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Administration

Adaptation to Climate Change The Norwegian Example



Foto: Knut Opeide



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Geirangerfjorden

www.visitnorway.no



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Lysefjorden, Prekestolen



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Tromsø



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Trondheim



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Stavanger, Old city

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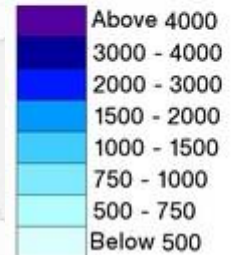
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Annual
precipitation (mm)
1971-2000

Map shows normal annual
precipitation (in mm) for normal period
1971-2000.

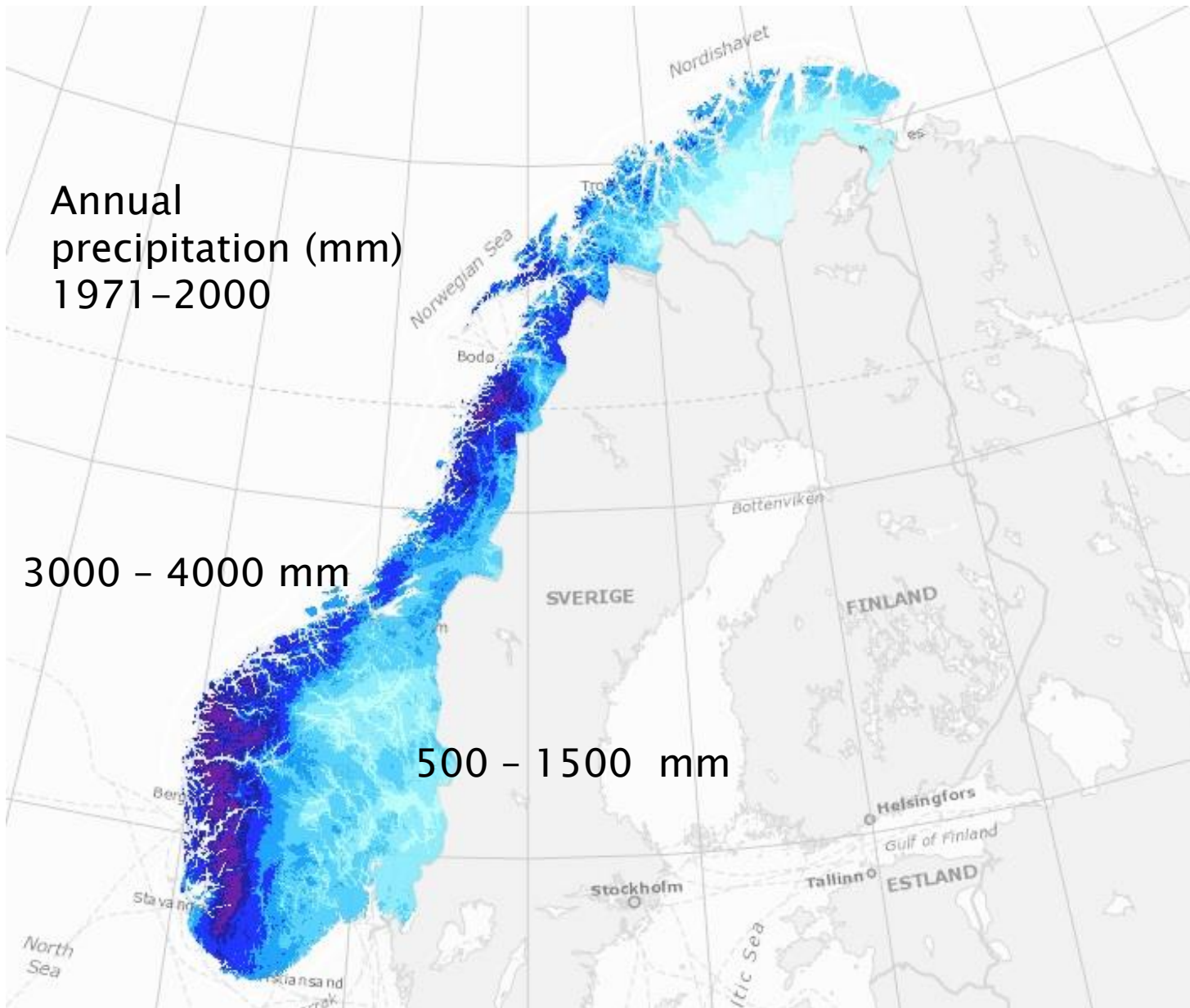
Data owner: Norwegian Water
Resources and Energy Directorate

mm



3000 - 4000 mm

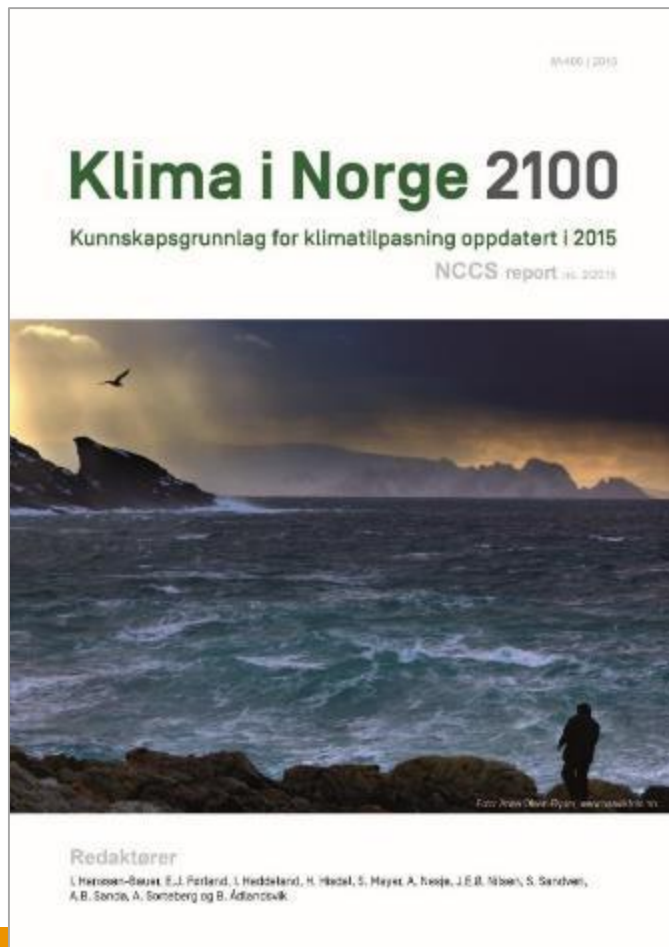
500 - 1500 mm





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National framework for adaptation Climate projections



Update following IPCC's AR5

The basis for calculations:

- climate developments in Norway so far
- assumptions about future greenhouse gas emissions.



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Climate in Norway 2100

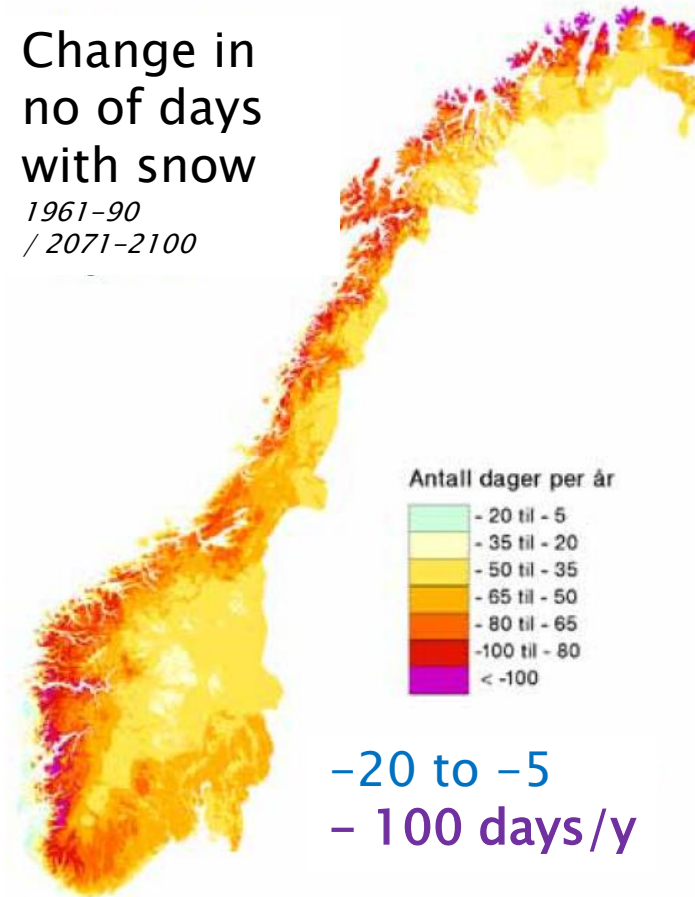
The climate we are adapting to..

Main conclusions

- More **precipitation** most places and seasons
- More **heavy rain** all over the country
- Shorter snow season
- Less snow in lower areas, eventually also in mountain areas
- **Generally more floods**: larger rain floods, eventually less «spring floods» from melted snow

Change in
no of days
with snow

1961-90
/ 2071-2100



National framework for adaptation

Climate projections

Precipitation / temperature / + + +

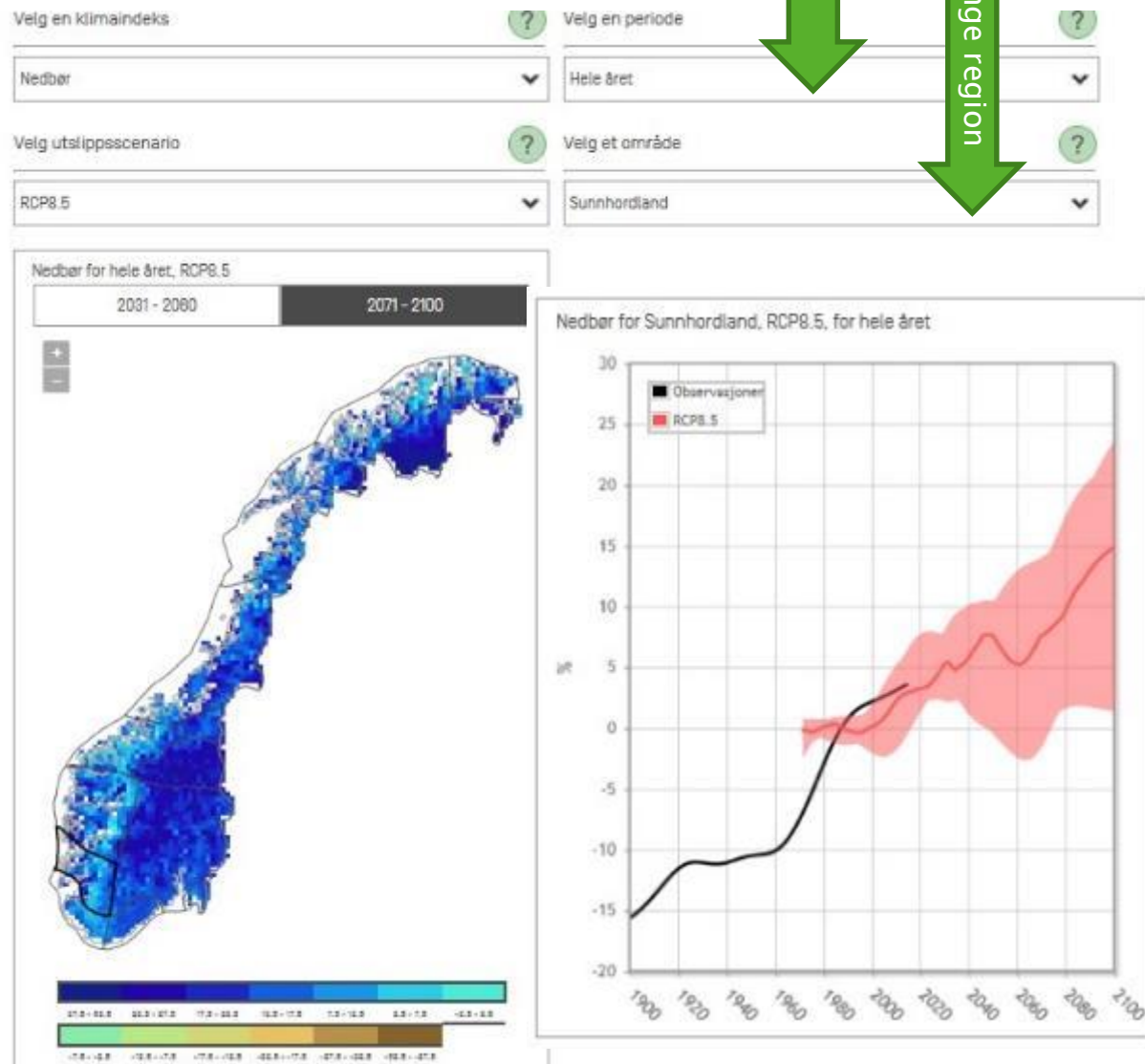
RCP 4.5 / 8.5

2050 / 2100

6 temperature
regions
13 precipitation
regions

>> annual and
seasonal
projections

[Interactive maps](#)





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National framework for adaptation

Norwegian Centre for Climate Services



eklima.met.no

Free access to weather- and climate data: historical, real time, forecast

www.senorge.no

Daily updated maps of snow, weather and water conditions and climate.

[Sea level change for Norway](#)

[Flood charts and flood projections](#)

[Short term precipitation](#)



Climate ADAPT

National level,
ministries

Sectors –
– state agencies

Management levels:
regions,
municipalities

1. Preparing the ground for adaptation
2. Assessing risks and vulnerability to climate change
3. Identifying adaptation options
4. Assessing adaptation options
5. Implementation
6. Monitoring and evaluation



Climate ADAPT

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ministries

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Climate ADAPT

National vulnerability survey

1. Preparing the survey
 2. Assessing risk and vulnerability
 3. Identifying adaptation options
 4. Assessing adaptation options
 5. Implementation
 6. Monitoring and evaluation
- vulnerabilities identified,
 - adaptation options recognised





Vulnerability & adaptation options

National vulnerability survey

1.

Sector-wise vulnerability analyses

Criteria for estimating the adaptive capacity:

- Organisation
- Resources
- Knowledge base for adaptation,
- Priorities

2.

Analysis of managements levels:
state, region, municipality





Climate ADAPT

1. Preparing the ground
2. Assessing risks and climate change
3. Identifying adaptation
4. Assessing adaptation
5. Implementation
6. Monitoring and evaluation

2013
White paper

«Adaptation to
Climate Change
in Norway»

National strategy





National strategy

White Paper on Adaptation to CC

2013: White Paper no. 33 (2012–2013)

«Adaptation to Climate Change in Norway»

- **Everyone** has a responsibility to adapt to climate change; both individuals, businesses and governments.
- Emphasis: good **common knowledge base** for adaptation.
- Strengthen the knowledge through **collaboration** across sectors and levels of management /government.
- Adaptation should aim at the **high projection of climate change**



National strategy

Main principles

- **The responsibility principle** entails that the agency that is responsible for a specific area in a normal situation is also responsible for handling extraordinary events within this area.
- **The similarity principle** means that the organisation used during a crisis should be as similar as possible to the organisation used on a day-to-day basis.
- **The proximity principle** means that a crisis should be handled at the lowest possible organisational level.



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Transportation infrastructure

Norwegian Public Roads Administration



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Transportation – Roads

- Ministry of transportation issued a
Strategy for public security in transportation
↓ ... includes adaptation to climate change
- Road Admin.:
Strategy for public security and adaptation to climate change
 - Plan, design and build more robust new infrastructure
 - Manage the existing road network in a better way
 - Be better prepared for extreme events
 - Improve our knowledge base!

How do we achieve this?



Transportation – Roads

- Ministry of transportation issued a
Strategy for public security in transportation
... includes adaptation to climate change



- Road Admin.:
Strategy for public security and adaptation to climate change

– **Plan, design and build more robust new infrastructure**



- Manage the existing road network in a better way
- Be better prepared for a demanding climate
- Improve our knowledge base!

How do we achieve this?



Transportation – Roads

Plan, design and build more robust infrastructure

- Revise design rules
- Develop better climate projections
- Carry out vulnerability analysis when planning infrastructure
-

Who does what..

... by which time..

... what are the costs?

How do we follow the work?



Transportation – Roads

Plan, design and build more robust infrastructure

- Revise design rules
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Who does what..

... by which time..

... what are the costs?

How do we follow the work?



Transportation – Roads

Implementation of the strategy ??

	Responsibility	Cost	Time	Priority
Revise design rules:				



Transportation – Roads

Implementation of the strategy ??

	Responsibility	Cost	Time	Priority
Revise design rules:				
Status – list of documents that need to be revised	Technology dept.	10'	Jan 2017	1
Decide the revision ammendments	Technology dept.	20'	May 2017	1
Edit and publish the revised documents	Respective dept's	10'	Jan 2018	1



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Cost–benefit analyses

Resource – value analyses (?)





Transportation – Roads

Monitoring plan

Monitoring plan per responsibility

	Responsibility	Cost	Time	Priority
Revise design rules:				
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Monitoring: regular reviews of status, discrepancies etc..



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Transportation – Roads

But how do we know we are improving?

Indicators of progress:





Transportation – Roads

But how do we know we are improving?

Indicators of progress:

Realised impact:

- number of road closures, costs of closure or repair

Exposure indicators:

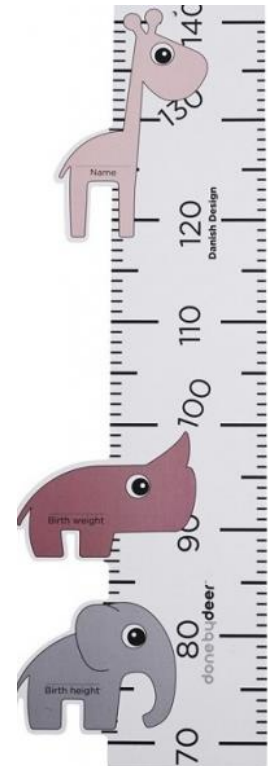
- km roads exposed to landslide or flood risk.

Vulnerability indicators:

- number of vulnerable point, not yet treated

Action:

- Have we managed to complete our action plan?
- Are we getting the budgets we need?





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Transportation infrastructure

Norwegian Coastal Administration



NCA's vision is to develop coastal and marine areas to be
the world's safest and cleanest.



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Transportation – Navigation

Climate and environment strategy

Norwegian Coastal Administration manages approximately 20,825 navigation units and about 1,300 quays and breakwaters in connection with state fishing ports.





Climate and environment strategy

Adaptation issues:

- more accidents at sea;
- changing demands on infrastructure and vessels;
- need knowledge and preparedness for acute pollution.

«Climate & environment strategy»

sets the course for climate and environmental work in correspondence with their environmental commitment





Climate and environment strategy

Aims for CC adaptation:

- integrate climate issues in
 - new infrastructure projects and
 - in operations and maintenance budget
- ensure that service levels are maintained
- conduct risk and vulnerability analyses as a basis for climate adaptation

How can this be achieved?
What is top priority?



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Transportation – Navigation

Action plan – Climate and environment

	Time	Responsible
Adapt to a changing climate		
Introduce climate adaptation in all maintenance plans	2016	Dept. A & reg. offices
Improve documentation of weather events	2017	Dept. B
Carry out vulnerability analyses	2017	Dept. C



Indicator: cut maintenance back-log??





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Water Management & Energy

The Norwegian Water Resources and Energy Directorate





Water resources & energy Strategy

NVE's shall ensure:

- **management of watercourses** – comprehensive and environmentally friendly
- an effective and evidence-based **license processing for power plants** – production and transmission of energy.
- efficient production, transmission, sale and use of **energy**.
- that **emergency preparedness** in the power supply is good
- communities' ability to deal with **flood and landslide risks**.

Particular focus on management areas where climate change is expected to have particularly serious consequences



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Water resources & energy

Responsibilities

NVE's role in climate change adaptation work:

- adaptation within their own administrative area.
- facilitation of cross-sectoral cooperation

Climate adaptation strategy





Water resources & energy

Main strategic aims & instruments

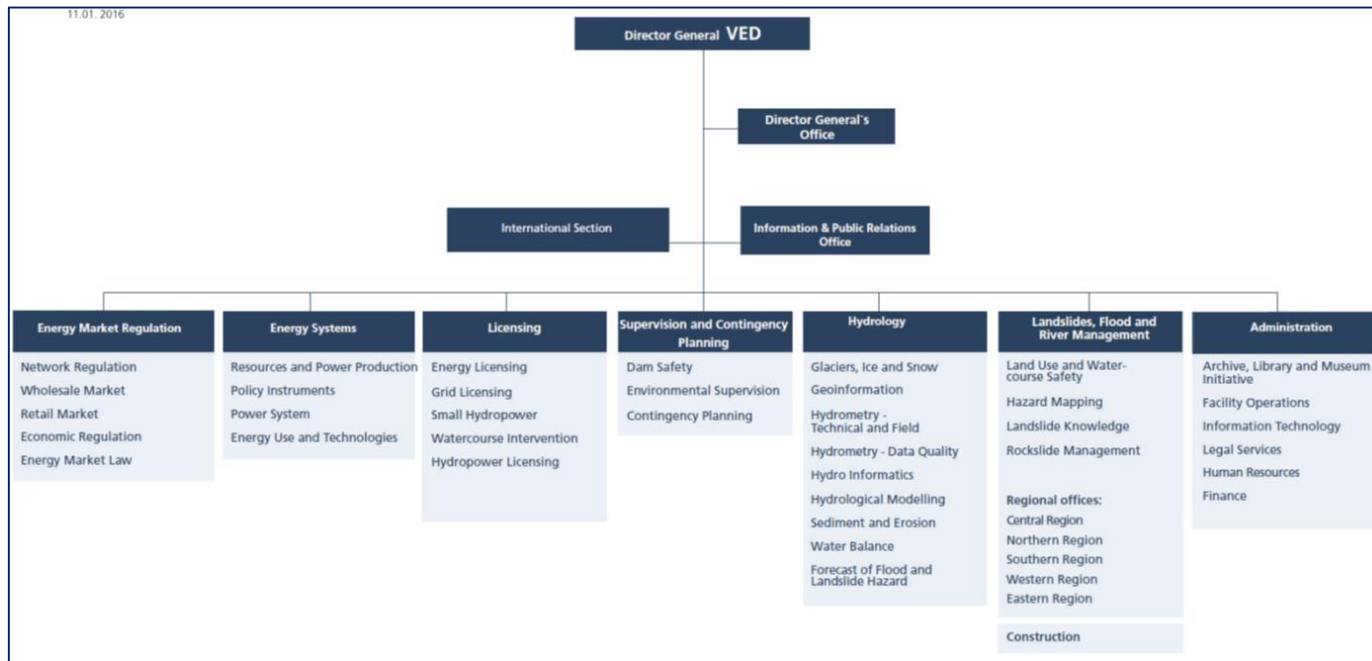
To achieve climate adaptation in their areas of responsibility, NVE needs:

- High **professional competence** and **good data basis** + network, research, collaboration with other state agencies
- **Provide robust recommendations** for future flood levels, harmonized with sea level rise, storm surge and heavy rain
-
- ...



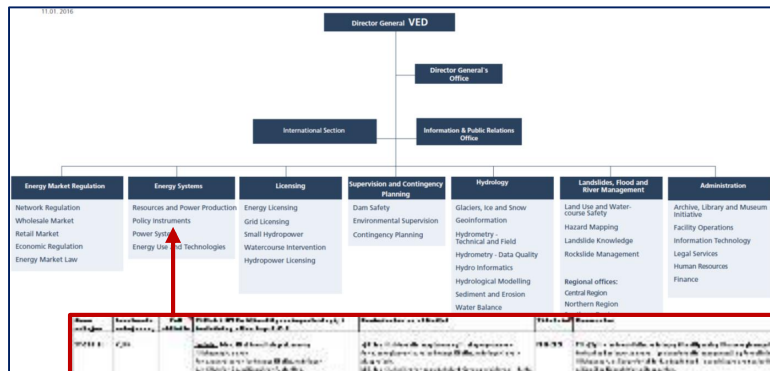
Water resources & energy Mainstreaming..

- Discussion and agreement on respective responsibilities





Water resources & energy Mainstreaming..



Item	Task	Responsible	Task	Responsible
1.1.1.1	Task description	Responsible	Task description	Responsible
1.1.1.2	Task description	Responsible	Task description	Responsible
1.1.1.3	Task description	Responsible	Task description	Responsible
1.1.1.4	Task description	Responsible	Task description	Responsible

- Discussion and agreement on respective responsibilities
- Aims broken down to concrete tasks, with responsible persons, budgets, time span etc.
- Table with comprehensive overview of tasks
- Basis for monitoring



Water resources & energy

Example of «action»

	Responsible section	Involved section	Time	Prio.	Comment
Complete climate profiles for all regions in Norway	Section 1	Sections 2, 4, 6	2016	1	It is realistic to complete 10 profiles





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Agriculture & Forestry

Norwegian Agriculture Agency

Landbruksdirektoratet
Eanandoallodirektoráhtta



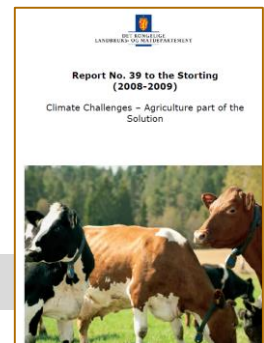
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Agriculture & Forestry

Norwegian Agriculture Agency

- Management of agricultural **grant schemes** for agribusiness.
- **Legal policy instruments**, control and documentation.
- Gather **knowledge**, monitor trends...
- Dissemination of **agricultural and food policy**
- **Dissemination of expertise** to regional and local management.
- ...

«Climate Change – Agriculture is a Part of the Solution»

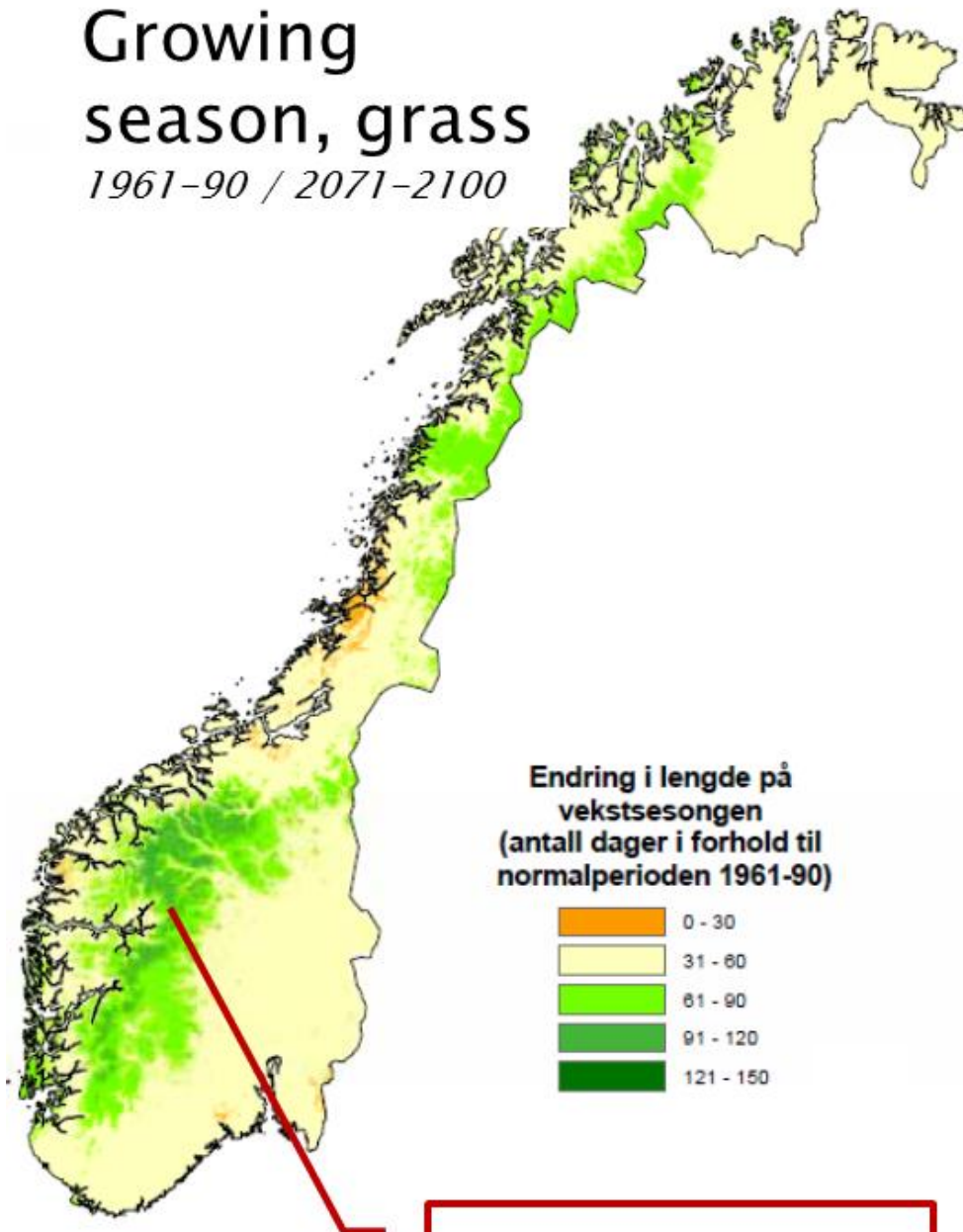


Growing season, grass

1961-90 / 2071-2100



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60-120 days/y

CC brings new opportunities!

Expertise must be developed in line with changes in production conditions

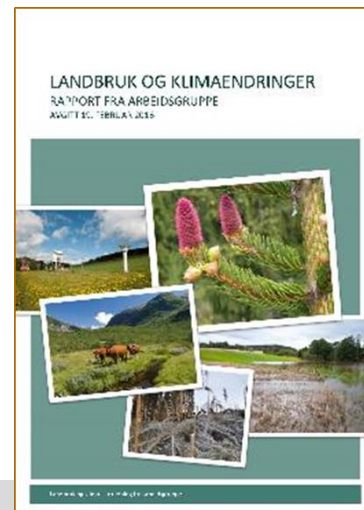


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Agriculture & Forestry

«Agriculture and Climate Change», 2015

- Recognises the threats from CC to agriculture and **food production globally** – a reason to maintain and strengthen Norwegian agriculture

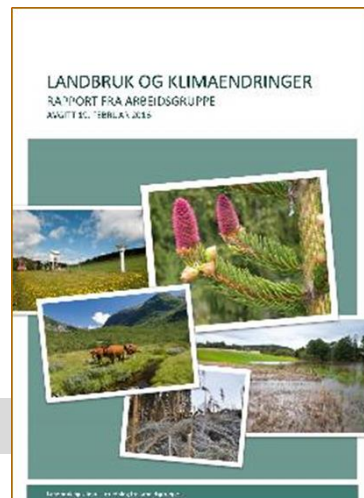




Agriculture & Forestry

«Agriculture and Climate Change», 2015

- Better stormwater management, better drainage
- Perform risk analyses – landslides, floods
- Preserved **water quality** in wetter conditions
- Long growing season requires **adjustments** (e.g. fertilisation etc.)
- **Surveillance** for prevention of spreading of various pests. Notification procedures...






Agriculture & Forestry

Norwegian Agriculture Agency

- **Double problem:** land is leased and not owned + *and* the climate is wetter.
- More focus on erosion protection, drainage (also for forests).
- More focus on climate adapted species
- **Compensation for climate related damage** is given only if advice on drainage and on climate adapted species is followed.



Research, advice,
dissemination
Graminor, NIBIO



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Fisheries and Aquaculture Strategy at the ministry level

- **Ministry of fisheries and coastal management (?)**
(p.t. Ministry of Trade, Industry and Fisheries)
- **Climate Strategy**





Fisheries and Aquaculture

Climate strategy – recognised adaptation options

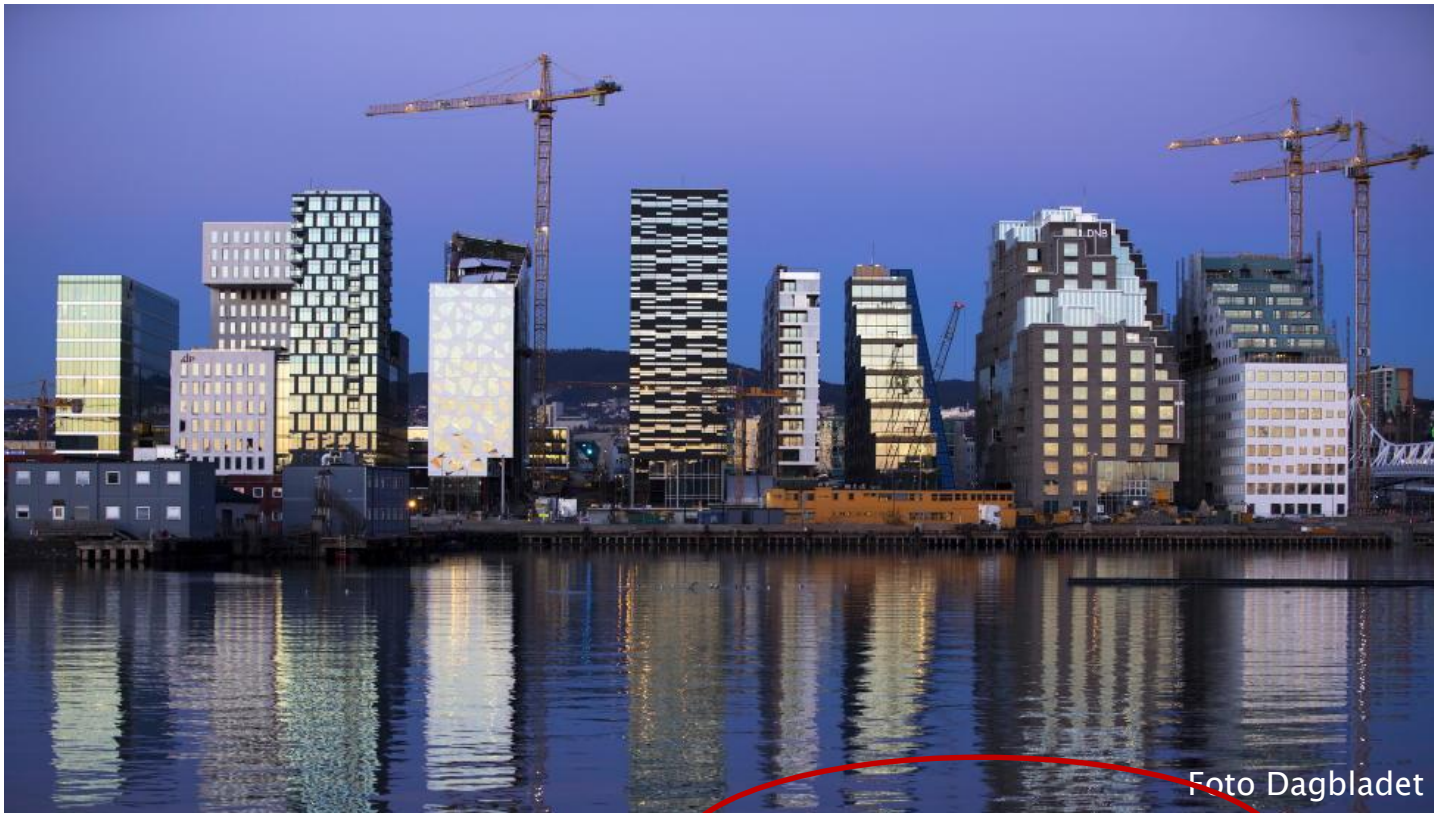
- **Identified a series of research needs:** impacts of CC on ecosystems, fish health, food safety, food industry etc.
- **Monitoring!** – better documentation of changes, better planning
- **Implement knowledge into planning and management,** design of harbors and aquaculture facilities, the design of the surveillance program, deciding fishing quotas etc.
- **Ensure robust maritime structures,** improve the facilities and infrastructure to safeguard fish.
- **Aquaculture: research** on climate adapted feed and vaccines. Disease surveillance are other measures. Climate labeling (branding) of feed.



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Municipalities are the most vulnerable...

Oslo Municipality



Climate adaptation strategy: stormwater management, spatial planning, infrastructure, health, nature environment and preparedness.



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- **Norwegian Environment Agency**
- **Coordination and monitoring of national adaptation work**





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Environment Agency / CCA-coordinator

Monitoring national adaptation work

- The Environment Agency (Miljødirektoratet) is responsible for coordination of activities in CCA (supports the Ministry of Climate and the Environment)
- Working on indicators in order to be able to monitor progress





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Environment Agency / CCA-coordinator

Monitoring national adaptation work

- 600' € support to municipalities
- applications worth 2,2 mill € were submitted
- 30 projects received support
- Reports will be a way of monitoring CCA



Thank you!



«Dagmar» 2011, Foto: Arne Veum