TransformAr

Accelerating and upscaling transformational adaptation in Europe: demonstration of water-related innovation packages

Learning stories on digital and techno solutions

Deliverable 4.4

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EXECUTIVE SUMMARY

The **D4.4 deliverable presents** four learning stories developed as part of the TransformAr project, focusing on innovative digital and technical solutions to address transformational adaptation in face of site-specific climate-related challenges. These solutions were deployed across three European regions: Galicia (Spain), Egaleo (Greece), Lappeenranta (Finland), and one replicator site, Gjøvik (Norway), which mirrors the approach implemented in Lappeenranta. Each learning story was created to showcase the adaptive technologies, the challenges faced, and the lessons learned. The learning stories are communicated through motion design videos, providing engaging and accessible insights for various stakeholders. This report outlines the development process of these solutions and learning stories, with an emphasis on collaboration, real-time data, and region-specific adaptation strategies. NTNU, in collaboration with the demonstration sites and technology providers, led the scripting and storyboarding, while NTNU Graphic Center supported video design.

1.0 INTRODUCTION

T4.4 in the **TransformAr project** is dedicated to accelerating and scaling transformational adaptation in vulnerable regions across Europe through innovative technological and digital solutions. Climate change poses diverse challenges to regions depending on their geography, and the TransformAr lighthouse demonstrators were designed to showcase scalable solutions addressing water-related risks and extreme weather events.

This deliverable focuses on the creation of **four digital solutions** and their accompanying learning stories, communicated via motion design videos. The aim is to distill the experiences and lessons learned from these projects to inspire broader implementation and replication in other regions across Europe.

2.0 METHODOLOGY

2.1 Collaborative Development Process

The development of the learning stories was a **collaborative effort** between NTNU, the technology providers, and the demonstration site representatives from Galicia, Egaleo, Lappeenranta, and Gjøvik. NTNU led the scripting and storyboarding of the videos with input from the demo sites, and several bilateral meetings were organized between Q4 2023 and Q3 2024 to ensure alignment in the storytelling.

Throughout the development of the video structure, script, and storyboard, a Miro board was used as a key collaborative tool. Miro allowed several team members to work simultaneously, enabling real-time visual collaboration and feedback. The board facilitated efficient drafting, sharing, and resolving of comments, making it an invaluable tool for aligning the creative vision. Additionally, generative AI tools, such as Adobe Firefly and Microsoft Copilot, were employed to sketch and prototype ideas quickly. NTNU provided full access licenses to work with both tools. These tools provided a rapid way to visualize concepts for each video scene. However, it's important to note that while AI-assisted prototyping helped accelerate the brainstorming phase, the final video production was completed entirely by human creatives.

2.2 Guidance from ADEME and the WP4 Framework

Throughout the process, NTNU consulted with the **WP4 leader, ADEME**, who provided guidance on the scope and format of the learning stories. These discussions shaped the decision to create motion design videos that could effectively convey the project's message in a concise, visually appealing format. Initially, four short videos were planned, each focusing on a specific solution. However, it was ultimately decided to deliver a single, longer video of approximately 3.5 minutes, which links all four solutions into a cohesive narrative. Nevertheless, the material developed for the design of the four shorter videos will be repurposed as communication material for the project, ensuring it remains a valuable resource for outreach and dissemination efforts."

2.3 Learning Stories as Motion Design Videos

The decision to use **motion design** for the learning stories was based on the need to engage a wide range of stakeholders. The videos were designed to be accessible, highlighting key challenges and solutions through a mix of live footage, animations, and data visualizations.

NTNU's **Graphic Center** supported the creation of the visual elements, while a professional video production company in Trondheim handled the final production of the videos. The learning stories cover four distinct digital and technical solutions, with each site contributing unique insights.

3.0 LEARNING STORIES FOR DIGITAL AND TECHNOLOGICAL SOLUTIONS

3.1 Intertidal Monitoring (INTERM) – Galicia, Spain

Background: Galicia's **intertidal sandbanks** have been a traditional source of shellfish harvesting for generations. However, climate change has begun to disrupt these delicate ecosystems, threatening shellfish productivity.

Solution: The **INTERM system**, developed by the University of Vigo, was designed to monitor sediment dynamics and environmental conditions in real time. This system provides critical data on changes in sea levels, currents, and sediment layers, helping to predict risks and protect shellfish habitats.

Lessons Learned: A key takeaway from the project was the value of **local stakeholder involvement**, particularly the collaboration between researchers and shellfish harvesters, which ensured that the data collected was immediately actionable and relevant to the industry.

Visual Storyboard: The video shows **aerial footage** of Galicia's intertidal sandbanks and the installation of advanced monitoring systems. The narration highlights the region's reliance on shellfish harvesting and the risks posed by climate change.

3.2 Mussel Raft Monitoring (MRM) – Galicia, Spain

Background: Mussel production is a critical sector for the Galician economy, but climate change is increasingly affecting the coastal environment, particularly through rising sea surface temperatures and salinity shifts.

Solution: The **Mussel Raft Monitoring (MRM)** solution, developed by CETMAR, uses **IoT technology** and sensors to provide real-time data on mussel health and environmental conditions. This helps mussel farmers adapt to changing conditions quickly and effectively.

Lessons Learned: The project underscored the importance of **integrating traditional knowledge** with digital solutions. By working closely with local mussel farmers, CETMAR was able to ensure that the technology met the sector's specific needs.

Visual Storyboard: The video features **footage of mussel rafts**, the installation of sensors, and real-time data analysis. It concludes with visuals of thriving mussel farms, emphasizing the system's success in safeguarding the local economy.

3.3 Smart Climate Stations (SCS) – Egaleo, Greece

Background: Egaleo, a densely populated city near Athens, faces rising temperatures due to the **urban heat island effect**, exacerbating the risk of heatwaves for its residents.

Solution: In collaboration with Demokritos, Egaleo installed **smart climate stations** to monitor local temperature variations and air quality. These stations provide critical real-time data to help city planners create targeted interventions, such as expanding green spaces and optimizing energy use.

Lessons Learned: The key lesson was the **importance of localized data**. The granular data provided by the climate stations enabled Egaleo to identify urban hotspots and implement solutions that directly benefit residents.

Visual Storyboard: The video features **urban heat animations**, technicians installing climate stations, and city planners reviewing data to make decisions on urban cooling interventions.

3.4 Stormwater Management System – Lappeenranta, Finland (Replicated in Gjøvik, Norway)

Background: Lappeenranta is grappling with an increase in **stormwater runoff**, which carries pollutants into **Lake Saimaa**, threatening the city's natural water resources. This issue was mirrored in Gjøvik, Norway, where similar environmental challenges were present.

Solution: The city, with support from **LUT University**, installed sensors to monitor stormwater quality in real time. These sensors track pollutants and water flow, enabling the city to take action when pollution levels rise. This system was successfully replicated in Gjøvik, proving its scalability.

Lessons Learned: One of the key lessons was the challenge of retrofitting **old infrastructure** to accommodate new sensor technology. The project highlighted the need for **tailored solutions** based on local infrastructure capabilities.

Visual Storyboard: The video includes **aerial footage** of Lappeenranta during a storm, sensors being installed, and dashboards showing real-time data. The replication in Gjøvik is illustrated with footage of similar sensors being installed there.

4.0 LEARNING STORIES COMBINED VIDEO

The final learning story video integrates the four regional stories into a single, cohesive narrative. The video opens with a **map of Europe**, zooming in on each region (Galicia, Egaleo, Lappeenranta, and Gjøvik) and highlighting the climate-related challenges each area faces.

The video is structured in **three segments**:

1. **Introduction**: Provides an overview of the climate challenges and digital solutions across Europe.
2. **Regional Solutions**: Presents each solution, showcasing the local context and technologies used.
3. **Conclusion**: Emphasizes the importance of collaboration, data-driven solutions, and the potential for scaling these technologies across Europe.

5.0 LESSONS LEARNED FROM THE LEARNING STORY PROCESS

5.1 Collaboration and Stakeholder Involvement

The learning stories highlighted the necessity of **early stakeholder engagement** in both the development of the solutions and the communication strategy. Close collaboration between technology providers and local communities ensured that the digital solutions were tailored to the specific needs of each region.

5.2 Challenges in Storytelling

The diversity of the regions and the complexity of the technological solutions presented a challenge in creating a unified narrative. However, by using motion design, NTNU was able to convey these stories in an engaging and understandable format for a broad audience.

6.0 CONCLUSIONS

The development of these four digital solutions and the accompanying learning stories represents a significant step forward in **climate adaptation** across Europe. Each solution demonstrated how digital technologies can be effectively deployed to address region-specific climate challenges. The **learning stories**, in the form of motion design videos, provide a powerful tool for sharing these experiences and lessons with a wider audience, inspiring further innovation and replication.

ANNEX 1: Intertidal Monitoring (INTERM) script

1. Opening Scene
Visuals:
Aerial shots of Galicia's intertidal sandbanks, with female workers harvesting shellfish. The camera glides over the workers collecting shellfish, with boats and traditional equipment visible.

Narration:
"Galicia's intertidal sandbanks have supported traditional shellfish harvesting for generations. But now, climate change is threatening this critical industry by disrupting the delicate balance of these coastal ecosystems."

2. The Challenge
Visuals:
Animations showing how rising sea levels and shifting currents affect the sediment layers in intertidal zones. Diagrams depict how climate change is disrupting the natural processes that sustain shellfish populations.

Narration:
"Changing sediment dynamics and rising ocean temperatures pose serious risks to shellfish productivity. Increased mortality and decreased productivity in shellfish harvesting are linked to multiple environmental factors, making it crucial to understand the complex interplay of variables affecting the ecosystem."

3. The Solution and Lessons Learned
Visuals:
Researchers from the University of Vigo monitoring the coastline, installing advanced monitoring systems, and reviewing data in the lab. Visuals of the monitoring systems capturing environmental data in real time.

Narration:
"In response, researchers from the University of Vigo have installed advanced monitoring systems to track environmental conditions that influence sediment dynamics. Using this data, predictive models can help identify risk areas early, allowing for targeted interventions to protect the fragile ecosystem."

Visuals:
Footage of local shellfish harvesters, or "cofradías," working alongside researchers. Visualizations of data shared with stakeholders.

Narration:
"One important lesson learned is the value of close collaboration between researchers and the local guild of fishermen. This coordinated effort ensures that new knowledge is transferred directly to those who depend on the health of these banks, making the research actionable and impactful."

4. Conclusion
Visuals:
A future vision of a thriving shellfish harvest, with sustainable practices integrated into the landscape. The camera zooms out to show the expansive, healthy intertidal zones.

Narration:
"Through technological solutions, collaboration with local stakeholders and proactive strategies, Galicia is learning how to build resilience against climate change, ensuring that its vital shellfish industry can thrive for future generations."

ANNEX 2: Mussel Raft Monitoring (MRM) script

1. Opening Scene

Visuals:
Aerial shots of the Galician coastline with mussel rafts in the water. Fishermen at work, showcasing the region's reliance on mussel production.

Narration:
"In Galicia, mussel-rafts are the backbone of a vital economic sector, but climate change is putting this economic lifeline at risk. Rising temperatures, shifts in salinity, and extreme weather events now threaten mussel habitats."

2. Transition to Problem
Visuals:
Animations of environmental changes: increasing sea surface temperatures, changing salinity, heavy rainfall, and ocean acidification. Graphics showing the impact of climate change on mussel health and production.

Narration:
"The effects of climate change are altering the delicate balance of the Galician ecosystem and pushing mussel production to its limits. Without collaboration and innovative solutions, the sector faces serious challenges."

3. Transition to Solution
Visuals:
Researchers from CETMAR working on mussel rafts, setting up monitoring equipment, and accessing real-time environmental data on digital screens.
Narration:
"To address these challenges, CETMAR has introduced the Intelligent Mussel Production Management solution. This cutting-edge system, part of the TransformAr project, uses advanced technology to monitor mussel-rafts in real time, providing critical data to help adapt to changing environmental conditions."

4. Journey Step (Lessons Learned)
Visuals:
Researchers, mussel farmers, and local stakeholders in meetings, collaborating on solutions. Farmers and scientists reviewing data together, adjusting their strategies, and implementing sustainable practices.
Narration:
"A key lesson learned is that involving stakeholders from the start leads to more practical, effective solutions. By working together, the mussel sector is building resilience to climate change, ensuring long-term sustainability."

5. Conclusion
Visuals:
A sunset view of thriving mussel rafts, healthy mussels being harvested, and the Galician coastline glowing under a golden sky.
Narration:
"Innovative solutions like the Intelligent Mussel Production Management system are key to securing the future of the mussel sector. By leveraging data-driven technologies, Galicia is ensuring the resilience and sustainability of its mussel production amidst evolving climate challenges."

ANNEX 3: Smart Climate Stations (SCS) script

1. Opening Scene

Visuals:

Aerial shots of Egaleo, a densely populated urban area with limited green spaces. Intense sunlight highlights the heat.

Narration:

"Egaleo, a vibrant municipality near Athens, is grappling with rising temperatures and frequent heatwaves, worsened by the urban heat island effect. This is putting residents, especially the most vulnerable, at risk. Understanding and addressing this challenge is becoming critical for the city."

2. The Challenge

Visuals:

Diagrams illustrating how heat is trapped in urban areas, contrasting cooler rural spaces. Shots of air conditioners running and people seeking relief from the heat.

Narration:

"Urban environments absorb and retain more heat than rural areas due to dense buildings and minimal vegetation. To address this, Egaleo needed precise, localized data to identify hotspots and understand how urban infrastructure contributes to overheating."

3. The Solution and Lessons Learnt

Visuals:

Technicians installing smart climate stations, sensors being calibrated, and data feeds being analyzed.

Narration:

"With support from Demokritos, Egaleo installed climate stations to monitor local environmental factors. A key lesson learned was the value of real-time data in providing deep insight into the city's microclimate, identifying heat hotspots, and enabling targeted action to cool the city."

Visuals:

City planners reviewing data, scenes of newly planted green areas, and energy-efficient buildings being constructed.

Narration:

"Another critical takeaway was the importance of community engagement. Involving local stakeholders ensured solutions were well-received and effective."

4. Conclusion

Visuals:

Sunset over a greener, cooler Egaleo, residents enjoying the new urban environment.

Narration:

"By learning from real-time data and adapting strategies, Egaleo is not only addressing today’s climate challenges but also creating a blueprint for resilient, sustainable cities of the future."

ANNEX 4: Stormwater Management (SWM) script

1. Opening Scene

Visuals:
Aerial footage of Lappeenranta, storm clouds gathering, transitioning to heavy rainstorms and water draining into Lake Saimaa.

Narration:
"Climate change is making its mark on Lappeenranta with more frequent storms and increased stormwater runoff. This water, carrying pollutants, threatens Lake Saimaa, the city's natural treasure."

2. The Challenge

Visuals:
Animations showing how stormwater collects pollutants, flowing untreated into natural bodies of water.

Narration:
"Monitoring stormwater pollution has been difficult with traditional methods—time-consuming, expensive, and not suited for real-time tracking. Lappeenranta needed a smarter, faster solution to tackle the rising challenge of stormwater pollution."

3. The Solution

Visuals:
Footage of sensors being installed in storm drains, dashboards displaying real-time data.

Narration:
"Supported by LUT, the city installed sensors to monitor water quality and flow in real time. But retrofitting sensors into Lappeenranta’s old infrastructure wasn’t easy. Manholes had to be modified, and sensors placed where conditions allowed, showing the challenges of scaling in legacy systems."

4. Conclusion and Lessons Learnt

Visuals:
Clean water flowing through urban landscapes, city planners reviewing data, and a sunset over Lake Saimaa.

Narration:
"Despite the obstacles, Lappeenranta's innovative stormwater solution is a model for cities facing similar challenges, demonstrating how collaboration and adaptability can lead to cleaner, more sustainable urban environments."

ANNEX 5: Final combined learning story video script

Opening Scene (20 seconds)
Visuals:
A dynamic, animated map of Europe appears. The camera quickly zooms in on the highlighted locations: Galicia (Spain), Egaleo (Greece), Lappeenranta (Finland), and Gjøvik (Norway). As each location is highlighted, simple icons pop up to represent each region's challenge (e.g., a shellfish for Galicia, a sun over Egaleo, a storm cloud for the Nordics (Lappeenranta and Gjøvik). This is paired with subtle, smooth transitions between each location.

Narration:
"Across Europe, cities and regions are adapting to the impacts of climate change. Innovative digital solutions are enabling them to adapt faster and smarter. Let's explore what the TransformAr project has learned through the use of digital and technological innovations to protect communities and build a more resilient future."."

Segment 1: Galicia – Mussel Raft monitoring [MRM] & Intertidal Monitoring [INTERM] (80 seconds)
Opening Scene Visuals (Mussels):
Aerial shots of the Galician coastline with mussel rafts and fishermen working.

Narration:
"In Galicia, the mussel sector is vital to the local economy, but climate change is disrupting this delicate ecosystem, affecting mussel health and production."

Challenge Visuals (Mussels):
Animations of rising sea surface temperatures, shifting salinity, and ocean acidification.

Narration:
"Increasing temperatures and changes in salinity are pushing mussel production to its limits. Innovative solutions are needed to safeguard this essential activity."

Solution Visuals (Mussels):
Footage of researchers installing monitoring equipment on mussel rafts and analysing real-time data on digital screens.

Narration:
"To address these challenges, CETMAR has introduced the Mussel Raft Monitoring (MRM) solution. This cutting-edge system uses advanced sensor and IoT technology to monitor mussel-rafts in real time, providing critical data to help adapt to changing environmental conditions."

Transition to Shellfish Harvesting Visuals (Intertidal):
Aerial shots of Galicia's intertidal sandbanks, workers harvesting shellfish.

Narration:
"In parallel, traditional shellfish harvesting on Galicia's intertidal banks are also under threat. Changing sediment dynamics are impacting productivity."

Solution Visuals (Intertidal):
Footage of researchers from the University of Vigo collecting oceanographic and coastal data through on-foot, on-board, and underwater surveys, along with lab work to model sediment dynamics and analyse the environmental factors impacting the intertidal banks.

Narration:
"In response, researchers from the University of Vigo have deployed advanced monitoring systems to track environmental conditions that influence sediment dynamics. Using this data, predictive models can help identify risk areas early, allowing for targeted interventions to protect the fragile ecosystem."

Lessons Learned (Galicia): Visuals of researchers and local stakeholders working together and reviewing data.

Narration:
"Across both solutions, collaboration with local communities, such as guild of fishermen, have been key, ensuring that technological innovations are grounded in practical, local knowledge."

Transition (5-10 seconds)

Visuals: A map of Europe zooms from Galicia to Egaleo, Greece.

Narration: "While coastal areas battle environmental shifts, urban regions face challenges of their own as cities heat up."

Segment 2: Egaleo – Smart Climate Stations (50 seconds)

Opening Scene Visuals:
Aerial shots of Egaleo's urban landscape under intense sunlight.

Narration:
"Egaleo, a densely populated city near Athens, is grappling with rising temperatures and the urban heat island effect, putting its residents at risk."

Challenge Visuals:
Diagrams showing how heat is trapped in cities compared to rural areas.

Narration:
"Urban environments absorb and retain more heat than rural areas due to dense buildings and minimal vegetation. To address this, Egaleo needed precise, localized data to identify hotspots and understand how urban infrastructure contributes to overheating."

Solution Visuals:
Technicians installing smart climate stations, sensors being calibrated, and data feeds being analysed.

Narration:
"Supported by Demokritos, Egaleo has installed climate monitoring stations to track local environmental conditions, offering valuable insights into the city's unique microclimate."

Lessons Learned (Visuals): City planners reviewing data, scenes of new green spaces being planted.

Narration:
"Similar to the approaches used in Galicia, this initiative relied on real-time data and fostered active collaboration with local stakeholders, ensuring the solution was both well-received and highly effective."

Transition (5-10 seconds)

Visuals: The map zooms from Egaleo to Lappeenranta, Finland.

Narration: “Just as real-time data is vital in cities, it also plays a crucial role in managing stormwater in northern regions, with solutions spreading across borders.”

Segment 3: Lappeenranta and replication in Gjøvik – Stormwater Management (50 seconds)

Opening Scene Visuals (Lappeenranta):
Aerial footage of storm clouds over Lappeenranta with water draining into Lake Saimaa.

Narration:
“In Lappeenranta, increased stormwater runoff is polluting Lake Saimaa, threatening this natural treasure.”

Challenge (Visuals):
Animations showing pollutants being carried by stormwater into the lake.

Narration:
“Due to the time-consuming and expensive nature of traditional water pollution sampling and analysis methods, the city implemented a technology-driven solution to expedite the process and reduce costs."

Solution (Visuals):
Footage of sensors installed in storm drains and real-time data dashboards.

Narration:
“Supported by LUT, the city installed sensors to monitor storm-and meltwater quality and flow in real time, allowing the city to track and reduce pollution levels.”

Replication in Gjøvik (Visuals):
Transition to Gjøvik, Norway, with similar stormwater sensors being installed.

Narration:
“This approach, successfully replicated in Gjøvik, shows potential for scaling across regions. A key lesson is the need to account for each city's existing technological and infrastructure systems. Without careful adaptation, implementation may face bottlenecks. Tailoring solutions to fit local infrastructure is crucial for seamless integration and long-term sustainability."

Final Scene (20-25 seconds)

Visuals: The camera zooms out from Gjøvik to show a full map of Europe, with all the key locations highlighted.

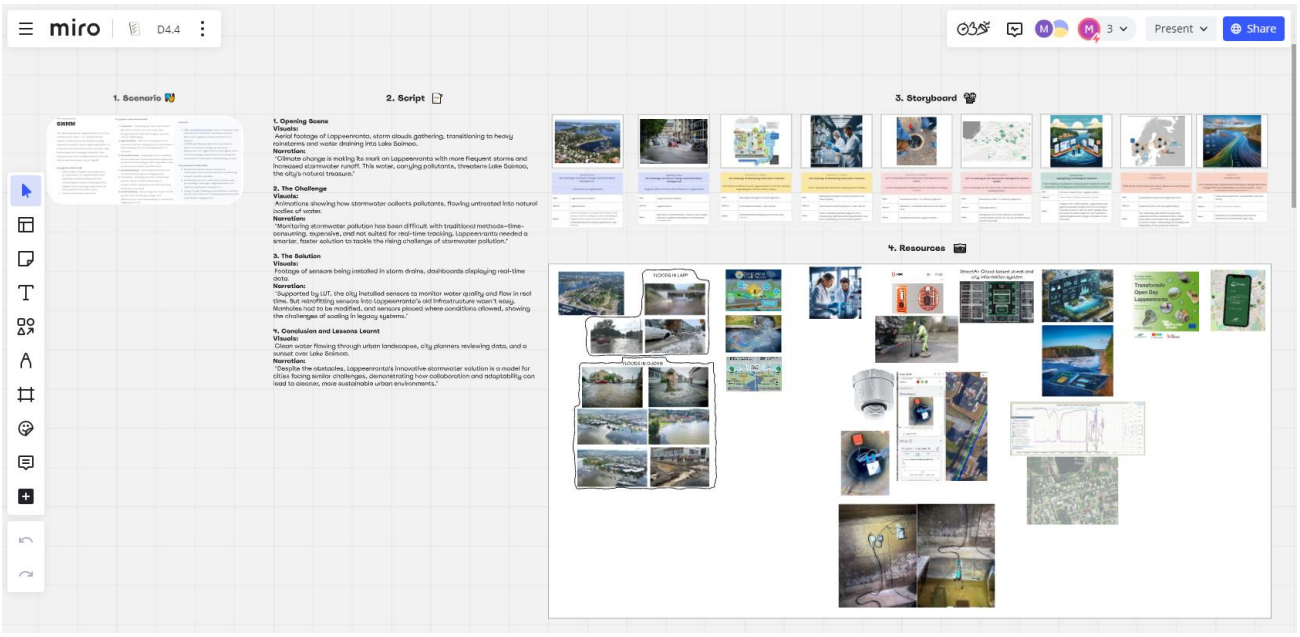
Narration: “Across Europe, these innovative solutions show the power of technology, real-time data, and collaboration. By working together, we are building a more resilient and sustainable future.”

Conclusion (5 seconds)

Visuals: Fade out to the TransformAr project logo and EU Horizon 2020 branding.

ANNEX 6: Example screenshot of the Miro collaborative board and access link to the full video scripting

Screenshot:



Link: https://miro.com/app/board/uXjVLc3ZUDo=/

ANNEX 7: Link to the motion design video teaser

A teaser announcing the full learning stories motion design video was produced by the graphic design company Berre. This teaser serves to engage stakeholders and build anticipation for the full video, which will showcase the digital and technical solutions developed in the project. A link to the teaser is provided below. The complete learning stories video is expected to be released by Berre in collaboration with Bloom by the second half of October 2024.

Link to the teaser (with subtitles): https://berre.wistia.com/medias/003j92fqw5

Link to the teaser (without subtitles): https://berre.wistia.com/medias/4jcqq1cnwl

Climate change impacts are here and now. The impacts on people, prosperity and planet are already pervasive but unevenly distributed, as stated in the new EU Blueprint strategy (European Commission-EC, 2019). To reduce climate-related risks, the EC and the IPCC agree that transformational adaptation is essential. The TranformAr project aims to develop and demonstrate products and services to launch and accelerate large-scale and disruptive adaptive process for transformational adaptation in vulnerable regions and communities across Europe.

The 6 TransformAr lighthouse demonstrators face a common challenge: water-related risks and impacts of climate change. Based on existing successful initiatives, the project will develop, test and demonstrate solutions and pathways, integrated in Innovation Packages, in 6 territories.

Transformational pathways, including an integrated risk assessment approach are co-developed by means of 9 Transformational Adaptive Blocks. A set of 22 tested actionable adaptive solutions are tested and demonstrated, ranging from nature-based solutions, innovative technologies, financing, insurance and governance models, awareness and behavioral change solutions.

TransformAr

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