate Change Adaptation, Preparedness, http://en.klimatilpasning.dk/technologies/ready-and-fully-prepared-emergency-preparedness.aspx Date accessed: 10/05/2018

[71] Danish Portal on Climate Change Adaptation, Preparedness, URL: http://en.klimatilpasning.dk/sectors/preparedness.aspx Date accessed: 10/05/2018

[72] Danish Emergency Management Agency, 2017, Nationalt Risikobillede, URL: http://brs.dk/viden/publikationer/Documents/Nationalt-Risikobillede-2017-LowRes.pdf

themes; DKK 30 million set aside by the innovation fund for development and market preparation of new generic climate adaptation solutions for export; DKK 122.6 million for green technology in 2013, including adaptation.

Funding is available for financing cross-cutting adaptation action (e.g. national scenarios and climate services, capacity building, website). Information on the various sources (including domestic public finance, private finance, and EU-level funds and grants) is provided on the Government's adaptation web portal[73]. Various funding sources are available to finance adaptation projects, including a number of private funding sources, such as: the MUDP, a subsidy for home owners to conduct renovations; Denmark's Green Investment Fund to co-finance green solutions; the Market Maturation Fund to help develop and market green solutions; and the Innovation Fund that provides grants for the development of knowledge and technology, that leads to the strengthening of research and innovative solutions for the benefit of growth and employment.

In the 2018 budget, money is specifically set aside to support municipalities and property owners to develop coastal protection in connection with climate adaptation between 2018-21.[74] This follows an agreement on the management of coastal adaptation between the sectoral organisation for municipalities and a detailed sectoral analysis by the Coastal Protection Directorate.[75] Some additional funding for related support activities has also been made available following the work of the inter-ministerial committee established to study the issue. Total funding will be approximately DKK 68 million[76].

The Danish Ministry for Environment and Food granted DKK 34.4 million in 2016 to 15 blue-green projects in which municipalities will take care of climate proofing, establish new recreational facilities and ensure better environmental conditions and less nitrogen in the aquatic environment.[77]

Local adaptation projects dealing with watercourses in cities and by roads are most often financed directly by the water utilities and municipalities. Until March 2016, water utilities could cover 100% of the cost of jointly managed projects, but new rules set a maximum of 75% financing by the utility. A governmental assessment shows that this has somewhat slowed investment in these projects[78].The Danish Coastal Authority participates in the EU

[73] Danish Portal on Climate Change Adaptation, Tilskud til klimatilpasning URL: http://www.klimatilpasning.dk/teknologi/tilskud-til-klimatilpasning.aspx Date accessed: 10/05/2018

[74] Ministry of Finance, Aftale om finansloven for 2018, URL: https://www.regeringen.dk/media/4500/aftale-om-finansloven-for-2018.pdf

[75] Local Government Denmark, 1 June 2017, Aftale om kommunernes økonomi for 2018, URL: https://www.kl.dk/ImageVaultFiles/id_85280/cf_202/-konomiaftale_2018.PDF

[76] Ministry of Environment & Food, Ministry of Industry, Business & Financial Affairs, Danish Ministry of Energy, Utilities, and Climate, Faktaark – Oversigt over initiativer vedr. kystbeskyttelse og klimatilpasning, URL: http://efkm.dk/media/11405/faktaark-initiativer-vedr-kystbeskyttelse-og-klimatilpasning.pdf

[77] Danish Ministry of Environment and Food, 21 December 2016, New Nature Solutions Prevent Cities from Flooding, State of Green, URL: https://stateofgreen.com/en/profiles/mim/news/newnature-solutions-prevent-cities-from-flooding

[78] Danish Ministry of Environment and Food, 2017, Evaluering af kommunal klimatilpasning. URL : http://www.klimatilpasning.dk/media/1174683/evalueringsrapport.pdf

Interreg co-financed project on adaptation in the North Sea, 'Building with Nature'[79] with funds from the ERDF. Furthermore, a number of Danish municipalities and stakeholders are participating Interreg adaptation projects,[80] including in (FRAMES)[81] dealing with flood resilience, and TOPSOIL[82] dealing with soil and water resilience.

Finally, several recent LIFE projects in Denmark have adaptation dimensions[83], particularly the Inter-municipal cooperation on 'Water Management and Climate Change Adaptation for The Stream of Usserød'[84] and the Central Denmark Region leads the EU-funded project 'Coast to Coast Climate Challenge', which has a goal of formulating and implementing a coordinated adaptation strategy for the region between 2017 and 2022[85].

Step D: Implementing adaptation action

8. Mainstreaming adaptation in planning processes

8a. Consideration of climate change adaptation has been included in the national frameworks for environmental impact assessments

Yes / No

Recent transposition of the revised Environmental Impact Assessment (EIA) Directive (Law number 448/2017) includes a provision that EIA should assess whether projects impact significantly on climate, and consider climate adaptation. It is unclear what consideration of adaptation is taken in Strategic Environmental Assessment (SEA). The Ministry of Environment and Food is currently developing a guidance document.[86]

8b. Prevention/preparedness strategies in place under national disaster risk management plans take into account climate change impacts and projections

Yes / **No**

According to Section 24 of the Danish Emergency Management Act, ministries and underlying authorities are to plan the retention and continuation of vital societal functions within their sector in the event of accidents and disasters. This obligation includes the timely

[79] Building with Nature, URL: http://www.northsearegion.eu/building-with-nature Date accessed: 10/05/2018
[80] Cooperating on climate adaptation in the North Sea region, URL: http://www.northsearegion.eu/fair/news/cooperating-on-climate-adaptation-in-the-north-sea-region/ Date accessed: 10/05/2018
[81] FRAMES project, URL: http://www.northsearegion.eu/frames/ Date accessed: 10/05/2018
[82] TOPSOIL project, URL: http://www.northsearegion.eu/topsoil/ Date accessed: 10/05/2018
[83] LIFE Programme, Denmark Overivew, 2016, URL: http://ec.europa.eu/environment/life/countries/documents/denmark_en_nov16.pdf Date accessed: 10/05/2018
[84] Usserød Å, URL: http://www.usseroed-aa.dk/ Date accessed: 10/05/2018
[85] Coast to Coast Challenge, URL: http://www.c2ccc.eu/om-c2c-cc/. Date accessed: 8 May 2018.
[86] Danish Ministry of Environment and Food, Miljøvurdering af planer og programmer, URL: http://mst.dk/natur-vand/planlaegning/miljoevurdering-og-vvm/miljoevurdering-af-planer-og-programmer/ Date accessed: 10/05/2018

development of preparedness plans[87]. The plans have to be revised to the extent made necessary by development, and at least once every four years. The municipal and regional councils adhere to the same planning obligation in accordance with Section 25 of the Danish Emergency Management Act.

The Danish Emergency Management Agency (DEMA) coordinates the overall national disaster risk management planning and is responsible for the inspection and counselling of state authorities, municipalities, and regions regarding their general disaster risk management planning and preparedness plans. Plans have to be inspected by the DEMA at least once every four years or once during each municipal and regional parliamentary term.

The DEMA's counselling is based, among other things, on the 'National Risk Profile'[88], which identifies hurricanes, strong storms, coastal flooding, and extreme rainfall as the climate-related risks that pose the greatest threat to Danish society and that need to be paid the closest attention by all authorities with disaster risk management responsibilities.

In addition to the 'National Risk Profile', the DEMA has produced other key guidance documents to support the agency's advisory and regulatory functions. In the guide 'Comprehensive Preparedness Planning'[89], it is recommended that authorities and organisations include all of their critical functions in their disaster risk management planning, and build general capabilities to protect their critical functions and values in the event of any type of accident or disaster, including those that are climate-related.

The guidance also recommends that authorities and organisations keep up-to-date with the current threats to Danish society, as described in the 'National Risk Profile'. In addition, critical functions should be mapped, continual identification and monitoring of threats should be established, and risk and vulnerability analyses should be conducted regularly to create an overview of the threats that constitute the biggest risks to the organisation, as well as the vulnerabilities that the organisation experiences in relation to these threats. Risk and vulnerability analyses can hereby form the basis for implementing counter measures against the identified threats.

The 'National Accident and Disaster Prevention Strategy'[90] emphasises the growing risk of extreme weather phenomena and the ever more complex climate-related challenges facing Danish society. The Strategy also underlines the need to initiate preventive measures and develop resilience amongst the general population, as well as among authorities with disaster risk management responsibilities. The Strategy contains a number of examples of prevention projects, for instance, concerning municipal climate plans.

In Denmark, the primary focus is on building general disaster risk management capabilities and preparedness plans that can be used in connection with a wide range of incidents; this is reflected in the National Preparedness Plan. The DEMA has noted that several government authorities, municipalities and regions are inspired by the 'National Risk Profile' in their

[87] URL: http://brs.dk/eng/legislation/act/Pages/the_emergency_management_act.aspx
[88] URL: https://brs.dk/viden/publikationer/Documents/National%20Risk%20Profile%20for%20Denmark.pdf
[89] URL: http://brs.dk/eng/Documents/Comprehensive_Preparedness_Planning.pdf
[90] URL: http://brs.dk/viden/publikationer/Documents/National-forebyggelsesstrategi-2017.pdf

disaster risk management planning and have developed preparedness plans that specifically focus on climate-related accidents and disasters.

The DEMA is currently working on operationalizing the climate-related challenges in the 'National Risk Profile' through the development of climate-related scenarios that are meant to form a basis for climate-related disaster risk management planning and exercises. Another purpose of the climate-related scenarios is facilitating the DEMA's supervision and counselling activities in relation to the size, scope and development of the municipal fire and rescue services. The overall purpose of the project and the operationalisation of the 'National Risk Profile' is to increase the resilience of the municipal fire and rescue services by strengthening cohesion and the utilisation of capabilities more optimally in dealing with complex climate-related accidents and disasters. This requires cooperation between the national and the municipal fire and rescue services.

8c. Key land use, spatial planning, urban planning and maritime spatial planning policies take into account the impacts of climate change

Yes / No

The Planning Act and associated guidance was amended in June 2012, so that municipalities could address climate adaptation directly in local development/land-use plans. The ability of wastewater companies to invest in climate adaptation was clarified by an amendment to the Water Sector Act in Spring 2012. This is important because water management companies are separate entities from the municipalities. Since most adaptation policies in Denmark are associated with water management, it was important to clarify the institutional responsibilities, capabilities and funding options of the water utilities and the municipal administrations with regard to adaptation[91].

In response to the EU Floods Directive, Denmark implemented a flooding risk assessment. The 22 municipalities identified as being in the 10 areas at high risk of flooding were subsequently required to develop flood risk management plans to establish areas where new building should be avoided and plans for flood protection measures[92]. These flood risk management plans should be revised every six years.

Changes to the Planning Act were adopted in April 2018. With the changes in place, municipalities have to revise or develop local flood and erosion risk maps and adopt guidelines for flood response measures[93]. The Coastal Authority will provide a national map

[91] Krausing, Jarl., Madsen, Simone., Jørgensen, Sune., 2017, Robusthed i kommunale klimatilpasningsplaner, Concito. URL: https://concito.dk/udgivelser/robusthed-kommunale-klimatilpasningsplaner

[92] Danish Coastal Protection Authority, Oversvømmelsesdirektivet, URL: http://kysterne.kyst.dk/oversvoemmelsesdirektivet.html Date accessed: 10/05/2018

[93] Personal communication with MS contact.

of these risks in coastal areas to help in the planning process[94] and the DMI has provided a Climate Atlas and future climate scenarios based on IPCCs 5th Assessment Report.

Copenhagen, among other cities, has a detailed plan for the city's future urban planning with adaptation at its core[95]. Approximately 300 specific projects addressing adaptation are proposed, and a 'climate-resilient neighbourhood' is being developed as a demonstration project with adaptation built into every aspect of its design[96].

8d. National policy instruments promote adaptation at sectoral level, in line with national priorities and in areas where adaptation is mainstreamed in EU policies

Yes / **In progress** / No

The primary implementation instruments have focused on coastal and flood protection at municipal level as outlined in relation to Indicator 8c. The sectoral organisation for municipalities negotiates a financial agreement with the Government every year. This agreement often outlines the specific details and requirements of climate adaptation policy for a given year. The most significant steps, such as the municipal plans, and changes to the planning laws were made in response to the NAP.

A wide number of laws now include consideration of adaptation, particularly:[97]

- Water Sector Law
- Act on Watercourses
- Flood Protection Act
- Coastal Protection Act
- Nature Protection Act
- Environmental Goals Act
- Act on payment rules for wastewater supply companies
- Roads Act
- Emergency Management Act
- Planning Act

The Ministry of Transport is working with the municipalities, in line with their climate action plans, to improve the design of roads where necessary.[98] The Ministry undertakes regular risk analysis and includes adaptation in EIAs for all major infrastructure projects.

[94] Regeringen vil styrke kyst- og klimasikring af Danmark, 17/08/2017, Press Release: Ministry of Industry, Business & Financial Affairs, URL: https://em.dk/nyheder/2017/08-17-kystbeskyttelse Date accessed: 10/05/2018

[95] City of Copenhagen, 2015, Climate Change Adaptation and Investment Statement. URL: http://kk.sites.itera.dk/apps/kk_pub2/pdf/1499_bUxCjgovgE.pdf

[96] The Climate Resilient Neighbourhood Østerbro, URL: http://klimakvarter.dk/en/om/ Date accessed: 30/05/2018

[97] Krausing, Jarl., Madsen, Simone., Jørgensen, Sune., 2017, Robusthed i kommunale klimatilpasningsplaner, Concito. URL: https://concito.dk/udgivelser/robusthed-kommunale-klimatilpasningsplaner

8e. Adaptation is mainstreamed in insurance or alternative policy instruments, where relevant, to provide incentives for investments in risk prevention

Yes / No

There is clear awareness of the role to be played by insurance, which is mentioned in the NAS, and is well covered by the Danish adaptation portal.[99]

Many insurance companies offer a discount if policyholders make investments in risk prevention. If the damage occurs, policyholders can apply for compensation from the Danish Storm Council[100]. The Danish Storm Council handles cases concerning three types of natural catastrophes: storm surge, flooding from waterways and lakes and windfall.

The trade organisation for insurance has collected a variety of data and information on climate damage, which is presented on their homepage on climate adaptation.

9. Implementing adaptation

9a. Adaptation policies and measures are implemented, e.g. as defined in action plans or sectoral policy documents

Yes / **In progress** / No

The NAP presented 64 initiatives: 62 are either planned or implemented; two have been cancelled. An overview of implementation has not been published.

All 98 municipalities have adopted adaptation plans as required. Practical implementation has begun but it is uneven. For example, at the time of evaluation in 2016, many municipalities did not have a detailed implementation plans or financial analysis of planned measures. Some have not addressed guidelines for new buildings in at risk areas. Practical cross-boundary cooperation is still not in place in many municipalities and coordination is often lacking.[101] Lack of financing and complex rules may hold back investments in some areas, as most investment in adaptation measures is still decided locally.[102] Implementation of adaptation measures is also still hindered by a lack of coordination and certainty at municipal level,[103]

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[98] Danish Government Adaptation Portal, Veje, http://www.klimatilpasning.dk/sektorer/transport/veje.aspx Date accessed: 10/05/2018

[99] Danish Government Adaptation Portal, Insurance, URL: http://www.klimatilpasning.dk/sektorer/forsikring.aspx

[100] The Danish Storm Council, URL: https://www.danishstormcouncil.dk/artikler/danishstormcouncil/about-the-danish-storm-council/what-is-the-danish-storm-council/ Date accessed: 10/05/2018

[101] Danish Ministry of Environment and Food, 2017, Evaluering af kommunal klimatilpasning. URL : http://www.klimatilpasning.dk/media/1174683/evalueringsrapport.pdf

[102] Krausing, Jarl., Madsen, Simone., Jørgensen, Sune., 2017, Robusthed i kommunale klimatilpasningsplaner, Concito, URL: https://concito.dk/udgivelser/robusthed-kommunale-klimatilpasningsplaner

[103] Krawack, Susanne, 2014,, Evaluering af regelsættet for klimatilpasning, Concito, URL: https://concito.dk/files/dokumenter/artikler/klimatilpasning_lovgivning_-_m_rettelser_28.08.14.pdf

and varying levels of political engagement with the issue.[104] Nonetheless, a large number of projects have been implemented across the country, and the situation has improved significantly since the introduction of the NAP.

9b. Cooperation mechanisms in place to foster and support adaptation at relevant scales (e.g. local, subnational)

Yes / No

Central to climate adaptation efforts is a strong interaction between state and municipalities. A new national Mobile Team with a focus on flooding and erosion has been established by the MEF to help share knowledge, best practices and enhance cooperation, primarily with municipalities.[105]

A formal municipal climate adaptation network exists to help share knowledge and solutions between municipalities.[106]

'Water in Urban Areas' is an "innovation network" of knowledge institutions, government agencies, utilities and private companies. Its aim is to develop, document and present climate adaptation technologies and associated planning tools for transformation of existing urban areas in Denmark.[107] At the same time, Water in Urban Areas supports network members in developing their export potential to climate adaptation for the rest of Europe and the world. The network is funded by the Danish Agency for Science, Technology, and Innovation.

See Section A2 and B2, for details of regional cooperation. Nonetheless, several studies (see Indicator 9a) have pointed to the need for enhanced cooperation at local and regional level, as practical cooperation between municipalities is still not as widespread as it should be, given the stated aims of the NAP. One study for example found that 42% of municipalities were still not cooperating, or considering cooperation with other municipalities regarding their adaptation plans and challenges.[108]

[104] Jensen, A., Nielsen, H.Ø. & Nielsen, M.L, 2016, Climate adaption in local governance: Institutional barriers in Danish municipalities, Aarhus University, DCE – Danish Centre for Environment and Energy, 102 pp. Scientific Report from DCE – Danish Centre for Environment and Energy No. 104 URL: http://dce2.au.dk/pub/SR104.pdf

[105] Danish Government Adaptation Portal, Rejseholdet, URL: http://www.klimatilpasning.dk/rejseholdet.aspx Date accessed: 10/05/2018

[106] Kommunernes Klimatilpasningsnetværk. URL: http://www.kl.dk/Kommunale-opgaver/Teknik-og-miljo/Vand/Kommunernes-Klimatilpasningsnetvaerk/ Accessed 08/05/2018

[107] Water in Urban Areas: Innovation network for Climate Adaptation, URL: http://vandibyer.dk/english/ Date accessed: 10/05/2018

[108] Krausing, Jarl., Madsen, Simone., Jørgensen, Sune., 2017, Robusthed i kommunale klimatilpasningsplaner, Concito, URL: https://concito.dk/udgivelser/robusthed-kommunale-klimatilpasningsplaner

9c. Procedures or guidelines are available to assess the potential impact of climate change on major projects or programmes, and facilitate the choice of alternative options, e.g. green infrastructure

Yes / **No**

Procedures and guidelines to assess the potential impact of climate change on major projects or programmes are mentioned in the NAS. Guidelines are continuously being developed by the Mobile Team to help municipalities to start the implementation of initiatives identified in the climate adaptation plans.

9d. There are processes for stakeholders' involvement in the implementation of adaptation policies and measures

Yes / No

A number of networks exist to involve stakeholders (municipalities, regions, universities, companies, NGOs & other civil society organisations) in the implementation of adaptation policies and measures. These include: Water in Urban Areas (see Indicator 9b); the regional cooperation projects (see Sections A2 and B2); CLEAN, a cluster for green technology enterprises to share knowledge, work together and find "green" solutions including to adaptation challenges[109]; the Danish Water Forum[110]; Danish Industry's Adaptation Network[111]; Innovation Network for Environmental Technologies (Inno-MT)[112]; and the now concluded partnership, 'Water from the Country'[113].

One clear example of stakeholder engagement in the implementation of adaptation-related policy is in the creation of river basin management plans (RBMP). In 2014, the Government created 23 water councils, involving a number of stakeholders (agricultural, industrial organisations, NGOs, water companies, hunters and anglers' associations) to advise local authorities on these plans.[114]

[109] CLEAN, URL: https://www.cleancluster.dk/hvem-er-clean/ Date accessed; 10/05/2018
[110] Danish Water Forum, http://www.danishwaterforum.dk/ Date accessed; 10/05/2018
[111] DI's Netværk om klimatilpasning, URL: http://di.dk/Shop/Netvaerk/Produktside/Pages/Produktside.aspx?productId=9319 Date accessed; 10/05/2018
[112] Innovation Network for Environmental Technologies (Inno-MT), https://inno-mt.dk/english/ Date accessed; 10/05/2018
[113] Vandet fra Landet, URL : http://www.klimatilpasning.dk/vandet-fra-landet.aspx Date accessed; 10/05/2018
[114] Graversgaard, M., Jacobsen, B., Kjelsen, C., Dalgaard, T., 2017, Stakeholder Engagement and Knowledge Co-Creation in Water Planning: Can Public Participation Increase Cost-Effectiveness?, Water 9(3):191, URL: http://static-curis.ku.dk/portal/files/192036307/water_09_00191.pdf

Step E: Monitoring and evaluation of adaptation activities

10. Monitoring and reporting

10a. NAS/NAP implementation is monitored and the results of the monitoring are disseminated

Yes / **No**

No monitoring is ongoing with regard to the 62 of the 64 initiatives in the NAP that have been implemented (two were cancelled). The results of initial monitoring were disseminated to the participating ministries. Nevertheless, no overview of implementation has been published.

10b. The integration of climate change adaptation in sectoral policies is monitored and the results of the monitoring are disseminated

Yes / **No**

No systematic monitoring of results of sectoral policies is conducted or disseminated.

10c. Regional-, subnational or local action is monitored and the results of the monitoring are disseminated

Yes / No

Subnational adaptation actions are monitored centrally rather than by the subnational administrations themselves.

In the period February to August 2016, a cross-ministerial working group carried out an evaluation of the municipal climate adaptation efforts. The evaluation (which was published in 2017)[115] of all 98 municipalities' climate adaptation plans showed that all municipalities had adopted adaptation plans but that the level of detail and themes covered were uneven.

The Danish adaptation web portal compiles a wide range of adaptation information at central and municipal levels[116]. Many municipal websites contain information about the local climate adaptation measures.

11. Evaluation

11a. A periodic review of the national adaptation strategy and action plans is planned

Yes / No

[115] Danish Ministry of Environment and Food, 2017, Evaluering af kommunal klimatilpasning, URL: http://www.klimatilpasning.dk/media/1174683/evalueringsrapport.pdf

[116] Danish Government Adaptation Portal, Kommunekort, URL: http://www.klimatilpasning.dk/kort/kommunekort.aspx Date accessed: 10/05/2018

Currently there is no systematic evaluation and review framework in place but there are *ad hoc* reviews based on findings of evaluations. The Government is expected to continuously take stock of the progress of the initiatives in the action plan and is expected to assess whether or not a review is needed.

A review of the NAP took place in 2013 and 2015 in an inter-ministerial process.

11b. Stakeholders are involved in the assessment, evaluation and review of national adaptation policy

Yes / **No**

There is no systematic involvement of stakeholders in the monitoring, evaluation and review of NAP actions.

SUMMARY TABLE

Adaptation Preparedness Scoreboard		
No.	**Indicator**	**Met?**
Step A: Preparing the ground for adaptation		
1 Coordination structure		
1a	A central administration body officially in charge of adaptation policy making	**Yes** / No
1b	Horizontal (i.e. sectoral) coordination mechanisms exist within the governance system, with division of responsibilities	Yes / **In progress** / No
1c	Vertical (i.e. across levels of administration) coordination mechanisms exist within the governance system, enabling lower levels of administration to influence policy making.	Yes / **In progress** / No
2 Stakeholders' involvement in policy development		
2a	A dedicated process is in place to facilitate stakeholders' involvement in the preparation of adaptation policies	**Yes** / No
2b	Transboundary cooperation is planned to address common challenges with relevant countries	**Yes** / No
Step B: Assessing risks and vulnerabilities to climate change		
3 Current and projected climate change		
3a	Observation systems are in place to monitor climate change, extreme climate events and their impacts	Yes / **In progress** / No
3b	Scenarios and projections are used to assess the economic, social and environmental impacts of climate change, taking into account geographical specificities and best available science (e.g. in response to revised IPCC assessments)	**Yes** / In progress / No
3c	Sound climate risks/vulnerability assessments for priority vulnerable sectors are undertaken to support adaptation decision making.	Yes / **In progress** / No
3d	Climate risks/vulnerability assessments take transboundary risks into account, when relevant	Yes / **In progress** / No

Adaptation Preparedness Scoreboard		
No.	**Indicator**	**Met?**
4 Knowledge gaps		
4a	Work is being carried out to identify, prioritise and address the knowledge gaps	**Yes** / In progress / No
5 Knowledge transfer		
5a	Adaptation relevant data and information is available to all stakeholders, including policy makers (e.g. through a dedicated website or other comparable means).	**Yes** / In progress / No
5b	Capacity building activities take place; education and training materials on climate change adaptation concepts and practices are available and disseminated	**Yes** / In progress / No
Step C: Identifying adaptation options		
6 Identification of adaptation options		
6a	Adaptation options address the sectoral risks identified in 3c, the geographical specificities identified in 3b and follow best practices in similar contexts	**Yes** / No
6b	The selection of priority adaptation options is based on robust methods (e.g. multi-criteria analyses, stakeholders' consultation, etc.) and consistent with existing decision-making frameworks	**Yes** / No
6c	Mechanisms are in place to coordinate disaster risk management and climate change adaptation and to ensure coherence between the two policies	Yes / **In progress** /No
7 Funding resources identified and allocated		
7a	Funding is available to increase climate resilience in vulnerable sectors and for cross-cutting adaptation action	**Yes** / In progress /No
Step D: Implementing adaptation action		
8 Mainstreaming adaptation in planning processes		
8a	Consideration of climate change adaptation has been included in the national frameworks for environmental impact assessments	**Yes** / No

Adaptation Preparedness Scoreboard		
No.	**Indicator**	**Met?**
8b	Prevention/preparedness strategies in place under national disaster risk management plans take into account climate change impacts and projections	Yes / **No**
8c	Key land use, spatial planning, urban planning and maritime spatial planning policies take into account the impacts of climate change	**Yes** / No
8d	National policy instruments promote adaptation at sectoral level, in line with national priorities and in areas where adaptation is mainstreamed in EU policies	Yes / **In progress** / No
8e	Adaptation is mainstreamed in insurance or alternative policy instruments, where relevant, to provide incentives for investments in risk prevention	**Yes** / No
9 Implementing adaptation		
9a	Adaptation policies and measures are implemented, e.g. as defined in action plans or sectoral policy documents	Yes / **In progress** / No
9b	Cooperation mechanisms in place to foster and support adaptation at relevant scales (e.g. local, subnational)	**Yes** / No
9c	Procedures or guidelines are available to assess the potential impact of climate change on major projects or programmes, and facilitate the choice of alternative options, e.g. green infrastructure	Yes / **No**
9d	There are processes for stakeholders' involvement in the implementation of adaptation policies and measures.	**Yes** / No
Step E: Monitoring and evaluation of adaptation activities		
10 Monitoring and reporting		
10a	NAS/NAP implementation is monitored and the results of the monitoring are disseminated	Yes / **No**
10b	The integration of climate change adaptation in sectoral policies is monitored and the results of the monitoring are disseminated	Yes / **No**
10c	Regional-, subnational or local action is monitored and	**Yes** / No

Adaptation Preparedness Scoreboard		
No.	**Indicator**	**Met?**
	the results of the monitoring are disseminated	
11 Evaluation		
11a	A periodic review of the national adaptation strategy and action plans is planned	**Yes** / No
11b	Stakeholders are involved in the assessment, evaluation and review of national adaptation policy	Yes / **No**