ENHANCING ADAPTATION ACTION IN TURKEY PROJECT

TR2017 ESOP MI A3 04

CLIMATE-ADAPTATION PLATFORMS IN THE EUROPEAN UNION AND THE MEMBER STATES AND RECOMMENDATIONS FOR TURKEY

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REPUBLIC OF TURKEY
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Enhancing Adaptation Action in Turkey

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LIST OF ABBREVIATIONS

EU	European Union
EEA	European Environment Agency
CAS Foundation	Climate Adaptation Services Foundation
GIS	Geographic Information System
CVI	Coastal Vulnerability Index
DG-CLIMA	European Commission Directorate-General for Climate Action
DMI	Danish Meteorological Institute
DNA	Danish Nature Agency
DSI	State Hydraulic Works
ETC/CCA	European Topic Centre on Climate Change Impacts, Vulnerability, and Adaptation
ICLEI	Local Governments for Sustainability
OGC	Open Spatial Consortium
SOA	Service-Oriented Architecture
TRGIS	Turkey National Geographic Information System
TUDES	Turkey National Sea Level Monitoring System
TAMBIS	Flood, Failure, and Response Spatial Information System
TARBIL	Agricultural Monitoring and Information System

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EXECUTIVE SUMMARY

With the development of climate adaptation policy and actions, the importance of accessing scientifically validated and reliable content for stakeholders has been becoming more important. For contents to be effectively collected, processed, and used in decision-making mechanisms, the members of the European Environment Agency introduced web-based platforms. Such platforms, established by members of EEA, are at the center of national and local climate adaptation policies and actions and serve as a guide for decision-makers. All data and information on climate adaptation across the country appear in such platforms as entries, and users are able to be informed of contents that have been produced by other stakeholders. The tools on the platforms help spread adaptation actions to the local level and serve as a guide particularly for adaptation actions that local decision-makers will undertake. Serving as a one-stop-shop, such platforms collect all content produced countrywide in a single resource and make available all the national climate adaptation action and database to stakeholders.

Climate adaptation actions are undertaken by various stakeholders (government agencies, non-governmental organizations, universities, etc.) in Turkey. The national adaptation platform that will be established will serve as a one-stop-shop for climate adaptation action where information and data related to climate adaptation are collected. The main purpose of establishing such a platform is to facilitate collecting, sharing, and using data about the impact of climate change, vulnerability, and adaptation actions as well as creating a long-term database. The platform will help Turkey to develop climate adaptation policies and bridge the gap in the dialogue between decision-makers and governmental or non-governmental stakeholders paving the way for effective implementation.

The first two chapters of the Report describe the platforms of EEA member countries, with an in-depth examination of the Danish, Dutch Spatial Adaptation Platform and Climate-ADAPT in terms of web content, technical infrastructure and management, and covering also the common and distinctive features of all EEA members' national adaptation platforms, monitoring & evaluation and funding mechanisms, publicity strategies and climate services on the platforms. The Report intends to exhaustively cover all EEA members' platforms, and its chapters are drafted using the national adaptation platforms published by EEA, Climate-ADAPT reports, and information on the websites of all platforms with references.

The final chapter of the Report aims to guide Turkey's National Adaptation Platform to be established. The recommendations were given in line with the platform solutions of the EEA members. Additionally, this chapter primarily addresses how the national platform that will be established can work in integration with such other platforms actively used in Turkey as TRGIS infrastructure and ATLAS application. The final chapter also includes challenges that may be faced during the establishment of this platform, operationalization and sustainability, information gaps and communication problems among stakeholders addressed in the section on Turkey, as well as the steps that should be taken to overcome such problems. Two major problems (obtaining data from public agencies, infrastructure, and funding of the platform) that may be experienced in the establishment of the platform and have sustainability implications are treated separately. Finally, recommendations are provided on the architecture of the national adaptation platform, derived from a review of platform architectures implemented and associated challenges experienced by EEA members.

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1.   INTRODUCTION

Analyzing countries at the national level, it is seen that climate adaptation is approached as a policy area that has steadily been improving and developing by countries. Many countries in Europe have formulated climate adaptation strategies, set the administrative groundwork, conducted climate change risk and vulnerability analysis completed the first phases of the adaptation-policy cycle and moved on to the policy development phase to monitor and evaluate the implementation and activities of adaptation strategies. For adaptation policy development processes to be effective, it is of major importance that information can be effectively used by all stakeholders. Accordingly, web-based adaptation platforms have been established to raise awareness on the necessity of climate adaptation, fill information gaps, and enabling the use of data and information on climate change in decision-making mechanisms to collect existing content on a one-stop repository (Karali and Mattern, 2017).

In this context, EEA members support and develop the aforementioned web-based adaptation platforms specially to develop and implement climate adaptation strategies and action plans. Analyzing such platforms, it can be seen that the immediate function for most is to serve as a one-stop repository for decision-makers who take measures against the impact of climate change and develop adaptation strategies, and for entities which support decision-makers. Besides, bringing sectors and contents produced by these sectors together, such platforms can avert potential problems that may be faced because of the intersectoral nature of risks caused by climate change and measures to be taken against such risks. Another benefit of such platforms is to avert the production of the same data by different institutions and sharing inconsistent information released by different sources (EEA, 2015).

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2.   EUROPEAN CLIMATE ADAPTATION PLATFORM (Climate-ADAPT)

> - The European Climate Adaptation Platform (Climate-ADAPT) was established in 2012 to provide access for all stakeholders to collected content on climate change adaptation and support decision-makers by serving as a one-stop repository.
>
> - While the priority target group of the platform is decision-makers, entities which support decision-making mechanism at national and local levels are also defined as the target groups of this platform.
>
> - To be able to serve as a one-stop-shop for climate adaptation as a reliable source of information, only contents coming from verified users who have Eionet account are accepted.

The broad scope and intertwinement of climate adaptation issues cause some problems to the government, local authorities, private sector, university, civil society, researchers, and the general public access to accurate information. Accordingly, as one of the priority areas of EU adaptation strategy, a web-based European Climate Adaptation Platform (Climate-ADAPT[1]) was established in 2012 in the partnership of the European Commission and Europe Environment Agency to enable access by a wide range of user groups to share information and facilitate decision-makers on adaptation strategies (EEA, 2018). Climate-ADAPT is governed by EEA in collaboration with the European Commission.

Not only does Climate-ADAPT enable the sharing of information about the expected impact of climate change on European countries, regions, sectors, and cities which have been or will be most affected by climate change, but also provides interaction opportunities in the fields of national and transnational adaptation strategies among users, case studies, potential adaptation methods for climate change and methods for developing climate adaptation plans at various geographical scales.

The users can access general information on climate adaptation, sectoral information, studies on national and transnational regions, case studies, projects, summaries of climate adaptation efforts of countries in such platforms. Moreover, such tools as the Adaptation Support Tool[2], Case Study Search Tool, and Uncertainty Guidance[3] on the platform help developing an adaptation strategy for decision-makers as well as provide information and guidance. The database of the website is designed in a way that users can easily search for and access information that has been checked and verified by experts in their fields.

In this context, the objectives of the European Climate Adaptation Platform may be defined as (EEA, 2014):

- Collect information on the impact of climate change, vulnerability, and adaptation options, relay accurate information to stakeholders and use such information to adapt to climate change,

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[1] For more detailed information, you can access through the link given to Europe Climate Adaptation Platform website. https://climate-adapt.eea.europa.eu/

[2] Website: https://climate-adapt.eea.europa.eu/knowledge/tools/adaptation-support-tool

[3] Climate Adaptation is a complex methodological phenomenon including several components. This situation may lead decision-makers to make a deficient decision or a decision without considering the results of the potential changes which may be faced in the future. Uncertainty Guidance is designed to guide decision-makers during decision-making phase. Website: https://climate-adapt.eea.europa.eu/knowledge/tools/uncertainty-guidance.

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- Establish a permanent database that will be continuously updated,

- Enable decision-makers to easily access accurate information produced to adapt to the impact of climate change

- Contribute to and develop coordination in adaptation activities at the sectoral and institutional level.

Climate-ADAPT was developed as a complementary platform for other adaptation platforms of EEA members (EEA, 2013). That is why all parties were included in the process during the establishment of the platform. Services covering entire Europe such as Copernicus Climate Change Service which is the observation institution for climate change of the European Union were incorporated into the platform which was mandated to serve all countries. The European Commission and the European Environment Agency collaborate continuously to enhance access to information and sustain communication between Climate-ADAPT and other related stakeholders effectively (EEA, 2019).

2.1. Platform's structure

Climate-ADAPT consists of two main components as **web content** and **database**. These two components work in a coordinated manner for reliable information and data on climate adaptation to be collected and users' easy access.

2.1.1. Web content

Web content, the first component of the platform, focuses on providing information and data on climate adaptation to EEA members. As seen in Figure 1, web content contains four different tabs in the main navigation bar: 1) EU Policy, 2) Countries, Transnational Regions, Cities, 3) Knowledge, and 4) Networks.

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Figure 1 Climate-ADAPT Home Page

EU Policy tab reflects Europe's perspective of climate adaptation in accordance with the EU Adaptation Strategy, providing information on the Covenant of Mayors for Climate and Energy including different policy sectors, fund opportunities, and Mayors Adapt on climate adaptation which is an urban climate adaptation initiative of the European Union.

Countries, Transnational Regions, and Cities tab provides information on climate adaptation actions for different government levels (transnational, national, and local governments).

Knowledge tab provides information and authority tools for steps of the adaptation-policy cycle.

Networks tab aims at developing cooperation by providing various relationships to such key partners as all institutions at the governance level, global platforms, universities, non-governmental organizations, etc.

In addition to the four main components, there is an "**About**" tab on the main navigation bar. Under 'About' tab, users find opportunities to receive information on the platform and how to use it, access published web-based seminars, and view accessible content on the platform (EEA, 2019).

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2.1.2. Management of Platform

Climate-ADAPT is managed by the European Environment Agency and the Directorate-General for Climate Action/DG CLIMA of the European Commission. The roles and responsibilities of such entities vary as indicated in Figure 2.

According to the Climate-ADAPT Strategy published in 2019 (Climate-ADAPT Strategy 2019-2021), EEA provides human and financial resources to the platform in general. In this context, EEA is responsible for the platform's maintenance, updating information content and platform, analyzing projects, and approving such contents in conformity with Climate-ADAPT's criteria. Being an international consortium as well as working with EEA, experts of the European Topic Centre on Climate Change Impacts, Vulnerability, and Adaptation – ETC/CCA[4] assist EEA in fulfilling such responsibilities. DG CLIMA provides financial support to bring new functions on the platform and also provides new information content to the platform as the outputs of the projects it has funded (Climate-ADAPT, 2019)

Furthermore, there is a permanent advisory group to support Climate-ADAPT's management. The main function of this advisory group is to address the development strategy of the platform. Accordingly, while the advisory group advises on the platform's content and the way how the existing information would be presented to users, it also helps in terms of required revisions for the EU's current adaptation strategy and determining priorities aimed at climate adaptation. The advisory group gathers two or three times a year to fulfill the aforementioned tasks (Climate-ADAPT, 2019).
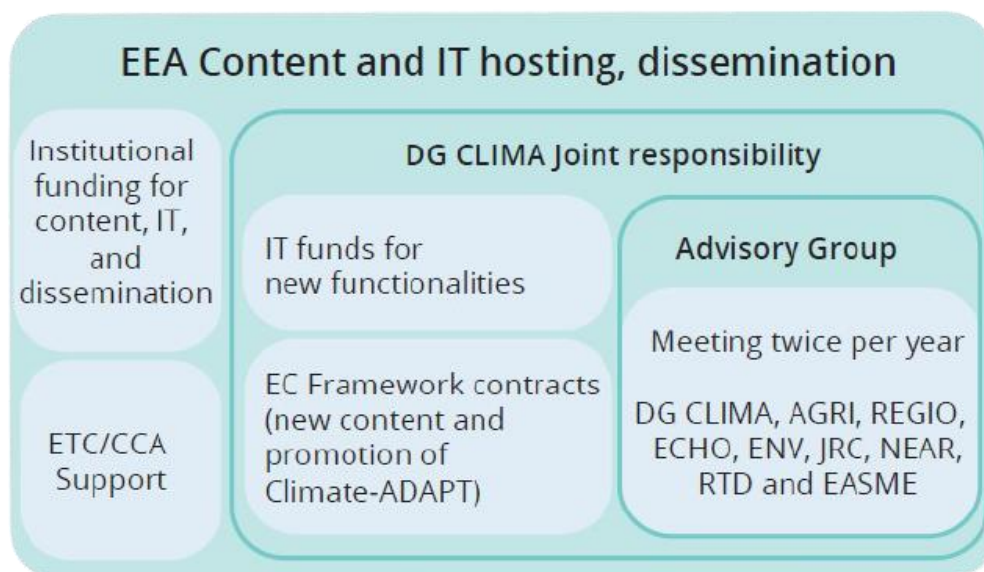
Figure 2 Climate-ADAPT Management Scheme (Climate-ADAPT, 2019).

2.1.3. Platform's target group

The platform has two main target groups. The first target group is directly the decision-makers. The other target group, however, is entities that support decision-making mechanisms in respect of developing, implementing and evaluating climate adaptation strategies, plans and actions of the

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[4]Website: https://www.eionet.europa.eu/etcs/etc-cca

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European Union at transnational, national and local government levels (EEA, 2018). Although designed for the specified first target groups, the platform currently appeals to a large user group including the private sector, non-governmental organizations, researchers and the general public.

Climate-ADAPT geographically embodies 33 European Environment Agency members, including 28 EU members and Iceland, Lichtenstein, Norway, Sweden and Turkey (EEA, 2019).[5]

2.1.4. Platform's main information and content providers

A systematic control mechanism has been created in Climate-ADAPT to keep up with climate adaptation knowledge which comes uninterruptedly into the service and grows steadily in terms of content. There are experts of EEA and ETC/CCA who are the main focal points in of management of the platform as well as the platform's information providers (Climate-ADAPT, 2019). Climate-ADAPT's main information and content providers are countries, transnational organizations/conventions, networks of cities/Covenant of Mayors, researchers/academicians, general directorates and other stakeholders.

Countries

EU members officially present climate adaptation reports according to the Monitoring Mechanism Regulation (MMR)[6] Article 15[7] (EU, 2013). The European Commission uses the information provided by countries to update the page contents of Country Information involved in Climate-ADAPT. Moreover, EEA members may voluntarily provide information to the platform in addition to MMR reports (EEA, 2019).

Transnational organizations/conventions

European Environment Agency provides information to Transnational Regions subtab in Climate-ADAPT which explains climate adaptation actions undertaken in transnational regions within EU borders and the political framework of such actions as well as updating this tab regularly. In this context, the information flow of climate adaptation actions is provided by transnational regions (EEA, 2019).

Networks of Cities and Covenant of Mayors

Such networks of cities at the European level as Local Governments for Sustainability/ICLEI share information on urban adaptation included in the Climate-ADAPT database and their structures regularly. Besides, uniting with the Covenant of Mayors for Climate and Energy, the Covenant of Mayors Initiative for Climate Adaptation (Mayors Adapt) developed the Urban Adaptation Support Tool/UAST in 2015.

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[5] Turkey applied for membership in June 1999; the Agreement was published in the Official Gazette of 18 March 2003 issue 25052, and Turkey became a full member to European Environment Agency on 1 May 2003.

[6] European Union Greenhouse Gas Monitoring Mechanism Regulation of 2013 lays down the European Union's internal reporting rules based on internationally recognised reporting obligations.

[7] MMR Article 15 focuses on 'reporting on national adaptation actions' and requires specifically that "[…] Member States shall report to the Commission information on their national adaptation planning and strategies, outlining their implemented or planned actions to facilitate adaptation to climate change. That information shall include the main objectives and the climate change impact category addressed, such as flooding, sea level rise, extreme temperatures, droughts, and other extreme weather events."

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Researchers/academicians

Individual researchers who are generally in the EU-funded research projects upload their studies and project output in the scope of such projects to the Climate-ADAPT database and share such knowledge through the platform. Such documents which passed Climate-ADAPT's content control mechanism[8] and uploaded on the platform are categorized in Knowledge-Research Projects subtab on the platform. Besides, project representatives who have been funded by countries' national resources also upload project outputs and achievements to the Climate-ADAPT database (EEA, 2019).

General Directorates

The European Commission DG CLIMA and other general directorates of the European Commission upload information on climate adaptation in their organization and their project outputs to Climate-ADAPT database. General directorates play an important role in especially updating the EU's sectoral climate adaptation policy content (Climate-ADAPT, 2019).

Other stakeholders

Every stakeholder (decision-maker entities, local/regional authorities, non-governmental organizations, academicians, the business community, etc.) which has created a European Environment Information and Observation Network/Eionet[9] account may upload any product (publications and reports, guidance documents, tools, research projects and their outputs, case studies) relating to climate adaptation action through "Share your information" page to Climate-ADAPT database (EEA, 2019).

2.2. Platform's content and functions

Instead of serving only as a data and information repository, Climate-ADAPT acts as a platform where many sources (public entities, non-governmental organizations academicians, etc.) that provide information may enter data. As a result, the content of the platform consists of a compilation of data and information that are available in many external sources.

When analyzed, it can be seen that the platform contents uploaded from various sources across Europe are categorized systematically under various thematic areas. Such a systematic approach ensures Climate-ADAPT is a 'user-friendly' platform enabling users' easy access to accurate information.

The platform serves as a **one-stop-shop** for Europe's climate adaptation action where the flow of information is provided, and a wide range of information verified for entire Europe in the area of climate adaptation is collected. EEA aims to be the **first stop shop** to access the climate adaptation information Europewide by widening the ''one-stop-shop'' mission in the future. In this way, Climate-ADAPT will be the first reliable source in the EU's legal entity for the provision of any kind of data and information on climate adaptation (Climate-ADAPT, 2019).

2.2.1. Content sharing and classification criteria on the platform

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[8] Climate-ADAPT's content phases are explained in Figure 5.

[9] Eionet is a common network consisting of EEA members and countries with which it cooperates. EEA controls dissemination of reliable data approved by national institutions collected via Eionet. Eionet sets the basis for integrated environmental data and evaluations distributed via EEA.

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Content providers stated in 2.1.4 are able to input content to the platform through Eionet accounts under specific standards. EEA only accepts data coming from users who have Eionet accounts to make sure that the platform remains a reliable source of information. The next steps are organizing, classifying, and putting the contents which are taken from many sources and have different formats into service with a user-friendly interface; thus, by making users' access to information easier, a user-friendly platform is offered. Analyzing Figure 3, it can be seen that Climate-ADAPT enables sharing by classifying through its ''Share your information'' page to be able to classify the contents that users uploaded to the right thematic area.

Figure 3 Climate-ADAPT Content Sharing Page

Another important factor to classify content accurately and facilitate access to information that users need is to specify the contents' metadata correctly before public access. Metadata is information that introduces the attributes and content and increases the usability of shared knowledge or data. It confirms the content's accuracy and availability for users as well as facilitating data sharing. The accurate description of metadata plays a big role in the identification of information and data which can be opened to sharing with external resources or sensitive content that cannot be shared. In conclusion, metadata can be stated as ''**information that describes the data**'' (Fleckenstein and Fellows, 2018).

Contents that will be published through Climate-ADAPT are chosen according to a range of criteria that are specified by the advisory group in terms of both content quality and accuracy of metadata and quality of content description. The platform's database is designed to convey accurate data to users by screening current metadata indicated in Figure 4 according to users' search criteria (EEA, 2019).

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Publications and Reports

Understanding Cities: Advances in integrated assessment of urban sustainability (2014)

Description

This book introduces key results from the European Science Foundation funded COST Action TU0902 network that brought together researchers and practitioners involved in urban integrated assessment.
Using case studies, theoretical approaches and reporting experience from across Europe this book explores the challenges and opportunities of urban integrated assessment through four perspectives:
(i) Quantified integrated assessment modelling;
(ii) Climate change adaptation and mitigation;
(iii) Green and blue infrastructure; and,
(iv) Urban policy and governance.
Chapters (ii) and (iii) are of particular interest for adaptation to climate change in urban areas.

Reference information

Websites:

 http://www.ncl.ac.uk/ceser/researchprogramme/costactiontu0902/Final_All_CoverLo.pdf

Source:

CESER, Newcastle University

Updated:
2014-10-08

Keywords:
blue infrastructure, green infrastructure

Climate impacts:
Non specific

Elements:
Sector Policies, Adaptation Measures and Actions, Adaptation Plans and Strategies

Sectors:
Ecosystem-based approaches (GI), Urban

Geographic characterisation:
Europe

Figure 4 Climate-ADAPT Sample Metadata Information

2.2.2. Review of contents to be shared on the platform

EEA and ETC/CCA experts are in continuous collaboration with content providers to ensure the reliability of the information in the scope of eligibility criteria. Contents that are uploaded to the platform by users who have Eionet accounts are reviewed in accordance with the mechanism explained in Figure 5 by the experts of EEA. Metadata and content eligibility are controlled, and revisions are requested when necessary in the analysis phase.
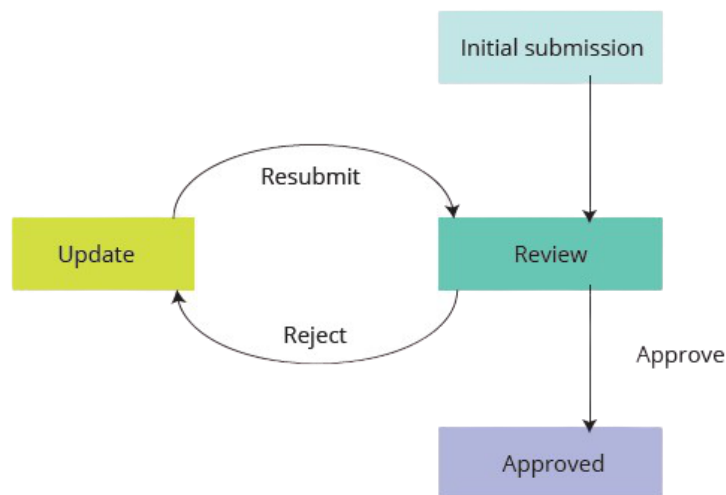
Figure 5 Climate-ADAPT Content Acceptance Scheme (Climate-ADAPT, 2019)

2.2.3. Contents on the platform

The general design and management of Climate-ADAPT are arranged according to the needs of the platform's target group. In this context, the main purpose of the platform is to facilitate collecting and

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sharing data by forming an accumulation of knowledge that is continuously updated and brings the collected data into use to ensure that climate adaptation strategies are improved effectively. The content and information published on the platform are classified according to the following thematic areas:

- Current impacts of climate change and its future projections
- Risk and vulnerability analyses specific to regions and sectors (current situation and future projections)
- National and transnational adaptation strategies
- Urban adaptation initiatives
- Case studies
- Development, implementation and monitoring of climate adaptation strategies
- Overview of the EU's climate adaptation process and policy framework including funding (EEA, 2019).

Accordingly, Figure 6 shows the areas of use by target groups of the platform.

Figure 6 Main features used by Climate-ADAPT's target group (Climate-ADAPT, 2019)

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There are 2246 different contents[10] in total on the platform which include **country fact sheets** based on the information compiled from formal reports of EEA members under all thematic areas mentioned, **climate adaptation tools** for information sharing based on collaboration, **bulletins** that information sent to users regularly are archived, and **articles** that include EU's current policy and information they obtained in the field of adaptation. For the platform's usability and widening its accessible group, the platform's official language is chosen as English (EEA, 2019).

The distribution of contents on the platform is shown in Figure 7.
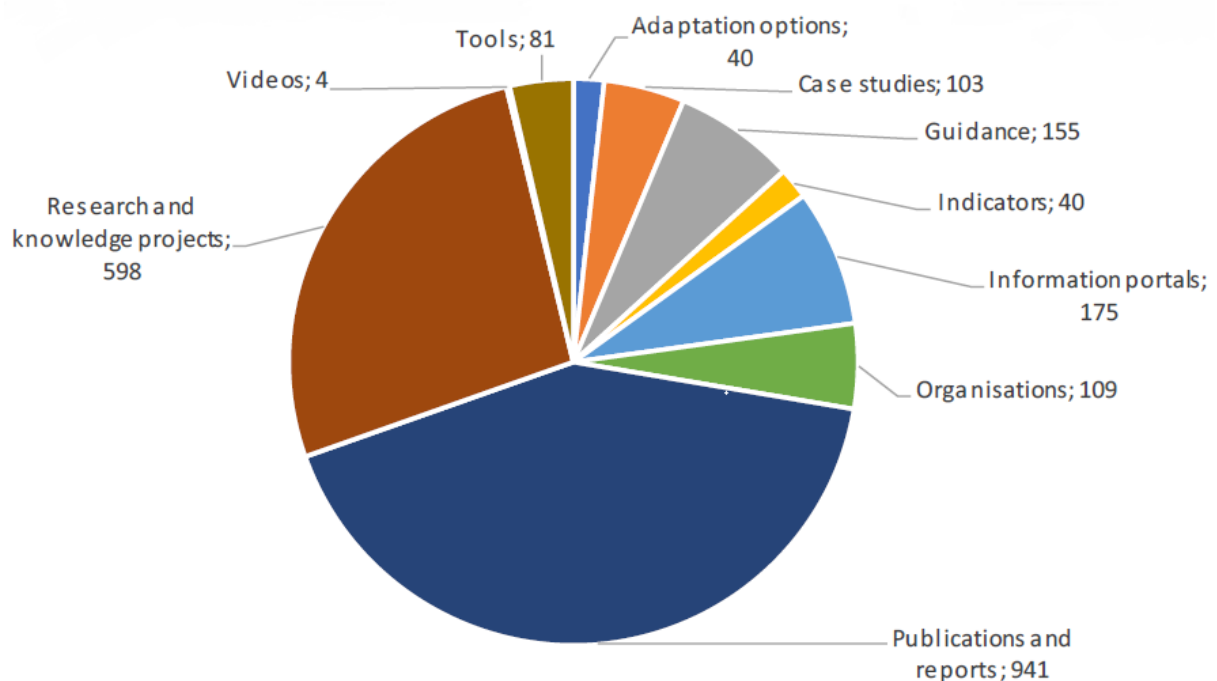
Figure 7 Climate-ADAPT Distribution of contents (Climate-ADAPT Factsheet, 2019)

2.2.4. Functions of the platform

The platform will have the following primary functions:

- Search functions in the database through filtering and keywords, ability to download search results in PDF format,
- The functionality of interactive map-based search to access such various features as case studies, urban and transnational policy information,
- Mapping functionality trough interactive Map Viewer for spatial climate change data generated through studies funded by the European Union,
- The ability for users to process the data on the platform for custom needs (an "Urban Vulnerability Mapping" tool by which users can generate custom maps),

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[10] Contents in platform by the end of 2019 are taken as a basis.

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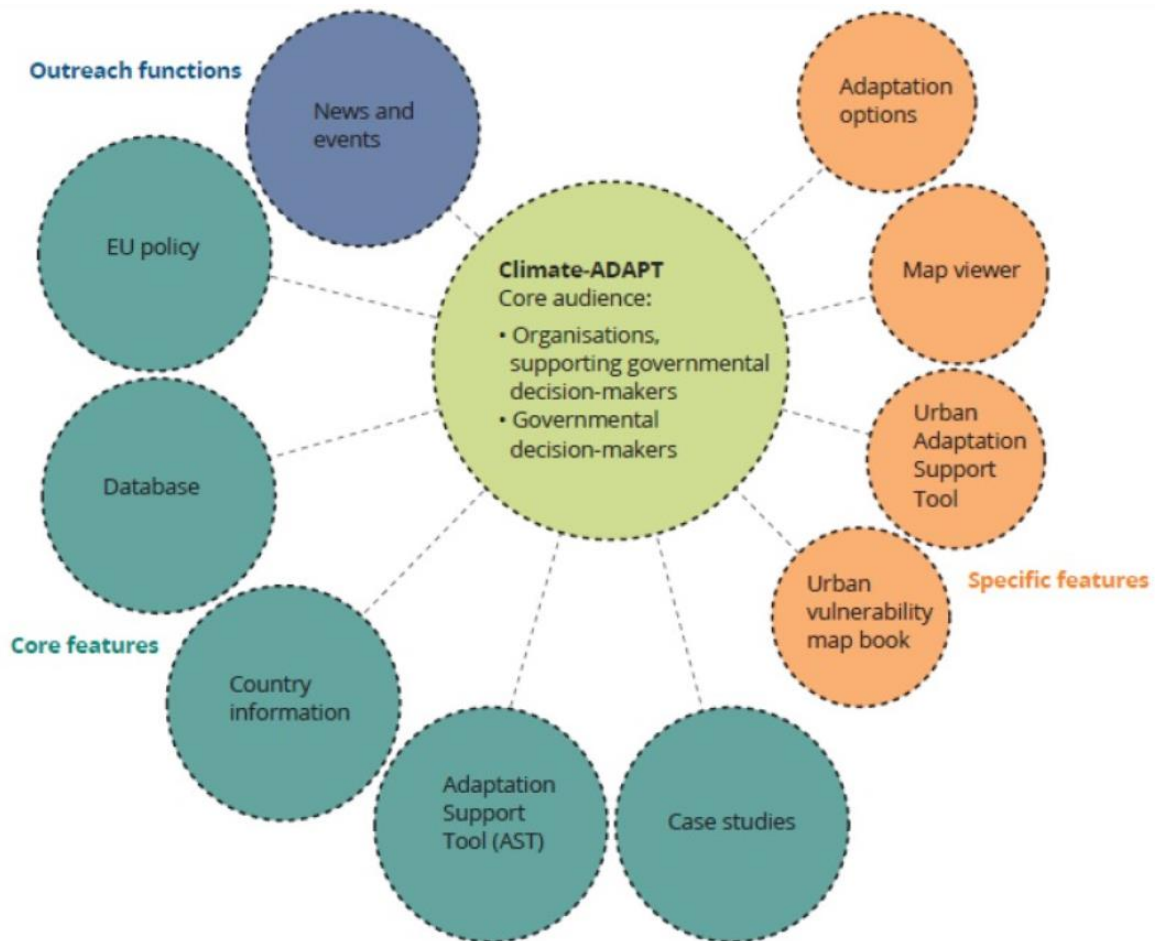
- Ability to visualize data (RDF) from other websites.

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3.   NATIONAL ADAPTATION PLATFORMS OF EEA MEMBERS

- A large number of EEA member countries have operationalized national adaptation platforms and have been using them actively. Currently, two of the EEA members are proceeding with the studies of the establishment of the platform.

- It is seen that platforms include countries' local and national climate adaptation policy documents, studies they have undertaken, outputs of the projects, tools that help spread adaptation actions to a local level and case studies from which other stakeholders can benefit.

- Although contents on the platforms are similar, platforms have different tools and visualization methods.

- User feedbacks, web statistics and indicators in the use of platforms appear in platforms' monitoring and evaluation mechanisms.

When EEA members are analyzed[11], it is seen that national adaptation platforms are in the center of countries' climate adaptation actions. Countrywide generated data and information database shared in one platform and thanks to this process, various stakeholders like governmental institutions, local authorities, non-governmental organizations, and university partners can interact continuously and use results of other's studies for their projects. Relevant government entities benefit from information and data that other agencies generated thus, it is prevented that the same data is generated by multiple agencies.

Web-based adaptation platforms are available for transnational level in the Alps and Pyrenes in Europe as well as adaptation platforms of EEA-membered countries. Under the Transnational Regions tab of Climate-ADAPT, information on transnational regions' climate adaptation actions is given on a web page which is specific for each region. The European Environment Agency specifies that sharing all the aforementioned web-based platforms' information and country experiences strengthen the adaptation actions and raise the visibility of the climate adaptation issue and intelligibility for groups (EEA, 2015).

National adaptation platforms have been founded and are used actively in 18 EEA members and UK. Also, platform development work is underway for two EU countries (Greece and Italy). Geographical demonstration of the countries which operationalized national adaptation platforms and which are in the platform development phase are shown in Figure 8.

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[11] Accessed on 13 June 2020 to Climate-ADAPT country profiles page to identify countries with adaptation platform in place and those developing one.

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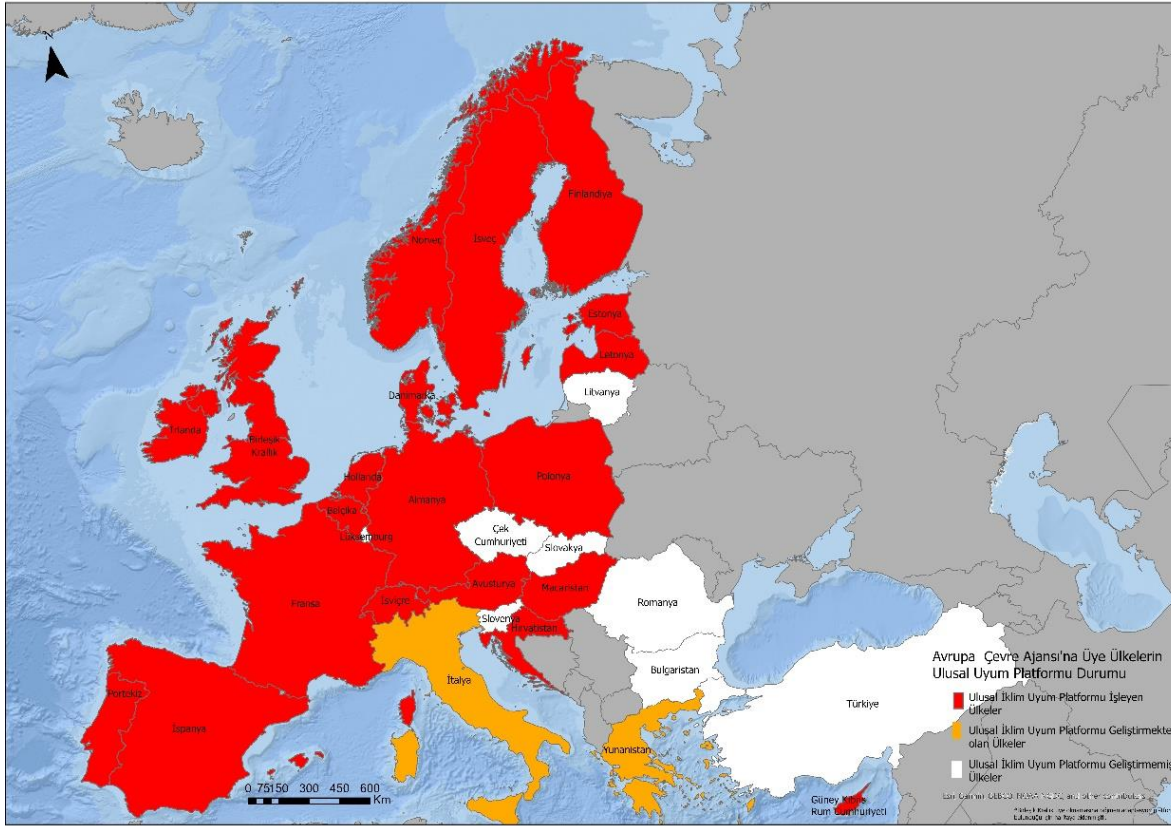
Figure 8 National adaptation platform status of EEA members

3.1.   Common features of national adaptation platforms[12]

When common features of national adaptation platforms are analyzed, it is observed that the following contents are valid for all the platforms:

i)   Policy actions at local and national levels
ii)   Results of scientific research
iii)   Outputs of the projects carried out at the country level
iv)   Tools which guide decision-making mechanism
v)   Experiences gained in terms of climate adaptation
vi)   Adaptation actions implemented currently (case studies)

Contents vary according to the platform's target groups, their budgets, their purposes and countries' current legal regulations on data sharing.

One of the outstanding features of the platforms (except for Croatia's national adaptation platform) is that English language support is provided. Thanks to this, platforms, inasmuch as they are on the national scale, can appeal to international users as well.

Another common feature of the platforms is that they include user feedbacks in monitoring and evaluation mechanisms. Some platforms such as the German National Adaptation Platform shown in

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[12] The common features of EEA members' national adaptation platforms are synthesised by analysing all country platforms' websites and opportunities provided.

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Figure 9, receive user feedback through a feedback page integrated directly on the website. Some platforms, however; use feedbacks that come directly from users via e-mail.

Through the interface seen in the Germany example, users can convey problems they have faced with, information and data requirements they want to be added and general comments about the platform. The platform is updated in accordance with users' opinions and suggestions.

Figure 9 German National Adaptation Platform Feedback Page

In most of the platforms, there are pages where users may upload information and data. Over the pages, users may share their information and data about climate adaptation actions which are scientifically verified through the platform.

3.2. Different features of national adaptation platforms[13]

Platforms differ from each other in terms of functionality. Tools that they have, and their visualization methods are the key differences between platforms (mapping, graphical demonstration etc.). Especially, the platforms of Finland, Hungary, Netherlands and Switzerland come into prominence on visualizing data on the map and graphically. Users are able to create special maps by adding data shaped as vectors and rasters for their own special needs and print out such maps. For example, the Hungarian National Adaptation Platform contains a mapping tool in itself. Users may project subjects

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[13] The common features of EEA members' national adaptation platforms are synthesised by analysing all country platforms' websites and opportunities provided.

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such as potential areas that will be affected by the impacts of climate change (pastures, cultivated areas etc.), various climate change scenarios and case studies conducted in their own countries on an interactive map and display the information.

The example in Figure 10 shows the likely change as a result of the impact of climate change on pastures in Hungary from 2006 to 2030.
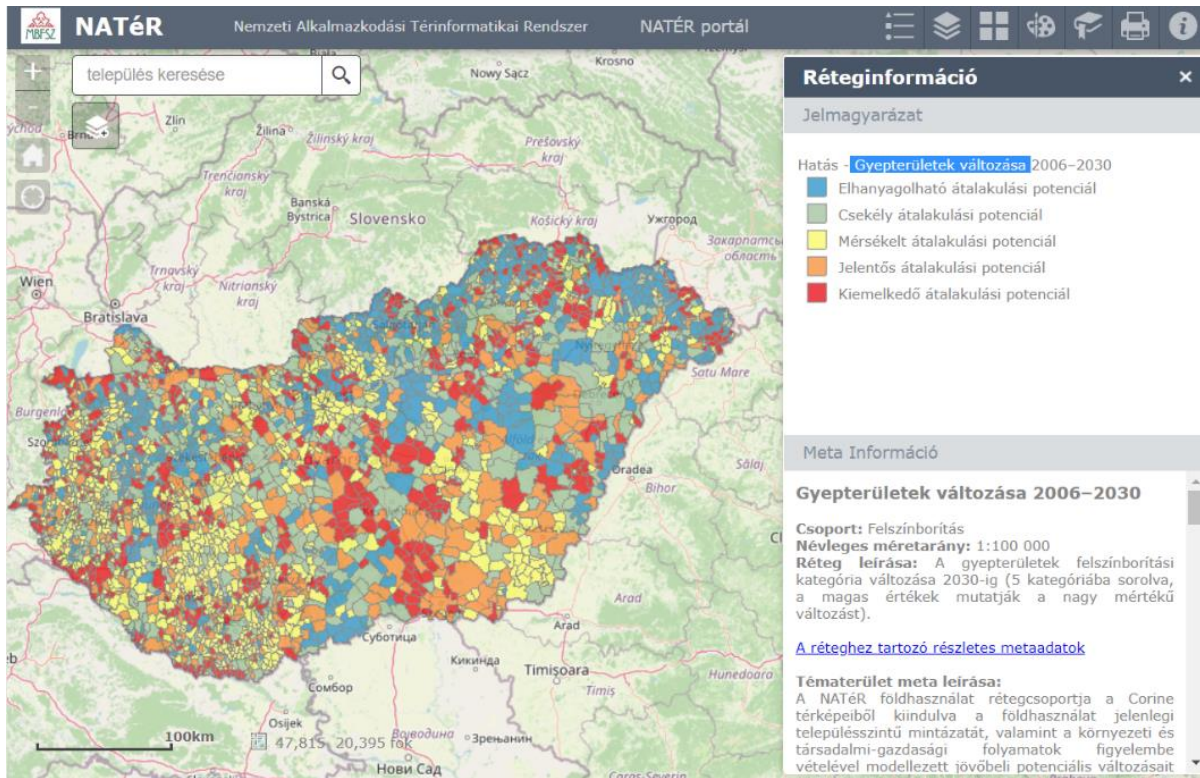
Figure 10 Hungarian National Adaptation Platform Map Tool

Tool functionality and variety differ in accordance with countries' needs and target sectors/target groups. For example, when the tools of the Danish National Adaptation Platform are analyzed, it can be seen that the general public, private and agricultural sectors are chosen as the target groups. While the Resilient House[14] tool in the Danish National Adaptation Platform guides users on how to make homes climate-resilient, AgriWizard[15] tool guides farmers on how to adapt to climate change.

When the Irish National Adaptation Platform is analyzed, it is seen that an extensive catalogue is offered to users to guide the decision-making mechanism and help spread adaptation actions to lower levels. When the platform's tools are analyzed, Urban Adaptation Support Tool[16] developed based on the Adaptation Support Tool[17] contained in Climate-ADAPT stands out. This tool is designed to support local authorities' decisions about the climate adaptation process and support them to choose the most effective one.

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[14] Website: https://en.klimatilpasning.dk/tools/theresilienthouse/

[15] Website: https://en.klimatilpasning.dk/tools/agriwizard/agriwizard/

[16] https://www.climateireland.ie/#!/tools/localTool

[17] Website: https://climate-adapt.eea.europa.eu/knowledge/tools/urban-ast/step-0-0

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3.3. Monitoring and evaluation mechanisms of national adaptation platforms

The monitoring mechanisms of EEA members' platforms are generally operated by considering user feedback, web statistics and indicators of the platform. In this context, users communicate opinions in line with their experiences. Along with users, feedbacks of content provider entities are also incorporated into the monitoring mechanism. In almost all EEA members which have established national adaptation platforms, the following steps exist in the monitoring mechanism:

- Analyzing feedbacks conveyed by platform's content providers (public entities, universities, etc.)

- Analyzing the number of platform visitors checked regularly

- Analyzing the content quality of the platform through user surveys

- Analyzing quality control (quality assessments and control (QA&QC) analyses which are conducted through contents that are provided by stakeholders).

Some platforms implement different monitoring methods in addition to such steps. For instance;

- Along with the monitoring of the platform's content and functionality in monitoring mechanisms; analyzing user types of different stakeholders at the end of each year, Germany determines to what extent the platform can respond to users' requests.

- The Dutch and Polish adaptation platforms enable users to deliver their opinions and requests directly via the "contact" button and they position users directly into the platform's communication mechanism.

- The Austrian adaptation platform collects users' feedbacks by not only organizing meetings, conferences and events but also collect them directly from responsible contacts from relevant institutions.

- The Finnish adaptation platform enables each user to directly share their opinion through a public group established on social media.

Climate-ADAPT also involves indicators in monitoring and evaluation mechanisms. At the end of each year, the platform management releases a factsheet. The published factsheet includes:

- Platform's weekly numbers of visit and page views,
- Number of visits to the platform's main tabs monthly,
- Most visited case studies,
- Percentage of database's content (tools, guides, case studies, etc.)
- Distribution of contents by sectoral and climate impacts
- Highlighting case studies added to the platform.

Considering such indicators, the platform management uses internal and external reporting mechanisms in its monitoring mechanism. The main purpose of internal reporting mechanisms is determined as facilitating platform management. External reporting mechanism, however, is used to provide information to stakeholders (users, content providers, decision-makers, etc.). Users' opinions and requests are also included in the monitoring mechanism. At the end of the year, the platform is

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evaluated with the help of an advisory group[18] by considering reporting mechanisms and users' feedbacks (Climate-ADAPT, 2019).

When the platforms' evaluation mechanisms are analyzed, it is seen that such mechanisms are defined in accordance with a systematic evaluation scheme directly connected to the platform's authority and targets. Accordingly, stakeholders who are also continuously providing content to the platforms are directly involved in the evaluation process. Another important factor in the evaluation mechanism is to what extent the platform supports decision-makers and how often it is used by decision-making mechanisms. This standard is evaluated as a success criterion for platforms. Feedbacks coming from users, however, stand out as a critical component for inspection and evaluation of the platform's content.

Accordingly, when the Finnish example is analyzed, it is seen that the institutional division of labor is preferred to conduct evaluation processes effectively. A "science editor" is continuously working to monitor the platform's content, collect user feedbacks and identify the part of the platform that needs to be developed. This person is responsible for enhancing the platform in line with the objectives and coordination with relevant research institutions to manage the platform. On the other hand, the evaluation mechanism operates using two different methods. The first of the two methods is that contents and recommendations offered to develop the platform are evaluated in accordance with the results of user and stakeholder workshops. In this context, the platform is evaluated considering the results of workshops, direct feedback from users, and statistics on the use of the platform. Then, such evaluation results are discussed in meetings with stakeholder participation and enhancements to be done specifically to the platform are decided. The second method is contacting directly to content providers and receive their opinions and give feedback on the topics that need to be enhanced by the content providers. Operating two methods independently ensures that they respond to the platform's users' requests and needs in the best manner (EEA, 2015).

3.4.   Publicity strategies of national adaptation platforms

When adaptation platforms of EEA members are analyzed, it can be seen that they employ different publicity strategies as follows:

- Denmark has chosen the target group from local authorities while developing its platform. Accordingly, a team that supports the phases of action plan and strategy development and organizes events (meetings, workshops, etc.) for the platform's publicity, continuously works in the platform.

- To increase the platform's publicity, Switzerland organizes conferences, and events for stakeholders, workshops where the platform's functionality is demonstrated. Moreover, organizing games and competitions on the platform increase the platform's visibility.

- Germany conducts public information campaigns to increase the platform's visibility.

- Finland publicizes its platform by attending important conferences and workshops in the country and presenting the platform. As another publicity strategy, Finland has adopted to publicize the platform by preparing various videos on the platform and its functions and

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[18] Function of Climate-ADAPT's advisory group is explained in Title 2.1.2.

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sharing them via social media. Content is provided to other platforms in the country thereby publicizing the adaptation platform on the recipients. Apart from such work, press bulletins are published regularly so that platforms can take part in media organs.

- Organizing official meetings and discussions, Ireland and Spain continuously engage with potential stakeholders of the platform and in this way, they promote it.

- Organizing face-to-face meetings and web-based seminars; Finland, Germany and the Netherlands try to increase recognition of the platform (EEA, 2015).

3.5. Climate services in national adaptation platforms

The main priority of climate services is to provide climate data and information to support decision-makers and the policy-making process.

- The Danish National Adaptation Platform uses climate services provided by the Danish Meteorological Institute (DMI). Accordingly, DMI offers climate scenarios, sea-level rise data, interactive maps, and climate data.

- The Irish National Adaptation Platform receives services relating to climate change observations and projections through the Irish National Meteorological Service.

- The German National Adaptation Platform features risks of climate change for sectors and sectoral risk evaluations. In this context, it receives sectoral impacts and risks of climate change, information produced by institutions that work effectively on climate change in the country, and meteorological incidents through a climate service named "Climate Navigator" established in the country.

The fact that platforms and climate services cooperate and that platforms receive content from such services increase data reliability. Also, establishing such a collaboration enables platforms to achieve their main goal which is to be a one-stop-shop for climate adaptation action (EEA, 2015).

3.6. Platforms' funding mechanisms

When EEA members' platforms are analyzed, it is seen that funding mechanisms vary according to political ownership level in terms of institutional and legal infrastructure. Fund flow is seen to be provided by the central government (like Switzerland, French) or both government and project-based (like the Netherlands) in the countries where political ownership is strong. A project-based funding mechanism (like Ireland), however, is a different funding method in use.

EEA indicates that operationalizing a useful platform prototype with project-based funding in members' platforms that it has analyzed is faster and more effective than using the central government funding with political ownership. However, trying to provide sustainability for platforms that are supported by short-term project-based funds, it has been observed that there are some serious problems in terms of developing the platform's content and finding new funds for stakeholders to take continuous part on the platform.

Besides, when political ownership is lacking, it has been experienced that system falls behind regarding updating the platform's content and services provided and using such content and information actively in climate adaptation actions of central and local governments. According to the experiences gained

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from the countries that established National Adaptation Platforms, project-based funding is generally used for establishing fast and usable platform prototypes, but governmental funding is needed for sustaining and increasing the effectiveness of platforms. In this way, the national platform can be located at the center of climate adaptation actions and serve as the main source of information (EEA, 2015).

When the Dutch Spatial Adaptation Platform's funding mechanism is reviewed, it can be seen that it differs from the other EEA members' platforms. Because of limited and uncertain governmental funding after the platform was operationalized, the platform management began to create different opportunities as an alternative of government funds for avoiding full dependency and complementary sources of government funding mechanisms. Along with this change, CAS Foundation's renewed current business model is constituted by the platform's maintenance and conveying information and data on the country's climate adaptation to stakeholders through the platform. The foundation signed a multi-annual contract with the government to conduct this business model and carried its studies on partially connected to funds provided through the Climate Knowledge Program and Infrastructure and the Ministry of Environment. CAS Foundation supports the platform financially with the revenues that it gains through projects as well as services and support to stakeholders. Furthermore, the foundation continues to effectively use new project opportunities in the European region to increase its funding.

EEA Members' platforms and websites are given in Table 1.

Table 1 EEA members' and transnational regions' adaptation platforms[19]

Adaptation Platforms	Titles of platforms	Websites
National		
Germany	Kompass- Climate Impacts and Adaptation in Germany (German National adaptation platform)	https://www.umweltbundesamt.de/en/topics/climate-energy/climate-impacts-adaptation
Austria	Klimawandelanpassung.at (Austrian National adaptation platform)	https://www.klimawandelanpassung.at/
Belgium	Adap2climate.be (Belgian National adaptation platform)	https://www.adapt2climate.be/
National		
Great Britain	GOV.UK (Climate Adaptation pages)	https://www.gov.uk/environment/climate-change-adaptation
Denmark	Klimatilpasning.dk (Danish National Adaptation Platform)	https://en.klimatilpasning.dk/
Estonia	klab.ee/kohanemine (Estonian National Adaptation Platform)	http://www.klab.ee/kohanemine/en/
Finland	Climate Guide	http://ilmasto-opas.fi/en/

[19] Table is compiled using the information in countries' webpages in Climate-ADAPT

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Adaptation Platforms	Titles of platforms	Websites
	(Finnish National Adaptation Platform)	
France	Observatoire National Sur les Effects du Rechauffement Climatique (French National Adaptation Platform)	http://wiklimat.developpement-durable.gouv.fr/index.php/Wiklimat:Accueil
Croatia	prilagodba-klimi.hr (Croatian National Adaptation Platform)	https://prilagodba-klimi.hr/
Netherlands	Dutch Adaptation Knowledge/Spatial Adaptation Portal (Dutch Adaptation Platform)	https://ruimtelijkeadaptatie.nl/
Ireland	Climate Ireland (Ireland National Adaptation Platform)	https://www.climateireland.ie/
Spain	Platforma sobre Adaptacion al Cambio Climatico (Spanish National Adaptation Platform)	https://www.adaptecca.es/
Sweden	Klimatanpassning.se (Sweden Adaptation Platform)	http://www.klimatanpassning.se/
Switzerland	BAFU Thema Anpassung an den Klimawandel (Swiss Climate Adaptation Information Platform)	https://www.bafu.admin.ch/bafu/en/home/topics/climate/info-specialists/anpassung-an-den-klimawandel.html
Cyprus	Cypadapt.uest (National Adaptation Platform)	http://cypadapt.uest.gr/
Latvia	National Climate Policy (Latvian National Adaptation Platform)	http://www.varam.gov.lv/eng/fondi/EEA_Norv/european_economic_area_financial_mechanism_programme__national_climate_policy
Norway	Klimatilpasning.no (Norwegian Climate Adaptation Platform)	http://www.klimatilpasning.no/
Poland	KLIMADA Adaptation Platform (Polish National Adaptation Platform)	http://klimada.mos.gov.pl/
Portugal	Apambiente.pt (Portuguese National Adaptation Platform)	http://apambiente.pt/index.php?ref=x178
Transnational		
The Alps	Klimaportal Alpenconvention (The Alps Climate Portal)	https://www.alpconv.org/en/home/
The Baltic	Baltic Sea Region	https://climate-adapt.eea.europa.eu/countries-

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Adaptation Platforms	Titles of platforms	Websites
		regions/transnational-regions/baltic-sea-region/adaptation/genera
Pyrenees	Observatoire Pyreneen du Changement Climateque. OPCC (Pyrenees Climate Change Monitoring Platform)	https://www.opcc-ctp.org/

3.7.   Cases of country platforms

When the platforms established by EEA members are analyzed, the Dutch Spatial Adaptation Information Platform **(Kennisportaal Ruimtelijke Adaptatie)** stands out for its functionality while the **Danish National Adaptation Platform (Klimatilpasning)** stands out for its user-friendly structure.

The Dutch Spatial Adaptation Information Platform is an important platform localizing adaptation in members' platforms. All contents on the platform can be visualized, processed, and interpreted on a map. There are 90 different tools designed to guide local decision-makers in the development stage of climate adaptation actions on the platform. Using tools on the platform, local decision-makers can choose the most suitable climate adaptation action for the project area by conducting cost and benefit analyses before implementing an adaptation action.

The Danish National Adaptation Platform, however, stands out for its user-friendly interface. The platform has chosen the general public, local governments and the private sector as its target group. The tools on the platform are also designed to respond to the needs of the specified target group. The platform involves tools that explain climate adaptation actions that citizens can implement (Resilient House tool) and climate adaptation actions that the private sector can implement (BusinessWizard) and target local governments explaining how regions would be affected by climate change at the local level and how they could adapt to it (Climate Atlas); thus, the platform guides stakeholders to implement effective climate adaptation actions which are applicable at the local level.

3.7.1.   Country case: Dutch Spatial Adaptation Information Platform (Kennisportaal Ruimtelijke Adaptatie)

The Spatial Adaptation Information Platform was developed in 2014 in the scope of Knowledge for Climate Research Programme and New Urban Developments and Restructuring Delta Programme. The platform makes contributions to the use of the information gained from specified programmes in the area of climate adaptation (EEA, 2015).

The Dutch Spatial Adaptation Platform, established to support Delta Plan on Spatial Adaptation[20] and National Climate Adaptation Strategy, is the most important source that the Netherlands uses for climate adaptation action.

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[20] Spatial Adaptation Delta Plan is a component of National Delta Programme which involves the collaboration among the central government, local governments and water administration in rural areas. The central government started Delta Programme for Netherlands to be prepared for projected flood disaster and extreme weather events. Spatial Adaptation

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The platform provides a central information database to decision-making mechanisms, private sector and non-governmental organizations for physical planning in the country to be undertaken in a way that is resilient to climate change impacts and disasters.[21]

Platform's content and functionality

The platform includes the tools to help the Netherlands achieving the goals set along with the National Climate Adaptation Strategy, case studies, spatial data, climate adaptation strategy and policies that the central government implements and additionally reports and publications that are published by non-governmental organizations and researchers. One of the most important features of this platform is that it can visualize all such contents spatially on a map. Users can access the platform's contents through the buttons on the platform's home page shown in Figure 11.
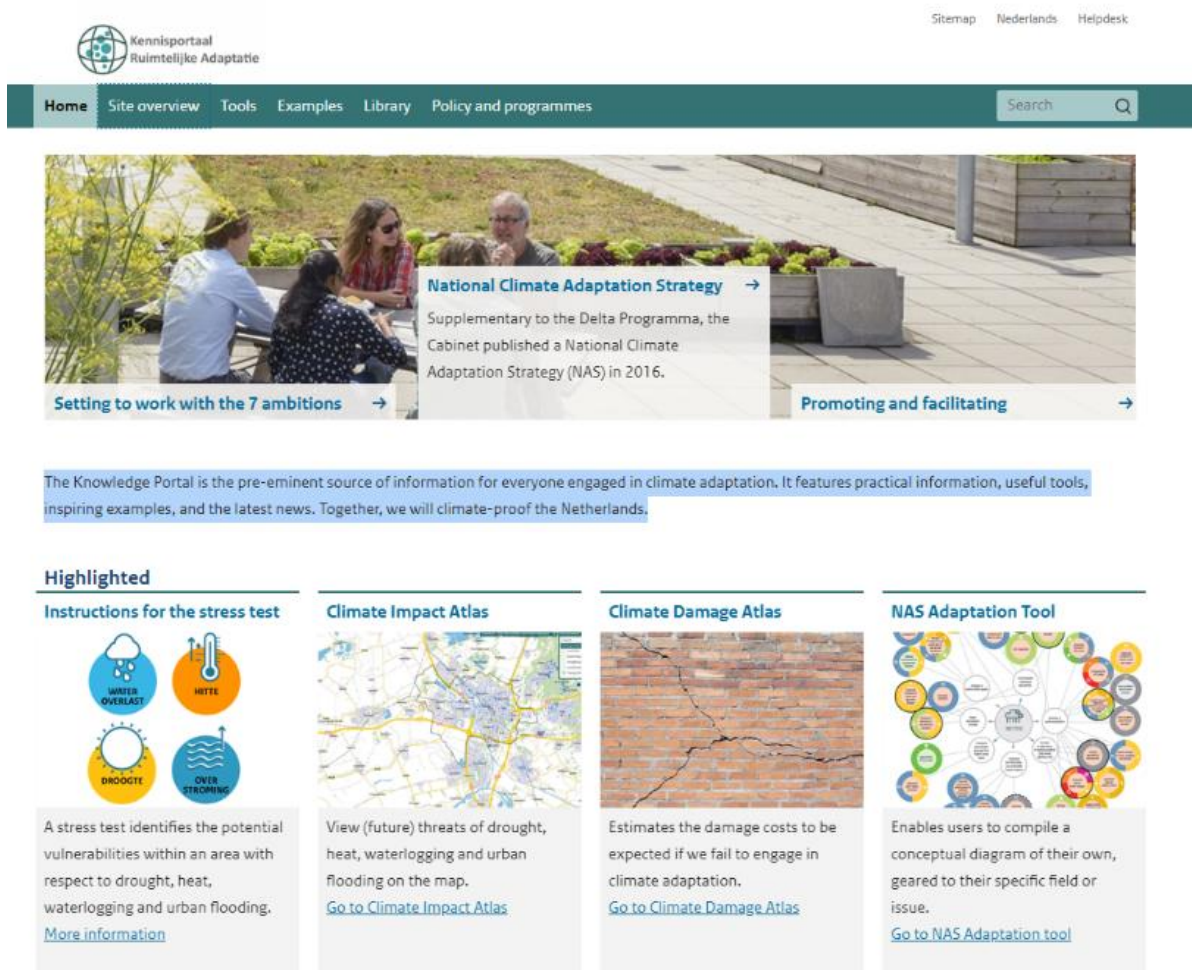

Figure 11 Dutch Climate Adaptation Platform Home Page

Tools

Delta Plan's other stakeholders are non-governmental organisations, business world and entities that has the expertise in water (Waterstaat, 2018)

[21] Dutch Spatial Adaptation Platform, About, https://ruimtelijkeadaptatie.nl/english/about-website/about-us/

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The platform contains 90 different tools[22] in total appealing to various target groups (the general public, decision-makers, private sector, agriculture, etc.). Climate Impact Atlas, Climate Proof[23] City Toolbox and Climate Damage Assessor stand out among these tools.

Climate Impact Atlas

The Climate Impact Atlas[24] informs on such impacts of climate change as flood, urban heat island and drought on an interactive online map. Users can observe the vulnerability of the region where they live from climate change through the tool. The maps demonstrating extreme conditions to be encountered as a result of climate change and potentially vulnerable groups and sectors for such conditions constitute the main information provided to users. Offered contents support users to analyze and map the risks of climate change. As seen in Figure 12, users can determine local thermic centers by adding different layers to their maps. Additionally, through the 'help' button in the tool, location-based GIS data can be requested free of charge. Although the Climate Impact Atlas is used by local governments as target groups to capture the intensity of impact from climate change in the impacted areas, different groups such as the general public, researchers, non-governmental organization and students also use this tool for academic purposes. The Climate Impact Atlas tool was developed with the collaboration of universities and government agencies.[25]
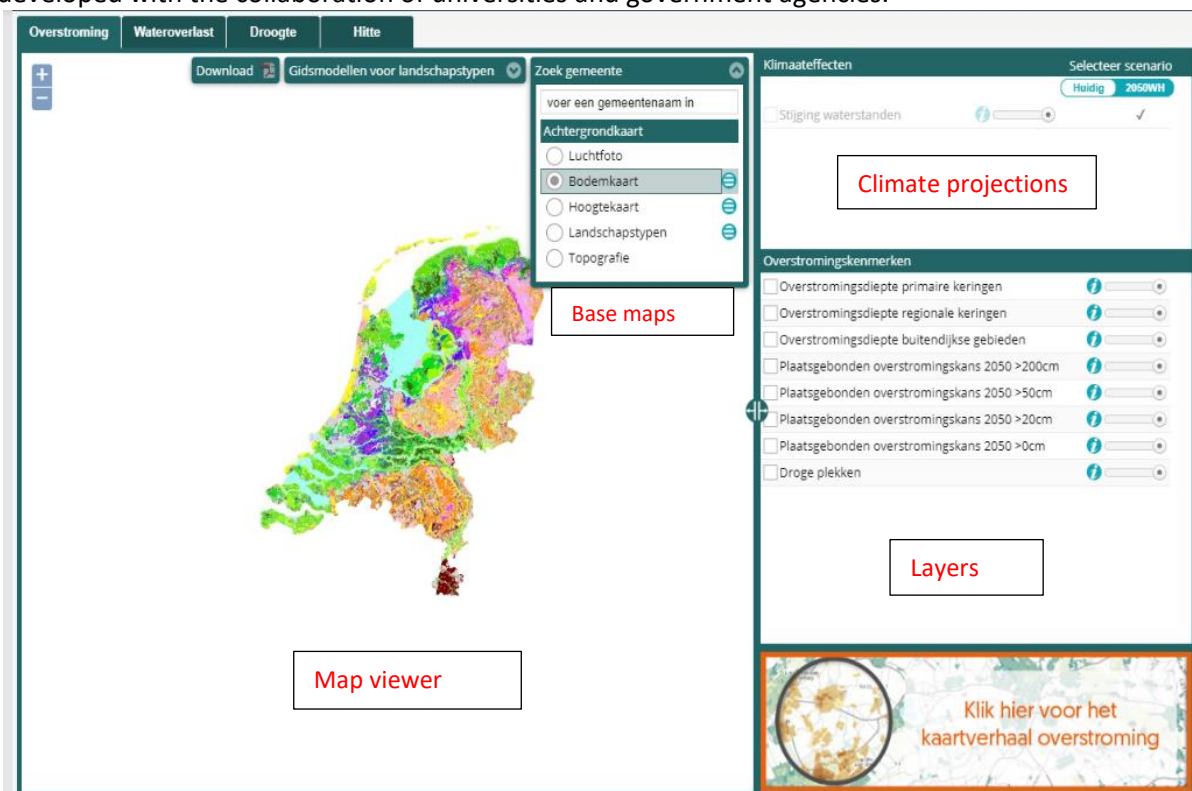

Figure 12 Climate Impact Atlas and its layers

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Climate-Proof City Toolbox

The Climate-Proof City Toolbox[26] was designed to guide decision-makers on which adaptation action would be more effective against such negative impacts of climate change impacts on a region as flood, drought, extreme weather events and heat islands. Users can create a project at first and choose the working area through an interactive map. Then, they can enter the characteristics of the area (industrial area, business center, historic center, etc.) and topographic and soil structure into the boxes involving tool entries and designate the goals they want to achieve (for example; reducing the temperature of a region which is under the impact of urban heat island by 1°C). Finally, as seen in Figure 13, users can choose the planned adaptation actions to be implemented to achieve the target determined and the area where such actions are implemented in the project area.

Figure 13 Resilient City Toolbox Adaptation Actions Screen

After such processes, the tool provides such information as an output as monthly, annual, and first investment costs of specified adaptation action as seen in Figure 14, how effective the selected adaptation actions will be and how well the user achieves the goal s/he has stated at the beginning of modeling.

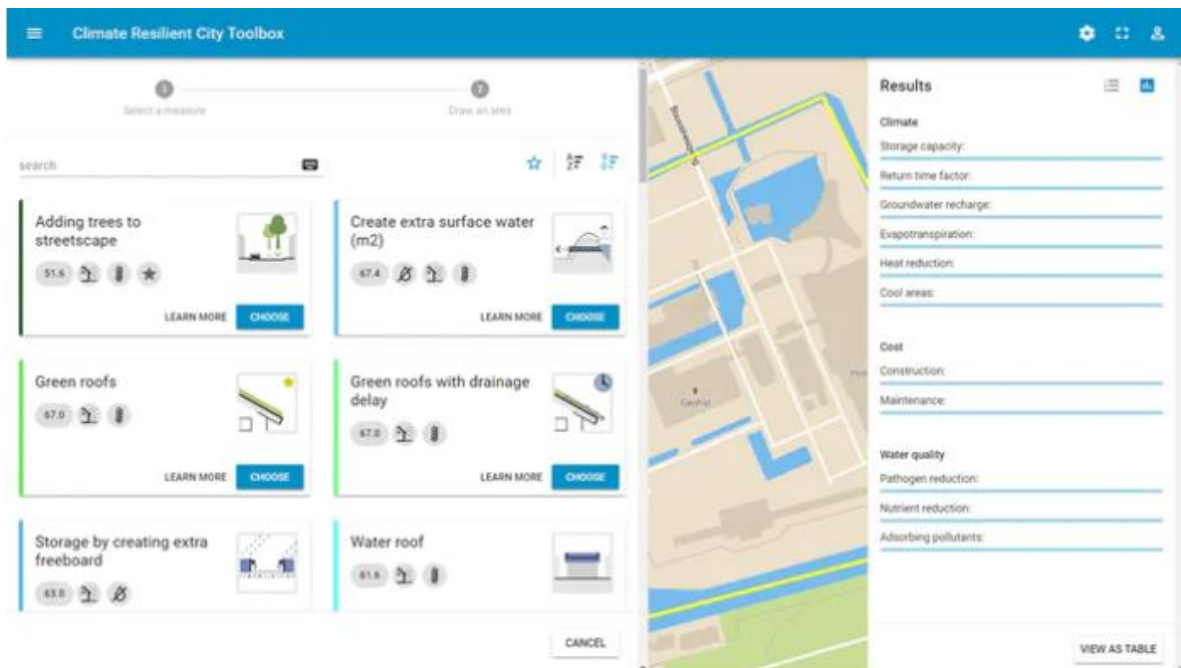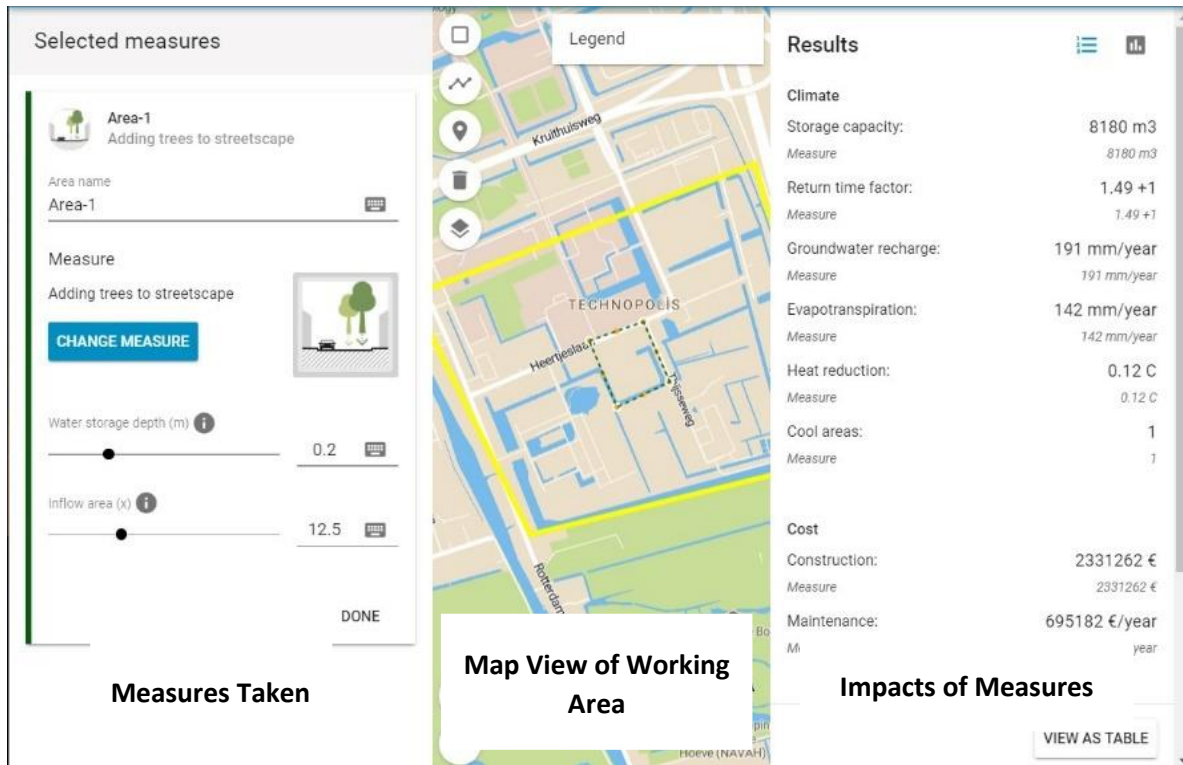[26] Website: https://kbstoolbox.nl/en/

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Figure 14 Climate-Proof City Toolbox's Output

The tool enables especially decision-makers to observe the potential impacts of the measures before implementing them for climate adaptation; thus, the most beneficial measure can be identified in terms of impact and cost for the specified region and especially decision-makers can take great advantage of the investment process.

Climate Damage Assessor

The Climate Damage Assessor[27] supports local governments in terms of gathering information on the cost of damages caused by climate change and forecasting the damages likely to happen. Local governments and water utility departments use this tool actively while developing risk analysis and adaptation strategies.

The tool conducts assessments evaluations covering 2018-2050 on thematic areas occurring due to heat, drought, floods in urban and coastal regions. Each local government's sphere of competence can estimate likely damages in many areas such as temperature increase and the number of people who will stay in the hospital because of floods. Under each theme, projected damages at the local government level are shown on a map. As seen in Figure 15, the tool guides decision-making mechanism to identify direct or indirect damages that municipalities and the general public will face as a result of climate change especially in specified themes, so local governments consider the financial effects of climate change in budget planning as well.

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[27]Website: https://climatedamageatlas.com/

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Figure 15 Climate Damage Assessor Tool

Case studies

As seen in Figure 16, case studies[28] that include pilot projects and initiatives about climate-resilient cities and climate adaptation actions are shown through the interactive map on the platform. At the same time, users can classify case studies according to their subjects (such as drought, change of temperature, flood), scale (local, national, urban scale and regional) and their compilation status. As much as case studies generally include projects and studies, water utility departments, local governments and central government carried/carries out; civil organizations, the private sector and academicians can also upload the studies did. By June 2020, the platform includes 231 different case studies in total.[29]

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[28] Website: https://ruimtelijkeadaptatie.nl/english/examples/

[29] Case studies have been uploaded at https://www.climatescan.nl/. The platform uses the case study in the said website by integrating its map to the platform. Users of all categories may open an account and log in to the website.

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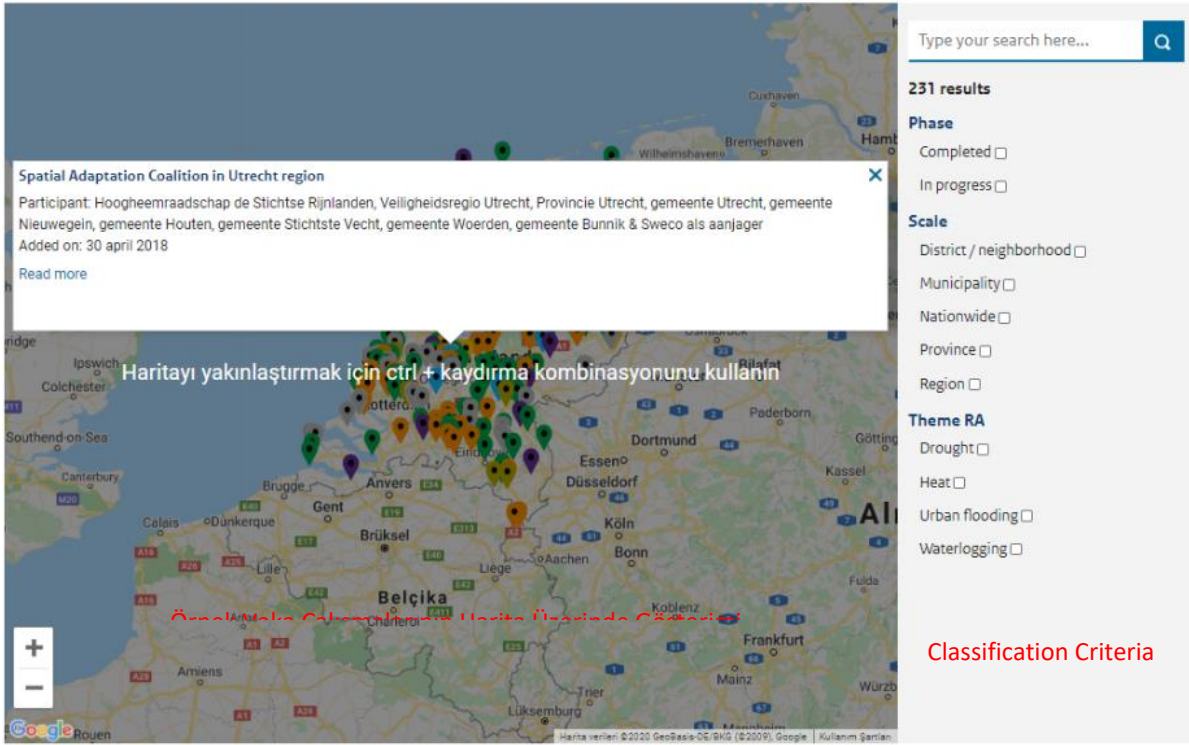
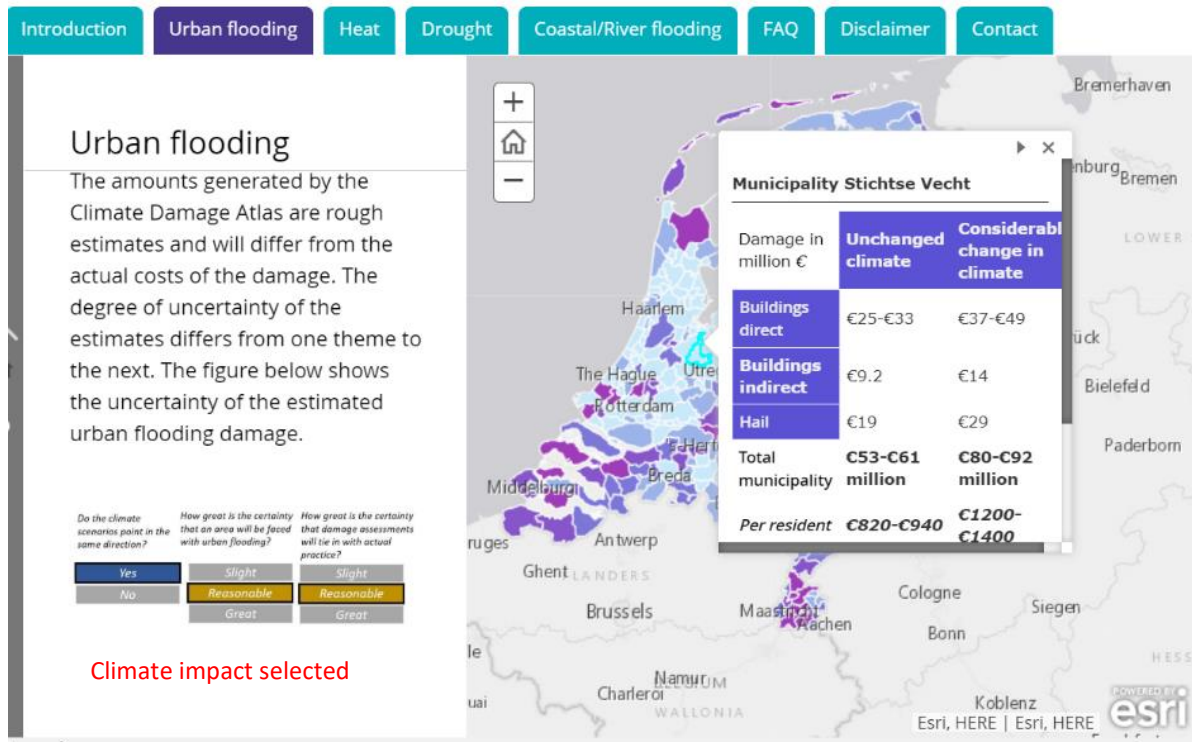**Figure 16** Platform's Case Study Tab

Library[30]

The platform also hosts a spatial adaptation library. This library includes Dutch publications and reports on climate adaptation. Main sources that feed the library consist of knowledge for climate[31], STOWA[32] and outputs of Delta Programme (see footnote 24 for Delta Programme). Because there are metadata inputs for contents in the library, users can access the information they need by filtering contents that have metadata through a search engine.

Platform management

The Dutch Spatial Adaptation Platform (Kennisportaal Ruimtelijke Adaptatie) was founded in 2014 by the Climate Adaptation Services, a non-profit foundation. Updating the tools and contents on the platform and improving its infrastructure is undertaken by the CAS Foundation. The Dutch Ministry of the Environment and Infrastructure supports the management of the platform as well. Ministry experts issue an opinion for the contents which will be added to the platform and tools that will be improved.

The platform is in cooperation with science institutes and advisors of various professions and updated by the latest technical information, data and tools. The publication board that consisted of

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[30] Website: https://ruimtelijkeadaptatie.nl/english/library/

[31] Knowledge for Climate: Dutch government, in collaboration with industry and businessmen, is a research programme developing applied knowledge for long-term decisions to be in line with the results of climate change. (Knowledge for Climate, 2014)

[32] STOWA, serves as a knowledge centre for Dutch water administrations. Its mission is to collect and distribute the knowledge they need to fulfil water administrations' duties and implementing the strategies developed on the field.

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representatives of various user groups that are the platform's target group (central management, local governments, water utility departments, etc.) make suggestions on contents that will be added for optimum usage, features and optimization studies. The publication board works also by considering feedback from users through the platform.

3.7.2. Country case: Danish National Adaptation Platform (Klimatilpasning)

The Danish National Adaptation Platform presents information on climate change produced country-wide in different areas and current information on climate adaptation. The target group of contents presented on the platform is **the general public, local governments and private sectors.** The platform provides information to specified target groups on timely research on climate adaptation at national and international levels and information on developed methods regularly. Additionally, the platform holds tools and case studies to strengthen climate adaptation actions and support decision-making mechanisms.

The continuously updated platform provides opportunities to users in terms of graphical demonstration of current climate data and content relating to regional impacts of climate change. The platform was founded under the climate adaptation strategy of the Danish Government and opened to users' access in March 2008 (Klimatilpasning, n.d.).

Platform's content and functionality

The Danish National Adaptation Platform stands out for its user-friendly interface. The target groups, which are specified as the general public, local governments and private sector users, can directly access the platform's categorized contents through the buttons on the platform's home page shown in Figure 11. Additionally, the platform includes literature knowledge to strengthen climate adaptation actions throughout the country, current studies at national and international levels, interactive tools to strengthen decision-making mechanisms, case studies conducted countrywide, and information and data categorized by sector.
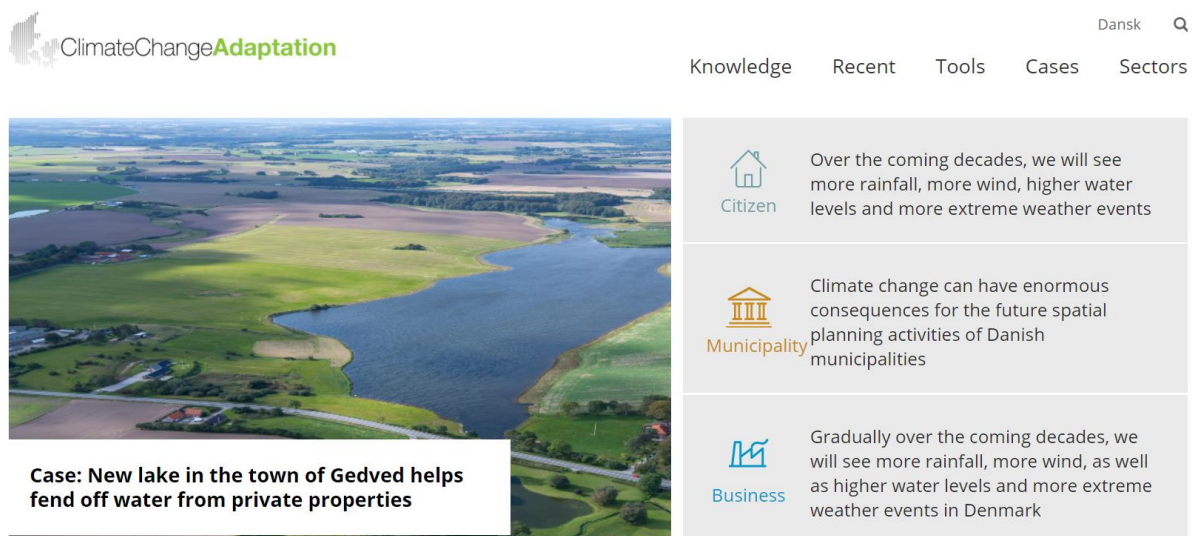

Figure 17 Danish National Adaptation Platform

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Tools

The platform includes 6 different tools[33] for the public, local authorities and private sector specified as target groups. Among such tools, **BusinessWizard, Climate Atlas, The Resilient House** and **AgriWizard** stand out for their supporting contents for local-level climate adaptation action and decision-making mechanisms.

BusinessWizard

BusinessWizard [34]enables the implementation of the private sector's active climate adaptation actions by acting as an interactive guide for potential problems and solutions that may be caused by extreme weather events. The tool is developed by the Danish Nature Agency for private-sector production facilities and buildings to adapt to climate change.

There are three different scenarios in the tool that include the external environment, the inside spaces of both the factory and storage and the inside space of the office. As seen in Figure 12, the potential effects of extreme weather events and how to adapt to such effects are told in each stage which includes these scenarios. Thus, BusinessWizard enables a company owner or a manager in the production sector to obtain information on damages that may stem from extreme weather events and climatic conditions before the costly event occurs. Thus, it enables firms in the private sector to implement low-cost adaptation actions instead of financial loss as a result of potential sanitation and repair costs or reducing production capacity after damage. (BusinessWizard, n.d.).
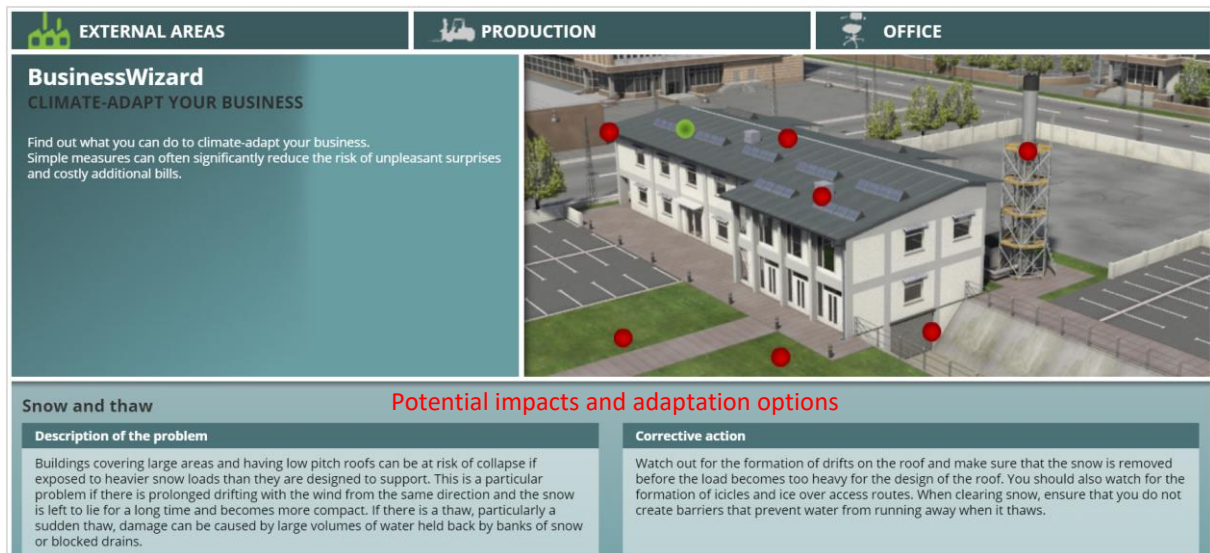
Figure 18 BusinessWizard Tool Interface

Users can see potential effects that may be caused by climate change and how to adapt to such effects by selecting different sections of the current facility in three different scenarios.

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[33] Website: https://en.klimatilpasning.dk/tools/
[34] Website: https://en.klimatilpasning.dk/tools/

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Climate Atlas tool

The Climate Atlas[35] provides local authorities data and information on rising sea levels, shoreline changes due to climate change impacts, temperature increases, changes in precipitation patterns, excessive precipitations and elevations of water caused by the storm. Thus, it is aimed at local governments identifying the most vulnerable regions against the effects of climate change and implementing climate adaptation actions. As seen in Figure 13, the tool provides climatic data for local governments provided by the Denmark Meteorology Institute and thus local governments make buildings and urban infrastructure resistant to projected extreme weather events.

The Climate Atlas presents climate projections of short, medium and long-term to users. It is planned that the tool's content will be enhanced by adding climate indicators such as wind speed, vaporization and extreme storm surge (Climate Atlas, n.d.).

Figure 19 Climate Atlas Tool

Users view the data of 1-km cell resolution provided by DMI on the map and are able to project climate change effects regionally according to RCP4.5 and RCP8.5 scenarios.

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[35] Website: https://dmi.dk/klimatlas

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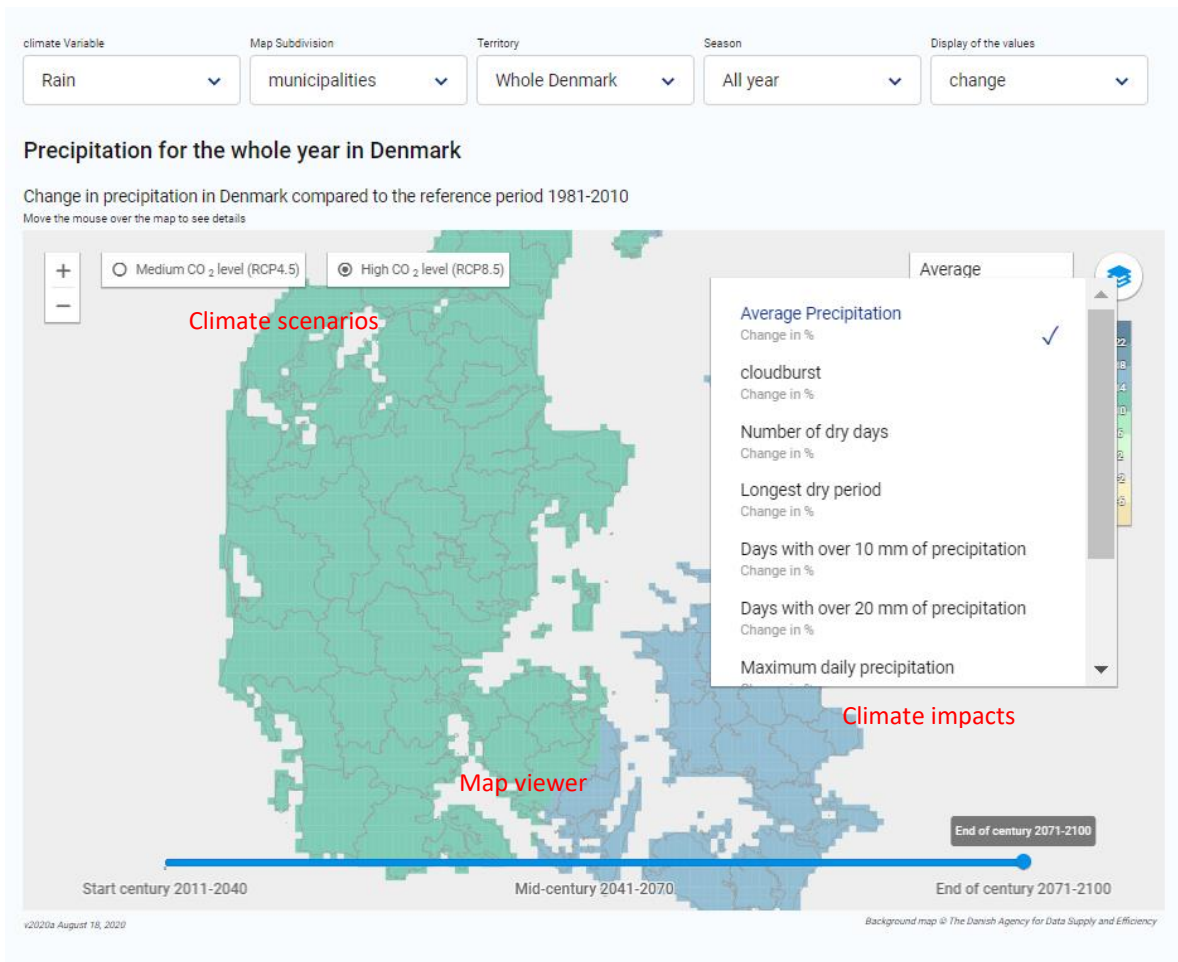**Enhancing Adaptation Action in Turkey Project**

Resilient House Tool

With the effect of climate change, it is expected that precipitation in Danish geography will be more frequent and highly severe, and heatwaves will affect many regions. Rapid melt of masses of snow and cloudbursts cause floods, especially in residential areas. In this context, the Resilient House tool[36] developed by the Denmark Nature Agency is developed for residents to show the impacts of climate change and adaptation options for extreme weather events due to these impacts.

As seen in Figure 14, the Resilient House tool, similar to BusinessWizard in structure, includes six different scenes. While three of these scenes address the outer environment of houses, the others refer to the living areas and basement of the house and cloudburst conditions. For all these scenes, by clicking the spots placed in various sections of the house, users can see how relevant sections will be affected by climate change and how to adapt to such effects.

The Danish Nature Agency aims at raising house owners' awareness of extreme weather events resulting from climate change through the Resilient House toolbox and making houses climate-resilient before damages resulting from extreme weather events occur. Thus, it aims to avert financial damage that may be caused by disasters.
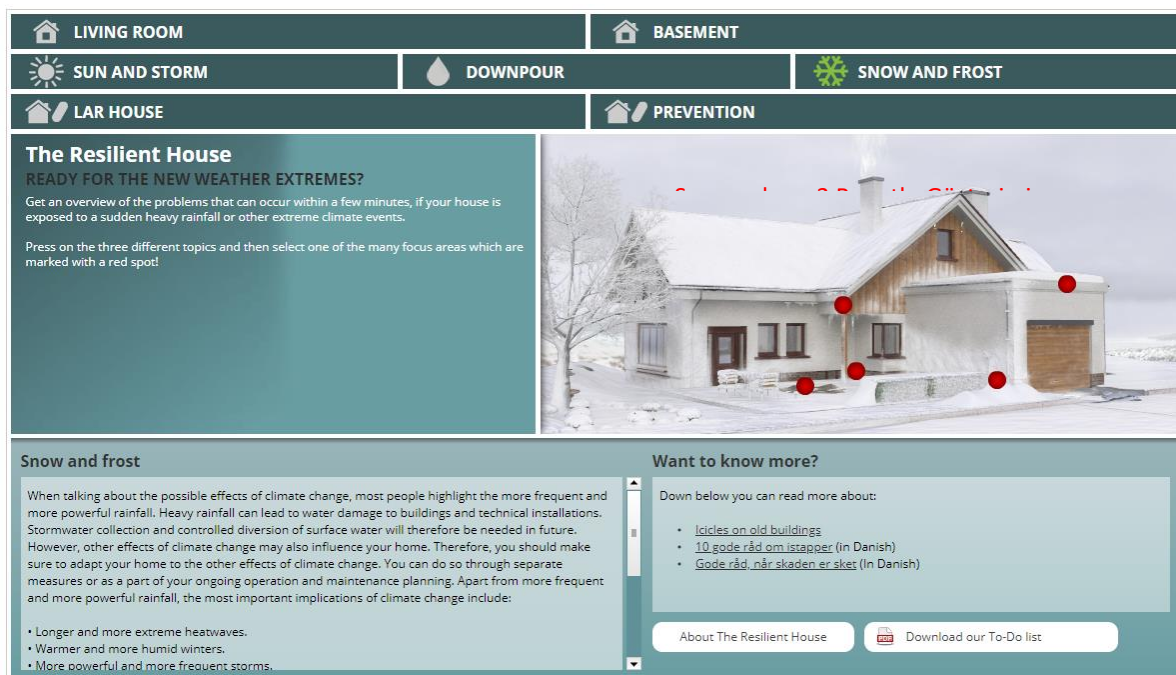
Figure 20 Resilient House toolbox

AgriWizard

AgriWizard[37] is positioned as an interactive guide showing how a farm can be protected against extreme weather events. Similar to the Resilient House tool and BusinessWizard in terms of structure, AgriWizard includes 6 different scenes as seen in Figure 15. Two of these scenes are about the shed

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[36] Website: https://en.klimatilpasning.dk/tools/theresilienthouse/

[37] Web-page: https://en.klimatilpasning.dk/tools/agriwizard/

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and its surroundings, two of them are about internal and external environments of the farm and the last two scenes are about the fields to be planted. Clicking on the spots in these scenes, similar to the other tools, users can see how the relevant part of the farm would be affected by extreme weather events and how farmers could adapt to such impacts. Thereby, the tool enables farmers to see any impact of climate change on crop yield without going through a financial loss and to implement effective climate adaptation actions.

Figure 21 AgriWizard Interface

Case studies

There are effective climate adaptation actions that will serve as a model on local and national scales on the platform. Compiling experiences by various thematic areas and sectors in terms of climate adaptation, case studies[38] guide users who want to develop adaptation action in similar areas. The platform has 63 case studies involving pilot projects and initiatives relating to climate adaptation actions as of August 2020. Such studies offered as a list in the platform enable users to classify studies according to thematic areas and sectors.

For each case study, the contact address of the focal points is provided. Thus, users with common problems can contact and share their experiences. Additionally, the platform offers various links that users can access detailed information on the thematic area and sector associated with the case study.

Sectors

The Danish National Adaptation Platform offers a "sectors" [39] tab to users as distinct from the other platforms. In this tab, information about how 11 different sectors would be affected by climate change, how they can develop effective climate action examples of other stakeholders associated with the sector is given. In addition, stakeholders can access information on impact-vulnerability analyses of

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[38] Website: https://en.klimatilpasning.dk/cases/
[39] Website: https://en.klimatilpasning.dk/sectors/

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related sectors, climate projections, and current situation. Thus, the aim is to raise climate change awareness at the sectoral level and guide users in terms of developing climate adaptation measures. Sectors given in the platform include coastal management, construction, water management, energy, agriculture, forestry, fishery, spatial planning, health, disaster risk management, and ecology.

Knowledge

Knowledge tab[40] includes general information about climate change, current technologies, sectors, economic impacts of climate change, international climate adaptation plans and actions, and published studies. The knowledge tab is updated regularly with the contents provided by the Danish Meteorological Institute, Ministry of Environment and Food, and platform management. Countrywide publications and studies about climate adaptation are also given in the tab. When contents in the library are analyzed, it is seen that metadata inputs have been generated for all contents. Thanks to establishing a metadata format for all kinds of information provided, users can find related content by using a search engine. Additionally, the responsible person's contact address (e-mail address and phone number) is provided for each content. For further information about the study, stakeholders can contact these focal points via provided information addresses.

Platform management

The platform was established in March 2008 as an initiative in line with the Danish Strategy for Adaptation to a Changing Climate which is the former climate adaptation strategy of the Danish Government. The platform, having updated its interface in 2018, is also regularly updated in terms of content. The platform's web portal, management and update are handled by the teams provided by the Ministries of Energy, Environment and Food, Finance, Economy, Industry, Defense, Health, Transportation and Construction. The Danish Meteorological Institute (DMI), Danish Energy Agency and Local Government Denmark are also in collaboration with the related ministries on the subject of providing content for the platform and platform management. The platform is managed by an interdisciplinary team and contents posted on the platform are reviewed and published by related departments.

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[40] Website: https://en.klimatilpasning.dk/sectors/

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4.   TURKEY'S NATIONAL ADAPTATION PLATFORM

> - The primary functions of Turkey's National Adaptation Platform will be to ensure the stakeholders' access to reliable information and to serve as a guide for decision-making mechanisms during developing climate adaptation policies. Through the platform, continuous information share between state and non-state stakeholders will be established, and a dialogue environment will be created.
>
> - The integration of location-based data that the platform will include, to the National Geographic Information Platform will support the decision-making mechanism, improving the functionality of the platform as well by incorporating the mapping and visualization skills to the platform.

When examined specifically for Turkey, studies on climate adaptation are being conducted by many different stakeholders (governmental agencies, non-governmental organizations, universities, etc.). Especially in the Paris Agreement, non-governmental organizations came into prominence, playing a role in the efforts as observers, consultants and pioneers (Allan & Hadden, 2017). Accordingly, non-governmental organizations in our country have been benefiting from various domestic and international grants and creating content contributing to climate adaptation action. Similarly, universities through climate change research and application centers carry out research projects and create content. A database for collecting information and data on climate adaptation generated by different stakeholders and serving as a one-stop-shop for climate adaptation was not established in Turkey. For such a need in adaptation, it is necessary to create a knowledge exchange platform at the national level. The main purpose of creating such a platform is to facilitate the collection, share and use of information on impacts, vulnerability, and adaptation of climate change and to establish a consistent and up-to-date information base. The platform by closing the dialogue gap between decision-makers that are currently developing the climate adaptation policies and state/non-state stakeholders will provide a base for sound application. In this context, in addition to the Turkey's National Adaptation Platform serving as the one-stop-shop for climate adaptation action, with its tools it will guide the adaptation strategies developed by the decision-making mechanism.

Considering the existing systems in line with the purposes of the Turkey's National Adaptation Platform, the **Turkey National Geographic Information System (TRGIS)** is at the forefront as another application that shares the same goals for location-based data and can cooperate in the future. Being implemented in the coordination of the General Directorate of Geographic Information System of the Ministry of Environment and Urbanization, the main objectives of TRGIS are to:

- Establish geographic information systems infrastructure at the national level in line with the EU INSPIRE Directive,

- Establish a web portal for public entities to share location-based data they generated on a common infrastructure and to use each other's data,

- Establish standards for the generation and sharing of location-based data in the designated theme frameworks (Alır, 2017).

In line with this purpose, the National Adaptation Platform has been implemented and allowed public entities to access instantly to data they need through **Atlas** application by providing the geographic web services generated by various entities in one place. Thus, decision-making mechanisms are supported. With the location information on climate change impacts, digitalization and proper formatting of data available on Turkey's National Adaptation Platform, the incorporation of a "data

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theme" in the National Geographic Information System will strengthen the platform's function of supporting decision-making mechanisms. Similarly, by using the National Geographic Information Platform's mapping and visualization abilities, the Turkey's National Adaptation Platform will increase its functionality and will strengthen Turkey's climate action by advancing it to modern norms.

4.1. Purpose of the platform

The Turkey's National Adaptation Platform will be established to achieve the following:

- Guide decision-making mechanism in Turkey,
- Guide development, support and application stages of climate adaptation plan and strategies throughout the country,
- Collect information and data on climate adaptation in a single repository and ensure easy access for stakeholders (public entities, private sector, universities, non-governmental organizations, citizens),
- Facilitate the collection and share of data by generating regularly updated knowledge and to make such data available for effective development of climate adaptation strategies,
- Establish a one-stop-shop for climate adaptation in Turkey,
- Strengthen the communication between stakeholders working on climate adaptation and to enable them to benefit from each other's work throughout the country,
- Prevent the generation of information and data on climate adaptation several times,
- Raise awareness on climate adaptation and to enhance stakeholders' capacity across Turkey,
- Strengthen Turkey's climate adaptation action.

4.2. Structure of the platform

The platform will consist of two main components, namely **web content** and **database**. As seen on the climate-ADAPT and EEA member platforms, these two components should be able to work in coordination to ensure the collection of reliable information and data and users' easy access to such information and data.

4.2.1. Web content

> - There should be public, local authorities and sectors buttons on the homepage of the national adaptation platform, facilitating the stakeholders' direct access to relevant content.
>
> - Establishing the platform within the ownership of the Ministry of Environment and Urbanization and giving the responsibility to the Department of Climate Change and Adaptation and General Directorate of Geographical Information Systems about the issues related to content and technical infrastructure of the platform will ensure the sustainability of Turkey's National Adaptation Platform.
>
> - It is recommended that the target group of the Turkey's National Adaptation Platform should be local and central decision-makers and entities supporting them.

The web content of the platform should focus on providing data and knowledge on climate adaptation.

In this context, it will be effective if the home (/entry) page of the platform to be established includes buttons for the public, local governments and sectors, and such links that allow respective stakeholders to directly access related content.

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Assessing the platforms of EEA members, web content is found to be classified under different tabs. These tabs are usually named as **library** tab (for some platforms knowledge or if there is an existing library integrated into the platform, the name of the library (e.g. Germany, UBA[41])) which includes countries' climate adaptation information and data. It consists of **recent** tab in which the recent developments on climate change actions of a given country can be found, **tools** tab in which tools that will strengthen the climate adaptation action and support the decision-making mechanism can be found, **case studies** tab in which examples of case studies can be found and **policy** tab in which countries' climate adaptation policies and adaptation programs can be found. In addition to these main tabs, through **About** tab users can obtain information on the platform and its use. This common structure can be used for Turkey's national adaptation platform. However, Turkey has a more effective mapping and visualization tool than other national adaptation platforms. Turkey National Geographic Information Systems (TRGIS) Project that is run by The Ministry of Environment and Urbanization the Directorate of Geographic Information Systems, by the **Atlas** application in it, enables the visualization on map, processing and interpretation of location-based data. Users in governmental institutions can access and use the data of other institutions in their account's authorizations' limits. Atlas also has publicly available data and websites in OGC standards can be displayed together (Alır, 2017). In this context, the integration of TRGIS infrastructure into the platform and adding the location-based climate adaptation data as a "thematic data theme" to the National Adaptation Platform will ensure the instant access of decision-makers to climate adaptation data and support the decision-making mechanism. Also, through the collaboration with the National Geographic Information Platform National Adaptation Platform will have superior mapping and visualization function compared to other countries' platforms. In this context, establishing the connection between the platform and the National Geographic Information Platform and for the access to climate adaptation data layers from the Turkey's National Adaptation Platform, it is important to add **Atlas** tab.

Atlas application can display all services with OGC standards (WMS, WFS, WMTS etc.) (Alır, 2017). Assessing the data that can be incorporated into National Geographic Information Platform, it is expected to be in form of vectors (point, line and range) and rasters. The data satisfying the OGC standards that will be added in this context can be serviced to users on Atlas application directly without additional conversion.

4.2.2. Platform management

As in the parts of the report assessing the platforms of EEA members and Climate-ADAPT, platform management is divided into two as **content** and **technical infrastructure**. Content management involves the phases of updating the information and data that the platform contains, examining the knowledge, data and projects provided by various institutions and entities and organizations and approving them according to platforms criteria. Technical infrastructure involves the phases of maintenance of the platform and updating the technical infrastructure according to country and users' needs.

On the platforms of EEA members, subunits of the same institution are assigned for content and technical infrastructure management, and as well as subunits of different institutions. A common characteristic observed in all platforms is that the assigned units **form a team** only for content

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[41] Website: https://www.umweltbundesamt.de/en/the-uba

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management and developing technical infrastructure. Because the content and technical infrastructure are elements influencing each other, it is important for units to be in continuous communication (EEA, 2015).

Besides the content and technical infrastructure management for the platform's coordinated progress with national climate adaptation strategies and to secure its place in the center of adaptation action, **advisory boards** also stand out. In the Dutch example, while the advisory board consists of academicians and stakeholders, in Climate-ADAPT example, the advisory board consists of EEA General Directories.

It is important for content and technical infrastructure to be carried out in coordination and in a sustainable way so that the Turkey's National Adaptation Platform in the light of this knowledge can support decision-making mechanisms actively and stay up to date. The platform should be implemented by designing a coordination structure with political ownership at the national level. It can be expected that the technical infrastructure to be implemented by the Directorate of Geographic Information Systems which involves information processing and management services.[42] As seen in EEA members, it is critical to form a team for the platform management that will coordinate reviews, updating of platform's content and process of publication of provided information and data . In this context, it would be useful in terms of accuracy and up-to-datedness of content to provide the content management by forming a study group from focal points of Ministries that are responsible of sectors, with the coordination of the General Directorate of Environmental Management which includes Climate Change and Adaptation Department.[43]

Forming a permanent advisory whose main function is to direct the platform's development strategy and which accordingly will advise on the content of the platform and the way available information is presented to users is important for identifying the priorities of the platform and its compatibility with national adaptation strategy.

4.2.3. Platform's target group

The target group of the prospective National Adaptation Platform similar to platforms of EEA countries should directly be local and central decision-makers, entities at the level of central and local governments supporting decision-making mechanism in subjects of climate adaptation strategy, plan and action development, application and assessment. Despite the prominence of the identified target group, it is very important for platform to be designed to address a wide audience including the private sector, non-governmental organizations, researchers and the general public.

4.2.4. Main content providers of the platform

Information and data have been generated in various sectors and fields since the preparation of the National Climate Adaptation Strategy and Action Plan (2011) in Turkey. Such generated information and data are stored within the stakeholders' structure and include rich content for the national adaptation platform. There are various studies on climate adaptation based on sectors conducted by the central government entities (Ministry of Environment and Urbanization, Ministry of Agriculture and Forestry, Ministry of Culture and Tourism, Ministry of Science, Industry and Technology, Ministry

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[42] https://webdosya.csb.gov.tr/db/cbs/menu/yeni_sema_2018_son_20180222_20191121091027.pdf
[43] https://webdosya.csb.gov.tr/db/cygm/menu/organisasyon-semasi-isimsiz-29-06-2020_20200629032255.pdf

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of Health, municipalities, etc.) as well as municipalities, non-governmental organizations, universities, research institutes and centers and private sector. The said stakeholders are the main content providers of the platform, and the results of grant projects which will support various areas under the project "Enhancing Adaptation Action in Turkey" will also strengthen the content of the platform.

Public entities

Information and data held by public bodies on climate adaptation, outputs of work conducted and still being conducted by them will be the main content of the platform. In addition to the work already completed, public entities contain databases, portals, platforms, and information systems that will contribute to climate adaptation action. Some examples that can be used actively and work integratively with the platform are noted below.

- **Turkish National Sea Level Monitoring System (TUDES):** TUDES, is a data center under General Command of Mapping and consists of 20 tide gauge stations at various Turkish coasts. TUDES Web Portal [44] is established in March 2016 to provide sea level data. Through portal, users have free access to sea level data in local data.[45]

- **Agricultural Monitoring and Information System (TARBIL):** TARBIL System aimed to assess satellite images and the data obtained from geodetic networks, to convert them to up to date agricultural information and to share with stakeholders simultaneously. At the pilot stage of the Project (2011), a monitoring system that can monitor the agricultural development in the Southeastern Anatolia region was developed. Images downloaded directly from satellite and ground station are processed and transferred to the data collection center (Üstündağ et al, 2015).

- **Clima-Hydro Database:** A "Clima-Hydro Database" which includes all of the data in Climate Changes Impact on Water Resources Project carried out by The Ministry of Agriculture and Forestry, General Directorate of Water Management between 2016-2018 is established. All the climate change impacts, and hydrologic projection can be found in Clima-Hydro Database through GIS application.[46]

- **Flood, Failure and Response Spatial Information System (TAMBIS)**: Geographic Information System (GIS) based on TAMBIS Project was implemented by the Ministry of Agriculture and Forestry for the General Directorate of State Hydraulic Works (DSI) to collect flood-related data and make it accessible (DSI, 2016).

Integrating the existing databases into the national adaptation platform will strengthen the platform's content and functionality.

On the other hand, local authorities will be able to enter their work outputs as well as climate adaptation actions (such as green infrastructure practices, awareness efforts) as example case studies to the platform. Climate adaptation actions implemented by local governments will be complied in the "example case studies catalogue" that will be prepared as a part of Enhancing Adaptation Action in Turkey and this catalogue will be able to provide for **example case studies** tab of the platform.

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[44] Website: https://tudes.harita.gov.tr/
[45] Website: https://tudes.harita.gov.tr/Portal/Index/2?lang=tr/TUDES
[46] Website: http://iklim.ormansu.gov.tr/Proje.aspx

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Universities and research institutes

Universities, climate change research and application centers are generating information and data on climate adaptation through projects. In this context, one of the main content providers of the platform is universities.

For example, the Intergovernmental Coordination Group for the Tsunami Early Warning and Mitigation System in the North-eastern Atlantic, the Mediterranean and connected seas (ICG/NEAMTWS) is providing sea-level data to Kandilli Observatory and Earthquake Research Institute (Turkey's Seventh National Communication, 2018). **CVI (Coastal Vulnerability Index)** analyses are conducted in all coastal areas to identify the sea level rise and disaster risks. Vulnerability indexes are calculated with a simple model using coastal population density, plant cover percentage, topography, human development indicators. States with delta areas Adana, Çanakkale, Samsun, Balıkesir and Aydin are identified as with the highest risk as an output of this study.

It will strengthen the platform's content to take inventory of similar studies conducted by universities and providing them to the platform as content input.

Non-governmental organizations

Non-governmental organizations benefit from various grant programs from domestic and foreign resources for activities relating to climate change thus generate content that contributes to climate adaptation action. Projects and practices by non-governmental organizations should be one of the main content inputs for the platform.

Other stakeholders

Stakeholders (decision-maker entities, local/central governments, non-governmental organizations, academicians, business community etc.) which generate all kinds of information and data on climate adaptation that is scientifically proven can upload their outputs relating to climate adaptation action (publications and reports, guidance documents, tools, research projects and outputs, example case studies). Accordingly, it should be paid attention that the content to be approved by a competent institution or team (such as thesis jury, peer-reviewed articles, approval of content created through grants by the grant provider) and on a scientific basis. Correspondingly, it will enrich the platform's content that it is possible for several different stakeholders to share content through the **Share your information** button that Climate-ADAPT and some other country's platforms have.

4.3.   Contents provided and content management

-Only the content uploaded by authorized users should be accepted in order to ensure that platform remains a reliable source of information.

- Especially the location-based data should comply with TRGIS metadata standards to ensure that the national adaptation platform and TRGIS can work coherently.

- The content that will be shared on the platform should be checked for metadata compatibility, scientific accuracy and expediency with the platform.

- Interactive tools should be included on the platform to strengthen the collaborative knowledge exchange and climate adaptation action.

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The platform to be established will act as a one-stop-shop that various sources (public entities, non-governmental organizations, academicians, etc.) can share climate change-related content regularly and can obtain content from instead of serving only as a data and knowledge base. Accordingly, it is needed that the content uploaded by several different sources and from all over Turkey to be systematically classified under various thematic fields. This systematic approach makes the platform 'user friendly' by enabling users to access accurate information easily.

4.3.1. Content sharing on the platform and content classification criteria

Climate-ADAPT's content sharing approach is explained in this report under 2.2.1.[47] Summarizing this approach, only the users with Eionet accounts are allowed to upload content to the platform. Similar to EEA's strategy, content provided by entities or persons that **have user accounts with authorization to upload content to the platform** should be accepted in order to the national adaptation platform to remain a reliable source of information.

The next step after the content uploading is establishing a user-friendly platform by organizing and classifying content in different formats taken from several sources. One of the important steps in achieving that is to ensure disaggregation of data users uploaded by **Share your information** page and execution of classification in the content uploading stage.

Another important factor for accurate classification of data and facilitating the users' access to information they need is ensuring that the content is shared with accurate **metadata** entering.[48] In the Dutch adaptation platform's metadata format, it is compulsory to enter a **summary**, **theme, location**, **type of work** (research project, policy documentation, etc.), **owner,** and **year of publication** of the content that is shared. The Turkey's National Adaptation Platform can use the metadata format that is currently used for the Netherlands' National Adaptation Platform. Thus, content classification is effectively done, and users can access the knowledge or data they are searching for easily by using various keywords.

Considering that the platform can work coherently with TRGIS Project, in order to integrate the location-based data that the platform will incorporate, TRGIS has to comply with metadata standards. The Turkish National Geographic Data Platform was implemented in 2012 as the result of work under TRGIS project carried out by the General Directorate of Geographic Information Systems. This portal is a platform where the metadata generated nationally by geographic web services, are entered and can be viewed. It includes metadata of by whom and when the data generated by entities is generated, which data theme it includes, area covered, coordinate system etc. (Alır, 2017).

It is necessary to work with the General Directorate of Geographic Information Systems for location-based content to be integrated into the National Geographic Information Platform in determining Turkey's National Adaptation Platform's metadata standards.

4.3.2. User access to content on the platform

It is expected that the main content provider stakeholders to be public entities. Because it is objectionable to share some content provided by public entities due to their level of confidentiality, it

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[47] Climate-ADAPT content uploading page is given Figure 3.

[48] The importance of metadata is explained in detail under **2.2.1** in content sharing steps of Climate-ADAPT.

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is possible that it will not be accessible to all users. This situation includes a wide range of areas from personal security to national security. It may be necessary to find a balance between the need of providing technical/scientific content to users and reservations of government agencies on providing content to the platform.

For this situation to not to hinder platform's operation, the procedure that TRGIS has used can be used. National Geographic Information Platform has user types in itself. Each one of such user types has a different level of access. For example, a user that logs in to the platform with an **open data** user type can access the data that is made public in the limits of their account's authorization. Public entities by logging in to the platform through **Ministry Log-in** with username and password created for them can access the data that can be shared within government but not shared publicly. Homepage of the National Geographic Information Platform is shown in Figure 24.

Figure 22 National geographic Information Platform Login[49]

Following a similar approach in the prospective national adaptation platform would solve potential concerns of public entities which are one of the main content providers of the platform and would facilitate the flow of content to the platform.

4.3.3.   Reviewing the content to be shared on the platform

The content that will be shared on the platform should be reviewed in terms of metadata compatibility, content's level of scientific accuracy and relevance to the platform's objective. The working group recommended under the "Platform Management" topic should control the potential content provided by different stakeholders regularly before uploading it to platform and should request revisions if needed. Therefore, ensuring that the platform always remains as a reliable information and data

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[49] Website: https://www.atlas.gov.tr/#

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source. In this context, it is important that the Climate-ADAPT content admission scheme given in Figure 5 is applied in the Turkey's National Adaptation Platform as well.

4.3.4.   Content allowed on the platform

The content that is allowed on the Turkey's National Adaptation Platform, assessed under the topic of main content providers of the platform will focus on;

- Existing impacts of climate change and projections of future
- Region or sector-specific risk and vulnerability analysis (current state and projections of future)
- Review of Turkey's climate adaptation process and policy framework
- National adaptation strategy and related policy decision documents
- Climate adaptation action information, data and experiences generated by stakeholders
- Urban Order[/Adaptation] initiatives
- Example case studies
- Development, implementation, monitoring and evaluation of climate adaptation strategies.

The platform should also include **interactive tools** to strengthen collaborative knowledge exchange and climate adaptation action. As indicated in the first part of the report that reviews EEA members, countries actively use climate adaptation tools to support the policymaking process for decision-making mechanisms and to strengthen climate adaptation action.

The development of climate adaptation tools is a process requiring multidisciplinary work by its nature. In this context, it is highly possible that at the first stage some sectors will be chosen, and tools will be developed for those sectors. Reviewing the most visited content statistics published by Climate-ADAPT, it is evident that the agriculture sector and biodiversity stand out the most. Climate-ADAPT's The Most Viewed Content in 2019 is given in Figure 26.
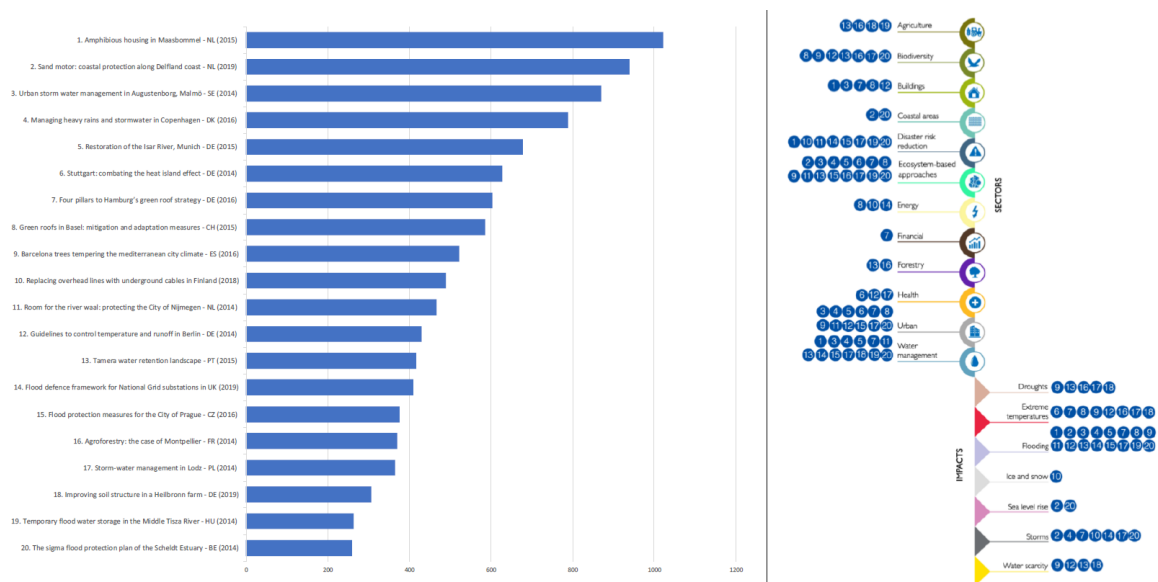

Figure 23 Climate-ADAPT The Most Viewed Content in 2019 (Climate-ADAPT Information Form, 2019)

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It is expected that it would be similar in Turkey as well. The agricultural sector is the top sector among the *climate-dependent* sectors exposed to negative impacts of climate change both in terms of the need for water resources and protection of the agricultural biodiversity. It should be considered that the sector has good opportunities to adapt to climate change impacts.

4.4.   Monitoring & Evaluation mechanism of the platform

Monitoring and evaluation of the platform is a useful tool to determine if the platform reaches specific goals successfully. The monitoring and evaluation mechanism is needed in the process of climate adaptation policy to meet stakeholder's ongoing needs and to modify the platform accordingly. User feedback is very important for the monitoring step. In this context, statistics such as times visited, user satisfaction and indicators relating to platform use (the most visited tool or sectors with the most searched content, etc.) are an important part of the monitoring mechanism. Additionally, taking one-on-one feedback from the platform's stakeholders that are content providers and users is important for active monitoring of the platform.

In the assessment mechanism, feedbacks from users should be considered and the extent to which the platform serves the national adaptation action should be determined regularly each year. Accordingly, it is very important that platform management would be able to access user feedbacks and ensuring that feedbacks are used effectively in the platform assessment process.

There should be an **Opinion and Suggestions** page on the platform for users to give feedback easily, given the importance of it for the monitoring and evaluation mechanism. Thus, platform management can do the assessment and update the platform according to users' needs and requests. Additionally, the opinions and suggestions of public entities especially should be requested, and such suggestions should be incorporated into the monitoring and evaluation mechanism. As seen on some of the EEA members' platforms; as a result of these actions, writing a monitoring and evaluation report that includes user statistics of the platform and by discussing this repost in workshops and meeting that stakeholders will participate in making the decisions accordingly would be an important step towards platform's sustainability.

Platforms of EEA members and Climate-ADAPT sends surveys in which users can deliver their opinions and suggestions on the platform regularly. So, it is ensured that the platform can always meet the users' needs. Conducting user surveys periodically and incorporating the survey results into the monitoring and evaluation mechanism would help to make the platform user friendly.

4.5.   Publicity of the platform

An examination of the platforms of EEA members reveals various strategies for publicity.[50] The Finnish National Adaptation Platform has the most comprehensive publicity among other countries.

Assessing the Finnish case, it is observed that the platform is publicized in important meetings and workshops, the platform's media visibility is increased by press releases, social media is used actively for publicity and the platform has reached users from different backgrounds through organized seminars and webinars.

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[50] This study is assessed under **3.4**.

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The publicity of Turkey's National Adaptation Platform is very important for the platform to reach its goals. In this context, Finland's model can be taken as an example. In addition to Finland example, it would be helpful for the platform's publicity efforts to include the national platform in meetings, workshops and conferences of projects that received grants as part of the Enhancing Adaptation Action in Turkey and to highlight that platform will include the generated content by such grant projects.

4.6.   Establishment phase of the Turkey's National Adaptation Platform and potential challenges

The Turkey's National Adaptation Platform aims to ensure access to scientifically proven, verified and factual data that will strengthen the climate adaptation actions of stakeholders (central government, local government, universities, private sector, non-governmental organizations and citizens) and will support decision-makers. It will be challenging developing this platform's extent and functionality, operating and ensuring its sustainability since the field of adaptation to climate changes impacts is interdisciplinary and multi-layered. Such restrictions are evaluated below.

4.6.1.   Obtaining information and data from public entities

> - Ensuring regular dataflow from public entities is one of the biggest challenges for the platform. It is expected that by establishing the platform's legal infrastructure this would be resolved.
>
> - Another challenge for the platform is obtaining content. It is expected that this challenge will be met by taking inventory of content provided by stakeholders and identifying content relevant to climate adaptation action.

Examining the platforms of EEA members, it is observed that platforms are updated regularly and improved according to user feedback and the country's needs. It is very important to update the platform's content for the reason that the Turkey's National Adaptation Platform will be at the center of climate adaptation action and serve as a information and data source providing to stakeholders. Accordingly, one of the greatest challenges in the platform's operation is the regular uploads of information and data from stakeholders.

It is especially important for public entities to provide content for the platform. Accordingly, the first challenge for the platform would be obtaining regular dataflow from public entities. As a result of consultation meetings with relevant institutions, it is observed that the National Geographic Information Platform has faced similar challenges. The General Directorate of Geographic Information Systems has overcome this challenge with **Presidential Decree No. 49 on Geographic Information Systems** and ensured regular dataflow. The decree empowers the Ministry of Environment and Urbanization relevant to National Geographic Information Systems on ensuring the coordination among public entities, ensuring geographic data and knowledge generation and updating, management, usage, ensuring access security and distribution (Presidential Decree on Geographic Information Systems, 2018).

The National Geographic Information Platform has established a legal infrastructure to collect data from public entities and to share those data with other stakeholders. The Turkey's National Adaptation Platform would need a similar **legal infrastructure** to sustain continuity.

Another challenge for the Turkey's National Adaptation Platform will be obtaining content. In the extent of project components, examining the studies conducted by Turkish public entities, it is found

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out that some of these studies are relevant to climate adaptation action, but the reports do not include the "climate adaptation" phrase. In this context, public entities may have difficulties connecting their generated information and data with climate adaptation and there could be drawbacks in sharing the content that is directly related to climate adaptation on the platform. To prevent this situation, it is important to take an inventory of information and data that stakeholders have and these inventories to be evaluated by people competent in their fields.

4.6.2. Funding of the platform

> - Institutional political ownership and allocating funds from the government budget are critical for the platform to sustain its continuity, regular updating and maintenance of the platform's content.

After the platform is established, one of the biggest challenges to ensure platform's sustainability would be the funding.

Developing a regular funding mechanism is critical to ensure the adaptation platform's sustainability, to update it according to the country's needs and for coordinated progress with the country's adaptation strategy. Examining the platforms of EEA members, it is observed that funding mechanisms vary according to the level of institutional political ownership and legal infrastructure.

Experience and outputs of 18 EEA members should be considered while developing the Turkey's National Adaptation Platform's funding mechanism. It is planned to create a useful platform prototype with funding under the Enhancing Adaptation Action in Turkey. These Project-based funds can be used to increase the platform's functionality (developing new tools, strengthening technical infrastructure, etc.). Institutional political ownership and allocating funds from the government budget are critical for the platform to sustain its continuity, regular updating and maintenance of the platform's content. In this context, it is important that the Turkish National Adaptation prospective platform with ***.gov.tr** extension under the Ministry of Environment and Urbanization in terms of the platform's functionality and sustainability.

4.7. Platform's architecture

Adopting a "Service Oriented Architecture" approach and designing a modular system would ensure that the platform is sustainable and has a high ability to integrate with other systems. Service-Oriented Architecture (SOA) is a software designing architecture focused on service-oriented and flexible business processes as a result of service routing. This architecture facilitates the workflow of the system and provides a longer lifetime with its improvable structure (Zorilla and Garcia-Saiz, 2012). The general objectives of service-oriented architecture can be listed as:

- Making services reusable,
- Increasing the interoperability between applications,
- Developing new derivative services from existing services and using those to create organizational business processes,
- Being able to adapt faster to changes in utilization processes (Bin Oh et al, 2007).

Advantaged of using Service Oriented Architecture:

- **Interoperability:** Different functions can be easily integrated into the system in a service-oriented architecture.

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- **Working independently:** Services can work independently in a service-oriented architecture.
- **Reusability:** One service can be used multiple times in service-oriented architecture (Bin Oh et al. 2007).

Well-designed services have a higher possibility to be reusable. Institutions benefit from this architecture by avoiding the costs rising from new software development and increasing the reliability of software inventory. Integrating an existing service into an application requires less effort than developing new software in a system-oriented architecture.

Layers of the prospective of Turkey's National Adaptation Platform are explained down below.

Application Layer: This layer includes interfaces that user's access, modules and content management system.

Service Layer: The layer that establishes applications' data flow and data integration with other systems. The systems that will be integrated into the system have to use this layer due to the requirements of service-oriented architecture.

Database Layer: The layer that contains contents of adaptation platform, module data, data of software of integration services.

Recommended layers for the Turkey's National Adaptation Platform are shown in Figure 27.
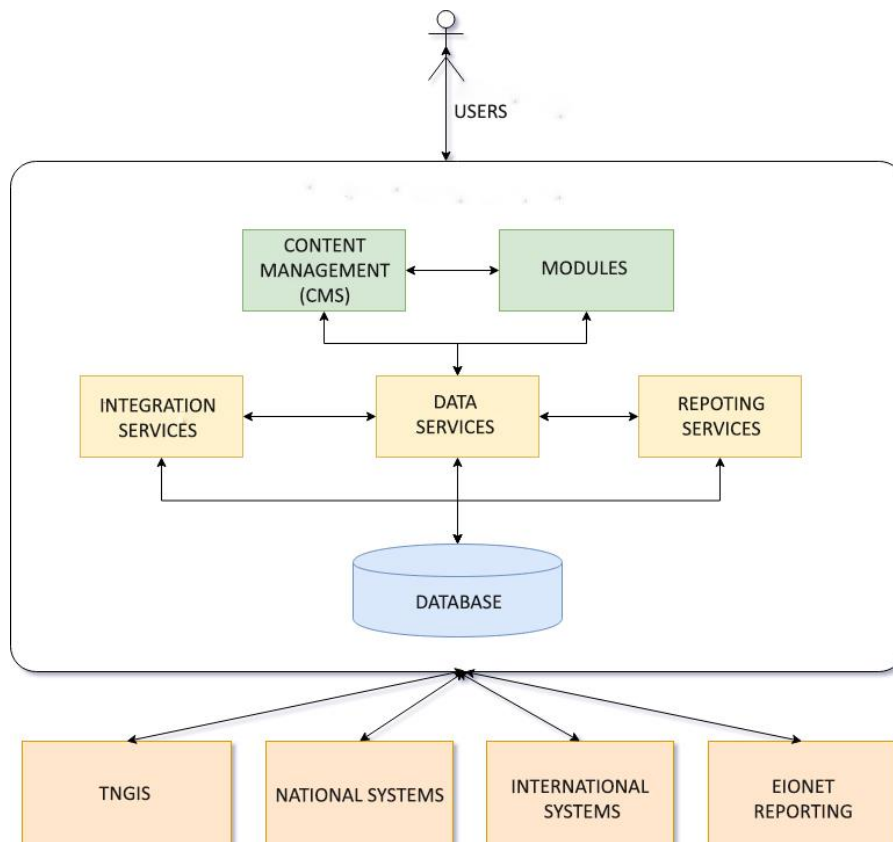
Figure 24 Recommended Layers for the Turkey's National Adaptation Platform

4.7.1. Systematic classification of the platform's content

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Systematic Classification of the content that is uploaded to the platform by stakeholders is very important for users to access the content they searched for and to take inventory of the platform's content. Examining the platforms of EEA members, it is observed that all data has complete metadata information and metadata is the most important criteria that reviewing institutions check before allowing the content on the platform. In this context, the accuracy of metadata inputs of the platform is very important for ease of use and access to knowledge.

Examining the platforms of EEA members, it is observed that usually similar metadata input is asked for the content that will be published on the platform. In Climate-ADAPT, content that is sent to the platform through the "Share Your Information" button by stakeholders is first categorized by the type of content. As shown in Figure 28, such content types are General, Publications and Reports, Information Portals, Guidance Documents, Tools, Research and Knowledge Projects, Adaptation Options, Case Studies and Organisations.

Share your information

| GENERAL |
| PUBLICATIONS AND REPORTS |
| INFORMATION PORTALS |
| GUIDANCE DOCUMENTS |
| TOOLS |
| RESEARCH AND KNOWLEDGE PROJECTS |
| ADAPTATION OPTIONS |
| CASE STUDIES |
| ORGANISATIONS |

Climate-ADAPT is a platform for sharing and integrating information on adaptation to climate change. This section provides short descriptions of the types of content which can be provided to Climate-ADAPT by its users. It also provides a guide on how to contribute different types of information to Climate-ADAPT. A FAQ for information providers offers further assistance.

To submit an item to the database choose from the list which type of information you would like to contribute.

In order to propose content contributions, Climate-ADAPT users need to have an account to log in, that can be requested here.

For general questions regarding such contributions, reporting issues or asking further information about the portal, Climate-ADAPT users can send us an email

Figure 25 Climate-ADAPT Content Classification

Stakeholder's metadata inputs are requested after contents are categorized at the sharing phase. The standard metadata format that Climate-ADAPT uses includes Summary section, **Name of the Institution and Source, Content's Date of Generation, Keywords, Climate Impacts, Sectors** and **Area Covered**. It is important that keywords are well defined and representative of the report especially for users to be able to find relevant content that they search.

Comparing platforms of EEA members, Climate-ADAPT stands out as the platform with the most detailed metadata format. For the Turkey's National Adaptation Platform's metadata format to be similar to Climate-ADAPT would make the platform user friendly and would ensure that the content is actively accessed in a classified format.

Climate-ADAPT's metadata format is given in Figure**Error! Reference source not found.**.

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Figure 26 Climate-ADAPT's Metadata Format

It is recommended that an explanatory video on how the stakeholders would upload content and how the metadata input should be entered and uploaded to platform.

4.7.2. Roles expected the system

As explained under 4.3.2, it is recommended to have two roles of users in the system. These roles are recommended as the **ministry** and **open data** similar to ATLAS application. Since the platform's stakeholders other than public entities are identified as universities, non-governmental organizations and citizens, data that will be shared with these stakeholders are expected to be open to the public. However, some content that is expected to be shared by public entities may not be shared for public use. Accordingly, access authorization should be asked to public entities on the content sharing page. Access to data that is confidential or should not be shared publicly should only be granted to users with ministry accounts.

A user role is needed on the platform as an **editor** that controls the content shared to be published on the platform established by the stakeholders, revises the content when needed and requests corrections. Thus, the continuity of the platform will be ensured as a one-stop share for climate adaptation action which is the main goal of the platform. Editor user role should make decisions to revise or publish the content according to feedbacks provided by the recommended team.

4.7.3. Data storage and database

Platforms under the European Environment Agency are managed by Reportnet 2.0 system. In this context, all the data collected and processed in Climate-ADAPT platform are collected in accordance with Regulation (EU) 2018/1725 of the European Parliament and of the Council of 23 October 2018 on the protection of natural persons with regard to the processing of personal data by the institutions, bodies, offices and agencies , and stored and distributed through the EIONET Portal (EEA, 2015). Data have to collected and processed for the discharge of duties for public interest pursuant to Regulation

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(EC) No 401/2009 of the European Parliament and of the Council of 23 April 2009 on the European Environment Agency and the European Environment Information and Observation Network, and for compliance with the legal obligations laid down in financial rules applicable rules to the EU budget.

Personal data processed and stored in Eionet User Directory are given below:

> User ID,
>
> First Name,
>
> Last Name,
>
> Full Name (in native language),
>
> Reason to create account,
>
> Job title,
>
> E-mail address,
>
> Mailing address,
>
> Phone number,
>
> Cell phone number,
>
> Fax,
>
> Institution,
>
> Department

The prospective Turkey's National Adaptation Platform will require personal information similar to Climate-ADAPT requests. In this context, examining the legal infrastructure in our country, personal data must be collected and stored in accordance with Law No. 6698 on Personal Data Protection (KVKK). Since the data requested does not fall under the "Special Categories of Personal Data", it is okay to collect data according to principles specified in Article 4.[51]

Examining the potential database architectures for data storing, it is observed that Climate-ADAPT uses a hybrid architecture. Climate-ADAPT uses MS SQL, NFTS systems for its database system, for data transformation processes uses FME server. It uses ArcGIS Desktop and Tableau for data analysis, data processing and visualization processes. For processes involving interactive visualization of data on online platforms and data sharing processes, Google and Esri services (ArcGIS Online, Story Maps) are

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[51] Principles to observe when processing personal data are defined in Article 4:

• Lawfulness and fairness

• Being accurate and kept up to date where necessary

• Being processed for specified, explicit and legitimate purposes

• Being relevant, limited and proportionate to the purposes for which they are processed

• Being stored for the period laid down by relevant legislation or the period required for the purpose for which the personal data are processed (Official Gazette, 2016).

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used (DG CLIMA, 2018). A detailed explanation of Climate-ADAPT's architecture is given in **Error! R eference source not found.**.
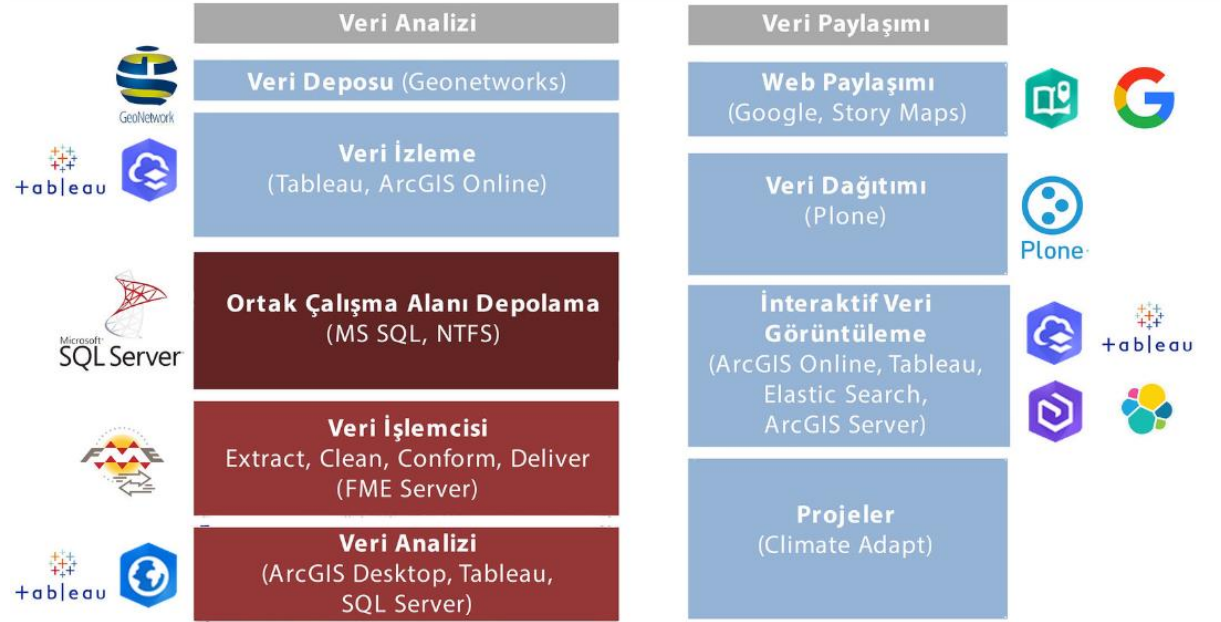
Figure 27 Climate-ADAPT's Architecture

Examining the legal infrastructure in our country, it is not possible to establish and operationalize an architecture built upon a hybrid or cloud system. Considering that the main providers of the platform will be public entities, it is perceived as a serious security risk to use Amazon services such as Azure system to store data obtained from public entities according to the Presidential Circular No. 2019/12[52] (Official Gazette, 2019).

In the light of this information, examining databases where data can be stored in a physical environment, PostgradeSQL relational databases comes into prominence as databases complying with international security standards and these databases are actively used in several sectors in our country. Additionally, in terms of compliance with KVKK, PostrageSQL database has certain steps. For example, through Task-Classify Data function at SQL Server database level, one can both make suggestions and add manually to classification and set the qualities and sensitivity levels of data on the columns. Accordingly, this protects the sensitive data that cannot be available to all, thus ensures compliance with KVKK. Further, as PostgradeSQL database is open-source software, it is less costly and in alignment with the policy of our ministries to use cost-free open-source applications. Another advantage of using PostgradeSQL database is that it supports geographic objects and can serve as a geographic data warehouse for location-based services and geographic information systems. Thereby, if a decision is taken to establish a tool based on geographic information systems similar to the Dutch Spatial Adaptation Platform, such tool can be easily integrated to the database.

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[52] Article 3: Data of public entities shall not be stored in cloud storing services except for the institutions' own private systems or local service providers controlled by the institutions.

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In this context, PostgradeSQL database is recommended to store the non-location-based data included in prospective Turkey's National Adaptation Platform. The section of the report on Turkey mentions how the prospective platform and Turkey National Geographic Information System will operate in coordination and feed one another. Accordingly, it will be beneficial for both platforms to use the Turkey National Geographic Information System to accommodate the platform's location-based data, and add such location-based data as a new layer to the Turkey National Geographic Information System and view such data on ATLAS application.

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