

Mosan Initiative for Climate Change Action

CREATING A COOPERATION SPACE FOR ADAPTING THE INTERNATIONAL MEUSE CATCHMENT TO CLIMATE CHANGE IMPACTS INCLUDING SUPPORTING THE FIRST EUROPEAN PROJECT PROPOSAL (AS LIFE OR INTERREG) OF THIS COOPERATION SPACE

Final report

Mission 3 – MOVING ON TO ACTION AT EUROPEAN LEVEL: THE FUTURE: ADAPTATION VISION AND RELATED MEASURES (INCLUDING AN ASSESSMENT OF THE POSSIBLE SYNERGIES BETWEEN HIGH-POTENTIAL MEASURES)

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1. Introduction

This report is part of the Mission 3 of the MICCA project: Moving on to Action at European level. This mission aims at defining a strategic vision for climate change adaptation for the basin and its related catalogue of operational actions.

During this mission, a preliminary inventory of the existing situation in terms of adaptation to climate change in the basin was carried out, related to both strategic planning and actions carried out in the Meuse Region. This assessment is provided in deliverable 3.1.

Based on this analysis, this deliverable presents the strategic vision for adaptation in the river basin up to 2050 and a catalogue of measures proposed by the main stakeholders of the Meuse Region. Finally, this deliverable is accompanied by the [ESRI online demonstrator](#) presented at the Rendez-vous de la Meuse in Roermond in May 2022.

2. Methodological approach

Based on the assessment of the common points and possible synergies between the existing adaptation plans and following the regular exchanges with the GRCC group and EPAMA, the vision of adaptation was formulated. This strategic vision is broken down into 4 strategic axes representing the themes or the expected "grouping of actions".

The strategic axes have been translated into an operational action plan. This takes the form of a catalogue. The actions developed in this catalogue are projects of actions to be carried out for the future of the basin or well-defined actions awaiting funding and/or supporting partner organizations. This catalogue was built on the basis of the workshops of Mission 2, the exhaustive review conducted in phase 3.1 and through a strong user engagement strategy. In order to formalise the catalogue, encourage the emergence of a common project and create synergies, and identify potential project leaders, a work of co-construction of the catalogue was implemented:

- **17 online interviews with stakeholders/potential project leaders** involved in the Meuse network were carried out. In these interviews, possible actions and groupings, the adaptation vision and the methods for composing the catalogue were presented. A further focus point was the discussion of and request for potential actions from the interviewees. The list of stakeholders interviewed is presented in Appendix 1.
- **Regular online interactions with the network** were maintained for the construction and validation of the detailed action sheets. Criteria for the action sheets were defined in close consultation with EPAMA and with a view on Mission 4.

In parallel, the ESRI online demonstrator of actions was developed. The demonstrator includes the main climatic impacts for the Meuse region, the adaptation vision for 2050 and a diverse selection of actions from the catalogue.

3. Adaptation vision

Through the aforementioned approach, the following vision was formulated:

“Water in 2050, a shared and managed resource in its scarcity and extremes”

Based on this vision, current and future drought and flood projections for 2050 were analysed to gain insights on what to expect the coming years. Further, potential climate change impacts were assessed, using socio-economic and biophysical impacts as guiding principles.

3.1 Current situation – future projections 2050

Droughts

The rivers of the Meuse basin are typical examples of rain-fed rivers characterized by a highly variable discharge regime with commonly low discharges during summer and autumn, and that is highly sensitive to droughts. Between 2017 and 2020, the Meuse river basin faced several consecutive years of summer drought, as a result of, among others, more severe low-water levels, lower groundwater recharge, increased water demand, increased evapotranspiration and dry soil.

A reduction in low water flows is expected in the future, even with the most optimistic greenhouse gas emission reduction scenarios. A 10% to 40% decrease in low-flow discharges for 2021-2050 and 2071-2100 is expected¹.

Floods

On the contrary, high flows of the river are usually found in winter and spring. Flow variations can lead to floods lasting from a few days to several weeks.

Examined climate scenarios in the AMICE project indicated a 15% to 30% increase in maximum discharges for 2021-2050 and 2071-2100 (considering a 100-year return period). Due to the morphology of the valleys, increases in future floods levels are expected to be much higher in the central part of the Meuse basin compared to the upper and lower parts.

The recent flooding of the Meuse in July 2021 was a good example of an extreme weather event. In that summer, a large low-pressure zone in parts of the Ardennes, the Eiffel and southern Limburg caused more than 150 mm of precipitation in 48 hours and up to 275 mm on the Hautes-Fagnes plateau, which corresponds to a return time of 1,000 years². This extreme precipitation event caused large-scale flooding of rivers and tributaries in Wallonia, North Rhine-Westphalia, Rhineland-Palatinate and in the southern part of the Netherlands. This resulted in many deaths and considerable damage to buildings and infrastructure.

In conclusion, climate change has a strong impact on the hydrological functioning of the Meuse river basin, as well as on human activities dependent on water resources.

¹ http://www.amice-project.eu/docs/pa1_pr104_1378151021_paperAC9_v04.pdf

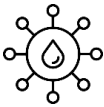
² [http://meuse-maas.be/getattachment/4fd152bd-ac41-4780-ba9c-da3b55e8972d/Report_Mregie_21_1def_en-\(1\).aspx](http://meuse-maas.be/getattachment/4fd152bd-ac41-4780-ba9c-da3b55e8972d/Report_Mregie_21_1def_en-(1).aspx)

3.2 Climate change impacts

Socio-economic impacts



Floods can generate severe physical, social and environmental damages for human health, the environment, cultural heritage and economical activities among the Meuse basin



Water scarcity can lead to potential conflicts related to water sharing (agricultural and industrial withdrawals, navigation) as well as the resource exploitable for drinking water production.



Impacts on surface water quality can compromise the production of drinking water from surface water (particularly in the Flemish and Dutch parts of the Meuse catchment)



Recreational activities can be affected during periods of severe low flows or due to bacteriological pollution

Biophysical impacts



Summer droughts lead to a decrease in the water level in wetland biotopes and can generate profound changes in their abiotic conditions



The increase in water temperature and the phenomenon of eutrophication involving human activities can generate a general deterioration of water quality and lead to a degradation of aquatic environments (development of invasive species, trivialisation of habitats) including possible impacts on fish populations

3.3 Conclusion

Floods and droughts lead us to consider the Meuse River basin as a vulnerable basin in relation to climate change. The basin should face thoughtful management of resources and their uses: drinking water supply, agriculture, environments, industry, etc.

In addition to droughts, flood management is a significant priority. Water retention (during summer), increase of permeability, preservation of the environment and overall attractiveness of the basin is to be promoted.

Downstream to upstream, climate change requires fine and delicate management, and the strengthening of transnational cooperation.

4. Synergies between high-potential measures

This strategic vision is broken down into the 4 strategic axes below representing the themes or the expected grouping of actions. For each axis, example actions from the list of actions are described for illustrative purposes (refer to Section 5).

- ❖ **Strengthen cross-border governance** by improving cooperation between water stakeholders across the basin taking into account the diversity of positions of different organisations, whose interests and ways of conceiving adaptation measures are challenged. One the main lever of action identified by the GRCC think tank to move forward on the cross-border adaptation governance is to work on what brings us together, not what separates us.



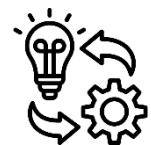
- Actions of this axis include the coordination of a joint action programme at catchment scale regarding adaptation to climate change, the facilitation of cross-border alliances at sub-basin level, the development of financial or regulatory development or the activation of the existing Meuse network.

- ❖ **Improve knowledge and coping capacities** including knowledge development of the impacts of climate change on water resources and economic uses, anticipation of water deficits across the basin and training programmes, but also animation, and facilitation of the emergence of solutions based on field experience.



- Actions include a project of cross-border vulnerability analysis to climate change, a socio-economic analysis of the value of water to have a better overview of the different uses across the Meuse region, water quality modelling through the PEGASE model, or the development of a climate change adaptation strategy at sub-basin level.

- ❖ **Launch pilot operations** along the Meuse River generating multiple co-benefits in the fight against droughts, floods and biodiversity erosion **relying in particular on nature-based solutions** which now appear in the basin as an axis for deployment and cooperation.



- This axis gathers several hydraulic actions and nature-based solutions (e.g. pilot actions related to water saving and water retention, rainwater storage operations, ecosystem restoration, wetland and short rotation plantations). It also includes actions aimed at the development of a more resilient agricultural sector.

- ❖ **To know and make known** to forge a common culture of adaptation between stakeholders, institutions and the general public in order to take action.



- Actions of this axis primarily include awareness-raising actions. Examples are the creation of a rotating exhibition to develop a cross-border adaptation culture or a participative campaign with public-water-land-art initiatives.

5. List of actions

The detailed list of adaptation measures with actions sheet is presented in Appendix 2 (Deliverable 3.3a – separate document). The list is in the form a Microsoft Excel table; an extract from the catalogue is presented below.

No.	Onlinc demonstrator	Strategic axis vision	Project, plan, programme to which the action is potentially linked	Type of action	Sub-type of action	Name of the action	Description	Mentioned by	Other contributors and beneficiaries	Water / biodiversity topic	Flood	Flow	Water t	Water sha	Pollut	Drinking w	Ecos em	Soil	River et	Water leg	MICCA network	
1	TBD	Improve knowledge and coping capacities		Knowledge_and_Behavioral_change	Information_and_skills_raising	Data sharing platform	Creation of a data sharing platform	Région Grand Est		Various topics											Knowledge	
2	Yes	Improve knowledge and coping capacities		Knowledge_and_Behavioral_change	Information_and_skills_raising	Cross-border vulnerability analysis	Analysis of vulnerability to extremes of the territories, economic uses (floods, low water, heat waves), environmental uses (wetlands/grasslands, etc.)	Région Grand Est		Various topics												Knowledge
3	TBD	Improve knowledge and coping capacities				Value of water	Socio-economic analysis of the value of the cubic metre of water on the Meuse catchment and uses among countries (green/blue water, virtual water, etc.)	Région Grand Est		Water withdrawals / Water share												Knowledge
4	TBD	Launch pilot actions		Nature_Based_Solutions	Blue_options	Groundwater recharge	Groundwater recharge operation (picometer equipment and adaptation of the HEBMA project's recharging/ZRDC site)	Région Grand Est	CD 55, Ardennes: Metropolis, Verdun, Neufchâteau													
5	Yes	Launch pilot actions		Nature_Based_Solutions	Green_options	Leakage reduction and infiltration pilots	Water saving/leakage reduction and infiltration operation	Région Grand Est	CD 55, Ardennes: Metropolis, Verdun, Neufchâteau	Drinking water												Governance
6	TBD	Cross-border governance		Economic_and_Finance	Financing_and_incentives_instruments	Financial or regulatory developments	Developments in financial support (evolution of regional schemes/EA, AMI dedicated to water saving?) or regulatory (evolution of drought decrees?)	Région Grand Est		Water withdrawals / Water share												Governance
7	Yes	Launch pilot actions		Nature_Based_Solutions	Green_options	Rivicult agricultural sector	Evolution towards more resilient agricultural sectors. A project of the Union Laitière de la Meuse (cooperative of milk producers) for the sustainable maintenance of livestock and meadows in the Meuse.	Région Grand Est		Freshwater ecosystems												
8	TBD	Launch pilot actions		Nature_Based_Solutions	Green_options	Silviculture evolution	Silviculture evolution: Development of irregular forest, forced migration of forest species (work of the Ardennes Nature Park and the PNIR des Forêts)	PNR Ardennes/ PNIR		Freshwater ecosystems												
9	TBD	Launch pilot actions		Physical_Land_Technological	Grey_options	Multi-use structures	Optimization of existing structures - creation of new multi-use structures (work with EDF on the Ardennes project in conjunction with the Choze power station)			Low-flows												
10	TBD	Improve knowledge and coping capacities		Physical_Land_Technological	Technological_options	Update Pegase	Update of the Meuse District Pegase model Database	IMC	AERM, AEAP, SPV, YMM, Luxembourg (AGE), MUNLV, RV/S	Various topics												
11	Yes	Improve knowledge and coping capacities		Physical_Land_Technological	Technological_options	Simulation of scenarios	Simulation of envisaged measures impacting quality	Liège Université	TBD- Any partner envisaging action	Various topics												
12	TBD	Improve knowledge and coping capacities		Physical_Land_Technological	Technological_options	Custom developments Pegase	Custom Developments to Pegase	Pegase-Aquapole-Ullique	TBD													
10	Yes	Improve knowledge and coping capacities		Knowledge_and_Behavioral_change	Capacity_building_empowering_and_lifecycle_practices	Joint training schemes	Joint training schemes : modelling tools for water resource management	Academic partners	Pegase - ADP - Ullique/TBD	Various topics												
14	Yes	Cross-border governance	FENICE project proposal (Interreg A-EMR call post-flooding in process of evaluation)	Governance_and_institutional_networks	Coordination_cooperation_and_networks	Cross-border alliances	Facilitating cross-border river basin alliances in the Three-Countries Park (on sub-basin level) Meuse tributaries from BE, DE, NL), may include water and climate ambassadors team	Euregio Meuse-Rhine (EMR)	Three-Countries Park (3LP) partners and local communities and land owners	Floods												
15	TBD	Launch pilot actions	FENICE project proposal (see above)	Nature_Based_Solutions	Blue_options	Small source ecosystem restoration	Small source area ecosystem restoration in the Euregio Meuse-Rhine (on sub-basin level) Meuse tributaries from BE, DE, NL)	Nature & landscape organizations	Euregio Meuse-Rhine, 3LP partners, local communities and land owners	Freshwater ecosystems												
16	TBD	Launch pilot actions	3LP Forum on climate resilient landscape (2021) follow-up	Nature_Based_Solutions	Green_options	Klimagrün	Klimagrün - 1) rainwater retention systems and contour strip farming reinstated; for landscape wise water retention, biodiversity and sustainable biomass management in the Three-Countries Park/EMR	LEADER local actions groups, Farmers	Euregio Meuse-Rhine, 3LP partners, local communities and land owners	Landscape legacy and cultural values												
17	TBD	Launch pilot actions	EMR project (2014) and HYPOWAVE project (2018) follow-up	Nature_Based_Solutions	Green_options	Wetland and short rotation plantations	Contrived wetlands and short rotation plantations for combined water retention, wastewater treatment of effluent polishing and sustainable biomass management in the Three-Countries Park/EMR	LEADER local actions groups, Farmers	Euregio Meuse-Rhine, 3LP partners, local communities and land owners	Aquatic pollution												
18	TBD	Launch pilot actions	Blue-green Star project proposal (LIFE, rejected)	Nature_Based_Solutions	Green_options	Blue-green Star	Blue-green Star - Enhancing water & regulation ecosystem services and connectivity through cross-border green infrastructure along 3 star-shaped corridors in the EMR	Euregio-Meuse Rhine and 3LP	water, nature and landscape organizations and other stakeholder	Landscape legacy and												

ACTION SHEET	
Name of the action	Enlarging the Meuse water storage capacity for the drinking water provision in Limburg: a feasibility study and a hydrological survey
Project owner(s)	Province of Limburg (tentative)
Location of the measure	Along the Meuse, Between Beegden and Horn, The Netherlands
Description of the project (max 250 words)	WML provides the people in the Province of (Dutch) Limburg with fresh drinking water. The Meuse is an important water source for WML (25%). During long dry spells / low flows it often occurs that WML can not abstract water from the Meuse, due to high pollution rates. Climate change results into more frequent and longer periods of no abstraction. To overcome this obstacle, WML makes use of a water basin where water can be stored for a couple of weeks. However, in the past 5 years we have observed that the storage capacity may not always be sufficient. Therefore another basin is needed, with a storage capacity of at least 6 million m3. The basin can be dug (cost neutral!) by extractors that sell the resources (sand, gravel). But before the basin can be dug, first a feasibility study needs to be done. Thereafter a thorough hydrological study needs to be carried out.
Goal targeted, expected change	Main goal: enlarging the water storage capacity for the drinking water company, in order to overcome long dry spells when the Meuse water is polluted and intake of water from the river is not possible. Second goal: the construction of an extra water basin has a positive effect on the ground water table; this diminishes the drought impact.
Resources used	The digging of the basin can be done by contractors who can sell the resources (sand and gravel) for the building industry. At neutral costs! But we first need to do a feasibility study and hydrological research
Main measures executed	This action concerns the preparation work for the digging a large water reservoir along the Meuse river to create extra water storage capacity
Timeline (duration, schedule)	Phase 1: feasibility study, stakeholder involvement; Phase 2: hydrological research and design
Public and target territory	This action is targeting the public water supply, but is also beneficial to nature development and to farmers as it reduces the drought impact in the vicinity of the basin.
Results (quantitative) expected	1) Outcome of the feasibility study; 2) Stakeholder involvement; 3) Outcome of the hydrological research; 4) Political goodwill to start the execution of the project.
Indicators of success	The concept of cost-neutral excavation by contractors for public goals (in this case the drinking water supply) has already proven itself in the 'Common Meuse'. The concept of a water buffer is also known and well functioning, except that we need a larger volume of stored water as climate has changed and dry spells occur more often and for longer duration
Link with EU and national legislation	not applicable for the feasibility study, stakeholder involvement and hydrological study?
Estimated cost	75.000 Euro (25.000 for the feasibility study and 50.000 for the hydrological research)
Potential co-funders	?
Estimating the probability of the action being carried out	80%

Appendix 1

Table 1: List of interviews conducted to build the catalogue of adaptation actions.

Name	Organization	
Bas de Boer	Water board Aa en Maas	The Netherlands
Noud Kuijpers	Programmabureau Maasregio	The Netherlands
Anja Bruell	Euregio Meuse-Rhine	Transnational
Edward van Keer	Departement Mobiliteit & Openbare Werken	Belgium
Bert Hidding	Rijkswaterstaat	The Netherlands
David Kroekenstoel	Rijkswaterstaat	The Netherlands
Mirjam van Roode	Waterleiding Maatschappij Limburg	The Netherlands
Christof Homann	Wasserverband Eifel-Rur	Germany
Lionel Gresse	Région Grand Est	France
Jean-Noël Pansera	International Meuse Commission	Transnational
Pol Magermans	University of Liege	Belgium
François Paulus	Service Public Wallonie	Belgium
Marina Pitrel	Agence de l'eau Rhin Meuse	France
Iris Adriaansen	Water board Brabantse Delta	The Netherlands
Lucie Ambroise	EPAMA	France
Florian Vannienwehhove	EPAMA	France