

TOPSOIL CAPITALISATION REPORT

Resilient soil and water resources,
understanding the water beneath your feet



INTRODUCTION & BACKGROUND

Within the North Sea Region, the effects of climate change – more damaging storms, floods and drought are hard to predict. Nevertheless, disruption is almost certain. Meanwhile, the effects of climate change can now be seen on the news almost daily. Take the drought in 2018, with low water level in rivers and crop damage, as well as flooding as a result of short and extreme thunderstorms.

But what we don't see is the change below the surface. There's a slow, invisible process taking place beneath our feet but with a significant long-term impact on the quality of our environment and on human existence. TOPSOIL is all about what's happening underground....

With this document we show how TOPSOIL pilots are and will be capitalized, emphasizing the need for adaptation. We have learnt a lot about stakeholder involvement, transnational cooperation and about the challenges faced in groundwater management resulting from climate change. We hope to support local and regional groundwater managers to better respond to their challenges for balancing seasonal changes in groundwater availability and quality.

As a result of the pilot studies, we gained tremendous knowledge, which in turn led to new management plans. For each of the pilots, steps have been identified to deal with the increasing need for adaptation, while recognizing - uncertainty and vulnerability. The pilots addressed current pressures (some already severe) - both on the upper subsurface levels, on groundwater and on surface water. TOPSOIL pilots have shown that climate change adaptation and sustainable groundwater management requires a stronger cohesion between land management and water management.

TOPSOIL

OUR 5 SHARED CHALLENGES

- Flooding
- Saltwater intrusion
- Groundwater buffer
- Soil conditions
- Break down capacity

THE MEANS

- €4.22 million ERDF
- 24 partners
- 16 pilot areas

THE IMPACT

- **Direct impact:**
 - New salinization map
 - New research methods such as Ttem
 - Ground conductivity meter map
 - Implementation of measures considering nutrients
 - PhD research
 - Stakeholder engagement
- **Ongoing impact:**
 - Creek ridge infiltration
 - Detailed 3D hydrogeological models
 - Policy recommendations
 - Increased recharge through artificial Managed Aquifer Recharge scheme
 - CSa project
 - Increased freshwater availability
 - Spin-off company Aarhus Geoinstruments

THE IMPACT CONTINUES

HOW TO INCREASE TOPSOIL'S IMPACT BEYOND THE PROJECT END

The TOPSOIL partnership aimed to expanding the reach of TOPSOIL results, and to disseminating results to reach both regional stakeholders as well as European policy level. The pilots have revisited their results and - although in times of the Covid-19 pandemic situation only in a limited way - implement regional meetings with stakeholders who can contribute to the further development of the TOPSOIL results after the project. The consortium considered also how methods can be part of new business models.

The capitalization strategy consists of two parts: the first is a communication strategy, since communication is key to understanding and involving. The second part is the technical capitalization. This part focusses on the technical aspects, the costs and potential risks.

On the next pages you can find more information about the capitalization activities within the pilot areas.

Communication strategy

Communication has been an important aspect of the TOPSOIL project. Ongoing communication is important for the dissemination of the outcomes to stakeholders and to implement the results, also after the TOPSOIL project has ended.

Technical capitalization

Different hydrological models and monitoring approached have been developed to emphasize the importance of groundwater and seasonal balancing. Models can be used to predict the impact of climate change and to calculate the impact of measures.

The TOPSOIL project showed that the impact of climate change is comparable in the North Sea Region but the approach to water management and climate adaptation is handled differently. This has helped the existing partner network within TOPSOIL to capitalize the results. Discussions between partners added knowledge, helped to develop models and supported the acceptance of solutions. The project also made it possible to test the new tTEM system in different pilot areas and supported the interested stakeholders in gaining more knowledge on the relationship between soil and management. Within the TOPSOIL network authorities, water managers, universities, experts and stakeholders were included. This made it possible to have collaboration between the end users - the regions, farmers, and the experts.

Recommendations

Capitalisation of results is an important aspect of every project. To be precise: it is as important as all other project activities. Why so? Well, the impact of even the brightest projects is still limited by the extent of its partners, duration or budget. Although many projects can be considered big steps forward, only occasionally the pre-defined problem or objective targeted is solved or reached.

Capitalisation actions are therefore necessary to help projects define a response to the big 'what's next?'. What will happen with the processes that were initiated in the project. For sure, nobody wants them to stop entirely. But who is going to take the initiative to continue? Who will maintain the actions on the ground? Who will pay for it?

In addition, combined with innovations and new insights project outputs can still be improved, made bigger or transferred to another region or working field to make a an even bigger impact. Thinking about the business model of your project activities will help maximize it's impact. Even if it is outside the official project period. And more importantly, it will help quantify the leverage effect of the initial investment made by the beneficiaries and the funding programme.

It is therefore important to already think about capitalisation actions during the preparation of your project. It will help maintain an open mind towards the long-term perspective and the different economical aspects of your project activities.

Capitalisation activities will give your project the legacy it deserves.

CAPITALISATION IN BELGIUM

REALISATION OF A TEST SITE FOR GROUNDWATER BUFFERING IN A SALINE AREA

THE ADDED VALUE OF TOPSOIL

Pilots in Belgium focused on mapping the distribution of fresh and salt water aquifers using helicopter mounted survey equipment to assess opportunities for increasing the freshwater availability for agriculture by implementing interventions such as creek ridge infiltration.

The new salinity map helps water managers to identify which zones are suitable for infiltration during winter. The TOPSOIL results are also being used to finetune water level management in the polders.

Additionally, the tTEM system was used in Belgium to map the upper 50 meters of the subsurface in very high resolution. The survey was conducted in Veurne, Koksijde, Damme and Knokke-Heist.



REPLICABILITY, TRANSFERABILITY OF RESULTS AND LONG-TERM PROSPECTS

As a direct result of the demonstration project, a follow-up research and monitoring protocol will be implemented for an optimal design and management of the system. The experiences gathered during the implementation are being documented so that water managers and farmers can build their decisions how to transfer the measure to their area.

In addition, the possibility to upgrade from local demonstration project to a solution on regional scale (e.g. 1 creek ridge infiltration system for a bigger area and shared with multiple farmers) will be considered, as well as a replication of the system at other locations.

With an anticipated increase in fresh water demand as a result of climate change in mind, this solution can become an important tool for farmers and water managers to help balance seasonal changes in freshwater availability.



CAPITALISATION IN DENMARK

- SEASONAL BALANCING OF GROUNDWATER IN THE SUNDS AREA
- CLIMATE CHANGE IMPACT ON SHALLOW AND SURFICIAL DRAINAGE FROM CONTAMINATED LAND SITES
- DEVELOPMENT OF NEW MAPPING TECHNIQUES IMPROVING MODELLING OF MEASURES TO PREVENT GROUNDWATER FLOODING

THE ADDED VALUE OF TOPSOIL

The pilots in Denmark addressed a range of issues including contaminated land, groundwater flooding, geophysical studies to explore the possibility of spatially targeted fertiliser regulations, and the development of an integrated hydrological model to reduce urban point source pollution.

In addition, new technology (tTEM) has been developed to support high resolution and cost effective geophysical surveys in Denmark and in each of the four other partner countries. The tTEM method is now being used and offered by consulting companies and the production of instruments has been outsourced to a new private company. Knowledge of the use of tTEM has been spread over the participating countries.



REPLICABILITY, TRANSFERABILITY OF RESULTS AND LONG-TERM PROSPECTS

A working group has been established to work on a national law proposal. This is possible because of detailed calculations made possible by a new hydrological model, for which data from project partners was used.

Based upon the TOPSOIL experience, the tTEM system is already undergoing further development, with – amongst others – the application of a smaller loop to make the system easier to handle and to enable the collection of data in small passages and at small sites.

In addition, the business potential of tTEM will be fully exploited, including the potential to apply the new technology for different purposes worldwide like aggregate mapping, groundwater mapping vulnerability mapping, etc. A spin off company - Aarhus Geoinstruments - was founded.



CAPITALISATION IN GERMANY

- GROUNDWATER BUFFERING FOR SEASONAL AQUIFER MANAGEMENT IN MORAINÉ AREAS
- INTERACTIVE WATER MANAGEMENT FOR BALANCING SEASONAL GROUNDWATER CHANGE
- AQUAMODUL-ONLINE
- DIFFERENT EFFECTS OF CONVENTIONAL AGRICULTURE AND ORGANIC FARMING ON WATER QUANTITY AND WATER QUALITY IN DRINKING WATER PROTECTION AREAS

THE ADDED VALUE OF TOPSOIL

Pilots in Germany included technical data collection and models to better understand the sub-surface and inform climate adaptation plans, practical work with farmers to protect ground water sources used for public supply from contamination from nitrogen and other pollutants, and developing a decision support system to prevent environmental impacts from abstraction for agriculture.

Using remote data transfer technology, the triple measuring results are constantly published online to enhance understanding and acceptance of irrigation and groundwater buffering.

The highly detailed groundwater model can be used as a decision support study for future MAR (Managed Aquifer Recharge) application. It shows the effects of managing the aquifer recharge. Potential stakeholders are advised to use the surplus water required for dry periods and to push back the infiltrating saltwater.



REPLICABILITY, TRANSFERABILITY OF RESULTS AND LONG-TERM PROSPECTS

Based upon the work carried out in TOPSOIL, at several locations in Germany, partners and stakeholders are looking into the opportunity to test solutions to increase the freshwater availability.

In addition, German partners are looking into the opportunity to make a decision support system combining real weather conditions with options to manage local groundwater abstraction from individual wells.

A stakeholder integrated groundwater monitoring system has been developed. It is used to identify the amount of groundwater which can be used for irrigation under the premises of WFD requirements for the nearby surface water. This concept will be transferred to other areas where groundwater is used for irrigation.

Last but not least, the successful TOPSOIL-pilots with farmers can be integrated into the existing agri-environmental schemes, considerably reducing the nitrate load and potentially offering new payment schemes for farmers.

CAPITALISATION IN THE NETHERLANDS

CLIMATE PROOF DRENTSCHE AA

THE ADDED VALUE OF TOPSOIL

Pilots in the Netherlands focused on developing a catchment based approach to tackling pesticide pollution, and balancing the seasonal availability of groundwater with the need for drainage, irrigation and environmental protection. This required data collection to validate current groundwater models and model the impact of climate change on groundwater levels, surface water run-off and pollutant leaching.

A range of suitable interventions were developed and tested aimed at making the catchments more resilient.

The farmers within the pilot area were mobilized to take measures by using field demos to demonstrate new sustainable machinery and farm management practices. A longer transformation to a more sustainable farm management is possible by combining it with a subsidy arrangement which can be extended after the project.



REPLICABILITY, TRANSFERABILITY OF RESULTS AND LONG-TERM PROSPECTS

The TOPSOIL-pilots in the Netherlands will be continuously monitored and evaluated in order to further optimize their efficiency. A stakeholder dialogue on implementing changes in the legislative context on water quantity was set up to jointly improve the regional legislative governance context on climate change adaptation in groundwater management.

In mode built in the NL-1 pilot model forms a base for new regulations on irrigation and drainage. It is already part of the strategic Water Plan of the Province Drenthe. After the last details are worked out, especially in relation to the N2000-requirements, it will be part of regional regulations.

After the end of the project, partners and stakeholders in The Netherlands will look into the potential to extend the successful TOPSOIL-measures into other catchments. Also the possibility to upscale the measures, as well as including them into new CAP regulations on sustainable farming will be considered.

CAPITALISATION IN THE UNITED KINGDOM

INTEGRATED WATER AND SOIL MANAGEMENT TO ACCELERATING THE RESILIENCE OF CATCHMENTS

THE ADDED VALUE OF TOPSOIL

Pilots in the UK aimed to demonstrate the benefits of a more holistic approach to the management of soil, groundwater and surface water in the context of climate change and catchment management governance.

Specific objectives included achieving a greater understanding of surface-groundwater interactions and the development of connectivity maps, working with farmers to improve soil health and reduce the loss of contaminants into the environment, testing innovative solutions such as Managed Aquifer Recharge (MAR) to store excess winter surface water in the aquifer and to integrate traditional water resources management as part of a broader more integrated multi-sector approach to water management at the catchment scale.



REPLICABILITY, TRANSFERABILITY OF RESULTS AND LONG-TERM PROSPECTS

Partners in the UK have embedded the project activities into existing catchment partnerships operating as part of the Catchment Based Approach and used the opportunities presented by TOPSOIL to continue to collect data, work with farmers and engage with and influence wider regional and national scale initiatives to ensure the projects legacy. Site based activities such as farm demonstrations and events, the use of innovative farm machinery and new land management techniques are being scaled up across the pilots and best practice rolled out more widely within the UK.

The benefits of the multi-sector partnerships developed in the project have resulted in new collaborative opportunities, direct influence on government strategy and new funding opportunities to address the challenges. This includes the communication of soil health data captured in the arable sector to the livestock sector proposed for delivery with "Farming in Protected Landscapes" funding and the development of a new INTERREG France (Channel) England project called 'Water for Tomorrow' which aims to improve the management of water resources to increase environmental, economic and societal resilience to water scarcity and drought.

