



A SUMMARY of THE NATIONAL CONFERENCE ON  
**CLIMATE ADAPTATION 2019**

# COLLABORATION AND HOLISTIC THINKING ENSURE WISE INVESTMENTS IN CLIMATE ADAPTATION

As a society, the need to address climate change requires us to make some of the biggest – and most necessary – investments of all time.

It is crucial that we face the task with a view of the wider picture. This is one of the main conclusions of Denmark's first national climate change adaptation conference, where more than 300 experts discussed the issues.

Here we bring together the most important recommendations from the conference for the handling of climate change in the future.

## A total of 21 sessions along three main avenues

In Horsens, the National Conference on Climate Adaptation offered a tightly packed programme. Based on 21 sessions, the many and complex aspects of climate change were debated with a particular focus on three main areas:

- The increased strategic value of climate change – the M-track
- Techniques and concepts – the T-track
- Organisation and collaboration – the O-track

In this way the conference took stock of the latest knowledge together with a number of

points that should be passed on to the relevant decision makers – at central, regional and local government level and with all the many actors who need to work together to make climate change adaptation successful.

At this national conference participants worked on a total of 21 sessions that broadly covered three overall avenues:

- The political: What goals can we set and what frameworks are required to achieve them?
- The organisational: How do we ensure that all the relevant actors are moving in the same direction?
- The technical: What outcomes do we have and how can we develop, for example, more sustainable solutions?

You can find the presentations, list of participants and pictures from the conference here <https://bit.ly/2GiLMpD>

Photo: Rune Borre Jensen, Region Midtjylland





## FACTS

- The National Conference on Climate Adaptation was held on the 23-24 October 2019 at the Hotel Opus in Horsens.
- A number of partners helped support the conference:
  - **Coast to Coast Climate Challenge**  
[www.c2ccc.eu](http://www.c2ccc.eu)
  - **Topsoil**  
[www.topsoil.eu](http://www.topsoil.eu)
  - **Water in Urban Areas**  
[www.vandibyer.dk](http://www.vandibyer.dk)
  - **KLIKOVAND**  
[www.klikovand.dk](http://www.klikovand.dk)
  - **CALL Copenhagen**  
[www.callcopenhagen.dk](http://www.callcopenhagen.dk)
  - **The Capital Region of Denmark**  
[www.regionh.dk](http://www.regionh.dk)
  - **Central Denmark Region**  
[www.rm.dk](http://www.rm.dk)
  - **Danish Technological Institute,**  
[www.teknologisk.dk](http://www.teknologisk.dk)
- **CLEAN** and **Insurance and Pension Denmark** supported the conference financially
- Read more about the conference at [c2ccc.eu](http://c2ccc.eu)

# THE FIRST NATIONAL CONFERENCE ON CLIMATE ADAPTATION – WHAT DID WE LEARN?

The climate is already changing – that is the reality. Even if the world community succeeds in acting, there will be major changes with patterns of rainfall, seawater and temperature. Denmark is well on its way to developing innovative climate adaptation solutions that generate a value far beyond their investment. And even more interesting for citizens, politicians and businesses – we can use climate change as a lever for a sustainable transition.

Therefore, we are both pleased and proud that over 300 professionals chose to spend two days in Horsens on 23-24 October 2019 to work on the future of climate change. Based on 21 sessions, the many and complex aspects of climate change were analysed and debated. The conference took stock of the latest knowledge as well as many important points and recommendations to be communicated both to the professionals who carry out climate adaptations and to the relevant decision makers at the central, regional and local government level, the utility companies and businesses.

## What have we learnt?

The conference demonstrated that adjustment to climate change has been in place for well over 10 years. It has fostered a professional field where knowledge and methods have been developed. A large number of exciting solutions that can handle both excessive and everyday rainfall and generate a recreational value show that the water sector has started a green transition, where water is increasingly being managed with nature-based solutions in mind. Denmark has become a country one travels to in order to see innovative climate adaptation solutions.

Many local authorities and utility companies are in step with this and will continue to plan adjustments to the climate over the coming decades. We are in the initial stages of Denmark's adaptation and of a very large-scale societal investment. The goal of the conference was to set the agenda for the next 10 years.

The conference was organised along three avenues: 'The strategic increased value of climate change' (the M-track), 'Techniques and concepts' (the T-track) and 'Organisation and collaboration' (the O-track). For each track, a series of questions was asked to which the sessions responded. Each session provided an overview of the latest knowledge on the subject and the discussion resulted in important recommendations for further work on climate change. We have summarised the main proposals related to the conference's ongoing issues below.



REGION MIDTJYLLAND  
SAMLER  
KLIMAKOMPETENCER

Coast to Coast Climate Challenge (C2C CC)  
er et 6-årigt klimatilpasningsprojekt, der forløber i...

Foto: Rune Borre Jensen, Region Midtjylland

# RECOMMENDATIONS FROM THE CONFERENCE

## Added strategic value of climate change (M-track)

- **Think wholeness and multifunctionality.** The adjustments to climate change are changing the face of Denmark. This has to take place from a holistic perspective on the water cycle, and the opportunities for multifunctionality must be exploited systematically.
- **Use the adjustment to climate change as a lever for sustainable transition.** The massive capital investment involved must be used strategically to make a contribution to the sustainable transformation of Denmark and the fulfilment of the Sustainable Development Goals. Climate adaptation must be linked to, for example, green mobility, biodiversity, health, urban development, etc. Consistent solutions have to be developed both in the city, in rural areas and along the coasts. And the solutions must be developed in collaboration with the civil society.
- **Create a common narrative about the added value of climate change adaptation** Climate change is the societal challenge we are handling. But when the broader benefits are included it is much easier to get project support and funding from politicians, citizens, decision makers and other organisations. We need to develop new methods to demonstrate the creation of these benefits.
- **Create green growth.** Businesses must be involved in developing solutions and designing projects. Innovative solutions have to be evolved, which need to be carried out in Denmark, exhibited, and made available as a significant export product.

## Techniques and concepts (T-track)

- **Document experiences and share knowledge.** Projekter og renseløsninger skal dokumenteres bedre og mere systematisk, og der skal opbygges nationale platforme for deling af viden.
- **Rules for the discharge of rainwater.** The existing understanding of rainwater, its recipients and purification must be summarised, and there should be systematic further development of both the knowledge about it and the regulation of its discharge.
- **Continued technical innovation.** We must take advantage of the opportunities that lie in the “smart city” (monitoring, collection and processing of data and digitisation). However, it is also important that we have the resources and knowledge to analyse, understand and use the data we collect. And we have to use the whole range of available technology.

Evaporation, for example, is an underused technology that has great potential.

- **Finance and organise innovation and development.** Long-term financing of innovation and development needs to be established and conceived of as partnerships between businesses and public institutions.
- **Look at the entire water cycle.** We have to plan with the whole water cycle in mind – when water disappears in one place, it is channelled to another place. We must move beyond the basic level of documentation and understanding about, for example, rising groundwater levels and evaporation as technology.
- **Showcase examples and aim for demonstration projects.** We need to learn from each other, both in terms of experience with finance, operations, technical solutions and planning. We need to undertake demonstration projects that can test and document the solutions’ functions before we construct more expensive technical facilities.

## Organisation and cooperation (O-track)

- **Support climate change adaptation through cross-sector networks.** The important cooperation between local authorities should be supported by cross-border organisations such as the regions and nationwide networks. Documentation and knowledge sharing should be supported by, for example, a national network or by the state.
- **Create solutions across professional, administrative and organisational boundaries.** Climate change affects silos, organisations and administrative boundaries. Cross-sector collaborations are thus essential.
- **Legislation and funding opportunities need reviewing.** Perhaps utility companies should be allowed to co-fund a wider range of solutions than is the case today. There must be a basic funding mechanism for documentation and knowledge sharing, just like the 3 eurocent/m<sup>3</sup> for mapping groundwater for example.
- **Optimise the planning framework.** For example, it should be a requirement to plan for water catchment areas and for the entire water cycle, and that municipal projects must include a water management plan. A national climate change adjustment strategy is needed; national level planning for coastal protection is needed in particular.

### Hovedaktører:



### Støttende aktører:



Further recommendations from the conference are provided on the following pages.



Photo: Rune Borre Jensen, Region Midtjylland

# THE STRATEGIC ADDED VALUE OF CLIMATE CHANGE ADAPTATION (THE M-TRACK)

## M1

### Status and vision for climate change adaptation – an ambitious agenda

*In Denmark we have come a long way in the last 10 years in developing an innovative approach to climate change adaptation. We must seize this momentum and set an ambitious agenda for the next 10 years. Therefore, with this opening session, we wanted to give an overview of what we have achieved and what challenges we face when we want to further develop responses to climate change. We also asked the question as to how this adaptation can contribute to a sustainable reorganisation, and we received an invitation from the director of the Danish Urban Planning Laboratory to put climate change adaptation into play in relation to a number of social challenges.*

#### Presented by

- Birgitte Hoffmann, Associate Professor, Aalborg University
- Ellen Højgaard Jensen, Director, The Danish Urban Planning Laboratory
- Anne Laustsen, Chief Engineer, Aarhus Water

#### Recommendations

### We shall use climate change as a lever for sustainable development.

In Denmark over a remarkably short period of time we have started a green transition of the water sector. But we still have great challenges ahead of us, and the forthcoming decades of climate change investment will require enormous resources and major changes to areas and their utilisation. This means that we not only have to think about the increased value of an individual system, but also see climate change adaptation as a lever for the sustainable development of Denmark. Climate change adaptation can, for example, contribute to urban regeneration and

land renovation, land reform and agricultural restructuring, improving nature and biodiversity, increasing green mobility, addressing health challenges and establishing green growth.

### We have to work strategically across boundaries and develop future planning

Climate change adaptation should be thought of as an invitation to anyone who can add strategic value to a project. Professional boundaries need to be broken down and cross-sector collaboration opened up. Climate change adaptation requires a holistic approach to the entire water cycle, where we create space for water across rural and urban areas. Locally, we must put this adaptation into play in the strategic development. We must find and link climate change adjustment to local goals and challenges in both cities and in open country.

### We have to work innovatively

In order to exploit climate change's potential a number of innovative enterprises are required, together with new experiments and technologies as well as research and knowledge gathering. We need to conduct pilot projects and learn along the way. Innovative and talented employees need the support of their managers and politicians to experiment and to work across the sectors.

## M2

### The climate-adapted roads of the future – a reason to redesign everyday urban spaces

*There are about 70,000 km of roads in Denmark, which are under the auspices of the local authorities, of which approximately 22,500 km are known as "private communal roads".*

*In the years to come we will have to use large parts of the road network to adapt our cities to climate change. In this session, we looked at the road, which is the urban space just outside*

*the door. We explored how climate change can help strengthen multifunctional pathways. We provided examples and set out a vision for how investments in the adaptation of roads can be used to contribute to green mobility, health and other societal changes*

#### **Presented by**

- *Maj-Britt Quitzau, Associate Professor, Aalborg University*
- *Søren Gabriel, Head of Development, Orbicon*
- *Jacob Dahl-Hesselkilde, Project Manager, the Municipality of Frederiksberg*

#### **Recommendations**

##### **Major health and economic potential lie in the redesigning of our roads**

In the years to come we will have to use large parts of the road network to adapt our cities to climate change. We can redesign roads to contribute to active mobility, nature, communities and rehabilitation. Projects in London and Portland have demonstrated that the redesign of roads can address societal challenges by supporting improved health and green transition. There is evidence that large health sector costs can be saved by redesigning roads with a focus on well-being.

##### **Roads have to be multifunctional**

In Denmark we have seen some examples of climate change adaptation's contribution to the redesigning of roads, for example in Rødovre, Middelfart, and Gladsaxe. Climate change adaptation can help to develop new streetscapes in the cities, where trees, channels, verges, rainbeds and mini-parks can all be included in various forms of road design and new connections.

##### **We need to undertake cross-sector and budgetary pilot projects**

We need multidisciplinary pilot projects and market-driven upscaling. It is a large-scale endeavour and we urge politicians and managers to support the development of pilot projects – across sec-

tors and budgetary boundaries. Cross-sector and participatory forms of collaboration are the most important contributions to be developed and built into our design work. This means challenging existing systems. Today, road legislation and the monofunctional regulation of roads are major barriers that need to be addressed.

## **M3**

### **Sustainable urban development – with climate change adaptation as a resource**

*Many fine climate change related projects show that adaptation can contribute to the quality of recreation and urban life. In this session, we took up this thread and developed a vision for climate change adaptation from the city's perspective – just what can climate change contribute to?*

*How can a response to climate change help to achieve sustainable reorganisation? How can investment and physical infrastructure help tackle local urban development and strategic themes? What good examples do we know and what visions can they inspire?*

#### **Presented by**

- *Marina Bergen Jensen, Professor, Copenhagen University*
- *Lykke Leonardsen, Programme Manager, the City of Copenhagen*

#### **Recommendations**

##### **We must think wholeness and the broad perspective**

If we are to contribute to sustainable urban development, we have to stop thinking inside the box. We have to put an end to thinking about individual problems. Climate change adaptation can be used to address multiple problems, but it requires a holistic approach. We must, for example, focus on the sustainable development goals so that we do not invest in CO<sub>2</sub>-heavy solutions. We also need to think about the entire water cycle – how do we manage both more wet and dry periods? Can water be recycled and stored? What is the potential of evaporation?

### **We lack the funds for innovation and climate change adaptation**

No matter how we reduce our CO2 emissions, climate change adaptation will be necessary for next many years. Therefore, politicians need to invest in adaptation and not just climate change mitigation – we need funds to innovate and achieve climate change adaptation objectives.

### **We need to document our solutions**

Rainwater management has undergone major development during the last 12 years, where we have amassed a multitude of new understandings. But the documentation of our solutions lags behind. We need to have a much greater focus on documenting the solutions and values we create.

## **M4**

### **Climate change adaptation and reorganisation in open country – across new collaborations**

*In open country there are major challenges related to both wetter and drier soils. Open countryside is also an important element in the climate change adaptation of Denmark. With a starting point in the history of rural areas we talked about previous management practices and the consequences they have had for the countryside. We then focused on how we work today to adapt to the climate with examples from C2C CC. Finally, we looked ahead and explored the possibility of using multifunctional land distribution for, amongst other things, creating spaces for climate-driven water in the open country context.*

#### **Presented by**

- Henrik Vejre, Professor, University of Copenhagen
- Henrik Vest Sørensen, C2C CC, Chief Consultant, Central Denmark Region
- Søren Møller, Chairman, Collective Impact

#### **Recommendations**

### **We have to solve the problems TAKEN TOGETHER and holistically**

It is not enough just to protect nature, increase afforestation etc. We must tackle the problems

as a whole. Politicians must be aware that individual messages must not stand in the way of holistic solutions. When we work in a cross-sector context, it is imperative that we change the mindset so that we respect and accept each other's success criteria – and ensure that we choose the right solutions from the start. Thus, it is equally important that the right organisations are in dialogue with the relevant parties.

### **We need to think of “rural renewal”**

As we have seen with urban renewal in cities, we now have to consider “rural renewal” in the open country.

Multifunctional land distribution becomes an important tool: It is possible to find solutions in rural areas that promote every agenda (nature, climate, environment, economy, recreation, rural development, etc.). Multifunctional land distribution needs to be put into use so that we can develop our land in a sustainable and smart direction. This requires the involvement and respect of several parties.

### **Establish government land and a climate fund**

Soon new regulation will be passed that require the catchment level management of open water channels and drains. This is an important step towards a holistic development of rural areas. It is not enough, though. We need a state land and climate fund that can initiate transformations in the countryside and in agriculture. We must have a financial fund that can follow up on business interests. The philanthropic foundations should follow up on public interest. In addition, we must recognise that our climate and biodiversity crisis cannot be resolved without an element of 'coercion'.

## **M5**

### **Culture, history and learning with climate change in mind**

*Water plays a major role in Denmark's complex history; climate adaptation takes place over generations and requires knowledge, learning and action. In this session we focused on water*

and climate adaptation in cultural contexts. We saw examples of how to protect and develop the cultural heritage – and vice versa, how cultural establishments such as museums and educational institutions can contribute to climate change adaptation?

#### Presented by

- Felix Riede,  
Professor, University of Aarhus
- Jesper Garsdal,  
Associate Professor, VIA University College
- Jørgen Hollesen,  
Senior Researcher,  
The National Museum of Denmark

#### Recommendations

##### **When we plan and execute climate change adaptation we influence our cultural heritage**

Over time our land planning has had a major impact on our cultural heritage. We are draining one place to gain more land but subsequently cause problems at another place or another time. It is therefore important to look at the past when considering solutions for the future. In what way do we influence our cultural heritage when we plan and implement climate change

adaptation? What effect will our coastal protection solutions have on the future shorelines and Denmark's cultural heritage?

##### **We need to have a new narrative about the past and the future**

We have a unique opportunity that is heading towards a sustainable future. We need to have a far-seeing approach to climate change solutions. It's about our children's children. But we need to decide what our attitude towards time is. We must think far ahead and think wisely. We need to decide on the future and the future narrative of climate change – where do we come from and where are we heading? Let's invest in the future more than committing to and preserving the past.

##### **The focus on history and increased value**

A national political consensus on the concept of increased value should be created. Today, several definitions exist in different local authorities / utility companies which can result in confusion. Therefore, a common understanding / definition of increased value must be arrived at, which among other things, has to include culture and citizens' training.



Photo: Colourbox



Photo: Rune Borre Jensen, Region Midtjylland

## M6

### A strategy for the coastlines of the future – how does climate change adaptation become a resource for coastal development?

What will be the focus for the climate adaptation response for Danish coasts in the future? What type of coastal environment will we pass on to the next generation and how? What is the objective of our coastal protection? In this session we provided examples of how coastal protection can help strengthen nature, recreation, communities, tourism and business, and how we have expanded the range of opportunities and priorities for local authorities.

What good examples do we know and what visions can they inspire?

#### Presented by

- Ole Fryd,  
Associate Professor,  
the University of Copenhagen
- Dan Hasløv,  
Director, Hasløv and Kjærsgaard Architects
- Anna Als Nielsen og Helle Baker,  
the Municipality of Svendborg

## Recommendations

### We lack a national coastal strategy

A national strategy for the coastal zones is lacking as a tool that can be used to create holistic coastal protection solutions and to ensure that our Danish shorelines are preserved for many generations to come. The strategy should guarantee, possibly by law, work across the local authorities in continuous water catchment areas and coastal stretches. Individual solutions that pass the problem on should be prohibited.

### Spring cleaning of the legislation is essential

Legislation related to coastal zones is complex and does not always appear logical. There is a need to clean up and adjust this legislation so that it provides real opportunities for action. Funding opportunities need to be adjusted so that cross-border and long-term cooperation is possible.

### We must change our norms – from security to handling

Instead of “climate protection”, talk about “risk management”. Climate change adaptation is not a guarantee of security and everyone needs to take responsibility. We also need to dare to think of adaptation as anything but hard ‘security’ solutions. Take a closer look and remember to think of opportunities.

# TECHNIQUES AND CONCEPTS (THE T-TRACK)

## T1

### Water quality, filtration and environmental permits

The purpose of the session was to provide an overview of the level of knowledge in relation to the quality of the rainwater run-off, the recipients' vulnerability and the effectiveness of the cleansing solutions. Using a case study, we illustrated the challenges around permits for the discharge and seepage of rainwater, partly because of the current level of knowledge and the lack of guidelines. The concept of BAT was brought up for debate, including: Do we share a common understanding when talking about rain runoff? and How do we get enough knowledge and documentation to create operational guidelines for future practice regarding the discharge and seepage of rainwater?

#### Presented by

- *Simon Toft Ingvertsen, Subject Specialist, EnviDan A/S*
- *Asbjørn Haaning Nielsen, Associate Professor, Aalborg University*
- *Karin Cederkvist, Senior Specialist, the Danish Technological Institute*

#### Recommendations

##### Focus on the documentation of filtration solutions

There are no BAT conclusions in rainwater filtration. We lack well-thought-out standard procedures for testing and documenting filtration solutions. This gap needs to be filled. It is therefore very important that in our future work we focus on obtaining documentation about the effects of climate change adaptation endeavours. Both in relation to filtration measures, functionality, etc.

##### The gap between legislation and reality

Today there is a gap between legislation and reality. The legislation, the guidelines, etc., are

deficient in the choices for the right filtration solutions and in setting the right filtration requirements.

When specific projects are planned for very high requirements are often set for documenting the solution, including the filtration effect. This can result in major challenges in relation to the testing of new methods etc.

##### The establishment of a state fund for the documentation of filtration solutions

In order to create a sufficient documentation base to ensure progress in climate adaptation and recipient protection, a state fund should be established to document projects that educational institutions, producers, local authorities and other actors can use.

## T2

### Seawater and coastal protection – we take a look at principles and solutions

There are many considerations that must be taken into account when planning interventions designed to counter the rise in seawater, storm surges and coastal erosion.

They have to be economically, environmentally and socially sustainable and, not least, they must relate to the particular distinctions associated with our shores. In this session we covered all the issues, both technical, natural, social, recreational and socio-economic conditions. We also looked at the choice of protection levels, that pose very special challenges with the increasingly bleak predictions about the climate of the future.

#### Presented by

- *Jeppe Sikker Jensen, Technical Director & Head of Section, COWI*
- *Dan Hasløv, Director, Hasløv and Kjærsgaard Architects*
- *Nina Larsen Saarnak, Head of Local Affairs, The Danish Society for Nature Conservation*

## Recommendations

### Climate change adaptation as an investment

It could be interesting to find out whether climate adaptation can become part of the investments in mortgage associations and pension funds, as they invest for very large amounts (about 50 billion euros). In addition, it could be interesting to investigate whether the storm surge fund is becoming more proactive and investing in prevention. It will be an important task for the newly formed national climate change adaptation network to address and make the necessary contacts.

### The need to test new solutions

In several places, more work needs to be done with regional perspectives and solutions. However, new concepts and solutions are essential. We have to realise that there are places where it is not socially sustainable to "solve" the problems in a specific area; withdrawal strategies will be needed at some point. Against this background, a national climate change adaptation strategy is needed, especially in relation to the management of our important coastal areas.

### Nature-based solutions

We must become even better at taking nature into account as part of the solution – especially in the countryside. We must create and promote sustainable solutions that work with nature and not against it.



## T3

### Smart Cities and water

Climate change adaptation is well underway for Danish local authorities and utility companies. In this session the Municipality of Frederiksberg and Aarhus Water presented their work employing a combination of monitoring and digital technology to ensure sustainable and smart solutions. In addition, the Danish Environmental Protection Agency presented a summary from the Industry Conference on Digitization in the Water Sector, held on 10 October 2019.

#### Presented by

- *Lene Stolpe Meyer, Project Manager, Climate Adaptation, Municipality of Frederiksberg*
- *Lene Bassø, Project Manager, Planning, Aarhus Water*
- *Henrik Dissing, Senior Consultant, The Danish Environmental Protection Agency*

## Recommendations

### Strengthening interdisciplinary cooperation

Green transition requires systemic changes. There should therefore be more focus on thinking across sectors internally within local authorities, across municipal boundaries as well as the local authorities / utility companies in between.

### "Four more years" is not enough

Politically, visions and solutions need a horizon broader than a single election period. A long-term strategy should be put in place.

### The state must also play a role in climate change adaptation

Local authorities must address the state and ensure that climate change and smart cities become a matter of national importance.



Photo: Colourbox

## T4

### High level groundwater in built-up areas – what do we do – who does it – and who pays?

Large parts of Denmark are affected by rising terrestrial groundwater. Along the coast, groundwater rises as the seawater rises. Inland, groundwater is affected by increased rainfall during the winter months. We also experience groundwater as a nuisance in urban areas, caused by changes in the abstraction structure for drinking water and sewers that are sealed. The effects of rising groundwater are increasingly experienced in the cities, with major consequences. This session asked the question: Who is the operator safeguarding Danish cities against rising groundwater?

In addition, this session was in part provided with an overview of the scope of the problem and the initiatives that, for the present, have been started in Denmark and partly focused on experiences from specific localities in two Danish municipalities where the utility company and the local authority worked together to understand and solve the problems in collaboration with the citizens.

### Presented by

- Carsten Christiansen, Marketing Manager, Groundwater and Water Utility, Orbicon
- Søren Brandt, Climate Adaptation Coordinator, The Municipality of Herning
- Anna Grudinina, Project Manager & Hydraulic Specialist, Herning Water
- Thomas Damgaard, afdelingsleder, Head of Department, Nature & Environment, The Municipality of Lemvig
- Lars Nørgård Holmegaard, Director, Lemvig Water and Wastewater and Klimatorium

### Recommendations

#### Robust holistic thinking

There is great uncertainty about future climate change. We need to broaden our understanding of the wholeness when we think of robust solutions, including, for example, drought, wet periods, the importance of winter etc.

**We have to avoid swapping in our cities and use groundwater as a resource and we must look at the entire water cycle – all the year round!**

#### Overall management and new financing options in the new climate and waterways legislation

We need a more systemic regulation. We need to include terrestrial groundwater in the new climate and water stream legislation. Our politicians should be prepared to change the law so that water management will accommodate the entire water cycle and allow local authorities and water utility companies to handle terrestrial groundwater relieving the individual citizen of the responsibility.

#### We have to make politicians and citizens take ownership of the problem

We have to have documentation showing how the groundwater level is really changing, as well as knowledge of how the groundwater fluctuates. We must acknowledge that our current understanding is somewhat simplistic. There is therefore a need for a parallel measure – knowledge and documentation must go hand in hand.

We must therefore raise the groundwater issue as a common challenge and highlight it to citizens and politicians.

## T5

### The operation of climate adaption solutions

If the operation of a climate adaptation solution fails the entire function of the system may fail and then the water can end up in the wrong places after all. In this session The Municipality of Frederiksberg talked about their experience from running 15 cloudburst projects. Technically complex projects often require special operation and often the cost is split between the local authority and the utility company in co-financed schemes. Guidelines for the operation of climate adaptation solutions are important to ensure that everyone is clear about the tasks to be carried out, about the outcome and the quality requirements of the installations.

#### Presented by

- *Anne Mette Dahl Jensen, Project Manager, Climate Adaptation & Operations, The Municipality of Frederiksberg*
- *Chanette Ingemann Nielsen, Landscape Architect, Waterart*

#### Recommendations

##### Protect your investment

The operation of LAR must be included as an element in the selection of the LAR system, so that the derived operation is incorporated into the project (including financially). We must work across disciplines and organisations, involving operations at an early stage. Remember operations, also in the long term!

##### Collect operational experience with a central and coordinated approach

We need collections of experiences with operations, including finances – since uncertainty about derivative operations can be an obstacle to getting projects started. So we should have gathered experience and knowledge located centrally. Knowledge bank – digital.

## T6

### The interaction between water management strategies

In recent years we have seen a rapid development in the implementation of a wide range of climate adaptation solutions. This session provided some examples of these concrete solutions and looked at how we optimise the interaction between the many different choices – seepage, storage, evaporation, transport to recipient, etc.

#### Presented by

- *Doktor Johanna Sørensen, Postdoctoral Researcher, Lund University of Technology*
- *Troels Christiansen, Senior Project Manager, Sweco*
- *Jens Veggerby, Department Manager, Sweco*

#### Recommendations

##### Prepare water management strategies

In local authority and utility company planning it is crucial that an early water management strategy is established, which provides a framework for the further physical planning of areas. Water management strategies should be prepared as early as possible as a continuation of the plan strategy and incorporated into the Municipality's proposals.

##### Key experiences we have gained from the planning and implementation phase

- The early involvement of hydrology is crucial to the realisation of projects
- Plan hydrology across project areas
- Water quality must also be included
- Operational experience (e.g. water and salt) must be collected and included in the development of next-generation solutions
- There is often a struggle for primacy. Be innovative and create solutions so we don't end up with a dilemma: Should we build or should we manage water?

##### Optimise forward-looking interaction

There is a need to optimise the interaction between the local authority plan and the wastewater plan.

### Every professional should be involved

In order to create holistic and sustainable solutions, it is imperative that relevant skills and interests are included from the start of the process.

## T7

### Excursion – The Climate Road in Hedensted

The Municipality of Hedensted has, in collaboration with VIA University College in Horsens, created the country's first section of climate road, which at the same time solves two of the current major climate challenges.

It is a stretch of 50 metres of the Dalbyvej road in Hedensted, which is now converted into a climate road.

One of the environmental challenges here is dealing with the increasing amount of rainwater caused by climate change. Therefore, so-called permeable asphalt is used on this stretch of road, through which the rainwater can penetrate. In this way, rainwater avoids entering the sewers and neither is it a nuisance to motorists.

The second challenge is to reduce CO<sub>2</sub> emissions, so that we avoid excessive climactic change. This is done on the climate road by producing sustainable heat.

This session took place as an excursion to the climate road where participants were presented with the project and given the opportunity to ask questions.

#### Presented by

- *Søren Erbs Poulsen, Associate Professor, VIA University College*
- *Merete Valbak, Climate Coordinator, The Municipality of Hedensted*

#### Recommendations

We must involve district heating companies in the development. Cross-sector organisation.

Focus on separate sewerage. We must be aware of new solutions and approaches in the field of energy.

Legislation must be liberated to enable energy potential and district heating / cooling to be connected with climate change adaptation.

## T8

### The techniques and solutions of the future

In the session we addressed the trends for future ways of dealing with rainwater on and around roads. We looked at evaporation from vertical surfaces and trees as well as cloudburst solutions in roadside rainbeds. In addition, we look at ways to plan preliminary terrain uplift surveys using satellite data.

#### Presented by

- *Marina Bergen Jensen, Professor, The University of Copenhagen*
- *Bo Brøndum, Engineer and Owner, BOVAK*
- *Benedicte Dyekjær, Forest and Landscape Engineer, The Municipality of Furesø*
- *Niels Henrik Broge, Senior Consultant, Geopartner*

#### Recommendations

##### The evaporation of rainwater has to be documented in order to be accepted

We need to use evaporation as a supplement to seepage, as there is great potential here. Vertical evaporation allows for new rainwater solutions in densely built-up areas. Evaporation from the various solutions has to be documented. Multiple, large trees can be the solution to some challenges.

##### Project experiences with specific types of solutions must be shared for the benefit of all

We have to share documentation about the effects of filtration solutions. For example, for rainbeds. There should be a database – à la Jupiter – where we share project experiences.

##### The result is no better than data allow

We need good data. Good data is a prerequisite for choosing the right solutions. And ultimately for data-driven management.

*Chairman of the committee for Regional Development in the Central Denmark Region, Jørgen Nørby was attending the conference.*

*Photo: Rune Borre Jensen*



# ORGANISATION AND COOPERATION (THE O-TRACK)

## 01

### **Comprehensive planning with a common strategy**

In Water in Urban Areas, KLIKOVAND and Coast to Coast Climate Challenge we have gained important experience with strategic cross-border collaborations of both subject, organisation and geography. Ambitions are raised, reality and research are linked, and it becomes possible to create holistic solutions.

In this session participants discussed how we can create ambitious networks / collaborations throughout the country. Who should take the initiative? And what should we avoid?

#### **Presented by**

- *Dorthe Selmer, Project Manager at C2C CC, The Central Denmark Region*
- *Kristine Vik Kleffel, Chief Consultant, The Capital Region of Denmark*
- *Jens Stærdahl, KLIKOVAND, Regional Task Force for Climate Adaptation*

#### **Recommendations**

### **There is a need for an effective nationwide network for the relevant actors in climate**

There should be an information network that could be funded by a wastewater tax. Specifically, it is proposed that a tax of 3 eurocents per day be levied per m<sup>3</sup> of waste water from the consumer for this purpose. The tasks will be the collection and dissemination of information between the actors as well as competence-building activities for all those involved. Relevant players include the state, regions, local authorities, utility companies, universities and educational institutions as well as NGOs and industry organisations.

### **The regions are relevant as the facilitators of far-reaching collaboration**

There are diverse opinions as to whether the regions should take on an actual government task.

On the other hand, there seems to be a consensus that it makes good sense for the regions to facilitate dialogue among the relevant actors, to provide process assistance and to provide tools and decision-making powers across all those involved. It is also suggested that the regions can provide funding to support planning processes.

### **Water catchment should be the starting point for a broad collaboration**

To avoid sub-optimisation, planning must take place throughout the catchment area. Planning within the catchment area should generate a shared vision, a common strategy and coordinated action. It does not make sense if, for example, action on municipal boundaries restricts the field of work. This also necessitates the provision of a uniform, high-quality database within the catchment area.

## 02

### **Climate adaptation as a lever for innovation and business development in partnerships**

The main question at this session was: What should be offered to companies when it comes to interacting with "the public" in their efforts to strengthen innovation, information access, networks and an international outlook?

NCC, Klimatorium and CALL Copenhagen contributed with their experiences and ideas.

The session set the scene for visits to the market place and posters.

#### **Presented by**

- *Lars Nørgård Holmegaard, Director, Lemvig Water and Wastewater and Klimatorium*
- *Ole Larsen, leder, CALL Copenhagen*
- *Michael Brask, Sales Manager / Project Manager, NCC PermaVej / Rain water Consultant, NCC Industry A/S*

## Recommendations

### The investment needed to adapt society to a new climate should help solve current societal challenges and create innovation

We are facing some of the biggest investments in recent times. They become difficult to finance and it is crucial to create confidence that the right, holistic solutions that address multiple challenges or needs are developed and applied. If we are able to do that and are “first movers” at a global level, there is great commercial potential in concepts and solutions that can be exported.

### Partnerships are crucial for creating innovative solutions that can be exploited commercially

Attention must be paid to the entire value chain – from start to finish – and that all parties are identified and involved. A good link between local authorities, utility companies, educational institutions and businesses is important. And it is also crucial that the wording of the water sector’s legislation on the ability of the utility companies to contribute to innovation is utilised. Researchers must provide information for use in partnerships. In this context, more funding is needed for applied research to ensure the quality and efficiency of solutions.

### Let climate change adaptation be one of Denmark’s strengths

It is necessary that legislation needs to be adapted to the new reality. This applies to the laws concerning roads, the water sector, etc. Utility companies are subject to regulations that are too strict and this targets management. Innovation requires both time and courage (and that some will fail along the way). It is therefore important that the utility companies have the framework to work experimentally and long-term.

In Denmark we need a development sandbox.

## 03

### Internationalisation, innovation and international business opportunities

The Danish water sector has a vision to increase the export of both water and climate adaptation technology and consultancy and thus contrib-

ute to achieving the Sustainable Development Goals. We must put pressure on exports if we are to achieve the Water Vision’s goal of doubling exports and creating 4,000 new jobs by 2025. Climate adaptation is a relatively new area that cuts across professional silos, but which has great export potential. Surveys show that companies that are part of cluster collaborations with learning institutions are more productive and have higher levels of innovation.

This session featured short presentations from CLEAN, DTU, and AquaGlobe, together with the Confederation of Danish Industry’s Water cluster, about how the beneficial experience of cluster collaboration and climate adaptation networks is being put into play for the export of Danish water and climate adaptation solutions. The session focused on how growth and new business opportunities in the water sector can be realised through projects and partnerships.

#### Presented by

- *Karsten Arnbjerg, professor, DTU Environment*
- *Jens Frederik Bastrup, CEO, Skanderborg Utility Company*
- *Lotte Lindgaard Andersen, Project Manager, CLEAN*

## Recommendations

### Denmark must be more visionary in relation to climate adaptation

Climate adaptation is becoming a significant export product in areas such as water and wastewater technology as well as consulting. Climate change adaptation can be a driver for solving key societal challenges in areas such as health. Climate adaptation is an integral part of the city’s identity (architecture, urban spaces and water).

Climate adaptation did not become part of the Climate Act, even though it appeared as a clear desire among the conference participants. But climate adaptation must not be overlooked in the actions that are partly necessary to achieve the goal of reducing climatic impacts and partly to create security in exposed areas.

## Denmark needs to play a far greater role in international research

It is about understanding mechanisms and creating new solutions that are long-lasting and can, in the future, also be exported. The sectors have to work together. It's also about showing the increased value of climate adaptation and getting the value of the solutions documented, including operational benefits. A set of relevant internationally applicable indicators is needed to document the value of the solutions. It tends to be measured only in terms of money or CO2 reduction, which is inadequate or sometimes irrelevant.

**Also take a look at O4.**

## Investments should be made in research and development

Funds must be set aside for research and innovation. There is a need for frameworks that, to a much greater extent than the current ones, foster innovation readiness in the utility companies, in the binding partnerships and clusters.

Financing mechanisms for water utilities' participation in export stimulating activities must be investigated and developed.

# O4

## Documenting the effects

We have a strongly held vision that climate adaptation must contribute to both climate protection and added value. We have also developed specific projects in Denmark with nature, recreational values and urban life. However, it is a challenge to describe and document these added values. It is crucial for us to develop climate change adaptation as an arena for local development and sustainable transition.

In this session we talked over the experiences we have had in documenting the effects and how we could improve on this. What do we need to document and how can we do it?

## Presented by

- *Niels Julian Ploug,  
Department Director, Statistics Denmark*
- *Birgitte Hoffmann,  
Associate Professor, Aalborg University*
- *Lene Stolpe Meyer,  
Project Manager, Frederiksberg Municipality*

## Recommendations

### The UN's Sustainable Development Goals are set as leverage and a framework for understanding work on climate adaptation

When we work in committed partnerships, we can create better, more robust and long-term solutions that add value in the long run. This means that different disciplines and administrations need to be integrated and involved in the solutions. There is still a need to break down silos, work in partnerships and change the existing culture. It also requires political will / support for cross-sector enterprises to realise the full potential.

### We control what we measure. We need to remember which values we have to measure

There is a need for precise requirements in order to monitor and document climate adaptation solutions. There is also a need to develop an internationally recognised, uniform, standard monitoring and documentation tool. Effects and values are more than simply financial, e.g. ecosystem services and added value.

**Also take a look at O3.**

### Create a common knowledge bank / database for the documentation of effects

Respect for the work is ensured when the effects are recorded, assessed and documented. Knowledge of the initiatives' many different effects must be widely available and lessons learned, so that we can continue to build on a broad basis.

## 05

### Collaborations on coastal flood protection

What does it take for the shorelines to become a reliable safeguard around Denmark for the future to come well?

The Future of the North Coast is a major coastal protection project aimed at saving the northern coast of Zealand from erosion by sand distribution.

In Hedensted Municipality's area the rise in sea level means that the town of Juelsminde is at an increased risk of flooding. The local authority can ease the situation by creating a dike.

In this session participants gained a clearer idea of how collaborations on protection against coastal flooding are handled in practice – focusing on organisation, law and economics.

The Coastal Directorate contributed to the debate among the participants by offering their perspective on the opportunities to stay and live in the coastal areas of the future, which was based on the Directorate's guidance for local authorities.

#### Presented by

- *Lise Holm, The Future of the North Coast*
- *Per Nørmark, Head of Department, Hedensted Municipality*
- *Carlo Sass Sørensen, Project Manager, The Coastal Directorate*

#### Recommendations

##### Action taken on the coast has to be planned from a regional perspective

There are already good examples of how the regions are an integrating factor and playing a role in the cooperation surrounding climate change adaptation. That role can be strengthened. The region naturally takes on the role of facilitator. We must acknowledge that many local authorities are small and under pressure from other societal challenges. And that there is not always an incentive to cooperate across the municipal boundary. Here, the regional initiative and per-

spective can assist the development of coherent and long-lasting climate adaptation solutions.

##### Citizens must be involved, actively participating in the planning and implementation

There are many good ways in which to collaborate with citizens / stakeholders. It is important for example, that the focus is on collaboration and not just involvement, and consultation alone should not be used as a measure for legitimacy. It is a specific recommendation that a strategy for the dissemination of risk and solutions be prepared for those citizens who need protection, to enable them to participate actively and to add value to the process.

##### The authorities have to dare to let go of control

When local authorities cooperate with each other and with citizens they have to dare to ease on their need for control. There must be room for the citizens to make a real impact on the planning, process and solutions. It is important that the overall state coastal protection plans take this into account.

## 06

### High-quality decision making in common

During this session participants became aware of how we can work together on data, what common knowledge brings us and how data is a prerequisite for good and robust climate adaptation solutions. In addition, the focus was on shortcomings, new common data and new knowledge, which must be disseminated or require different action.

#### Presented by

- *Jens Hesselbjerg Christensen, Professor and Researcher in Ice, Climate and Geophysics, The University of Copenhagen*
- *Alan Sørensen, Project Manager at Climate Atlas, DMI*
- *Frank Brodersen, Director of Cooperation and Green Growth, HOFOR*

## Recommendations

### **There should be easy access to and communication of data for relevant users**

A considerable volume of data is already available – e.g. in DMI's Climate Atlas. But it is necessary to ensure smooth access to and interpretation of relevant data for users. It must be matched with the need for an overall government declaration of the protection level.

### **Government declarations on security levels are being demanded**

As of now, the individual local authority decide the protection level. This creates far too great a difference in climate adaptation in Denmark and for those citizens living in different local authorities. From an overall perspective this is inappropriate since water does not know or respect the municipal boundaries.

### **We need a wide-ranging discussion about which risks to accept**

There is a need for a political focus on what a changed global climate will mean in a Danish context. In addition, it must be emphasised that even if the goals of the Paris Agreement are reached, Denmark will still need to adapt to a changed climate. Therefore, a national strategy for climate change adaptation management is needed to ensure that the right challenges are addressed. The task must be solved at the state / regional level.

## 07

### **A new paradigm for holistic planning of climate change adaptation**

This session focused on how we best support forward-looking climate adaptation in Denmark. What is needed to develop cross-municipal collaborations and ensure coherent planning that creates holistic solutions? In what different types of partnerships can the many different players engage themselves, and what can the different types of partnerships achieve – and what can they not? A number of the Danish networks that support climate adaptation have begun to work more closely together and are forming an umbrella organisation. How will this strengthen climate adaptation in Denmark? The

participants discussed how we best support climate adaptation in Denmark and what roles the networks should play.

#### **Presented by**

- *Inge Nilsson, Senior Konsultant, Concito*
- *Dorthe Selmer, Project Manager at C2C CC, The Central Denmark Region*
- *Ulrik Hindsberger, Centre Manager, The Danish Institute of Technology*

## Recommendations

### **Denmark needs to have a national climate adaptation strategy**

There is a need to promote interdisciplinary cooperation between local authorities, regions and different stakeholders. Part of the strategy may be the establishment of a national network linking local structures and knowledge centres, enabling shared learning and more. All these actors should work together to develop a national climate adaptation strategy that parliament can adopt and develop.

### **Facilitators in broad cross-sector networks need to ensure both innovation and anchoring**

It is important that the various actors in climate change adaptation help formulate clear goals for the work on climate adaptation in Denmark. There is a need for the enhanced facilitation of cooperation between the many different actors and interests. Only in this way can we ensure that the knowledge gained is utilised for new, innovative solutions.

### **We should have a new planning paradigm**

The relevant actors must be brought to the centre of attention and a wide-ranging, cross-border, constructive interaction (municipal boundaries, authorities, disciplines, interests) must be furthered, with the state setting up a framework responsibly and providing the necessary tools.

Planning legislation needs to be renewed, moving from the hierarchical paradigm to one of working together.

## 08

### The drainage system of the future and the sustainable city

The specific planning of a future drainage system and the cloudburst protection of our cities is an enormous, critical task. The 'Aarhus Method' is a detailed proposal for principles, prerequisites and methods for solving the task. Based on Script 31, other local authorities and utility companies have chosen different principles and methods.

Participants made clear what information they lacked and what decisions they needed to make to move forward with their concrete planning.

#### Presented by

- *Anne Laustsen, Chief Engineer, Aarhus Water*
- *Gitte Normand, Team Leader for Technology and Environment, Aarhus Municipality*
- *Søren Gabriel, Development Manager for Climate and Sustainability, Orbicon*

### Recommendations

#### You have to work with the entire water cycle when considering wastewater planning

Planning has to take into account the fact that the climate of the future requires areas reserved for occasional flooding. Today, there is a public demand for consistently high quality bathing water, which must also be taken into account when rethinking drainage systems.

#### Legislation needs to be adjusted making it compulsory to create a water management plan that considers the entire water cycle, based on a socio-economic analysis method

In this respect, local authorities must be given the responsibility to carry out the necessary planning or instructions. There must be coherence across municipal planning to devise and coordinate adjacent areas for adaptation and to create safeguards.

#### Financing needs to be adjusted

Among other things, it is proposed that the Water Sector Act be amended so that the utility companies can pay for separate sewerage right up to private property and that the waste water tariff be raised by 3 eurocents, which will be used for climate adaptation.

In addition, the rainwater tax may be levied when discharged from private parcels, and that the utility companies could work with a broader range of solutions and carry out more under the co-financing scheme.



Photo: Rune Borre Jensen, Region Midtjylland

## TOPSOIL

The National Conference on Climate Adaptation marked the end of the TOPSOIL project.

The EU Interreg project has a budget of approximately 7.3 million euros. Since 2014, 24 partners in five North Sea countries have gathered to develop and test solutions for managing the upper 20-30 metres of the subsurface.

The aim has been to ensure the protection of people and the environment in line with climate change, and as indicated by the conference's "Topsoil-track" the partners have delivered a huge number of impressive results and – not least – accumulated valuable experience. Both at the technical level, at the organisational level and in relation to the opportunities and barriers that administration and legislation in both the EU and individual member states offer.

### **TOPSOIL bridges science, practice and the management of five common challenges:**

1. Floods due to rising groundwater levels caused by rainfall.
2. Saltwater intrusion into freshwater reserves due to rising seawater levels.
3. The need for a groundwater buffer in periods of excessive rainfall.
4. Lack of knowledge about soil conditions and thus impaired resistance to extreme rainfall with the risk to water quality and crops.
5. Lack of knowledge about the ability to break down nutrients and other environmentally harmful pollutants in the top layers of the earth.

During the project period a large number of models, technical solutions and concrete approaches were developed within these five areas. The website [northsearegion.eu/topsoil](http://northsearegion.eu/topsoil) provides detailed presentations of the project output.

The main points, recommendations and experiences from TOPSOIL presented at the National Conference for Climate Adaptation are set out on the next pages.



*Claus Kondrup, Senior Expert – DG Climate Action – European Commission told about the importance of the experiences that we obtain in Denmark.*

*Photo: Rune Borre Jensen*

### **Presented by**

- *Rinke van Veen, Senior policy maker, Province of Drenthe, The Netherlands*
- *Dieter Vandevelde, Project Manager, Groundwater, Flanders Environment Agency*
- *Anders Juhl Kallesøe, Senior Consultant, GEUS*
- *Dr. Christina Aue, OOWV*

### **Think internationally and outside of the box**

The good results gained from TOPSOIL demonstrate the strength of international cooperation. Although there are major local differences in problems and needs there are a very large number of common challenges associated with climate change. This means that common solutions often end up with wider applications than originally intended. In this way, international cooperation forces us to think outside of the box. At the same time, it is important to recognise that climate change is a problem right across Europe. We must exploit European cooperation and incorporate climate adaptation into EU legislation (Nature2000, WFD etc.).

### **Use collaboration as a communication channel for politicians**

Collaboration across professional and administrative boundaries – and national borders – in itself serves as a strong communication channel for politicians, both in individual administrations and in the EU. Similarly, collaboration as a strong and professionally credible remit affects other key stakeholders – both private and public. To take advantage of this requires a great deal of knowledge of the individual stakeholders. What are their needs and concerns? We must ask them and involve them in the decision-making process with the aim of seeking win-win opportunities. An example is how the buffer surplus of rainfall in winter is today utilised for irrigation purposes in the summer.

### **Invest in research and provide grants for demonstration**

There is a great need for capital to fund both research and the development of new solutions. This also applies to private capital and this is an important task in investing public funds in lowering the threshold for private interest in the field. This is partly achievable by investing in qualitative scientific research that foster better understanding of the current and future effects of climate change, and partly by providing grants for climate adaptation demonstration projects.

### **Think long-term and across projects**

When it comes to climate change, time is not a luxury we can afford. We must act immediately and we must ensure as soon as possible that all aspects of the water cycle are implemented in the work on climate adaptation. Although we are acting now – and in the short term – we must, however, act with a long-term view. By working on projects with a long timeframe, we strengthen the exchange between member states and the contact between politicians, experts, authorities and other actors. The EU should therefore allow a longer “breathing space” for the duration of climate adaptation projects.

### **Get the pollution of the past under control**

The use of nitrate and pesticides in the past has left a very heavy burden on groundwater, and regardless of whether a local area is directly affected by climate change, there must be a focus on water quality, which will always be a product of all the processes in the soil above. Here, every square meter counts. Improving resilience is very difficult if no new European practice emerges. We must realise the 50 mg nitrate limit in groundwater, based on the EU Nitrates Directive.



*Photo: Nick Wenmaekers*





Hovedaktører:



Støttende aktører:

