Mosan Initiative for Climate Change Action
phase1

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

Interim report

Mission 1 – GAINING SUPPORT: creating a relevant and action-oriented stakeholder group

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Summary

This report summarizes the work performed to support EPAMA into developing the Mosan Initiative for Climate Change Action (MICCA), focusing on “mission 1” which is an inventory of stakeholders acting on “water & climate change” issues in the Meuse international river basin.

The report starts with setting the boundaries of the work, defining the perimeter of the Meuse international river basin, setting time boundaries and exploring the main topics under the “water & climate change” title (Chapter 2). The methodology used on mission 1 is briefly presented, the main support documents being detailed in annex or separate files (Chapter 3). We also list the main strategies, master plans, program of measures and studies relevant to the topic “water & climate change” on the Meuse catchment: this list will be further explored and expanded under “mission 3” (Chapter 4).

The stakeholders involved, directly or indirectly, on “water & climate change” issues and potentially relevant for the development of MICCA have been listed in a database. The balance between the countries, the roles and the fields of expertise is analyzed in order to identify gaps and missing actors. The professional networks already active and covering (part of) the Meuse catchment are also described (Chapter 5). A critical analysis is performed to highlight strategic stakeholders for the Mosan network and a strategy to mobilize them is finally proposed (Chapter 6).

Glossary

ARNE	*Agriculture, ressources naturelles et environnement* (Directorate for agriculture, natural resources and environment in the Public Service of Wallonia)
BAMEO	*Barrages de l'Aisne et de la Meuse* (company for the modernisation of the dams of the Aisne and Meuse rivers)
DREAL	*Direction régionale de l'environnement, de l'alimentation et du logement* (Regional State representative for environment, food and housing in France)
EC	European Commission
EDF	*Electricité de France* (French electricity provider)
EPAMA	*Etablissement Public d'Aménagement de la Meuse et ses Affluents* (French river basin management authority on the Meuse catchment)
EPTB	*Etablissement Public Territorial de Bassin* (river basin management authority)
EU	European Union
GEMAPI	*Gestion de l'eau, des milieux aquatiques et prévention des inondations* (water management, aquatic habitats and floods prevention)
GRCC	*Groupe de Réflexion Changement Climatique* (climate change think tank)
GTHi	*Groupe de Travail Hydrology inondation* (workgroup hydrology and floods)
IMC	International Meuse Commission
INRAE	*Institut national de recherche pour l'agriculture, l'alimentation et l'environnement* (National Research Institute for Agriculture, Food and Environment)
IPCC	Intergovernmental Panel on Climate Change
MICCA	Mosan Initiative for Climate Change Action
NABU	*Naturschutzbund Deutschland* (nature conservation NGO in Germany)
NGO	Non-Governmental Organization
NRW	North-Rhine-Westphalia
PG	Project group
SAGE	*Schéma d'Aménagement et de Gestion des Eaux* (water management plan)
VNF	*Voies Navigables de France* (French organization for navigable waterways)
WFD	Water Framework Directive
WG	Workgroup
WML	*Waterleiding Maatschappij Limburg* (drinking water supplier in Limburg)
WVER	*Wasserverband Eifel-Rur* (river basin management authority on German tributaries)

1. Introduction

Climate change is one of this century's top challenges. It is set to impact freshwater resources, water ecosystems and the associated biodiversity. The capacity of the regions concerned to develop solidarity and to set up mitigation and adaptation measures with a view to limiting the negative impacts of climate change on river uses and freshwater ecosystems will be vital in this context.

Water has always played a key role in territorial development. The **Mosan Initiative for Climate Change Action (MICCA)** seeks to contribute to the reflection on whether the water uses of the Meuse and its tributaries will need to be adapted to these transformations and, if yes, how.

From 2009 to 2013, the Interreg project *Adaptation of the Meuse to the Impacts of Climate Evolutions* (AMICE) started to work on an international response to the expected impacts of climate change. As a continuation of this project, EPAMA-EPTB Meuse has led a Meuse discussion group on climate change (called "Groupe de Réflexion Changement Climatique" or GRCC). This discussion group or *think tank* has identified **three phases** to work on:

1) *Gaining support and structuring: defining and creating an international cooperation "space" (first called "Mosan observatory" and now "Mosan Network" for climate change action) to support the introduction of measures aimed at adapting to climate change in the international Meuse basin and at promoting the discussion and dissemination of knowledge*
2) *Updating knowledge of the impacts to be expected: developing an overall assessment of the impacts of climate change on water uses and freshwater ecosystems (thereby including environmental needs)*
3) *Supporting the introduction and implementation of public and European policies: helping develop the political support and the transfer of climate change adaptation policies to the international Meuse basin.*

The objective of the first phase is to develop the framework and design the future partnership with a view to **moving on to the implementation phase of adaptation and mitigation measures,** in anticipation of the impact of climate change on ecosystems and the population living in the region of the international Meuse basin.

This first phase "gaining support and structuring" should therefore set the framework and build the path towards a broader **climate change action plan** in the future.

A consortium of consultants was hired in order to provide technical assistance to MICCA for phase one.

2. Framework of MICCA - Phase 01

2.1. Missions of the consultant-consortium

Promoted by EPAMA since the end of 2019, the goal of the Mosan Initiative for Climate Change Action (MICCA) is to identify and foster the implementation of measures for adapting to and mitigating climate change throughout the international watershed during the next programming period for European calls for projects (2021-2027).

The first phase of MICCA "Gaining support and structuring" is about specifying the possible form of the Mosan cooperation space called "Mosan Network" (FR: “réseau Mosan") and developing the first project that will be carried by this network under Life or INTERREG funding programs.

The consultant-consortium will help with:

- gaining the support of various stakeholders for the cooperation platform (“espace de coopération”),
- providing advice and expertise for transitioning to the operational level,
- identifying potential actions for the future project(s) on the topic of “water & climate change” in the watershed,
- ensuring throughout the study that the results of the missions are oriented towards the development and writing of a European project proposal.

The consultants’ work is organized in 5 missions that span over 12 months:

1. gaining support – creating a stakeholder's group
2. structuring - missions, objectives, functioning of the "Mosan network”
3. moving on to action at the European level
4. developing and submitting a first project in the framework of an EU call for proposals
5. building a first bibliography

The present interim report describes work carried under mission 1 “Gaining support”.

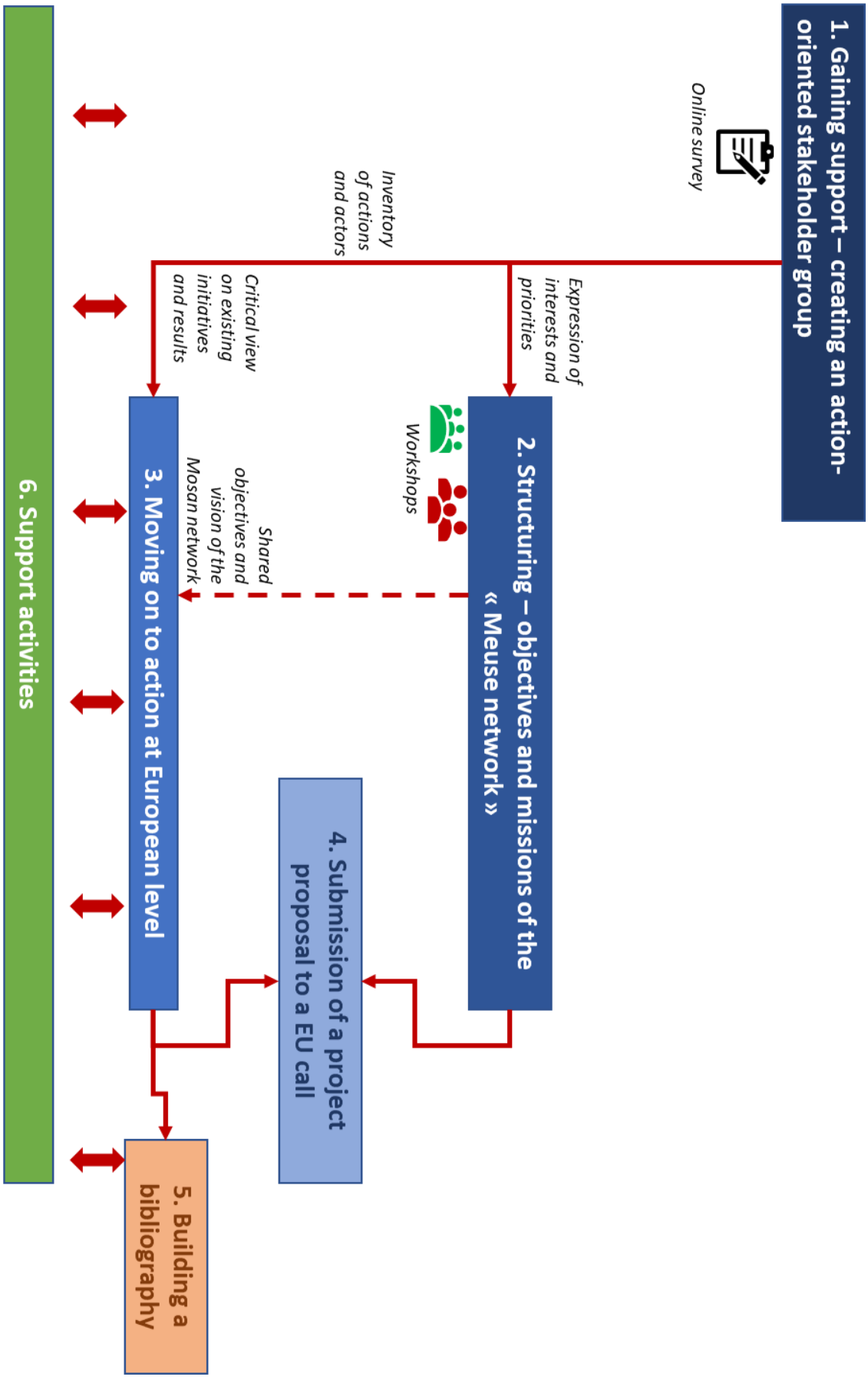


Figure 1. Organization of the consultants' missions to support the development of MICCA phase 1

2.2. History: A Meuse network for 'getting things done'

The starting point was the observation, by the water practitioners, that the international Meuse river basin lacked an informal arena where science, policymakers and NGOs can meet and share ideas. The International Meuse Commission (IMC) is the place for discussions and coordination among State representatives but the link between the political and the operational level lacked strength.

Exchanges within the GRCC think tank started at the end of 2019 with the organization of 2 workshops on climate change adaptation plans in the different countries of the Meuse river basin, and on available knowledge in the international catchment. In 2020, there were 6 meetings in an online format to present and discover similar initiatives and elaborate milestones to be followed for the Meuse. The group coordinated by EPAMA came to the conclusion that the first lever for joint action was to arrive at a mutual understanding of the problems encountered by each of the stakeholders. To achieve this, **knowledge has to be shared, discussed, understood and accepted by all stakeholders**. This data should help in providing Meuse stakeholders with information on the areas up- and downstream of their stretch of the river and thus to support the implementation of appropriate measures.

Following this line of thought, the group had first discussed the development of a **"Mosan observatory" for climate change**. This would allow data to be collected, shared, and would serve as a discussion forum between scientists and decision-makers, ultimately allowing measures for adapting to climate change to be taken. It would be a "collaboration space" granting the stakeholders, including water management bodies, scientists, policymakers and citizen initiatives, to discuss topics on the basis of shared knowledge and in complete transparency, but also to jointly find solutions for adapting to climate change suitable to each stakeholder.

However, it quickly became apparent that an observatory would require considerable long-term financial resources to be able to perform its work over time. Second, it referred to a structure for collecting, analyzing and processing data, whereas MICCA's intention is to set up a network leading to action. The idea of **creating a "collaborative space" or a "Mosan network"** has therefore gained ground. This "Meuse network for climate change" would help structure and implement actions within the framework of European projects. It would be **an interface between researchers, policymakers, citizens and water stakeholders for implementing measures aimed at adapting to and mitigating climate change.**

The possibility to subsequently set up **a scientific committee** to ensure the scientific consistency of the projects was also discussed.

The discussions that led to the MICCA initiative and the hiring of a consultant to support its first stage are summarized in Annex 1 – History of discussions among the Meuse stakeholders leading to MICCA.

2.3. Scope & boundaries

2.3.1. Spatial scale

The Meuse river has a length of almost 950 km from its source in France, a little north from Dijon, to the Hollands Diep in the Netherlands. The Meuse basin covers an area of about 36,000 km^2 and includes parts of five countries: France, Luxembourg, Belgium, Germany, and the Netherlands. The main tributaries include the Chiers, the Viroin, the Semois, the Lesse, the Sambre, the Ourthe, the Rur, the Niers and the Dieze. The study will cover the catchment of the Meuse river and its tributaries. All the artificial water bodies linked to the Meuse river - including the Albertkanaal (16-22 m^3/s), the Zuid-Willemsvaart (~16 m^3/s), and the Julianakanaal (~16 m^3/s) - are also part of the investigations.

Groundwater will not be a primary focus, except if connected to the surface waters. The coastline, the transition waters and the marine waters are excluded from the scope of the study.

All 5 countries of the Meuse basin are considered: France, Luxembourg, Belgium (both Wallonia and Flanders), Germany and the Netherlands.

Missions 1 and 2 will be carried out at a rather broad scale, taking into account the sub-basins plans and programs, accounting for the projects and initiatives that cover territories larger than the municipal level. Under mission 3, the focus will be narrowed down, and individual measures will be listed (some measures being very local such as ponds, river obstacles, hedges, etc.).

The project faces the challenge to combine operational measures (action is demanded in the tender of the MICCA phase 1 project and investments are being funded by the European funds), while offering a vision at the international level, based on solidarity and cooperation values.

2.3.2. Time scale

The investigations will take into account all studies, projects and initiatives as far back as 2008. Earlier references are not considered relevant for our mission, because the knowledge has significantly improved since.
Projections in the future as far as 2100 are considered, but not later than the XXI° century as the uncertainties would be too great.

2.3.3. Topics

The scope of the project is labelled “water & climate change”.
The list of topics below is a synthesis of the most recent subjects discussed within the Meuse Symposium, the IMC, the Transf’eau workshops or the GRCC. The aim of this list is to narrow down the scope of investigations to be carried out in Mission 1. It is in no way the result of a collective and negotiated work (which will be carried out in Mission 2) and is not prioritized.

Floods

Flood is a major hazard on the Meuse catchment and protection or prevention measures have been implemented for decades. The recent extreme rainfall events and damaging floods of July 2021 have been a reminder of how vulnerable this territory is. Data collected during the extreme flood will be studied during the coming months by local researchers and water managers, to improve knowledge overall, in particular hydrological models or economic analyses. Funds have also been made available to rebuild the damaged assets (for example in the Netherlands, a budget of 1.2 billion euros has been voted for the reconstruction in the Province of Limburg[1] and the waterboard has already started implementing actions including nature-based solutions[2]).

In parallel to the prevention and protection measures, exercises on flood crisis management are regularly held to prepare the emergency services, local authorities and inhabitants to a flood event.

[1] https://www.binnenlandsbestuur.nl/ruimte-en-milieu/nieuws/limburg-wil-1-2-miljard-euro-tegen-wateroverlast.18808739.lynkx
[2] https://www.waterschaplimburg.nl/actueel/nieuws/@6942/leerevaluatie-waterschap-limburg/
https://www.waterschaplimburg.nl/actueel/nieuws/@6517/gesprekken-tweede/
https://www.waterschaplimburg.nl/actueel/nieuws/@6498/limburg-1-2-miljard/

Though most exercises are carried out at the local level by the emergency services, some are also carried out in coordination with the neighboring country.

Low-flows

Low-flow is a rather new concern compared to floods in the area though it poses a threat to ecosystems and water uses for anthropic activities. Low-flows are expected to worsen as a result of climate change and modification of the rainfall patterns. Changes in the land-use (destruction of wetlands, reduction of permeability of soils, etc…) also contributes to a modification of the hydrology and lower water levels. The drivers of low-flows have been summarized by Deltares in the following graph.

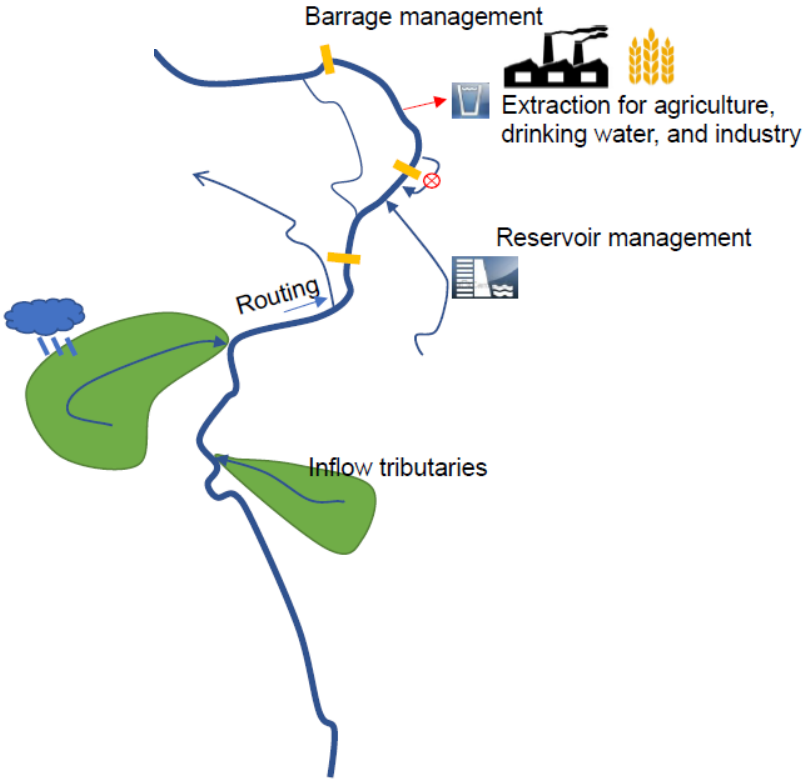


Figure 2. Factors that have an impact on low river discharges on the Meuse (source: Deltares)

During low-flows, the relative contribution of the Belgium and German tributaries increases. Reservoirs are found in the upper branches of the Rur, the Viroin, the Semois, the Sambre, the Ambleve, the Ourthe, and the Vesdre. These reservoirs are mainly used for electricity production, drinking water supply, leisure and flow regulation.

The IMC has just published its "Plan for managing exceptional low-flow conditions in the Meuse Basin"[3]. It lists the available knowledge on extreme low-water situations in the Meuse basin, as well as their concrete consequences on river uses or on the ecological status of the watercourse. The

[3] http://www.meuse-maas.be/CIM/media/Etiages-exc/Plan%20d'approche%20dec%202020/Plan_approche_Mregie_19_21def_f.pdf
http://www.meuse-maas.be/CIM/media/Etiages-exc/Plan%20d'approche%20dec%202020/Plan_approche_Mregie_19_21def_n.pdf
http://www.meuse-maas.be/CIM/media/Etiages-exc/Plan%20d'approche%20dec%202020/Plan_approche_Mregie_19_21def_d.pdf

publication also puts forward a number of recommendations. In this report, the experts belonging to the Working Group Flood and Hydrology of the IMC performed a “naturalization of flows” exercise, providing information on the water flows that would be "naturally" available in the Meuse and highlighting the impact of human activities.

Water temperature

The combination of increasing air temperatures and lowest flows will lead to increased water temperatures as well as lowest oxygen concentration. The combination of both is a source of eutrophication problems.
High water temperature is also jeopardizing the functioning of the nuclear power plant (one site in Chooz, France and one site in Tihange, Belgium). To protect the ecological functioning of the Meuse river, the power plant has to respect water temperature thresholds (some fishes are sensitive to high water temperatures). If the cooling water cannot be discharged back to the river, the plant has to stop. In 2021, the power production at Chooz had to stop for one month – with severe economic consequences for EDF, the French national energy operator. The sustainability of electricity production on the site is questioned.

Water withdrawals / Water share

One of the main recent questions that sparked the discussions in the GRCC, the IMC or the Meuse Symposium deals with the sustainability of water uses and the long-term balance with water resources quantities. This North-West European territory is not used to dealing with water scarcity (in comparison to the Mediterranean basins), but the increase in water demand combined with the effects of climate change on the rain pattern poses a threat for water availability in the near future. Some uses might be prioritized over others and a north-south solidarity is considered. One significant point is that a share of the Meuse water is abstracted and used outside of the river basin. It implies that the managers and beneficiaries of the canals shall be included in the Meuse stakeholders.

By the time the water from the Meuse flows into the North Sea, it will have been of service to many users; from shipping, industry, and energy provision to nature, agriculture, drinking water and recreation. Some users discharge the water back to the river (treated wastewater, cooling water) allowing it to be reused for other purposes downstream.

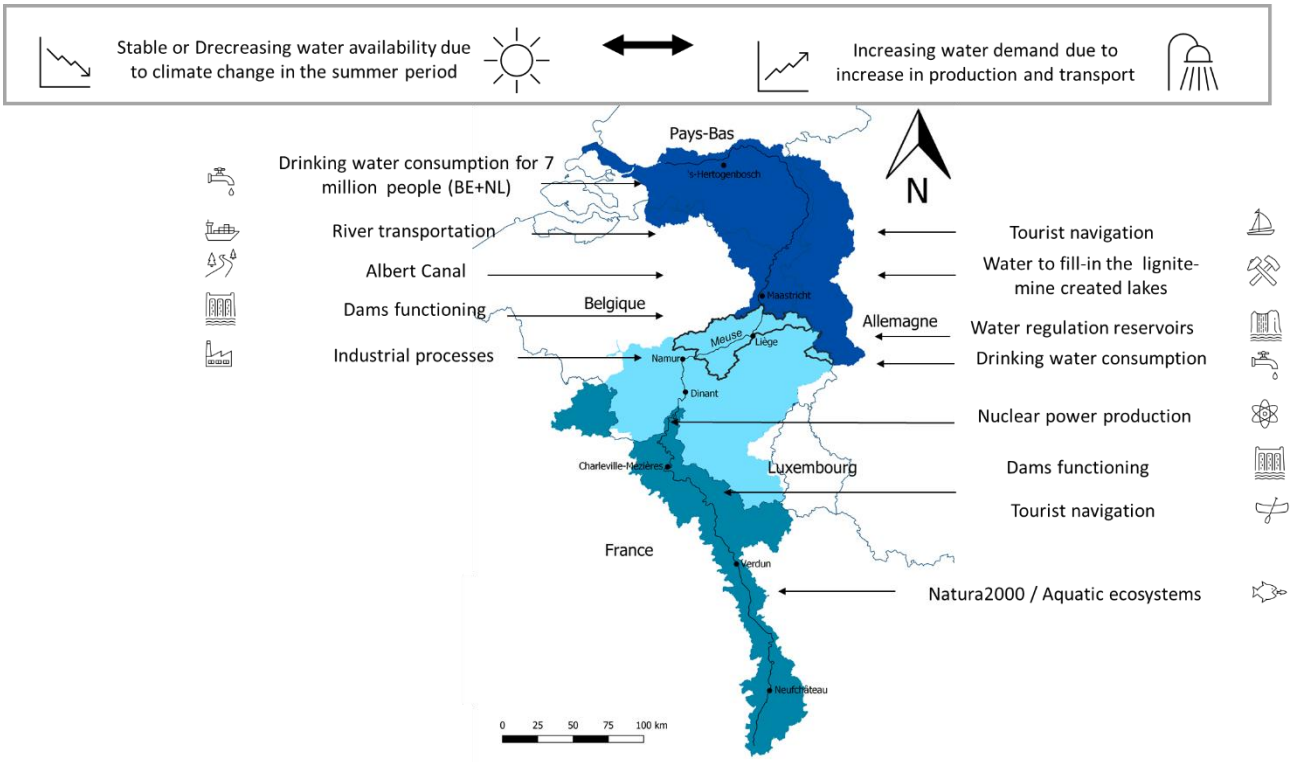


Figure 3. Summary of the water uses along the river

Aquatic pollutions

During high-flows, the river carries macro-pollutants such as plastics and sediments (potentially contaminated with micro-pollutants) while during low-flows, human activities are responsible for the warming of the river, which lead to unhealthy conditions (cyanobacteria and pathogens, increase of the micro-pollutants concentration, decrease of oxygen supply, etc.).

Accidental pollutions still occur on the Meuse or its tributaries. For example, on the Chiers in august 2019, a pollution occurred as a result of a strong fire. The waters used to extinguish the flames spilled out of the wastewater dam and polluted the river with ammonium and dramatically reduced the oxygen concentration. Authorities in France and Belgium were warned.

Macro-plastics are monitored both as part of the quality check of the Meuse river and the quantification of plastic load to the North Sea. Inventories[4] have been conducted on the river banks and an Interreg project is under way for the reduction of plastic litter in the catchment (LIVES – Litter free Rivers and Streams)[5].

Micropollutants and endocrine disruptors are on the top list of the IMC[6]. Emerging pollutants are a concern because of the extra treatment costs to produce drinking water as well as consequences for the ecosystems.

[4] https://iopscience.iop.org/article/10.1088/1748-9326/abb2c6/pdf
[5] LIVES – Litter free Rivers and Streams
[6] Source: workshop held for the celebration of the Meuse agreements' 20th anniversary

Figure 4. The "plastic whale" created by STUDIOKCA out of 5 tons of plastic collected in the Pacific Ocean, has been exposed in Brugges and Utrecht to raise awareness on macro-plastic pollution.

Drinking water

In the Meuse basin, water abstraction in the main course of the river provides about 500 million m³ of drinking water yearly to seven million people, mainly in Flanders and the Netherlands, even outside the Meuse catchment[7]. A recent study[8], focused on the adaptation of reservoir operation rules in the Vesdre sub-basin, revealed that the present lack of knowledge on the evolution of water demand is among the highest sources of uncertainty on the future performance of large reservoirs in the Meuse basin.

Domestic use is by far the largest part of all produced drinking water. Due to the decrease in specific consumption (by up to 2 % per year), the total volumes of water sold have been decreasing for over 15-20 years, despite a generally increasing population, which partly compensates the reduction in specific consumption. These conclusions[9] are relatively uniform at a macro-scale across the considered French, Belgian, German and Dutch areas.

Freshwater ecosystems

The international Meuse commission coordinates the master plan on migratory fishes. It covers issues such as ecological continuity, conservation of habitats for the reproduction and growth of fish

[7] RIWA Maas annual report, 2019

[8] Bruwier, M., Erpicum, S., Pirotton, M., Archambeau, P., and Dewals, B. J.: Assessing the operation rules of a reservoir system based on a detailed modelling chain, Nat. Hazards Earth Syst. Sci., 15, 365-379, doi:10.5194/nhess-15-365-2015, 2015

[9] Westhoff, M., Dewals, D., Towards enhanced estimates of future drinking water demand in the Meuse basin, June 2015

populations, migratory fishes' repopulation, fishing regulations. The report on the implementation of the plan on the 2011-2020 period has just been published[10].

Transf'eau was an 18 months Interreg project led by EPAMA (2017-2019) and Contrat de rivière Semois-Chiers to improve the coherence of restoration measures on rivers between France and Wallonia, through transboundary workshops and a shared database of contacts. There was a diverse range of topics, from the maintenance of river banks, fight against invasive species, mitigation of pollutions from diverse sources, and ecological continuity.

The Houille river is candidate for the French label "Site Rivière Sauvage" (wild river site) which awards ambitious conservation efforts on pristine rivers. It would be the first transboundary river (France and Belgium) to be awarded the label.

Sediments management

The Meuse is a dynamic river. These dynamics are influenced by human settlements as well as climate change (see the consequences of the recent extreme floods). Understanding erosion and sedimentation processes is therefore relevant to improve the overall basin management.
Sedimentation is a hazard for navigation (shallow river beds) and increases flood risks. It reduces the storage capacity of reservoirs. If deposits are of bad quality, it can be harmful to the health of humans and other living species. It also leads to loss of land and potential damage to infrastructures.
EPAMA is driving a study on the topic of sediment transport and hydro-morphological behavior of the French part of the Meuse.
A project idea called the "Joint Sediment Initiative – Meuse" has emerged[11] during the summer 2021 for a cross-boundary sediment study in the Meuse Basin. It could lead to a transboundary sediment management plan (examples exist for the Danube and the Elbe).

By now, it is unknown how climate change will affect the sediment supply to the Meuse, or how climate change will influence the sediment-transport capacity of the river. Will erosion and sedimentation worsen? And what will be the effect on biodiversity, flood safety and the human use of the river? Sediment experts from different countries in the Meuse Basin would like these topics to be addressed internationally.

Rainwater management

Rainwater management has been occasionally mentioned but there is no initiative yet (either under the scope of the IMC or the GRCC) that deals with this topic. It is often a side topic to the flood management plans though rainwater management can be used to improve the supply of underground water resources.

Landscape legacy and cultural values

The international Meuse catchment does not yet have a strong territorial identity, in contrast to other territories such as mountainous areas (the Vosges, the Alps, …) or large urban areas, though a Mosan art exists in architecture[12].

[10] http://meuse-maas.be/CIM/media/RAPPORT-GRAND-PUBLIC-POISSONS/Rapport%20grand%20public/Rapport-grand-public_Mecol_21_12def_f.pdf
[11] Joint proposition by Wageningen University, Rijkswaterstaat and Université de Liège
[12] https://en.wikipedia.org/wiki/Mosan_art

3. Methodology to collect information

3.1. Data provided by EPAMA

EPAMA has provided several documents gathering information about the Meuse basin governance, stakeholders, research, projects, activities and initiatives. This background information has been used to frame our work (see following chapters) and to build upon.

The lists of references are available in Annex 2 – References provided by EPAMA:

- Table of documents
- Table of initiatives
- Table of studies

3.2. Online survey

In order to complete the mapping of relevant actors and initiatives for a Mosan network, an online survey was carried out. The objective of the survey was to identify stakeholders involved in water management, aquatic biodiversity protection, and/or climate change policies and strategies, as well as interests and ways to collaborate on the topic of "water & climate change" in the international Meuse watershed.

The survey was divided in 6 parts:

1. A description of the respondent's profile and his/her contact details
2. Issues experienced by the respondent, related to the topic "water & climate change"
3. Known (and/or observed) initiatives related to the topic "water & climate change", with the possibility to be recontacted for a targeted phone interview to discuss such initiatives
4. Relevant stakeholders involved on the topic and their roles, as identified by the respondent
5. Actions that should be taken on the topic (ideally), according to the respondent
6. The respondent's interest in the Mosan Initiative on Climate Change action, and its conditions for success

It was disseminated between 26 October and 15 November 2021, in four different languages (FR, EN, DE, NL), through a professional online survey software (SPHINX[13]). The link to the questionnaire was shared on social media (consortium's networks) and by an email sent by EPAMA to its networks. A reminder was sent after two weeks.
65 respondents have replied, their country of work is indicated by the graph opposite.

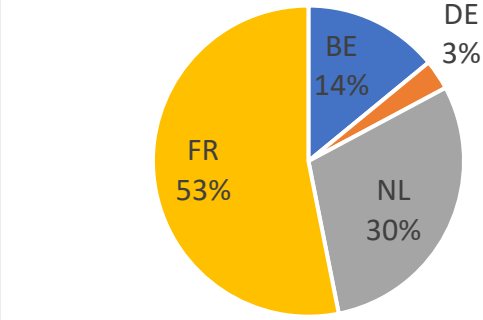


Figure 5. Country of origin of the respondents to the online survey

All the information collected has been integrated into a database to feed the analysis and visualization tools to produce a summary of the dynamics of actors and a mobilization strategy.

The list of questions as well as the survey analysis are available in Annex 3 – Online survey questionnaire and Annex 4 – Online survey results.

[13] https://www.lesphinx-developpement.fr/logiciels/sondage-en-ligne-sphinx-declic/

3.3. Online research and consultants' references

Information was also collected online via the websites of EPAMA's partners and their projects webpages. The list of consulted websites is provided in footnotes throughout the report.

4. Water and climate change – Plans and programs

In this chapter are listed and summarized the ongoing master plans and programs on water & climate change (climate adaptation and mitigation plans, river basin management plans, flood prevention programs, etc.). The goal is to get the bigger picture of the countries or regions' ambitions and priorities regarding water & climate change issues. The supporting studies and research projects (current research on climate change and its impacts) that provide results for the Meuse or its sub-catchments are also added.
MICCA will stem from these plans and programs, providing an operational response (see Mission 3 report). The operational actions and measures will be detailed in Mission 3.

Below for each country are detailed the:


Master plans and programs


Research initiatives


Large operational programs

4.1. In the Netherlands

Delta Program


The Delta Program[14] is a national program with a focus on water safety, freshwater availability and climate adaptation. The national program is subdivided into regional approaches, including the Delta Program Meuse. As part of it , the committee has drafted documents detailing future challenges and potential measures in the basin. In 2016, proposals were made for urgent measures, of which some are currently being studied and implemented. It is noted that other subprograms are part of the program. While some will be noted here (refer to next section), other relevant programs will be elaborated upon in phase 3.

Hoogwaterbeschermingsprogramma


The Hoogwaterbeschermingsprogramma[15] (English: Flood Protection Program) is a program aimed at strengthening and improving dikes, locks and pumping stations, with the goal of having them all in accordance with the applicable norms by 2050. It is a collaboration of 21 water boards and Rijkswaterstaat and is part of the overarching Delta Program (refer to previous section). One of the program's bigger projects is the Meanderende Maas project[16] (English: Meandering Meuse). Focused on a specific section of the Meuse, it aims to strengthen dikes, increase capacity of the river and make the area more environmentally and economically attractive.

[14] Deltaprogramma. (2021). Rivier Maas. https://www.deltaprogramma.nl/gebieden/rivieren/maas
[15] Hoogwaterbeschermingsprogramma. (2021). Wie we zijn en wat we doen. Hoogwaterbeschermingsprogramma: https://www.hwbp.nl/over-hwbp/wie-we-zijn-en-wat-we-doen
[16] Projectteam Meanderende Maas. (2021). Meanderende Maas: Veilig, Mooi en Economisch Sterker. https://www.meanderendemaas.nl/over-het-project/

Programmatische Aanpak Grote Wateren

The Programmatische Aanpak Grote Wateren (English: Programmatic Approach to Large Waters) aims to make the large waters in the Netherlands robust and ecologically healthy. In 2017, a study was performed by Rijkswaterstaat to determine the requirements for achieving this goal by 2050. The result is an inventory of measures for various categories of water systems, including the large rivers. The program is a collaboration between different layers of government, with coordination being done on a national level and execution of the projects on a regional level (Informatiepunt Leefomgeving[17] and Rijksoverheid[18]).

Vlaams Nederlandse Bilaterale Maascommissie

The Vlaams Nederlandse Bilaterale Maascommissie[19] (English: Flemish Dutch bilateral Meuse commission) is a consultation forum for the improvement of Flemish and Dutch collaboration related to the Meuse. It aims to implement part of the Meuse discharge agreement between the Netherlands and the Flemish district (effective since July 1996). Tasks include aspects related to policy and management (e.g., planning, discharge management, water quality management, nature protection and development, monitoring and research, shipping, and legal aspects). The commission consists of Belgian and Dutch civil servants.

Beleidstafel Wateroverlast en Hoogwater

The Beleidstafel Wateroverlast en Hoogwater (English: Policy-table Flooding) was initiated by the Dutch minister after the Meuse-flooding in July 2021 and aims to learn from the crisis and develop policy advice for the Meuse and its tributaries and in general for the entire country.

Meuse hydrological modeling

RIWA Meuse and the Deltares research institute are currently conducting a study modelling the flows of the Meuse. Working with the RIver BAsin SImulation Model (RIBASIM), this study involves two phases: the modelling of the water balances and an analysis of the contribution of the river's tributaries. The RIBASIM modelling study has been developed by Rijkswaterstaat, Dunea – Duin & Water, WML – Limburgs drinkwater, Evides – waterbedrijft, Deltares and RIWA. Its objective is to assess the current and future water availability on the Meuse to produce drinking water, taking into account the needs of the other economic sectors. The model is a combination of rainfall-runoff modules (catchment scale) and water abstraction modules (drinking water network scale).

Though an initiative from Dutch water authorities, the study targets the whole Meuse catchment.

[17] 2021, https://iplo.nl/thema/water/oppervlaktewater/ecologie-maatregelen-effecten/programmatische-aanpak-grote-wateren/doel-pagw/
[18] 2021, https://www.helpdeskwater.nl/onderwerpen/water-ruimte/ecologie/programmatische-aanpak-grote-wateren-pagw/doet/
[19] VNBM. (2021). http://www.vnbm.eu/index.php

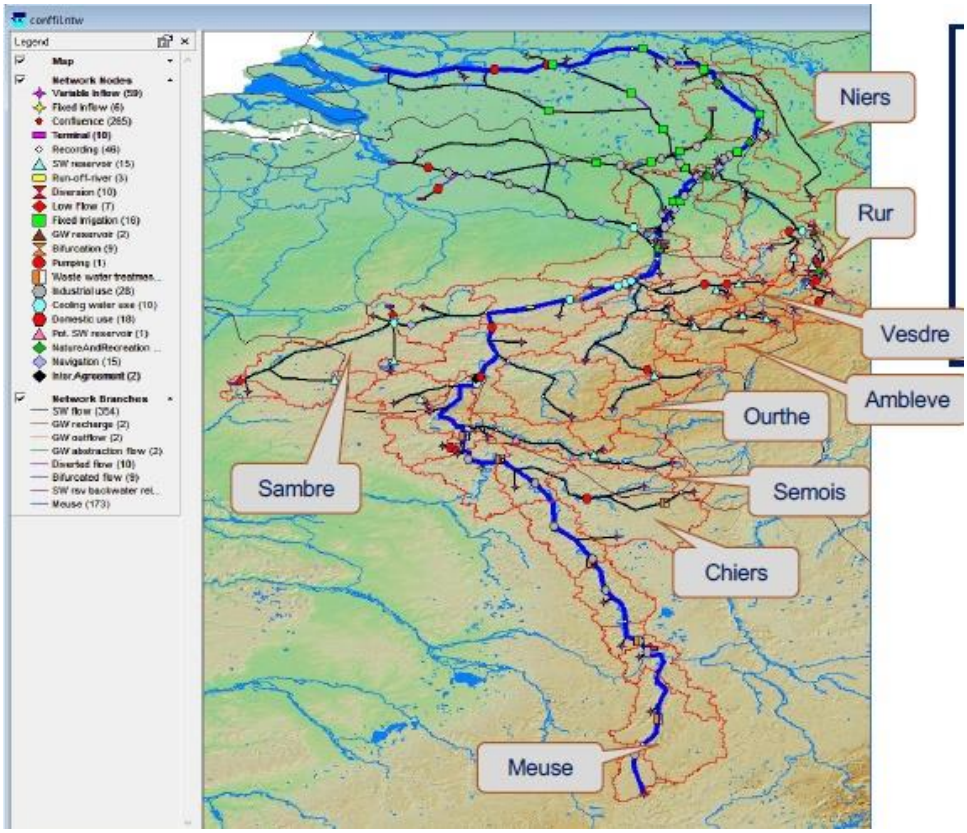


Figure 6. Visualization of the RIBASIM model (as presented at GRCC meeting, 06.07.2021)

Maaswerken

The Maaswerken[20] is an operational plan that was established in 1997 and is expected to run until approximately 2024. Major focus points include increasing the capacity of the river, improving navigability, developing nature areas and mining minerals (e.g., sand, clay and gravel). In the plan, a total of 52 projects were and are being implemented for a stretch of 222 kilometers, divided into three separate programs: Maasroute, Zandmaas and Grensmaas. The plan is a collaboration between Rijkswaterstaat, contractors, environmental organizations, municipalities, waterboards, residents and shipping agencies.

Ruimte voor de Rivier (completed)

The Ruimte voor de Rivier[21,22] (English: Room for the River) was a program that ran from the start of the 2000s until 2019. In this strategy, focus was put on giving more capacity to rivers, instead of traditional dike heightening. A total of 34 measures were implemented along the major Dutch rivers, including the Nederrijn, Waal, Merwede and Ijssel.

[20] Rijkswaterstaat. (2021). Maaswerken. https://www.rijkswaterstaat.nl/water/waterbeheer/bescherming-tegen-het-water/maatregelen-om-overstromingen-te-voorkomen/maaswerken

[21] Rijkswaterstaat. (2019). Ruimte voor de Rivier officieel afgerond: winst voor hoogwaterveiligheid en landschap. https://www.rijkswaterstaat.nl/nieuws/archief/2019/03/ruimte-voor-de-rivier-officieel-afgerond-winst-voor-hoogwaterveiligheid-en-landschap

[22] Rijkswaterstaat. (2021b). Ruimte voor de rivieren. https://www.rijkswaterstaat.nl/water/waterbeheer/bescherming-tegen-het-water/maatregelen-om-overstromingen-te-voorkomen/ruimte-voor-de-rivieren

Schone Maas

The Schone Maas[23] (English: Clean Meuse) is a project that was established in 2015 with the aim of improving water quality in the Meuse. From 2019 until 2021, an action program was established with concrete measures for achieving their goals. The program is a collaboration between a number of waterboards, drinking water utilities, governmental organizations and the association of river waterworks RIWA.

Samenwerken aan riviernatuur

The Samenwerken aan riviernatuur[24] (English: Collaborating on river nature) program aims to improve environmental quality of the rivers and their surroundings (primarily focused on ecology). The goal of the program is to have all the projects completed by 2027, with part of the projects being implemented around the Meuse river. The program is headed by Rijkswaterstaat in collaboration with waterboards, municipalities, provinces, Staatsbosbeheer, private organizations and environmental agencies.

4.2. In Belgium

All information about climate change policies / impacts / evaluations in Belgium are available through: https://www.adapt2climate.be/. It also highlights case studies of adaptations (basic information for Mission 3 of MICCA).

The national climate plan was adopted on April 19, 2017 by the Climate National Commission. It contains about ten measures of national scope (development of new common climate scenarios, development of a national platform on adaptation, ...) that complement the measures contained in the regional plans and in the federal contribution. The development of the plan was coordinated within the CABAO working group. The plan has been submitted to the different Belgian entities and to the advisory opinions.

4.2.1. Flanders

Stroomgebiedbeheerplan voor de Maas 2016-2021

The stroomgebiedbeheerplan voor de Maas 2016-2021 (English: delta management plan Meuse 2016-2021) defines measures related to surface and groundwater quality and flooding. The plan is based on both European legislation (Directives 2000/60/EC and 2007/60/EC) and legislation of the Flanders government. The plan includes measures encompassing multiple topics, including but not limited to sustainable water use, quality and quantity of surface and groundwater, flooding, and hydro-morphology (Coördinatiecommissie Integraal Waterbeleid[25]). A new plan has been prepared for the period 2022-2027.

Regional Climate Plan

On December 9, 2019, the Flemish government gave final approval to the Flanders Energy and Climate Plan 2021-2030. This plan constitutes the strategic framework for climate for the next ten years. The plan also designates the Flemish adaptation plan 2021-2030 as part of the Climate Policy Plan 2021-2030. The adaptation plan builds on the measures and results of the current Flemish adaptation plan

[23] Schone Maaswaterketen. (2021). Over ons. https://www.schonemaaswaterketen.nl/over-ons/
[24] Samenwerken aan riviernatuur. (2021). Onze visie. https://www.samenwerkenaanriviernatuur.nl/onze+visie/default.aspx
[25] Coördinatiecommissie Integraal Waterbeleid. (n.d.). Stroomgebiedbeheerplan voor de Maas 2016-2021. Aalst: Vlaamse Milieumaatschappij.

2013-2020 with the aim of further strengthening Flanders' resilience to the consequences of climate change and to adapt to the expected effects.

Information on climate change impacts in Flanders can be accessed through: https://klimaat.vmm.be/.

The Blue Deal

The Blue Deal[26] (2020) is a plan of the Flemish government in the fight against water scarcity and droughts that the region is increasingly facing. It is a plan involving many parties with numerous concrete actions and projects and large investments to structurally tackle drought and water scarcity.

The Blue Deal contains over 70 actions and bets on 6 scenarios. The plan was approved in the summer of 2020. Thirteen investment projects of the Blue Deal will receive an extra boost through the recovery plan 'VlaamseVeerkracht', for a total budget of 343 million euros. It concerns (field) realizations by the Flemish government and the financial support of initiatives by (agricultural) companies, local authorities, sector organizations, knowledge institutions, associations, ...

4.2.2. Wallonie

Les Plans de Gestion des Risques d'Inondations (PGRI)

In 2003, the PLUIES[27] plan was adopted by the Walloons government to prevent and protect against flooding and its impacts. The PGRI (English: flood risk management plans) were published in 2016 and serve as a (partial) update of the PLUIES plan. They are focused on specific river basins and focus on key topics: improving knowledge, reducing and slowdown of run-off, developing rivers and alluvial plains, decreasing vulnerability to flooding, improving crisis management and mitigating social and financial impacts of flood events[28]. Plans for the second cycle (2022-2027) will be published in 2022, but draft versions have already been made available. While these plans will define new measures to be taken in the associated river basins, they also aim to analyze the results of the first edition.

Plans de gestion 2016-2021

The river management plans are published by the Walloons government and serve to implement the European Water Framework Directive (Directive 2000/60/EC) in combination with the Floods Directive (Directive 2007/60/EC). Focused on specific river basins, the plans aim to give an overview of the rivers and groundwater areas, the associated risks, targets for 2021 and a program of measures and financial means[29]. It is noted that the first plan was adopted in 2012 and the second in 2016 for the period up to 2021. The third cycle shall be published shortly and will be adopted from 2022 to 2027.

Plan Air Climat Energie (PACE)

The Walloon regional plan is the AIR-CLIMATE-ENERGY plan (PACE) which was adopted on 21 April 2016. The PACE 2016-2022 contains 142 measures to reduce greenhouse gas emissions and other air pollutants, improve air quality and adapt to the impacts of climate change. The various sectors of activity are concerned: agriculture, industry, transport, residential, ... The PACE is the central instrument for implementing the Climate Decree adopted by the Walloon Parliament in February 2014.

[26] https://www.integraalwaterbeleid.be/nl/beleidsinstrumenten/blue-deal
[27] Waalse Overheidsdienst. (2021). Ontwerp van overstromingsrisicobeheersplannen 2022-2027.
[28] État de l'environnement Wallon. (2017, December 15). Plans de gestion des risques d'inondations. http://etat.environnement.wallonie.be/contents/indicatorsheets/TRANSV%201.html
[29] Service public de Wallonie; DGO3. (n.d.). De ontwerpversies van het Overstromingsrisicobeheerplan (ORBP) en de 2e Waterbeheerplannen van de 4 stroomgebiedsdistricten (SGBP) in Wallonië. DGO3.

Stratégie Sécheresse

In 2021, the Walloon Government has adopted its integral strategy for droughts with the release of a credit of more than 20 million euros for the implementation of concrete measures as part of Wallonia's recovery plan "Get up Wallonia". This strategy is based on 3 dimensions: eco-resilience, analysis and management of water demand, strengthening and mobilization of water resources.

Perex 4.0 for waterways

Perex 4.0 is a decision-support tool focused on the maintenance of 450 km of navigable waterways (and related infrastructures: 80 locks and 40 dams) in Wallonia. The tool is still in development and in 2021, the complete Maas/Schelde basins are included. Forecasts will be generated regarding hydrology, navigation and maintenance.

Meuse Saumon 2000

The Meuse Saumon 2000 is a program by the government of Wallonia and the university of Liège. It was established in 1987 and aims to reestablish the Atlantic salmon in the Meuse. This is done by reproduction of the salmon in fish farms and reintroducing them to the Meuse river on a yearly basis[30,31].

PARIS - Programmes d'Actions sur les Rivières par une approche Intégrée et Sectorisée

Wallonia has a planning and coordination tool for watercourses. It is the operational side of the PGRI and the river basin management plans. These are the PARIS (English : Action Programs on Rivers by an integrated and sectoral approach). Each PARIS sector is the subject of an inventory of devices and the managers determine and classify what is at stakes (hydraulic, economic, ecological and socio-cultural). They assign management objectives and then plan the actions to be taken to achieve the set objectives. A PARIS per sub-watershed basin is established and gather in a single document all the information and the planned interventions on the watercourses for a period of 6 years. The first PARIS period also covers the period 2022-2027.

4.3. In France

Schéma directeur d'aménagement et de gestion des eaux (SDAGE)

The Schéma directeur d'aménagement et de gestion des eaux[32] (English: River basin management plan) is the French implementation of the European Water Framework Directive. The aim of the plan is to set guidelines for achieving good water quality status for each of the French basins. The plan is supplemented by a program of measures, which defines operational actions for each basin. The newest cycle of the program is set for 2022 to 2027.

Plan d'adaptation changement climatique du bassin Rhin-Meuse (PACC)

The Rhine Meuse Water Agency's "Climate change adaptation and mitigation plan for water resources" broadly outlines measures "compatible" with sustainable and desirable development, recommending the tracking down of "bad adaptation" measures and the promotion of "no regrets" measures.

[30] Paquer, F., & Philippart, J.-C. (2006). Retour du saumon et perspectives. https://www.saumon-meuse.be/saumon/retour_saumon.html
[31] Notre Nature. (2020, June 16). Le grand retour du saumon atlantique dans nos rivières. https://www.notrenature.be/article/le-grand-retour-du-saumon-atlantique-dans-nos-rivieres
[32] Gest'eau. (2021, December 21). Qu'est-ce qu'un SDAGE ? https://www.gesteau.fr/presentation/sdage

Restraint in the use of water resources is a leitmotiv of all adaptation and mitigation initiatives, with precedence to be given to nature-based solutions, soils restauration and multifunctional measures.

Schéma régional d'Aménagement, de Développement Durable et d'Egalité des territoires (SRADDET)

The SRADDET (English : Regional Plan for Sustainable Development and Territorial Equality)[33] is a strategy for the planning and sustainable development of the Grand Est region up to 2050. In 2015, a law made the adoption of such strategies mandatory for all French regions. The SRADDET incorporates older regional separate plans (regarding climate issues, waste management, biodiversity protection) to define a transversal view of regional dynamics. This new plan has a prescriptive value, which means sub-territorial planning strategies must follow SRADDET's guidelines to be approved by state services.

In Grand Est, this strategy converges around 2 axes:

- The first axis bears the ambition of a Grand Est that faces climate change by adjusting its development model
- The second axis aims to overcome borders and strengthen cohesion, for a connected European space.

These two axes are declined in 30 rules, which can be completed with support measures. Climate change adaptation structures many of these rules and measures, on various issues such as urban planning, agriculture, biodiversity protection, etc. This core role of climate change adaptation is a specificity of the region's SRADDET, which set climate change as one of its priorities.

Plans Climat Air Energie Territoriaux (PCAET)

In 2020, EPAMA made an inventory of all ongoing PCAET (English : Climate, Air & Energy Plans*)* on the French Meuse. These plans are designed at the scale of inter-municipal associations and include actions to mitigate and adapt to climate change. In 2020, 2 PCAET were being discussed and 5 were being implemented on the Meuse basin. However, water resources are only scarcely mentioned in these plans.

Contrats de Territoire Eau et Climat (CTEC)

The Rhine-Meuse water agency has launched new contracts since 2018 to support local authorities in the joint management of water and climate[34]. The contracts are signed for a four-year period. EPAMA has signed a contract covering the French part of the Meuse basin, to support its actions on climate adaptation. Other contracts are under development on the Meuse catchment.

Explore 2070

The study delivered projected river discharges on a number of gauging stations in France, accounting for climate change.

CHIMERE21

CHIMERE21 is a joint research project[35] led by INRAE with contributions from EDF, the University of Lorraine and DREAL Grand Est. It aims at studying the evolution of the hydrology over the XXI° century on the Chiers and French Meuse. The climate data simulations are consistent with the 5th IPCC report.

[33] https://www.grandest.fr/politiques-publiques/sraddet/

[34] https://www.eau-rhin-meuse.fr/le-contrat-de-territoire-eau-et-climat

[35] https://webgr.inrae.fr/chimere-21

The downscaling follows the ADAMONT approach. An ensemble of 4 hydrological models (GRSD, SIM2, PRESAGES and MORDOR-TS) have been used. A strong focus was also put on the quantification of uncertainties. This project was presented in June 2021 and the final report of CHIMERE21 is online[36].

The research concludes on a warmer climate (+1.8°C to +4.1°C by the end of the century). Uncertainties are higher as regards the precipitation patterns (+33% to +31.1% in the far future). The annual rainfall signal is wetter, though drier summers are not excluded. The winter river discharges will increase, as was already concluded by earlier studies. The results are less pessimistic than previous studies with regards to droughts but show clear differences between French up- and downstream territories.

Prospective study evaluating the quantitative status of water resources in Grand Est Region

In 2019, the Grand Est Regional Council commissioned a "prospective study aimed at evaluating the quantitative status of water resources" with the aim of assessing the risks of future imbalances. First results were presented at the beginning of 2021, showing the trends for 2050 and 2100. The results on the water availability in each catchment was shared with French stakeholders in December 2021.

Water governance study

In 2016, EPAMA ordered an inventory of all public entities having a role on water management on the Meuse basin. The goal was to define a strategy to share roles and responsibilities among parties, following the French "GEMAPI" law (management of water, floods and aquatic ecosystems).

Aménagements Hydrauliques et Environnementaux du Bassin de la Meuse Amont (HEBMA)

Project HEBMA[37], conducted by EPAMA, aims to protect against flooding and improve water quality for the Vosges and Haute-Marne departments. It comprises 29 measures, divided into flood protection measures (i.e., increasing storage capacity and adding retention areas in case of flooding) and measures to improve the ecological state of the Meuse tributaries. Furthermore, the aim is to restore natural environments and correct imbalances caused by human influences.

4.4. In Germany

Hochwasserrisikomanagementplan NRW

A flood risk management plan[38] has been drafted for the Meuse basin in the North Rhine-Westphalia region. In the plan, measures are defined based on flood hazard and risk maps. These measures are divided into measures related to land use, water retention, flood control, prevention and recovery. Along with a management plan for the Meuse delta, plans have also been established for the individual municipalities[39,40]. Plans are valid for a period of six years ; the latest version[41] was released in 2021.

The objectives for the current period (2021-2017) are avoidance of new risks, reduction of existing risks, reduction of negative impacts during flooding events and after flooding events[42].

[36] https://hal.inrae.fr/hal-03206168/document
[37] EPAMA-EPTB. (2021, December 21). HEBMA : Protéger des crues et restaurer la qualité de l'eau. https://www.epama.fr/projets/hebma-proteger-des-crues-et-restaurer-la-qualite-de-leau
[38] https://www.flussgebiete.nrw.de/system/files/atoms/files/hwrm-plan-maas-final.pdf
[39] MKULNV NRW et al. (n.d.). Hochwasserrisikomanagement in Nordrhein-Westfalen.
[40] MKULNV NRW et al. (2015). Hochwasserrisikomanagementplan Maas NRW.
[41] MUNLV NRW. (2021). Hochwasserrisikomanagementpläne. https://www.flussgebiete.nrw.de/hochwasserrisikomanagementplaene-8409
[42] Bezirksregierung Köln. (2021). Hochwasserrisikomanagementplan für das nordrhein-westfälische Einzugsgebiet der Maas für den Zeitraum 2021 bis 2027. Köln.

Bewirtschaftungsplan 2022-2027 für NRW

The management plans for the 10 river basin districts in Germany were published by the end of December 2021. The management plan for the Meuse basin was published on the website[43] of the North Rhine-Westphalia region.

Bewirtschaftungsplan zur Umsetzung der Europäischen Wasserrahmenrichtlinie (WRRL)

Management plans are established for the North and South area of the Meuse. The reports describe the implementation of the European Water Framework Directive and measures that are to be taken. The reports[44] have been drafted by the German Ministry for Environment, Agriculture, Conservation and Consumer Protection of the State of North Rhine-Westphalia and cover the Rhine, Weser, Ems and Meuse. Measures are defined so as to achieve the water quality standards of the associated water bodies.

It is noted that the previous plan was effective until 2021; the plan for the upcoming cycle (2022-2027) was finalized in December 2021.

Hochwasser: Verstehen, Erkennen, Handeln!

While not strictly a program or plan, the document drafted by the German environmental agency describes the current state of affairs regarding flood management. With respect to responsibilities, the German national government has implemented the European Directive on flood risk (2007/60/EC) into national legislation. This implementation is not restrictive and allows for lower administrative bodies to implement their own policies. Responsibility for drafting the flood management strategy and measures is with the 16 states. The municipalities are, dependent on the area, responsible for the individual projects.

In addition, the German environmental agency[45] describes a number of opportunities regarding flood management. These include increasing the capacity of the rivers, steering land use, strengthening natural water retention, responsible river development (related to shipping), increasing public awareness, improving flood protection structures and collaborating on an international level.

Nationales Hochwasserschutzprogramm

The Nationales Hochwasserschutzprogramm[46] (English: National Flood Protection Program) is a program that aims to boost the identification and prioritization of effective flood protection measures. Focus lies on finding promising flood retention areas and the identification of weak points in existing flood protection infrastructure[47]. Although no measures specific to the Meuse region were included, these could be added at a later stage.

Nationale Wasserstrategie

On 8th June 2021, the Federal Environment Ministry published its ideas for a National Water Strategy[48]. It is intended to provide answers as to how the water supply for people and the environment can be

[43] https://www.flussgebiete.nrw.de/bewirtschaftungsplan-2022-2027-fuer-nrw-9180
[44] MKULNV NRW et al. (2015). Steckbriefe der Planungseinheiten in den nordrhein-westfälischen Anteilen von Rhein, Weser, Ems und Maas: Bewirtschaftungsplan 2016-2021. MKULNV NRW.
[45] Umweltbundesambt. (n.d.). Hochwasser: Verstehen, Erkennen, Handeln! Bonn.
[46] LAWA. (2014). Nationales Hochwasserschutzprogramm. Kiel.
[47] Bundesministeriums für Umwelt, Naturschutz und nukleare Sicherheit. (2014, October 24). Nationales Hochwasserschutzprogramm. https://www.bmu.de/download/nationales-hochwasserschutzprogramm
[48] https://www.bmu.de/en/download/national-water-strategy

secured in sufficient quantity and necessary quality in the year 2050. This strategy is based on several dialogue processes with stakeholders and citizens. It will now be discussed further, especially with the 16 federal states and the other federal ministries.

Klimawirkungs- und Risikoanalyse für Deutschland 2021

On 14th June 2021, the Federal Environment Ministry published the Climate Impact and Risk Analysis[49] 2021 for Germany. More than 100 impacts of climate change were examined and urgent action was identified for about 30 of them, e.g. lack of water in soils and increased frequency of low water periods. The results of the study form an essential basis for the further development of the German Climate Change Adaptation Strategy (DAS). A sub-report[50] of this analysis deals with the topic of "water".

NRW-Klimabericht

North Rhine-Westphalia published its new climate report[51] on 14th December 2021. 79 indicators highlight the consequences of climate change on the environment and society as well as the progress made in preventing it.

4.5. In Luxembourg

The national adaptation strategy and plan[52] were developed based on past observations and future projections of the effects of climate change. In order to set up measures, an evaluation grid was established. By combining the probability of occurrence of the impact with the importance of this impact for Luxembourg, a total of 42 measures in 13 different sectors have been developed. The implementation is planned for the period 2018-2023.

Municipalities are involved in adaptation policy through a Climate Pact ("Klimapakt") between the State and the municipalities (https://www.pacteclimat.lu). All 102 communities of Luxembourg are engaged under the Climate Pact, and one of the measures in the new climate pact is to set up local adaptation strategies with adaptation goals. With the launch of the “Naturpakt”, municipalities will also have a catalogue of measures - at local level - to help to tackle biodiversity and climate change issues.

The river management plans[53] to implement the European Water Framework Directive and the Flood risk management plan[54] for the Floods Directive for the period 2022-2027 shall be published between 21st December 2021 and 22nd March 2022.

[49] https://www.umweltbundesamt.de/publikationen/KWRA-Zusammenfassung
[50] https://www.umweltbundesamt.de/publikationen/KWRA-Teil-3-Cluster-Wasser
[51] https://www.lanuv.nrw.de/landesamt/veroeffentlichungen/pressemitteilungen/details/3099-neuer-klimabericht-79-indikatoren-zeigen-folgen-des-klimawandels-und-fortschritte-bei-der-vorsorge
[52] https://environnement.public.lu/content/dam/environnement/documents/klima_an_energie/Strategie-Adaptation-Changement-climatique-Clean.pdf
[53] https://eau.gouvernement.lu/fr/administration/directives/Directive-cadre-sur-leau/3e-cycle-(2021-2027).html
[54] https://eau.gouvernement.lu/fr/administration/directives/directiveinondation/2ieme-cycle/ProjektDesZweitenHochwasserrisikomanagementplans.html

4.6. At international level

4.6.1. AMICE – Adaptation of the Meuse to the Impacts of Climate Evolutions

The project was led by EPAMA and lasted from 2009 to 2013. Its aim was to understand the impacts of climate change on the international watershed and demonstrate some adaptation measures.

4.6.2. International Meuse initiatives

Roof sections of flood risk management plans and river basin management plans

The International Meuse Commission is responsible for the writing of the roof sections of the basin management plans related to the Floods Directive and Water Framework Directive implementation. The roof sections describe how the neighboring countries coordinate their plans and ensure smooth execution of the Directives in the border regions.

Blue zone Meuse Project idea

Blue zones[55] are regions of the world thought to have a consequent number of people living much longer than average, identified by Gianni Pes and Michel Poulain. Five "Blue zones" have been posited: Okinawa (Japan); Sardinia (Italy); Nicoya (Costa Rica); Icaria (Greece); and Loma Linda (California, USA). Blue Zones support the ideas of healthy eating, active lifestyles and community involvement. In the beginning of MICCA, the idea came up on creating blue zone communities in the International Meuse Basin.

The "Rur-Meuse linkage" on water quality on the Meuse basin

EPAMA is one of four partners besides Alterra Wageningen University (lead partner), RWTH Aachen University and the University of Liege-Ulg.
The "Rur-Meuse linkage" deals with:

- The effects of water diversion and climate change on the Rur and Meuse in low-flow situations
- The Rur and Meuse management in low- and mid-flow situations
- The enhancement of estimates of future water demand in the Meuse basin
- The exhaustive assessment of stakes dealing with water quality on the Meuse basin.

4.6.3. Meuse Symposiums

The Dutch research institute Deltares and the University of Liège have been organizing the "Symposium on the hydrological modelling of the Meuse basin" for several years now, taking stock of current knowledge and developments in the field of modelling.
The seventh edition of the Symposium took place in September 2021, online due to pandemic conditions. Researchers from several organizations and officials from different public administrations presented their work on the Meuse basin.

[55] https://en.wikipedia.org/wiki/Blue_Zone

4.6.4. Elsewhere in Europe

Outside of the Meuse basin, initiatives on water & climate change serve as inspiration for a Mosan initiative.

Co-Adapt project

The Co-Adapt project[56] [02/2019 – 09/2022] is bound to create a more resilient future for river basins. It receives funding from the Interreg 2 Seas program and is led by the Somerset County Council. Co-Adapt will develop, test and roll-out approaches to co-creation of nature based and natural process solutions (NBS) to improve adaptive capacity to the water-related effects of climate change. The project will develop more open and transparent governance for adaptive water management by embedding co-creation in policy frameworks, especially spatial and water management strategies - leading to greater awareness and stakeholder-led action to improve climate resilience. It plans to involve 3000 stakeholders in co-creation leading to changed public attitudes to water & climate risks, with 80% of participants feeling involved and supporting NBS measures. The project is led by the Open University[57], based in Heerlen (Dutch Meuse catchment).

[56] https://www.interreg2seas.eu/en/co-adapt
[57] https://www.ou.nl/en/

5. Stakeholders of the Meuse river basin

A central part of the consultants' work in support to the development of the Mosan network is to list the stakeholders involved on water & climate change issues, describe their current missions as well as the way they already interact through networks, associations, or think tanks. The goal is also to point out the "missing" stakeholders (i.e., organizations that are not yet involved with the GRCC activities but would be needed to accomplish the goals of the Mosan network).

5.1. Stakeholders' description

To facilitate the understanding of the stakeholders' roles and relations on the Meuse river basin, a database has been built. At the local level, the organizations are not listed individually (one entry in the database for all municipalities from the Meuse catchment), providing they share the same roles in water management or climate adaptation.

Each organization involved in water & climate issues is listed, with information on its country, perimeter of action, fundamental missions, contact details. The missions are labelled to match the GEMAPI French law (law on the management of floods and aquatic ecosystems) which is a comprehensive list of water-related missions and had been previously used by EPAMA.

Country	**Type of territory**	**Fundamental missions**	
France	Hydrological	Integrated River Basin Management (IRBM)	**a**
Belgium	Administrative	River management and restoration	**b**
Netherlands		Water supply	**c**
Germany		Rainwater and runoff management, fight against erosion	**d**
Luxembourg		Floods management	**e**
Other		Fight against pollution	**f**
		Surface and Groundwater resources protection and conservation	**g**
		Aquatic ecosystems, wetlands and ripisilve protection and restoration	**h**
		Hydraulic installments for civil security	**i**
		Hydraulic works maintenance and exploitation	**j**
		Monitoring of water resources and ecosystems	**k**
		Facilitation and consultation at the hydrographic scale	**l**
		French GEMAPI Typology of actions	

Table 1. List of water-related missions and corresponding code in the database

A typology of actors has also been proposed, inspired from [Schreirer & al.][58].

[58] Schreiner, B., Mtsweni, A., & Pegram, G. (2011). An Institutional Framework for Stakeholder Participation in Transboundary Basins. Water Research Commission.

Type	Sub-type	Code
General public actors	National	GS-NA
General public actors	Regional	GS-RE
General public actors	Provincial	GS-PR
General public actors	Local	GS-LO
General public actors	Other	GS-OT
public actors with direct water mandate	Water board	SW-WB
public actors with direct water mandate	Drinking water utility	SW-DW
public actors with direct water mandate	Wastewater utility	SW-WW
public actors with direct water mandate	Other	SW-OT
Non-public actors	Commercial/industrial user	NS-CU
Non-public actors	Commercial/industrial discharger	NS-CD
Non-public actors	Residential user and/or discharger	NS-RE
Non-public actors	Interest group	NS-IG
Non-public actors	Research	NS-RS
Non-public actors	Other	NS-OT

Table 2. Typology of actors used in the Meuse stakeholders database

The database started with 133 entries (contact lists from EPAMA and IMC) and was expanded to **184 entries** through recommendations by MICCA participants as well as the consultants' research. The typology of stakeholders and their respective countries are summarized below.

Étiquettes de ligr	GS-LO	GS-NA	GS-PR	GS-RE	NS-CU	NS-IG	NS-OT	NS-RS	SW-DW	SW-OT	SW-WB	SW-WW	GS-OT	Total général
France	19	5	15	7		11		3		4	7	3		74
Luxemburg		1				2			1			1		5
Belgium-Wallonia			3	5	2	3		4	7		8	1		33
Belgium-Flanders				1				1	1	1				4
Belgium			5	1		2			2				4	14
Germany		1		1				1	3		1		1	8
Netherlands	1	3	10	1		8	1	3	5		5		6	43
Other				1					1		1			3
Total général	**20**	**10**	**33**	**17**	**2**	**26**	**1**	**12**	**20**	**5**	**22**	**5**	**11**	**184**

Table 3. Typology of stakeholders listed in the database, in each country of the Meuse river basin

There are more stakeholders listed in France than the other two main countries of the catchment (Belgium and the Netherlands), as a database was already available for this country. The number of stakeholders known in Germany, Flanders and Luxembourg is very limited and will be expanded.

Most of the public authorities' representatives listed, act at the regional, provincial or local levels. The national State representatives are less invested in the Mosan affairs as the Meuse basin often represents a small part of their territory (especially from the points of view of Luxembourg, Germany or French States).

As regards to the non-public organizations, more than 25 interest groups are listed as well as 12 research organizations. On the opposite, a very limited number of water users has been identified, and only in Wallonia. Contrary to Belgium and the Netherlands where research organizations are already active within the GRCC but also within other research initiatives in the Meuse catchments, the French and German universities have been harder to mobilize. One reason is that they are not located on the Meuse catchment, though they have carried out studies or field surveys in the past.

The water-related organizations in the database are mainly surface water bodies managers or drinking water producers (22 and 20 entities respectively). The drinking water companies in France have not been listed because this sector is very fragmented and usually organized at the municipality scale. The wastewater sector is not sufficiently known on the Meuse river basin (names of the operators or their federations, number of operators, etc. have not been inventoried).

In order to facilitate the visualization of the roles of the different organizations identified, we produced **maps displaying, for each water-related mission, the names of the organizations and their perimeter** of action. The maps are available in Annex 5 – Stakeholders maps.
We discuss our observations below and highlight important messages for the structuring of the MICCA network.

The whole Meuse catchment is covered by **river basin management** organizations which are operating at the basin scale (within each country). One notable exception is the management of the main Meuse river in Belgium which is distinct from the tributaries: the Meuse is indeed considered more as a waterway than a river and is under the responsibility of the Walloon region (general direction for hydraulics) and the Vlaamse Waterweg in Flanders.

- ➔ **River basin organizations are already well identified and taking part in MICCA**
- ➔ **There are two complementary authorities in Belgium on the Meuse catchment: DG02 for the navigable Meuse and DG03 for the coordination of tributary rivers organizations**

River management and restoration is a joint responsibility between basin authorities (basin-level strategic vision) and nature conservation organizations (operational actions). In France, the recent GEMAPI laws have given responsibility for river restoration to local authorities, which are coordinating their actions with EPAMA. Nature conservation organizations involved in river management have not been identified in Luxembourg or Germany.

- ➔ **Stakeholders responsible for the operational maintenance and restoration of rivers are not yet part of MICCA, but they already have partnerships with MICCA members**

The **drinking water supply** sector is structured in two opposite ways in French-speaking and Dutch-speaking countries. In France, Wallonia and Luxembourg, the sector is very fragmented with many municipalities -scale drinking-water providers. In France, water for human consumption is abstracted from underground resources and the infrastructures are rather small. In Wallonia (or in Germany as well), the municipalities have a larger scale. Some drinking-water providers are also operating a water storage and manage the whole network supplied by the reservoir. In Dutch-speaking countries, the drinking-water sector is owned by a very limited number of private companies. Water is abstracted from surface resources (the Meuse or major tributaries) and the associated treatment infrastructures are large. It is therefore easier to identify (and involve) drinking-water companies from Flanders or The Netherlands.

- ➔ **Drinking water companies in the downstream part of the Meuse are few in numbers and have important means. They are also more vulnerable to climate change as the water supply depends directly on the Meuse discharges.**
- ➔ **Drinking water companies in the upstream part of the Meuse will not have the capacity to participate in MICCA: federations or professional associations (such as Aquawal in Wallonia) will be approached.**

Rainwater and runoff management is often considered as a side topic to floods management. Few stakeholders have been identified with a clear responsibility on erosion as well. The topics are included in the action plans of the river basin management authorities, but no associated partners are clearly named (land-use managers or agriculture sector representatives have been sought).

- ➔ **Rainwater, runoff or erosion management has not been assigned to any specific stakeholders, the topic is included in the overall responsibilities of the basin authorities**

Floods management is in the hands of the river basin authorities in most countries of the Meuse catchment. The exception is in France where a distinction has been made between prevention of floods

(role of EPAMA through strategic planning) and operational management of flood situations (which remains in the hands of the State and local emergency services).

➔ **Floods managers are already well identified and taking part in MICCA**

The **fight against water pollution** is a mission of several overlapping stakeholders. River basin scale organizations are involved as well as wastewater managers (local to regional scale), representatives of the agriculture sector (prevention of the use of pollutants) as well as NGO campaigning for litter-free waters or bathing-quality rivers. This diversity is strongly dependent on the local pressures: in rural France, the main concern are nitrates and pesticides from farming practices; in densely populated Belgium the industrial and domestic pollutions are a higher priority; in The Netherlands, all the upstream pollutions are a concern in addition to macro-waste and micro-plastics which accumulate on banks and in sediments.

➔ **Water quality is a joint responsibility of many stakeholders, not only water managers**

➔ **Representatives of economic sectors that are sources of aquatic pollutions are not yet involved in MICCA**

Nature conservation is included in the missions of the river basin managers. However, they are not alone in this field. There are other stakeholders operating at a large scale, with a strategic vision (*Conservatoires d'Espaces Naturels* in France, *Natuurpunt* in Flanders, *Natagora* in Wallonia, NABU in Germany, or *Natuurmonumenten* in the Netherlands). There are also more local actors responsible for the management of natural assets (wetlands) or species (fishing associations). There are also cross-border natural parks[59] on the catchment and each country designated natural protected areas[60].

➔ **Nature conservation organizations are not yet involved in MICCA, though some of them could have a direct interest to work on water & climate change – be it for the conservation of habitats or species in the Meuse catchment**

➔ **No local conservation organization has been identified in Germany and Luxembourg (other than the river management authorities which also have conservation missions)**

The construction, maintenance and operation of **hydraulic equipment** is a very distinct role from river basin management: all countries of the Meuse catchment (except Germany) have different stakeholders for the management of the major hydraulic infrastructures – usually under direct supervision of the State.

➔ **Hydraulic infrastructures managers in the downstream countries are actively involved in MICCA already whereas their Walloon (BAMEO, DG02) and French (VNF) counterparts have not yet been engaged**

Regarding the monitoring of water resources and ecosystems, each country of the Meuse catchment has a distinct share of roles. Public authorities remain responsible for the data collection and storage, as well as the reporting to the EU under the Water Framework Directive. The operational management of the monitoring network can also be delegated. In France and the Netherlands, nature protection organizations are taking part in the data collection, in particular on the ecological parameters. In Wallonia, the two universities of Namur and Liège are working in close collaboration with the Region to maintain and exploit the monitoring network.

➔ **There are many stakeholders involved in the monitoring of water resources and aquatic ecosystems but the public authorities remain responsible for the quality, consistency and accessibility of the data**

[59] Dreiländerpark / Parc des Trois Pays / Drielandenpark

[60] For instance : Rivierpark Maasvallei, Limburg, Netherlands

Last, the coordination of stakeholders or the facilitation of public participation is carried out by organizations working at the Meuse scale or even larger. They are therefore quite easy to identify.

➔ **Stakeholders with coordination or facilitation missions are already active within MICCA**

Some stakeholders have not been mapped as they are not involved directly on water & climate change issues, however, they could have an interest in MICCA because the shared adaptation vision of the Meuse catchment is relevant for their activities. These stakeholders are listed in the database, before example: energy providers (i.e., EDF in France), energy and climate public authorities, agriculture representatives, urbanists and land planners, navigation sector, etc.

5.2. Stakeholders' dynamics

This section describes the existing networks of stakeholders involved in water and climate change issues. The future Mosan network will have to work with them and complement them.

The International Meuse Commission

The International Meuse Commission[61] is the body responsible for coordinating the various management schemes for the Meuse basin. In this capacity, it is tasked with monitoring the proper implementation of the EU Water Framework Directive (WFD - Directive 2000/60/EC) and of the Floods Directive (Directive 2007/60/EC). The starting agreement has been signed by the governments of the Federal Republic of Germany, the Flemish Region of Belgium, the Walloon Region of Belgium, the French Republic, the Grand Duchy of Luxembourg and the Kingdom of the Netherlands. Represented by their water and/or environment dedicated services, these administrations are the heads of delegations in the commission. Some of them also coordinate working groups, that can also be conducted by other actors (researchers, etc.).

The heads of delegations, working group leaders and observers are represented in the figure below. Other organizations are also active in the IMC and its working groups but are not heads nor leaders: they do not appear on the stakeholders' map.

There are five permanent working groups:

- "Regie and Coordination" Working Group (WG R)
- "Accidental Pollution" Working Group (WG P)
- "Hydrology/Floods" Working Group (WG H)
- "Water Framework Directive" Working Group (WG A)
- "Monitoring" Working Group (WG M)

The commission also relies on permanent or temporary project groups, to carry specific tasks. The following project groups are the permanent ones:

- "Ecology" Project Group (PG E)
- "Chemistry" Project Group (PG C)
- "Groundwater" Project Group (PG S)
- "Geographic Information Systems" Project Group (PG G)

[61] http://www.meuse-maas.be/

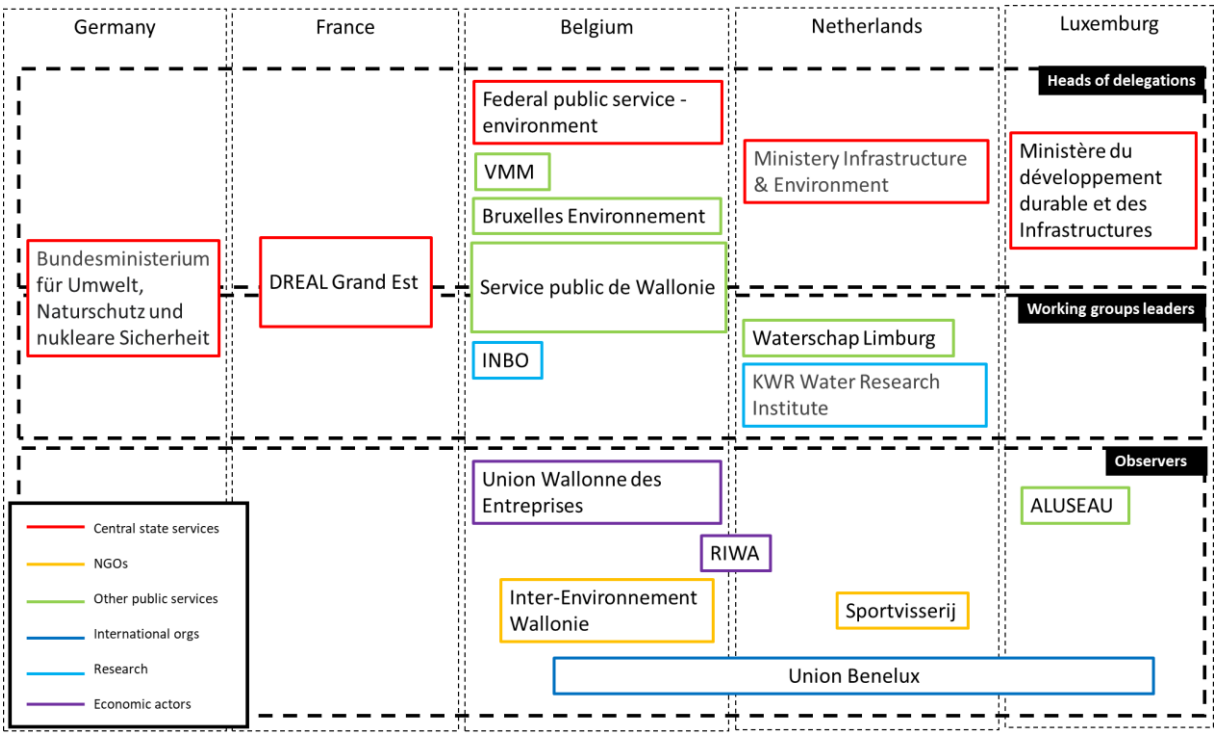


Figure 7. Members and roles within the International Meuse Commission

In its statutes, the IMC allows the involvement of observers in its work. They participate in the exchange of information but do not have the right to vote in the different areas of the commission to which they have been invited to participate (working groups and project groups). All organizations (NGOs, professional federations, various public organizations) whose interests and expertise are likely to enlighten and advance the work of the Commission can be recognized as observers.

The IMC is the body where transboundary treaties or agreements are negotiated. The future Mosan network shall not take-up this role but complement it, with a more operational role.

The Vlaams-Nederlandse Bilaterale Maascommissie (VNBM)

The VNBM[62] is a working group for Flemish and Dutch administrations responsible for the management of the Meuse. It exists since 1996.

Program Office KRW/DHZ Maasregio

The Program office Maas facilitates the cooperation between the water managing parties in the Dutch Meuse basin. This cooperation is a steering group, and the main partners are the Water Boards Brabantse Delta, Dommel, Aa and Maas, and Limburg, the provinces of Noord-Brabant and Limburg and Rijkswaterstaat. This cooperation started in 2010, around the Water Framework Directive. It has since been expanded to include the Delta Plan for High Sandy Soils, a regional elaboration of the national Delta Plan for Freshwater, which focuses on freshwater availability.

[62] http://www.vnbm.eu/index.php

*The think-tank on climate change (*Groupe de réflexion changement climatique – *GRCC)*

Since 2019, monthly online meetings on the topic of water & climate change are organized by EPAMA, with the aim of attracting a large group of stakeholders of the Meuse basin. The group's ambition is to share information on on-going initiatives, projects, conferences and collaboration opportunities on water & climate change issues. The group has remained informal up to now and has no dedicated budget.

Though initially an initiative from Waterboard Aa en Maas and EPAMA, the leading organizations are today the Program Bureau Maas and EPAMA due to changes in the chairmanship at the Waterboard Aa en Maas.

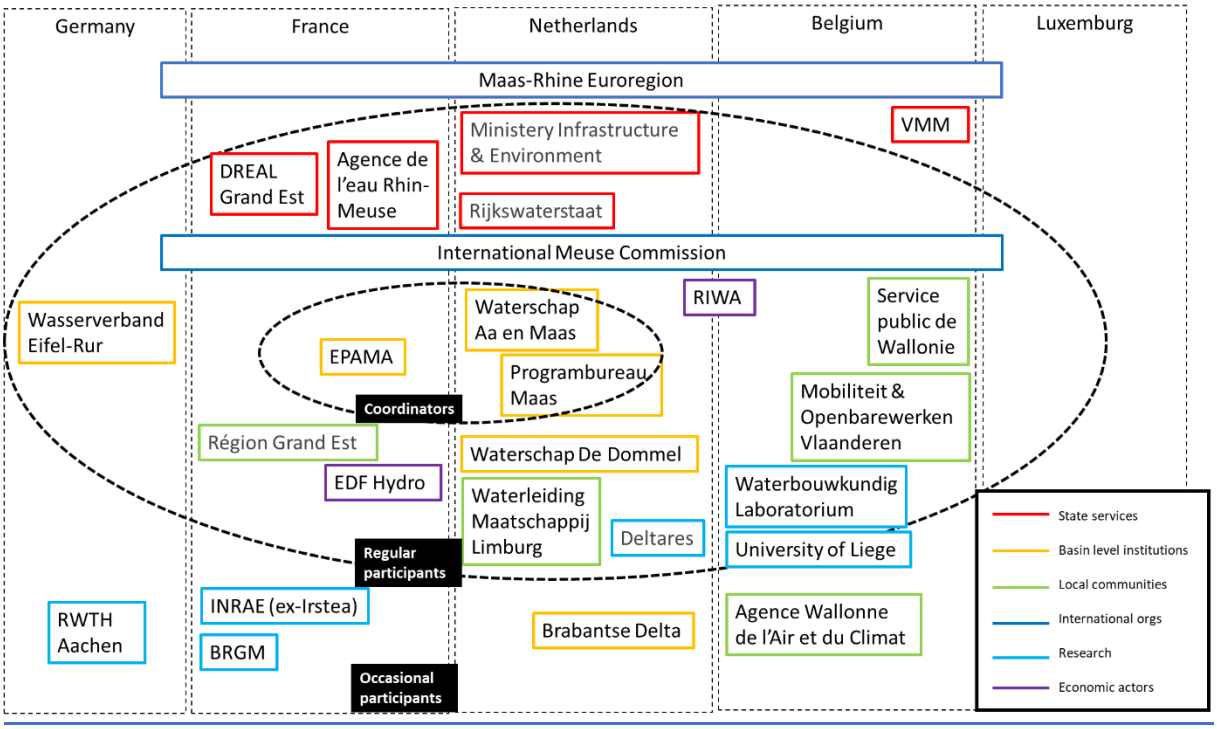


Figure 8. Map of the GRCC members and participant

Federations of drinking water companies - RIWA

RIWA is the association of river water works. Its members are drinking water companies in the Netherlands and Belgium, representing a total abstracted volume of 450 billion liters a year, distributed to 7 million consumers: Vivaqua, Water-link, WML, Dunea, Evides waterbedrijf and Brabant water. RIWA is striving for a quality of surface water good enough to produce impeccable drinking water from it with only natural purification. For the level of purification to be reduced, and in compliance with article 7 of the Water Framework Directive, the water quality needs to improve further. RIWA is part of a wider network of drinking water suppliers in Europe, called the European River Memorandum (ERM)[63] coalition.

In the Walloon region, drinking water is supplied by 50 different utilities. Among them, the regional utility *La Société Wallonne des Eaux* (SWDE) serves the largest number of connections (about 66 % - representing 101 million m^3 each year), while eight other utilities (associations of municipalities) serve

[63] https://www.riwa-maas.org/en/riwa-maas-3/european-river-memorandum/

about 24 % of the connections. The remaining is served by smaller utilities at the municipality level directly.

RIWA and Deltares have jointly launched a transboundary research project to gain insight in current and future water availability in the international Meuse catchment. A first draft has been published in march 2020. The research objective of the study is to gain insight into:

- o The volumes of water available (during low-level water),
- o The source of the water (historical data-based study into main rivers and tributaries in the basin),
- o User functions depending on the water in the Meuse catchment,
- o Quantitative amounts of water extracted, extraction locations, and the impact of low-level water on these functions,
- o Future developments under various climate scenarios.

Figure 9. Map of distribution area of drinking water companies in the Netherlands (source: www.vewin.nl)

Covenant of Mayors for Climate and Energy (Convention des maires pour le climat et l'énergie)

Originally a European initiative bringing together local and regional authorities, it is based on the voluntary commitment of the signatory municipalities.

Mayors for a Drinkable Meuse (Réseau des maires pour une Meuse à boire)

This network of mayors promotes the vision of a Drinkable Meuse. The network was initiated by activist Li An Phoa and the mayor of Charleville-Mézières, Boris Ravignon. The aim of this international network is to implement measures backed by the mayors to preserve Meuse water and … make it drinkable. EPAMA supports this network. On a larger scale, Drinkable river[64] association's activities include river walks, citizen science and support to local initiatives.
The association is supported by public authorities, private companies as well as individuals.

EuroRegio Maas-Rhine

The Maas-Rhine Euroregion (EMR) is a cross-border cooperation area between Germany, Belgium and the Netherlands. Founded in 1976, its territory covers 11,000 km² with a population of over 3.88 million people. Its main themes are economy, education, culture, tourism, health, security, mobility and sustainable development. Although the delimitation of the region itself is linked to the rivers Meuse and Rhine, water management is not directly part of its working themes, but remains connected to several of them. It is in this perspective that the EMR participates in various bodies of the Meuse basin, bringing with it, its expertise in transboundary cooperation in Europe.

EMR is currently spread over five national regions (3 in Belgium, 1 in the Netherlands, 1 in Germany).

Mission Opérationnelle Transfrontalière (MOT)

The Transborder Operational Mission (MOT)[65] is an association that was set up in 1997 by the French government. The MOT's role is to assist project developers, to promote the interests of cross-border territories and to facilitate the networking of players and the sharing of experiences. It acts as the interface between the different stakeholders in order to find cross-border solutions at the right levels. On the Meuse catchment, the members of the MOT are:

[64] https://drinkablerivers.org/mayors-for-drinkable-rivers/
[65] http://www.espaces-transfrontaliers.org/en/

- Provincie Limburg
- Région wallonne
- Région Grand Est
- Grand Duché du Luxembourg
- Département des Ardennes
- CC Ardenne Rives de Meuse
- CC Ardenne Métropole

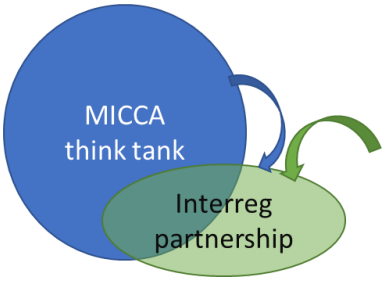
Other networks can briefly be mentioned such as:

- BENELUX: the politico-economic union and formal international intergovernmental cooperation of three neighboring states: Belgium, the Netherlands, and Luxembourg.
- The Permanente Nederlands-Duitse Grenswateren-commissie to coordinate river management on the border between the Netherlands and Germany.
- The Maasbekken: the Flemish decree on integrated water policy which puts together all Flemish organizations working on the Meuse and Scheldt river basins.
- The Belgium-Dutch regional platforms GoW Jeker-Geul, GoW Dommel-Thornerbeek and GoW Mark-Molenbeek.
- The EUROPARC Federation[66] is the network for Europe's natural and cultural heritage. The Federation works to improve the management of Protected Areas in Europe through international cooperation, exchange of ideas and experience, and by influencing policy.

5.3. Key stakeholders for MICCA

Among the list of nearly 200 stakeholders and networks working on water & climate change issues on the Meuse river basin, not all of them will be engaged in the same way within MICCA activities. It is still difficult at this stage to recommend an exact list of organizations, as **the goals, missions and actions of the MICCA network are not yet defined** (see Mission 2 of the consultants' work). However, we can sketch which strategic groups should be approached to further develop the MICCA concept.

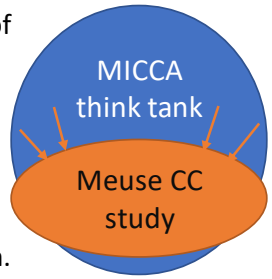
The present MICCA think tank has been described in chapter 5.2. It is bound to evolve in several directions.



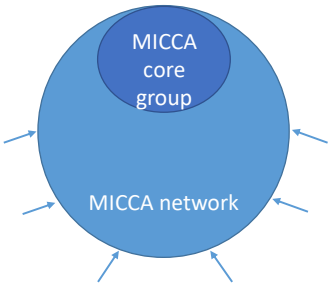
The first evolution is the creation of a partnership to draft a European proposal for funding under Interreg B. The partnership shall be limited to a number of organizations who actually have the capacity to take action and make investments, and that are willing to take part into a European project. This partnership can stem from the MICCA think tank with the addition of a few selected partners relevant for the project's topic. Example of relevant partners are: **managers of hydraulic infrastructures, managers of natural areas or conservation sites, drinking-water companies, energy producers**, … The partners will sign a partnership agreement to rule their relations throughout the Interreg project.

66 https://www.europarc.org/?utm_source=ep&utm_medium=body&utm_campaign=linktrack&utm_content=wysiwyg&p=3495

MICCA also has the ambition (see Phase 2) to carry a study on the impacts of climate change on water uses. This study at the international scale could be a joint research effort from the **data producers of the Meuse catchment** (State services and their delegates), **the universities and the research centers.** All these stakeholders are already in the MICCA contact lists but they may not be regularly present to the monthly meetings of the think-tank. The opportunity of a funded research and joint international collaboration would draw them in. Willingness to share data will be a challenge to overcome.

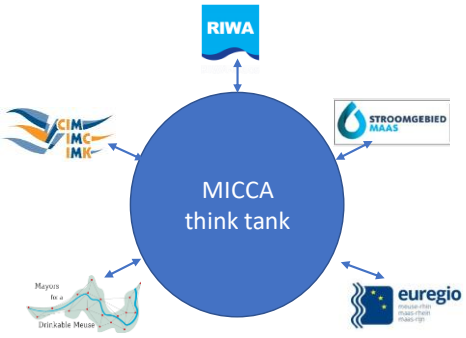


This group could also evolve towards a **scientific committee** for MICCA.



As the activities of MICCA will unfold (activities to be defined under Mission 2 – it could range from communication, lobbying, research, coordination, data sharing, etc.), more and more partners will have an interest to join in. The present format of the MICCA think tank (2 hours discussion once a month) may no longer be relevant. The more active members of the future MICCA network will constitute a "core group" (or Board, or Pilot Committee, depending on the status of the network) with more frequent meetings to manage and coordinate the activities, while the other partners may meet twice a year in plenary or in smaller groups for dedicated activities. The core group would be composed of willing partners who already **play a coordinating role on the basin**: EPAMA in France, Walloon region, ProgramBureau Maas in the Netherlands, Wasserverband Eifel-Rur in Germany, … for instance. Some organizations are already very active in MICCA, while others shall be encouraged to take a more leading role.

Finally, the MICCA network will take advantage of organizations who are participants in other networks in order to create the necessary bridges and increase the synergies. These networks can range from **State representatives (IMC), economic sectors, river basin managers, funders, elected representatives, drinking-water companies**, … but also students associations or citizens action groups (which do not yet have links with MICCA).



5.4. Missing stakeholders

Since the beginning of the consultants' work, it is apparent that there are still countries and organizations that are more strongly represented than others in the MICCA meetings, workshops or the survey. The existing mailing lists and stakeholders' databases have a large number of people and organizations from all the countries in the Meuse region, but there is still a lack of active contribution from some parts of the Meuse watershed in the shaping of this project. There are also blank spots which have so far been completely overlooked.

5.4.1. Countries representatives

The stakeholders database remains poor in representatives from the following countries:

- **Germany**: The WVER and the NRW Lander have representatives in MICCA but they lack means to become more actively involved. The German part of the Meuse river basin is also lacking contact details of stakeholders related to water users (economic sectors), land managers, nature conservation as well as research institutes.
- **Flanders**: Similar to Germany, the key stakeholders for water management are already within MICCA but it would be useful to expand the contact lists beyond the waterways sector.
- **Luxembourg**: The Meuse river is only a very small part of the country and the public authorities[67] consider that their engagement through the International Meuse Commission is sufficient and efficient. The identification of another actor[68] (university, municipality, association) would be a relevant addition to the MICCA network – also suitable to its operational ambition.

Though many stakeholders have been identified in **Wallonia**, only few participate on a regular basis in MICCA activities so far. The main actor for water issues, the Walloon Region, was noticeably absent and the other local public authorities or river managers may not feel legitimate or may lack the means to participate in an international network.

The **Sambre** catchment shall not be forgotten either: this tributary of the Meuse takes its source in France but is not within the perimeter of EPAMA nor the Rhine-Meuse water agency. The local authority is the *Communauté d'Agglomération Maubeuge Val de Sambre*.

5.4.2. Economic sectors

So far, the private sector and the water users have hardly been represented in MICCA think tank meetings, to the exception of the drinking-water companies. Depending on the missions and actions that MICCA wants to undertake, contacts will have to be initiated, for instance with: urban planners[69] (to work on soil sealing, rain water infiltration), agriculture sector representatives (to work on nature-based solutions, pollution or irrigation), industries (to work on water savings), energy producers (both hydropower and nuclear power), navigation sector but also private companies in hydrology, hydro-morphology or hydrobiology[70]. It might be too difficult for independent companies to take part in an initiative such as MICCA but they could be approached through their federations or associations[71]. Many local public authorities also support economic development through their services or agencies[72].

[67] Administration de la gestion de l'eau du Luxembourg =
- Division de l'hydrologie/Servie régional sud (Cours d'eau, inondations, renaturations, franchissabilité biologique…)
- Division de la protection des eaux (Stations d'épurations, rétention des eaux pluviales)
- Division des eaux potables et eaux souterraines

[68] For instance : SIACH : Syndicat intercommunal pour l'assainissement du bassin de la Chiers (wastewater) ; SES : Syndicat des eaux du Sud (drinking water) ; SICONA-Ouest : Syndicat Intercommunal de l'Ouest pour la Conservation de la Nature (river restoration)

[69] The Communauté d'Agglomération de Charleville Mézières (FR) has expressed interest to work on improving the infiltration of soils.

[70] Profish provides solutions to study fish population and fish ecology : they have expressed an interest in MICCA

[71] See for example "reseau entreprendre wallonie" : https://www.reseau-entreprendre.org/wallonie/soutenir/

[72] See for example : https://www.wallonie-developpement.be/

5.4.3. Students and young professionals

To date, there is no "Mosan network" created by students or young professionals. Examples from neighbor river basins are given below, as MICCA could support the development of such groups.

Scheldt Youth Parliament

The Scheldt Youth Parliament[73] is a network of students living or studying on the Scheldt river district, interested in the topics of water management. The Youth Parliament members can propose their vision of water management and support actions to inform the young generations. A plenary session is organized every two years. The Youth Parliament is an official observer to the International Scheldt Commission. It exists since 2007.

Youth for the Rhine

Youth for the Rhine[74] is a youth-led initiative intended to motivate younger generations across the Rhine Basin in thinking about and addressing one of Europe's major societal issues: climate adaptation and the diverse issues of water, food, and energy. The network is quite active on social media. It has been created in 2020.

Master of Sciences on River Delta Development

This Master[75] is hosted by three Dutch universities: HZ University of Applied Sciences (coastal regions), Van Hall Larenstein University of Applied Sciences (river systems), and Rotterdam University of Applied Sciences (urban water).

Other relevant programs from universities can also be mentioned, for example the Meuse is part of the **River Commons**[76] project at the Wageningen University and Research. Finally, the **European Junior Water Program**[77], though not limited to the Meuse catchment, could support traineeships for young professionals on water & climate change issues.

5.4.4. Citizens

Citizens are more and more willing to get engaged on environmental issues. There are no known citizens associations on the Meuse catchment with an international dimension, though local action groups (for instance: flood victims' groups, children education initiatives, volunteers for river clean-ups, etc.). Some initiatives are being launched at the European or worldwide scale on water resources: MICCA could support a Mosan transposition of these initiatives (i.e., the Big Jump[78], the water runs, etc.). Citizen-science is also becoming more and more popular with the help of numerical devices and social media: see for example the citizens observatories on climate evolution (SAGE Ferrifère[79]).

[73] https://www.facebook.com/ScheldtYouthParliament/
[74] https://www.youthfortherhine.org/
[75] https://hz.nl/opleidingen/river-delta-development#Programme
[76] https://www.wur.nl/en/project/River-Commons.htm
[77] https://juniorwaterprogramme.eu/#:~:text=The%20European%20Junior%20Water%20Programme,projects%20for%20resilient%20water%20management.
[78] https://www.bigjump.org/fr/
[79] https://sagebassinferrifere.grandest.fr/observatoire-citoyen-evolution-du-climat/

6. Strategy to mobilize additional stakeholders

6.1. Main findings and challenges to overcome

The description of stakeholders and their dynamics under chapter 5 as well as comments collected through the online survey, yield four major observations:

- Most stakeholders still act on their own initiative and under their own agenda. Thanks to active cross border relations as well as international networks, they inform each other about the forementioned initiatives. However, the depth of interaction hardly reaches beyond information (the information being shared after a study has been carried out, after a project has been launched). Most initiatives still lack a true joint effort and an early-on discussion with stakeholders from the other countries.
- The mandatory coordination is ensured through the International Meuse Commission, namely the drafting of water management plans and their implementation under the Water Framework Directive and the Flood Directive. However, there is no coordination and even less cooperation regarding climate change mitigation or adaptation plans. The climate strategies have been written independently by each region or country, preventing any possible synergies or solidarity across the Meuse river basin.
- The stakeholders struggle to have a comprehensive view of roles and responsibilities regarding water & climate change issues in the other countries of the Meuse. This lack of overview seems to be the major barrier to an improved cooperation. Language barriers explain this difficulty to understand each country's internal organization (most institutional websites are only available in the country's language). Language barriers also prevents practitioners from attending meetings or conferences, communicating to and learning from their counterparts. Frequent changes in the institutional landscape are also creating confusion as to who is responsible for what on which territory. The recent GEMAPI law in France (law for the management of aquatic ecosystems and prevention of floods) has significantly changed the responsibilities, led to the disappearance of smaller organizations as well as the extension of the perimeter of intervention of the remaining ones.
- Means are limited, especially in the public organizations. Financial means are restricted and prioritized and each organization needs to be fully convinced of the usefulness and efficiency of a project before committing public funds. As the MICCA agenda is still under discussion, the participants have trouble convincing their superiors to engage money into the initiative. In addition, many organizations operate on a yearly budget and no extra fund can be obtained in 2022 if it had not been negotiated in 2021. Human means are also limited, with more and more tasks or projects being assigned to individuals: for many participants in MICCA up to now, climate change is an extra topic on top of their core expertise (hydraulics, water quality, basin management, dam management, etc.). This explains the heterogeneity and irregularity in the attendance to the monthly online meetings of the think-tank as well as the low commitment level on extra activities. Also, NGOs, trusts, students or citizens, do not have any dedicated means to be involved in MICCA – on the contrary, their active participation would require subsidies or donations.

6.2. A three-scale mobilization strategy

There are three levels of involvement of Mosan stakeholders in MICCA (see Figure 8):

1- Strong involvement (the "core group") with a regular participation to the monthly meetings, proposition of agenda points, frequent contacts with EPAMA and willingness to participate in future activities of the network. This group knows about MICCA and the consultants' work, they have a good enough understanding of "water & climate change" related issues, projects and stakeholders, and – most importantly – they have expectations as to the becoming of MICCA. This core group shall not be left aside or overlooked when seeking additional members. They have supported MICCA from the start and their continuous engagement shall be accounted for.

➔ **It is proposed that this group is kept closely associated to all developments related to MICCA** (the Interreg project, the stakeholders' workshop, the evolution of the network's status or the activity plan). **The monthly meetings shall be maintained throughout 2022 to share updates on the consultants' work. The group shall be invited to take an active role along EPAMA in the upcoming activities. The opinions of these participants on MICCA's evolutions shall be considered with great attention.**

2- Stakeholders already in the contact lists of EPAMA and invited to the monthly meetings of the think-tank, but unable or unwilling to take part. These actors are water managers on the Meuse catchment and may already be involved in other professional networks or in the IMC. Some of them have declared that they read the think-tank's meetings' minutes but cannot participate. This group is aware of the existence of MICCA, however, their understanding of its ambitions and current activities might not be thorough, which prevents them from seeing the opportunity for their organization to commit more. For this group, joining-in the MICCA monthly meetings is a barrier as the discussions are on-going.

➔ **Bilateral discussions are recommended in order to take the time to present MICCA as well as the main organizations presently active in the network. It would also be an opportunity to hear out their needs and wishes and discuss how MICCA could benefit them. A way should be found for them to step in the initiative** (via the monthly meetings, the workshops or other mean to be agreed upon).

3- The missing stakeholders (see chapter 5.4) which are not yet aware of MICCA. In these organizations, a contact person has not been identified (or the contact point has changed). This group gathers organizations that are not directly related to water & climate change issues (but to other topics: biodiversity, energy, transports, agriculture, urbanism, …) or that are not professionals (students & citizens). The MICCA current functioning (monthly online meetings and email exchanges in English), the topics discussed and the scale of work (international basin) have been barriers so far. On the other hand, it might not be strategic to involve everyone at once and to multiply the tasks of MICCA to reach out to all stakeholders in an early stage. As the MICCA goals and missions will progressively be narrowed down, it will become easier to identify who are the relevant members in the "missing stakeholders" list, and to put in place dedicated actions to associate them.

➔ **It is recommended to reach out to targeted stakeholders only when more tangible activities have been agreed upon. A first list can be mobilized early-on in relation with the Interreg proposal's topic. Other contacts can be made in a later stage once MICCA has taken shape. In the meantime, opportunities to network will be grasped** (participation to events or fairs, handing-out the MICCA flyer, answering spontaneous queries, etc.).

The strategy of mobilization can unfold over three time periods:

- **1st semester 2022**:
  During this semester, the Interreg proposal will be drafted (first stage) and a partnership set up. The partnership will stem from MICCA core group and additional partners will be sought who have the capacity to carry-out investments on the Meuse catchment. Several workshops are also planned to further discuss the goals and missions of MICCA, the core group and the MICCA contacts will be invited to participate. Finally, ProgramBureau Maas is organizing a Meuse rendezvous dedicated to water managers across the Meuse catchment, which will be an opportunity to meet bilaterally with potential MICCA members. A MICCA flyer is being developed to support the networking and advertising the initiative.

- **2nd semester 2022:**
  On the second semester, discussions will continue regarding the Mosan network status and action plan. More and more stakeholders will be contacted and invited to join as the scope of the network is defined (both MICCA contacts and new contacts depending on the MICCA list of activities). The aim is to agree on a MICCA governance, budget and action plan by the end of the year. In parallel, the Interreg proposal will reach second stage and the project be further developed.

- **2023 and beyond:**
  The action plan of MICCA will unfold and the "missing stakeholders" will be more directly approached so the network grows bigger with time. The Interreg project, if successful, will be implemented, some of his results supporting the MICCA initiative.

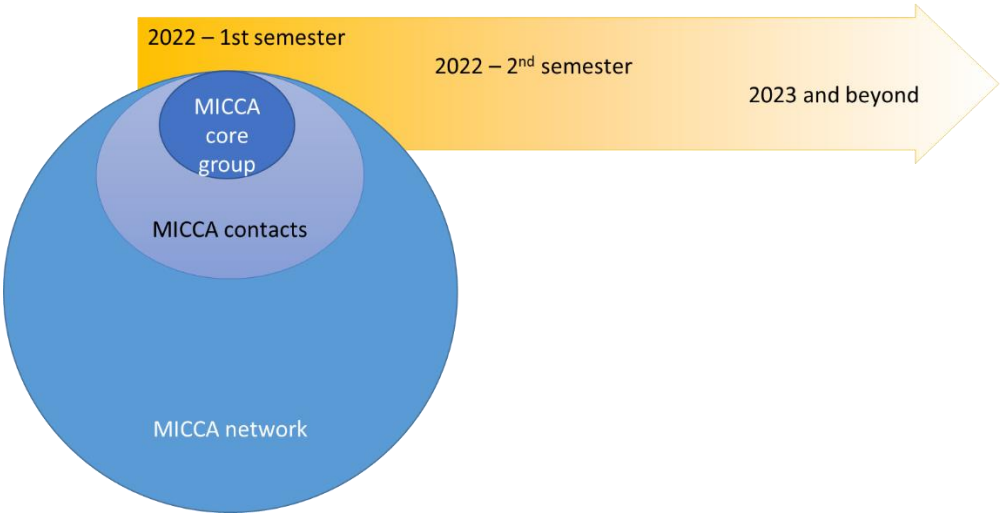


Figure 10. Visualization of the stakeholders' mobilization 3-scales strategy

6.3. Impacts on missions 1 – 2 – 3 – 4 of the consultants' work

Under **mission 1**, the following tasks are performed to support the mobilization strategy during the 1st semester 2022:

- Production of a MICCA flyer in English and in French, sent in PDF to all MICCA contacts and used during the Meuse rendezvous
- Printing the stakeholders' maps for the Meuse rendezvous
- Meeting the Walloon region

The Walloon Region had been contacted early on regarding MICCA but declined an active participation in the GRCC as long as the missions, budget and status have not yet been decided. The Region could not commit itself on an uncertain evolution of the Mosan network. Once progresses will be made, a meeting can be requested with the Walloon Region to present the network and assess whether it would meet the goals of the Region.

It is advised that the discussion includes not only EPAMA but other Mosan organizations such as: Region Grand Est, ProgramBureau Maas (representing the Dutch provinces) and Rijkswaterstaat. This would be a strong indication that the Mosan network has gained the approval of institutions on both sides of Wallonia and that they are also ready to commit themselves in the network's activities.

It will not be possible to compel the Walloon Region to get involved actively into MICCA activities. Two lesser roles can be discussed, to ensure that the Region is still informed about MICCA's activities and can decide at any time to take a bigger part in the discussions:

- Act as an observer in the future Mosan network, not being a member as such but receiving information about the network's activities and achievements (through a regular newsletter or an annual event for instance),
- Act as a funder for the other Walloon stakeholders actively involved in the Mosan network (Provinces[80], river contracts, universities, associations, …). It would then be up to the beneficiary of the Walloon Region's subsidies to report back the progresses.

Under **mission 2,** three workshops are planned as well as a session during the Meuse rendezvous:

- Workshop 1 on 11th January 2022 to discuss MICCA's objectives
- Workshop 2 on 22nd February 2022 to discussion MICCA's missions
- Meuse rendezvous on May 12th to promote the initiative
- Workshop 3 to be defined in autumn 2022 to:
    - Clarify the legal status of the Mosan network
    - State clearly the missions of the network and priority topics
    - Clarify a core group of members as well as the target groups to work with

These three objectives are linked: the missions of the network will determine the appropriate status, the status will determine which organizations can be part of the network, the members will decide on the missions and topics they want to focus on.

Under **mission 3**, bilateral interviews will be conducted with stakeholders that are currently implementing (or plan to implement) measures to adapt to climate change in order to build a catalogue. These bilateral interviews will jointly promote MICCA and gather information on current or planned actions on the Meuse catchment.

Under **mission 4**, the first stage proposal will be drafted making use of contacts gathered under mission 1 as well as preliminary results on MICCA's scope from the January and February workshops (mission

[80] The Province of Luxembourg has contacted EPAMA in spring 2022 to prepare the organization of its *Assises de l'Eau* (Water Sessions).

2) and the developing catalogue of measures to adapt to climate change (mission 3). Dedicated meetings for the Interreg project's partnership will run in parallel to the GRCC think-tank but the think-tank will be kept informed on a monthly basis. The 1st stage proposal shall be submitted by June 15th. The second stage is planned for the end of the year 2022.

7. Annexes

Annex 1 – History of discussions among the Meuse stakeholders leading to MICCA

Adaptation to climate change initiative International Meuse watershed

06.10.2020

The Mosan observatory for climate change action: a great opportunity to meet international needs

The idea of this initiative came up after several meetings with the climate change working group over the past few months; This group meets once a month and highlighted the need for common knowledge in the watershed. Within this circle scientific observatory projects in France and Spain were presented. Their characteristics fit also Mosan needs: collection of data, promotion of dialogue, evaluation of impacts, etc. As such, the creation of a ***Mosan observatory for climate change*** *appears to be a great start in order to foster the implementation of climate change actions in the future.*

This document provides a brief summary of the different meetings that took place so far and how the project will continue.

September 5 - 2019

Presentation of regional and national climate change adaptation plans:

- Identification of shared bottlenecks with regard to climate change
- Exchange about priorities that Mosan countries and regions have in common

November 27 - 2019

The second workshop was dedicated to gathering knowledge and sharing information. The participants presented projects and studies that were carried out in the Meuse countries. Participants agreed on the fact to work on a Meuse-broad project.

The project idea “Blue Zone Communities in the International Meuse basin” was presented. « Blue zones » are worldwide areas where people live longer than the average and the goal would be to improve the way of living in the Meuse watershed (health, food, water presence, circular economy, etc.). The participants welcome the holistic and inspiring approach of this project idea but also consider that this needs the participation of the whole society. Participants don’t feel having the necessary skills to develop this type of project (very broad and health oriented).

Nevertheless, the idea of a **« water-impact oriented approach »** comes up.

April 23 - 2020

The results of workshop 2 have been elaborated by EPAMA in a project proposal. This proposal underlines the need to make available knowledge accessible and usable on a larger scale. This would be the first step to **making findings acceptable by all countries and stakeholders**. This proposal goes much further and proposes to start a prospective work to develop a cross-cutting approach to climate change for the Meuse.

In addition to this, a proposal was submitted by RIWA focusing on mapping the demand for and availability of water now and in future. This is a 3 steps approach charting the contributions from the tributaries, mapping of usage and distribution of available Meuse water during periods of low river discharge and finally mapping the effects of projected climate changes on the discharges of the tributaries.

May 6 - 2020

In this meeting it is discussed how the proposals mentioned above can be combined and which priorities should be set. The group agrees that "**we cannot do everything**."

It is discussed which questions should be worked on as a matter of priority, so what the project should focus on:

- Gathering knowledge (to create a collective and shared view)
- Communication between countries and stakeholders (common vision)
- Governance (need for new structures, need for additional agreements?)
- Implementation of action is urgent

Gathering of action ideas …….

- assess the potential of optimized management of existing infrastructures,
- prefer nature-based solutions and foster healthy ecosystems,
- identify nature friendly solutions for water retention measures,
- implement water saving measures on large scale,
- artificial recharge of water bodies,
- improve communication and information between countries, but also between stakeholders, who's adapting how to low flow

June 2 - 2020

In this meeting the **focus of the project** is discussed:

- *Bring together available knowledge.* The aim is not to conduct new research, but to make existing knowledge accessible and acceptable.
- *Communication.* This part focuses on "joint fact-finding" and the facilitation of consultation to this end. Help decision-making.
- *Governance / decision-making*. We want to determine who the decision-making forces are within the Meuse region, which mandate lies where, and which political agenda could, or might not be, helpful

Short introduction of AcclimaTerra project in France, a scientific committee on climate change for the region Nouvelle-Aquitaine. Suggestion to present this project and similar ones at the meeting in July in order to see what could be adapted to the Meuse watershed.

Idea of hiring a consultant to help frame the project. Stakeholders have different priorities. The project needs an innovative approach in order to meet transnational needs regarding adaptation to climate change.

July 7 - 2020

Presentation of three climate change initiatives working with scientific committee and observatories. This highlighted that the creation of a scientific committee or an observatory could be an answer to the initial Mosan need →share and accept mutual findings. Sharing of two working documents: one gathering questions to work on, the other concerning the specifications for hiring a consultant (to sharpen the project) and/or writer (to translate the project into Eu-call language)

A general, but important question came up during this meeting:

How determine the "desirable future" for the whole watershed?

September 1st 2020

Presentation of a three steps initiative, based on the previous documents, gathering of potential needs regarding the building of an adaptation strategy for the Mosan International watershed. The idea is the creation of a scientific observatory (I), development of a global study regarding the impact of climate change on water uses including environmental needs (II), building of a political network regarding climate change adaptation in the region (III).

The first step would be the observatory because if we don't have shared knowledge, we cannot build a concerted action on adaptation to climate change in the future.

The next step is now to hire a consultant to help getting the project, and particularly the observatory sharper:

- work on the missions,
- make the link with implementation of action
- identify possible forms (new structure or different committees for example)
- work on the governance,
- identify the relevant partners (partnership)
- financing opportunities for the observatory

Once this part is decided, it would be good to work with a writer who can help putting the project into EU-call language.

Agenda :

<table>
<tr><td>October 2020</td><td>November 2020</td><td>December 2020</td><td>January 2021</td><td>February 2021</td><td>March 2021</td><td>April 2021</td><td>May 2021</td><td>June 2021</td><td>.....</td><td>January 2022</td></tr>
<tr><td></td><td></td><td colspan="4">work with consultant</td><td>writer for call</td><td colspan="3"></td></tr>
<tr><td>Specifications consultant</td><td>Choose consultant</td><td colspan="4">consultant :
Sharpen project,
Confirm needs, identify partners, funding opportunities,
organize meetings, workshops</td><td>Project objective, Governance & partnership</td><td>writer</td><td>writer</td><td colspan="2">EU funding decision : 1 or 2 steps</td></tr>
<tr><td>Meeting 06.10.2020 presentation initiative</td><td>Project outline</td><td>Presentation IMC 10.12.2020</td><td></td><td></td><td></td><td>Hire writer</td><td colspan="2">Write EU proposal</td><td></td><td>Project start</td></tr>
<tr><td colspan="3">Budget 2021 preparation in our organizations</td><td></td><td>EU objectives</td><td>EU calls</td><td>EU calls</td><td></td><td>Deadline proposal</td><td></td><td></td></tr>
</table>

Annex 2 – References provided by EPAMA

Table 4. List of documents

source	name	format	what is it about?	language
EPAMA	Questions to precise the mosan observatory project	Google Docs	exchange within the MICCA group about opportunity to create an observatory	EN
EPAMA	Questions to precise the mosan observatory project	excel		EN
EPAMA	MICCA_who_is_who_v1	pdf	doc to prepare who-is-who online survey (fom discussion within GRCC discussion)	
EPAMA	MICCA_who_does_what_Meuse_watershed_INVENTORY_v1_210930	excel		
EPAMA	200825_Presentation_Initiative_Mosane_Adaptation_CC_EPAMA	pdf	outcomes GRCC 2019/2020 - observatory idea	
EPAMA - GRCC	201008_Mosan_initiative_climate_change_action_GTHi_EPAMA	pdf	short information shared with the Hydrology/Inundation working group of International Maas commission (CIM)	EN
EPAMA	200626_CC_Questions_to_work_on_v1	doc		EN
EPAMA	2016_etude_gouvernance_Fiches_acteurs_EPAMA_vf	excel	Governance study of EPAMA - carried-out prior to GEMAPI law	FR
EPAMA	CR_Rencontre_EPCI_Mars_2017_v.def	pdf	Governance study of EPAMA - carried-out for GEMAPI implementation	FR
EPAMA	2016_EPAMA_Cartographie des competences_13-12-2016	excel	Governance study on the French river basin - stakeholders and their roles	
EPAMA	2016_EPAMA_Cartographie des actions_21-03-2017	excel	Governance study on the French river basin - actions	FR
EPAMA	EPAMA-EPTB_membres_mars2020_v2	jpeg		
EPAMA	EPAMA-EPTB_delegation_projet_2021	pdf		
EPAMA	dossier : rapports d'activités 2015 à 2020	pdf	Annual reports 2015-2020	FR
EPAMA	MICCA meeting minutes			
EPAMA	folder : MICCA presentations workshop 1 and 2			
EPAMA	MAPA2021_005_CCTP_EN			
GRCC idea	190905_BleuZe Meuse Project - idea for Interreg VI - EVK - 2019-09-09	doc	this project idea is based on the blue zones "where people live very old"	
EPAMA - Transf'eau	A101a_besoins_outil_communication_compliation_des_reponses_aux_questionnaires_ateliersLibramont_enligne	pdf	survey targeted to the river managers and technicians for the project TRANSF'eau : transboundary network for water, from 2017 and 2019 with 3 river contracts in Wallonia	FR
EPAMA - Tranf'eau	folder : ateliers franco-wallon par sous bassin versant ou par thématique	pdf	Meeting of walloon and french stakeholders, to discuss the Meuse tributaries and shared topics	FR
CIM/CIE	20181018_mf_synthse_CIE_CIM_v3_f_ateliers_20ans	pdf	summary of the workshops in Charleville, organized for the celebration of 20 years of IMC	FR exists in NL/DE
EPAMA/RGE	200827_CC_propositions_actions_BenoitGrandmougin	pdf	échange courriel avec Région Grand Est - liste d'actions	
CIM	8_Rapport-annuel-2020-mep_Mregie_21_3rev2_f__	pdf	Rapport annuel 2020 de la CIM	FR exists in NL/DE
CIM	2020_CR_pleniere_CIM_EXTRAIT	pdf	extrait pleniere 2020	
EPAMA	170316_contactsLuxChiers	pdf	acteurs aux Luxembourg	

Table 5. List of initiatives

source	name	format	what is it about?	language
EPAMA	2020_MICCA_Tableau_ActionsACC_FR_annexe	EXCEL	CC initatives and contacts, actions but more mitigation and only few water topics	FR
EPAMA	2020_Benchmark_Sructures_Transfrontalieres	doc	benchmark of boundary / political forces in the watershed and examples beyond	FR
EPAMA	Acclima Terra_EN-1	pdf	summary by EPAMA of the AcclimaTerra report	EN
RIWA for GRCC	200506_draft_structure_for_Ccproject	doc	discussion within GRCC to identify important questions to work on	EN
	200707_Presentation AcclimaTerra_ENG			EN
	200707_OPCC_EPAMA-Meuse-070720_presentation		ppt presentation given by OPCC, Pyrenean Observatory on Climate Change	EN
	200707_OPCC_Presentation_EN		summary by EPAMA in EN of the OPCC presentation	EN
	Adour2050_Presentation_EN		summary by EPAMA in EN of the Adour 2050 initiative	EN
	AcclimaTerra_summary_EPAMA			
Acclima Terra	Acclima Terra Anticipating CC - short report	link	AcclimaTerra : Comité Scientifique Régional sur le Changement Climatique - official report in English	EN
RIWA	RIWA_Briefing note Meuse Symposium October 2019	pdf	meeting organized by RIWA in Maastricht for waterstakeholders with important needs (powerplants, drinkging water, navigation, Industry, managers)	EN
Deltares/Ulg	International Meuse Symposium	pdf	210921_International_Meuse_Symposium_Bernhard_Becker_plenary_discussion_outcomes_menti_meter	EN
EPTB Charente	Prospective_Charente2050_Livret methode	PDF	example of adaptation method	FR
Oieau/MTES	Journée techniques "solutions fondées sur la nature" du MTES	lien	examples in France of "nature-based-solutions" (NBS)	FR
ICE	Presentation Youth parliament Scheldt/Escaut	pdf		EN
DRE	Dam Removal Europe : online survey	link	survey from "Dam Removal Europe " to identify actions	EN
NL	2021_Enqueteresultaten_Grenswateren_Maasregio	doc	Online survey from Provincie Brabant to prepare Meuse Rendez-vous	EN
FR	Rapport_MISEN03_2021_fiche_ZH	pdf	Priority actions of the MISEN (interministerial mission on water and nature) 2020 report (Vosges department)	FR
FR	retour_GT1_ZH	pdf	Action 20 of the Vosges MISEN : preservation of wetlands, dampers of CC, against urban sprawl	FR

source	name	format	what is it about?	language
FR			GRACC - groupe de reflexion CC du Grand Est est une initiative de la Région, de l'ADEME et de la DREAL. Ce groupe d'achange se réuni deux à trois fois par an et s'informe sur différentes thématiques et initiatives autour du CC. Il n'y a pas de compte rendu des échanges, seulement des ateliers. Le dernier était sur la fôret/bois et a eu lieu début Octobre.	
FR			Initiative de l'Ardenne transfrontalier	
FR	fleuve sans plastique		Initiative pour lutter dans les territoires contre la pollution plastiques / initiative à destination des maires et présidents des villes de grands fleuves français (campagne de signature de charte d'engagement) https://www.fleuve-sans-plastique.fr/la-charte/	
NL	LIVES - Litter free rivers and streams		Litter free rivers and streams - projet INTERREG Euregio qui se termine actuellement - concerne directement la Meuse comme territoire d'expérimentation et d'étude	NL/DE/ FR/EN
EN	UNECE environment policy		https://unece.org/environment-policy/water/areas-work-convention/water-allocation-transboundary-context	
EN	UNECE environment policy - main messages		https://unece.org/sites/default/files/2021-12/MAIN_MESSAGES.pdf	
FR	ARMUE : L'ARMUE est l'Association pour le Bassin Rhin-Meuse des industriels Utilisateurs d'Eau. Elle regroupe sur ce bassin hydrographique tous les industriels utilisateurs d'eau, sans aucune distinction d'activité et sans critère de taille.		Regroupant plus de 100 adhérents, l'ARMUE a une triple mission : - Représenter les industriels utilisateurs d'eau auprès des pouvoirs publics (DREAL, Agence de l'Eau, Comité de Bassin, Commissions Locales de l'Eau, etc…) - Informer ses membres quant aux dispositifs locaux liés à la gestion de l'eau - Accompagner les chefs d'entreprise sur une thématique juridique ou fiscale se rapportant à la question de l'eau.	
FR	SCOT Nord Ardennes - élaboration du document		Pour le Syndicat Mixte du SCoT Nord-Ardennes Communauté de Communes 29 rue Méhul 08600 GIVET Tél : 03.24.41.50.90	
FR	PCAET Nord Ardennes			

Table 6. List of projects or studies

source	name	format	what is it about?	language
INRAE	CHIMERE21	pdf	ppt presentation during MICCA meeting- CC study : hydrology French Meuse	EN
INRAE	CHIMERE 21 - rapport final	lien	CC study : hydrology French Meuse	FR
RWS	joint sediment study	pdf		EN
RIWA	RIBASIM_Maas_balance_Model	pdf		EN
Deltares	RIBASIM - RIverBAsinSImulation Model	link	link to model	
INRAE	CHIMERE21- naturalisation des débits dans le BV de la Meuse	link		FR
REANE	210830_REANE_Deraccordement_ph1_eaux_pluie			FR
EPAMA			Sediment Study on French Watershed	FR
CIM	Plan d'approche pour la gestion des étiages exceptionnels dans le bassin versant de la Meuse	link	Low-flow management scheme on the international Meuse river basin	FR EN
AERM / Comité de bassin	Climate change adaptation and mitigation plan for water resources	link	Plan from the wateragency of the French part of the Meuse	EN
Region Grand Est	2020_etude_Region_ressources-en-eau_ppt_RGE	pdf	prospective study aimed at evaluating the quantitative status of water resources" , Work is ongoing - contact at Region Grand Est	EN
EPAMA	150529_VF_Exhaustive assessment of stakes dealing with water quality	excel	this questionnaire was realized for a project called "Rur-Meuse" about futur water demand in the catchment	EN
EPAMA	150529__FINAL_answers_Exhaustive assessment of stakes dealing with water quality. - Google Forms	pdf	project called "Rur-Meuse" about futur water demand in the catchment	EN
EPAMA	1506_Report_Stakes_Assessment_Epama_EN_vf	pdf	report "Rur-Meuse linkage" about futur water demand in the catchment -	EN
AWTH / Ulg	Report "Future drinking water demand_Final" and "Report_Rur_Meuse_Linkage_Submit"	pdf	results of research on water demand by RWTH and Ulg	EN
RWS	Development of a joint low-water management model	info	At the initiative of Wallonia, the development of a joint low-water management model has been started, which would support water management in this complex area of the three countries / region (Wallonia, Flanders, Netherlands), and the implementation of a trilateral agreement. The required measurement have already been performed. Data is collected and analyzed. According to the schedule, the entire model would be operational in 2020, but it may be later.	EN
REANE	rain infiltration measures	pdf	study about on site rain infiltration (étude de déraccordement des eaux pluviales)	FR
Ardenne Metropole	rain infiltration measures	info	study about on site rain infiltration (étude de déraccordement des e aux pluviales)	FR

Annex 3 – Online survey questionnaire

Introduction

The objective of this survey is to identify stakeholders involved in water management, aquatic biodiversity protection, and/or climate change policies and strategies, as well as interests and ways to collaborate on the topic of "water & climate change" in the international Meuse watershed.

Your data will only be used for the aim of the Mosan Initiative for Climate Change Action (MICCA) and will not be kept nor shared for any other purpose. Filling this form will take about 15 minutes of your time.

By filling in this online survey you agree that we use the information from the survey (including your personal data) for the purpose of the Mosan Initiative for Climate Change Action.

The survey is divided in 6 parts:

1/ Who are you?

2/ Water & climate change: issues you experience,

3/ Water & climate change: initiatives you know or see,

4/ Water & climate change: which stakeholders are essential in the process,

5/ Water & climate change: actions that should be taken, in your opinion

6/ The Mosan Initiative on Climate Change action.

Do not hesitate to come back to us if you have any questions and to share this online survey with colleagues or stakeholders who you think could be interested in the initiative.

In advance, many thanks for your time and interest.

I – Who are you?

1. Yourself:

Name and surname	Position in your organisation	Contact details (mail and telephone)

2. Your organisation:

Name	Type of organisation (academic, public authority, private organisation, NGO)	WebLink

3. Location of your organisation:

- Enter zip code

4. At which scale do you mainly work?

List:

- land/country
- province
- watershed
- sub-watershed
- municipality/urban area
- Other scale, please specify:

II – Water & climate change: issues

5. Which are, according to you, the most important negative impacts posed by climate change in the international Meuse watershed (one answer per line)?

	High impact	Moderate impact	Low impact	No impact	I don't know
Flooding, extreme rainfalls					
Marine submersions					
Drought, lack of water					
Heatwaves					
Shrinkage-swelling of clays					
Erosion, ground movement					
Modification of rainfall patterns					
Loss of aquatic biodiversity					
Change of land-use					
Impact on water quality					
Sanitary crisis					
Increased water demand					
Increased energy demand					
Navigation problems (low water levels)					
Other, please specify:					

6. Which are, according to you, the main positive impacts posed by climate change in the international Meuse watershed (one answer per line)?

	High level of opportunity	Moderate level of opportunity	Low level of opportunity	No opportunities	I don't know
Milder climate: less heating during winter					
Milder climate: higher crop yields (for some crops)					
Milder climate: better conditions for new crops					
Milder climate: opportunities for tourism					
Other, please specify:					

III – Water & climate change: initiatives

"Water & climate change initiatives" may for example refer to: nature-based solutions for flood protection, rainwater management by local infiltration, water saving measures, wetland preservation, etc. (this list is not exhaustive).

7. Is your organisation involved in ongoing or planned initiatives addressing water & climate change issues, within the international Meuse watershed (e.g., academic research, studies, monitoring, on-site works, programs and plans, regulations, etc.)?
Select: Yes / No.

8. Do you know of any initiatives addressing water & climate change issues, within the international Meuse watershed?
Select: Yes / No

9. Do you know of any inspiring initiatives addressing water & climate change issues, from nearby international basins (Scheldt, Rhine…) or any other international basins in the world?
Select: Yes / No

Comments on known initiatives:
Paragraph

If Yes Q7/8/9:

10. Would you agree to be reached through a short telephone call in order to discuss these initiatives?
Select: Yes / No

If Yes Q10:

11. Thank you for sharing contact details on how and when you prefer to be reached (telephone line, preferred schedule or days):
Paragraph

IV– Water & climate change: stakeholders

12. According to you, which entities have a crucial role (and which one) in addressing water & climate change issues in the international Meuse watershed?
Table to fill:

Entity	Country	Role (choose among: data provision, implementation of measures, policy-making, financing, communication, coordination, other, please specify …)
…		
…		

13. What part should citizens / inhabitants play in addressing climate change & water issues in the Meuse watershed?
Paragraph

14. Do you know of citizens / inhabitants' initiatives related to climate change & water on the Meuse watershed? If yes, please specify.
Paragraph

V – Water & climate change actions that should be taken

15. What are your main areas of expertise?

	High expertise	Moderate expertise	Low expertise	No expertise
Water management (quality)				
Water management (quantity)				
Aquatic biodiversity protection				
Climate change (mitigation)				
Climate change (adaptation)				
Other, please specify:				

16. Are you interested to work on the following emerging topics?

	Very high interest	Moderate interest	Low interest	No interest
Water, CC and urban planning				
Water, CC and agriculture				
Water, CC and land use / infiltration measures				
Natural protections against floods and low water				
Water, CC and public procurement				
Other, please specify				

17. In your opinion, what should be done in priority to adapt the Meuse River basin to climate change?
Paragraph

18. Who should be responsible for implementing the above actions?
Paragraph

19. What organisation / cooperation should be strengthened or put in place in priority to implement or coordinate the above actions?

	High priority	Moderate priority	Low priority	No priority	I don't know
International Meuse commission (with State representatives)					
Research network					
Practitioners' network					
Association					
Informal group					
Other, please specify:					

VI – The Meuse Initiative on Climate Change Action (MICCA)

MICCA, the Mosan Initiative for Climate Change Action, aims at defining and implementing measures and actions for preparing the international Meuse watershed to the impacts of climate change but also to mitigate these impacts. The setting of an action-orientated stakeholder group is the first step of the MICCA.

20. Have you heard before about the Mosan Initiative for Climate Change Action?
Select Yes/No

If Yes Q20:

21. How have you already been involved with the Mosan Initiative for Climate Change Action?
Paragraph

22. Would you be interested to participate in the initiative?
Select: Yes / No / Maybe

If Yes / Maybe Q22:

23. Do you have expectations regarding the Mosan Initiative for Climate Change Action? Please elaborate: what could be interesting outputs from MICCA? What added value do you see of such an initiative?
Paragraph

If Yes / Maybe Q22:

24. What do you think are preconditions for it to be successful, including for keeping stakeholders interested in time?
Paragraph

If Yes / Maybe Q22:

25. What could be your inputs to such an initiative? Would you be willing to invest:

	As much investment as needed	Moderate investment	Low investment	I don't know
Time				
Money				
Knowledge				
Other, please specify:				

If No Q22:

26. Could you let us know why not?
Paragraph

27. Do you have anything more to add, concerning the Mosan Initiative for Climate Change Action or any of the topics above?
Paragraph

****

Thank you for your valuable contribution!

For more information or enquiries, please contact:

- Concerning the online survey: Camille PARROD, ACTeon, c.parrod

Concerning MICCA: Arnaud LIRIA, MICCA coordinator, EPAMA-EPTB Meuse (France), international@epama.fr

Annex 4 – Online survey results

1. Description of the survey sample

A total of **65 respondents** answered the survey. Their area of work is represented in the graph below (Figure 11). Half of the respondents is based in **France**; the other half is distributed mostly between **the Netherlands and Belgium**. Only 2% of the respondents work in Germany.

The majority (60%) are **public authorities**, the rest is shared between "other", academic, NGO and private organisations (Figure 12). Most of the respondents work either at **watershed or province levels**. Another quarter works at a sub-watershed level, the rest is distributed between national/land, municipality and "other" levels (Figure 13).

The **other types of organisations** include:

- French public establishments (5)
- Association / NGO (2)
- Research institute (1)
- Drinking water company (3)
- French local administration (1)
- International organisation (2)

The **other scales of work** include:

- Common Meuse (Belgian bank, approx. 50 km) (1)
- Associative structures intervening on a part of watercourse (1)
- French local administration intervening at a group of municipalities' level (3)
- International (2)
- Namur Province (1)

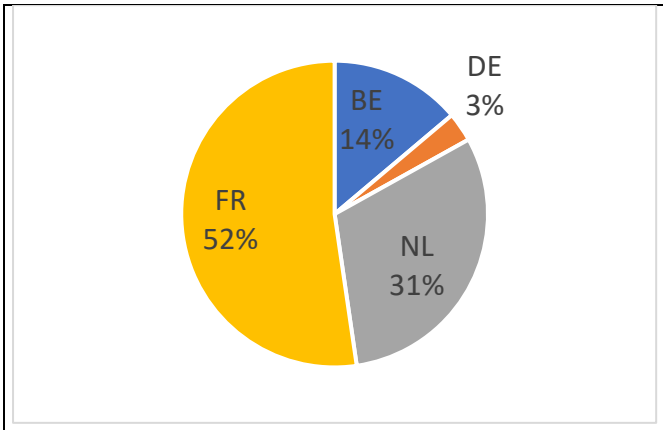


Figure 11. Countries represented

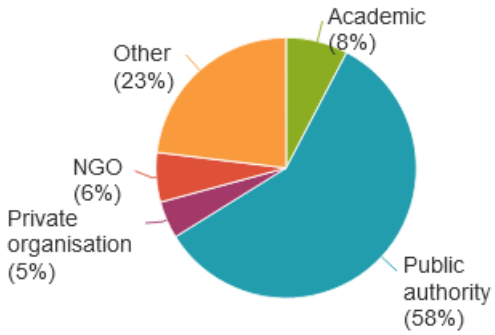


Figure 12. Types of organisations represented

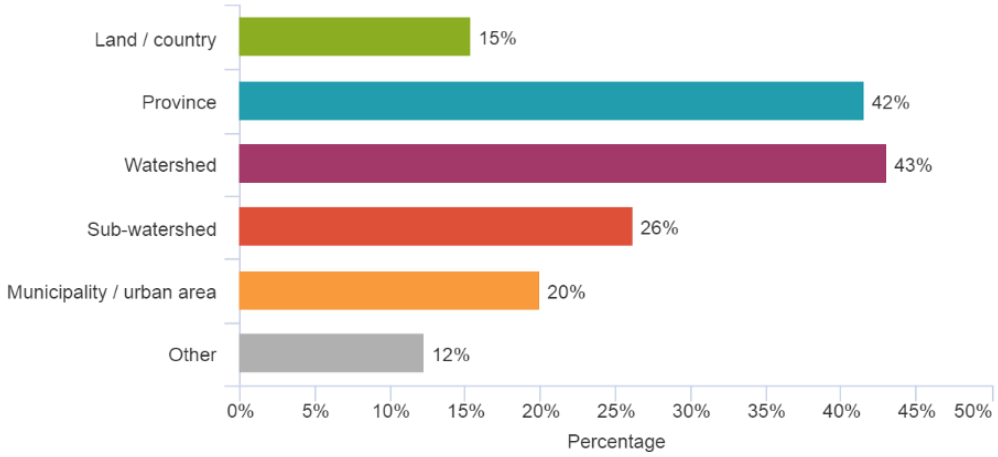


Figure 13. Scale of work

2. Flat sorting of responses from the total sample

For a flat sorting approach, we suggest going through the themes of the questionnaire:

- Issues experienced with regards to climate change impacts
- Known initiatives addressing water & climate change
- Perception of important stakeholders to act on water & climate change
- Actions that should be taken on the subject
- Reactions to the Mosan Initiative on Climate Change action

Issues related to climate change

Respondents were asked to hierarchize a series of negative as well as positive impacts of climate change. The results of the **negative impacts** are shown in the figure below.

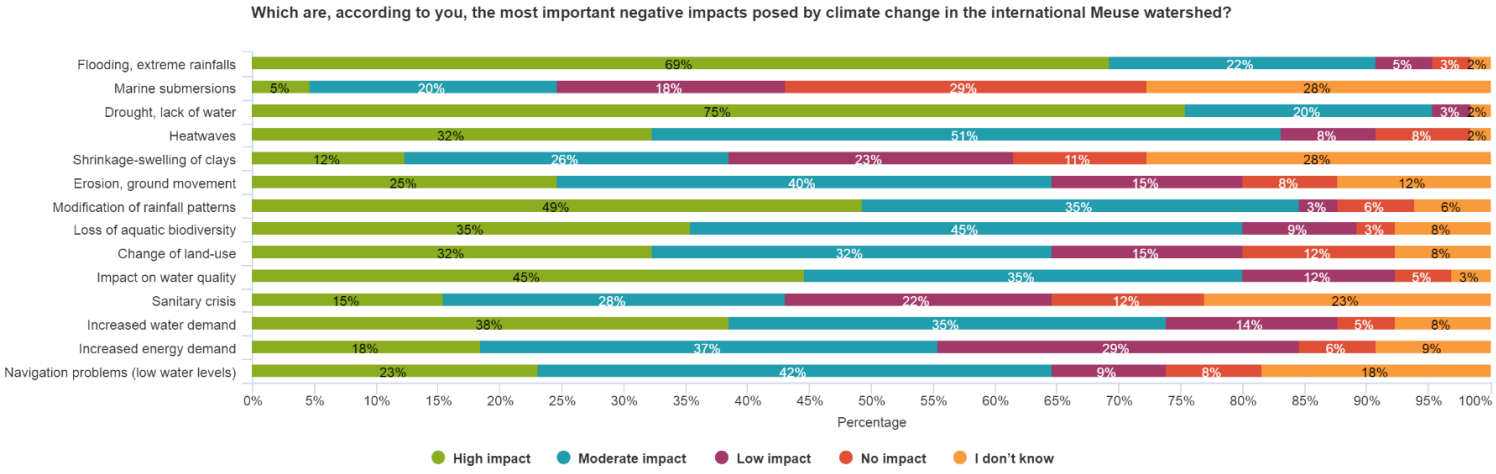


Figure 14. Most important negative impacts posed by climate change in the international Meuse watershed

We can see that the top three **high impacts** concern **drought & lack of water** (75% of responses in this category), **flooding & extreme rainfalls** (70%) and **modification of rainfall patterns** (50%).

The top three rates of combined "**low impact**", "**no impact**" and "**I don't know**" categories concern **marine submersions** (which is understandable as the surface of the Meuse international watershed is mostly inland, with a low percentage which is coastal), **shrinkage-swelling of clays** (which depends on the nature of the soil), and **sanitary crises** (which may be more pronounced at other scales such as urban or peri-urban scales, where the population density is higher or activities are more concentrated).

In the "**other negative impacts**" question, many responses refer to the links to:

- **Water uses** (agriculture, security), and how they are impacted by extreme events (drought, flooding, etc.), with risks of conflicts of use that arise
- Saltwater intrusion into aquifers (groundwater) and rivers (surface water) during low flow and drought situations, and general **quality issues** due to extreme events combined with human activities
- The loss of **terrestrial biodiversity** as well as aquatic, and the development of invasive alien species

- The evolution of **vegetation and forests**
- (human population) **Migration issues**, due to these impacts

One of the comments made is that the intensity of the impact depends on the **time horizon** which is considered (2030, 2050, 2100…). Indeed, the question did not specify whether the impacts considered were present or future.

The results of the **positive impacts** are shown in the figure below (Figure 15).

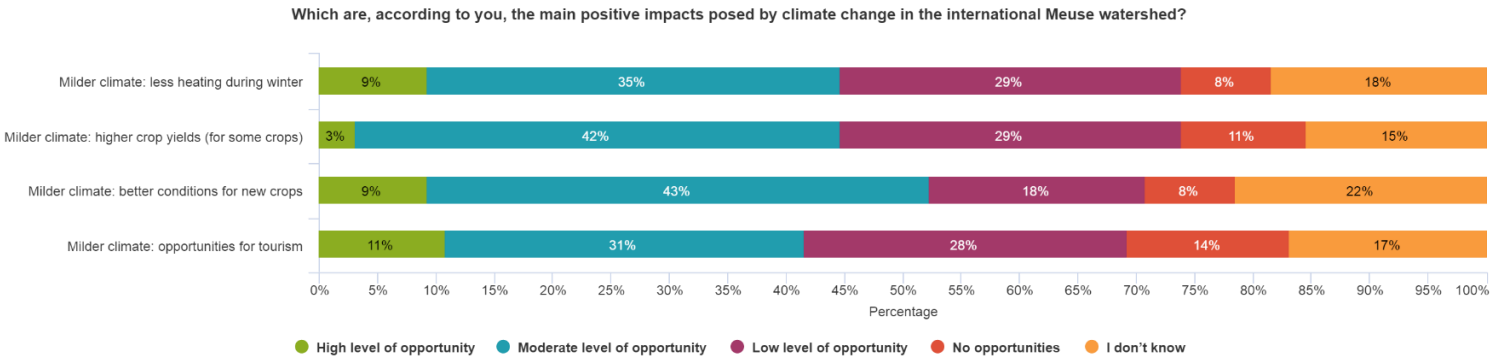


Figure 15. Most important positive impacts posed by climate change in the international Meuse watershed

Most levels of opportunity, all categories of impacts considered, are either **moderate or low**. None of the identified positive impacts stands out more than the others.

Some respondents consider that a milder climate either should not be seen as an opportunity but as a failure of public policies and collective action to limit global warming; or is counterbalanced by the negative effects. Others consider that it may be seen as an opportunity to raise consciousness for the need to act and a sense of urgency for cooperation.

Initiatives addressing water & climate change

Most respondents' organisations **are already involved in ongoing or planned initiatives** addressing water & climate change issues, within the Meuse watershed, at 90%. 75% of them know about other similar initiatives in the Meuse watershed, the remaining 25% doesn't.

When asked about initiatives from **other international basins**, 40% claim to know about inspiring initiatives. The known initiatives have been integrated into the list of on-going master plans and programs on water & climate change (mission 1), and the operational actions and measures in Mission 3.

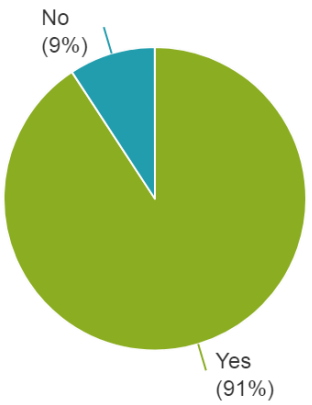


Figure 16. Organisations involved in water & climate change initiatives

Important stakeholders and their roles

The results from this question directly fed into the mapping of stakeholders and their roles (mission 1). Two questions concerned the part that citizens or inhabitants should play in addressing climate change & water issues in the Meuse watershed, and whether the respondent knew of any ongoing citizen initiatives.

According to the respondents, citizens or inhabitants should play a role by:

- shifting their **behavioral and consumption patterns** (e.g., have a reasoned use of water / energy / materials, manage the water of their plot directly, reuse rainwater for certain needs such as watering lawns, gardens, outdoor cleaning, be informed on the origin of the water which arrives at their tap, avoid certain discharges in domestic water, stop settling in the major riverbed without technical construction precautions, reduce soil sealing on their parcel, etc.),
- participating to **public decision-making** (e.g., by being “local data providers” and/or “climate witnesses”, or by participating to the public debate / public meetings and processes such as public consultations) and **pressuring** elected officials / institutions to take measures,
- **getting involved** in measures set up by local authorities and associations (water and energy savings, soil sealing, tree planting, waste recycling, etc.),
- **organising into group**s to have more leverage.

A prior condition is to have been informed and made aware of certain issues, for instance the impact of climate change on the hydrology of the Meuse, both high discharges and low discharges, and the associated risks.

Most respondents consider that the citizen / inhabitant must be the first actor in the chain of the fight against climate change and water problems but are only a small part of the solution.

One respondent thinks that the participation of residents in the current set-up of the MICCA collaboration is difficult, except for the importance of raising awareness of the possible consequences of climate change on water management in the Meuse basin and what societal impacts it can lead to (so it gets political attention).

Concerning citizen initiatives, 6 respondents mentioned the Drinkable Rivers initiative (though not directly aimed at climate change). Several other identified citizen initiatives for cleaning up waste after high water episodes (again, not directly linked to climate change).

Other initiatives were mentioned; however, they are not necessarily citizen initiatives, at the international Meuse level or linked to climate change action:

- HEBMA project (hydraulic and environmental development project), which was led by EPAMA in concertation with different stakeholders,
- Agroforestry project in Maxey-sur-Vaise,
- Central Limburg regarding designing dynamic flood defenses,
- "Eau qui mord" and collective "eau 88" in the Vosges, to preserve the water resources of the aquifer (exploited by Nestlé),
- Natagora association,
- The Covenant of Mayors.

What should be done

Respondents' areas of "high expertise" mostly relate to **water management (quantity)**. **Climate mitigation** is the area which has the highest low level of expertise and no expertise combined. Respondents consider having a moderate level of expertise on all the themes of the questionnaire (Figure 17).

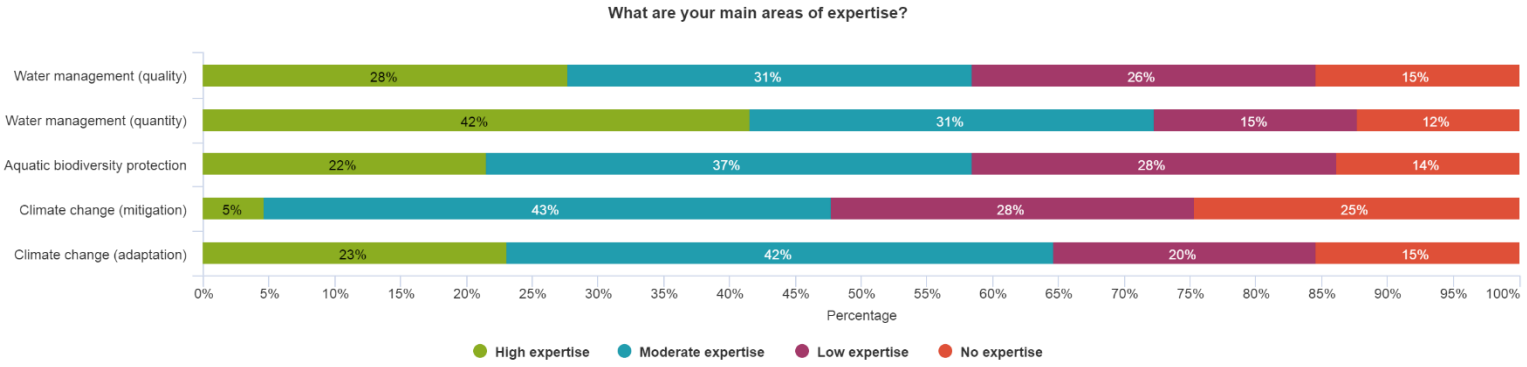


Figure 17.Respondents' main areas of expertise

Other areas of expertise include agriculture (linked with hydrology), drinking water production, waste service management, hydroelectricity production and urban planning.

Types of activities were mentioned such as international cooperation, project management, breeding, GIS, data processing, environmental modelling, public participation, as well as **disciplines** (civil engineering, geochemistry, environmental chemistry, ecotoxicology, ecology, hydrology, hydromorphology, interdisciplinary approaches, NBS…).

A high level of interest (65%) was expressed regarding **natural protections against floods and low water**, followed by water, CC and **land use / infiltration measures** (Figure 18). Water, CC and public procurement was the emerging topics which collected the least interest by the respondents, although

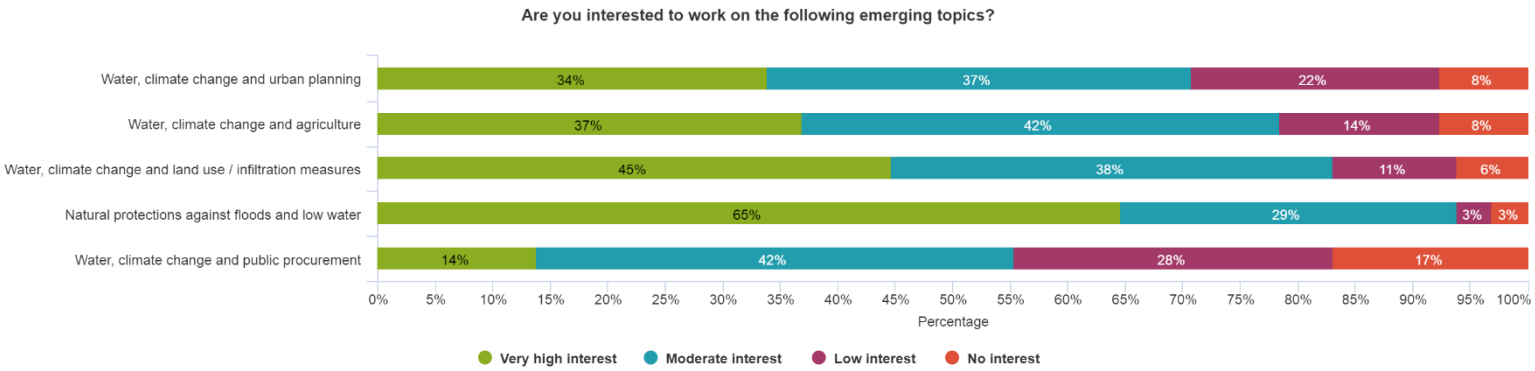


Figure 18. Emerging topics of interest

there may have been a bias related to the understanding of the notion / common definition.

To the question "what should be done in priority to adapt the Meuse River basin to climate change?", a majority of answers indicates that **flooding and drought** should be managed in priority, especially in the context of the relations between upstream and downstream areas. An integrated management is required to address these two facets of the same system of hydrological extremes.

Recovering **water quality** and favouring the **renaturation of rivers and tributaries** are another field which requires priority action.

Strong **levers** to address these issues may be found in how the space is used for human activities (agriculture, urban planning), to which extent ecosystems and natural zones play their role (buffer, retention, and filter functions), and whether pollution as well as water consumption is rationalised and/or under control – at a "macro" / river basin level.

65% of the respondents consider that the strengthening of the **International Meuse commission** represents a high priority to implement or coordinate the actions mentioned previously, closely followed by the setting up / strengthening of a **practitioners' network**. A **research network** is also considered a high priority by 46% of the responses (Figure 19).

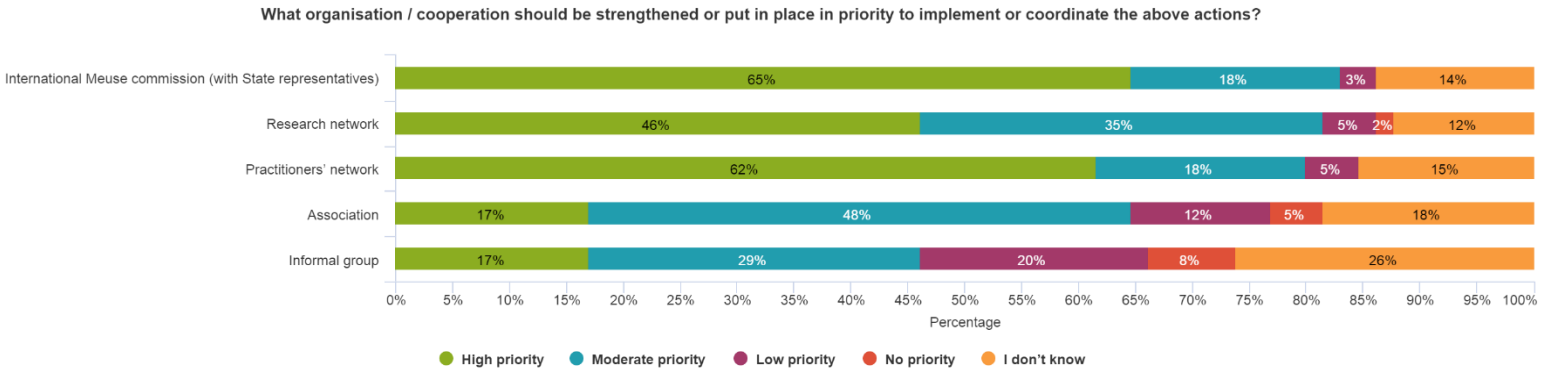
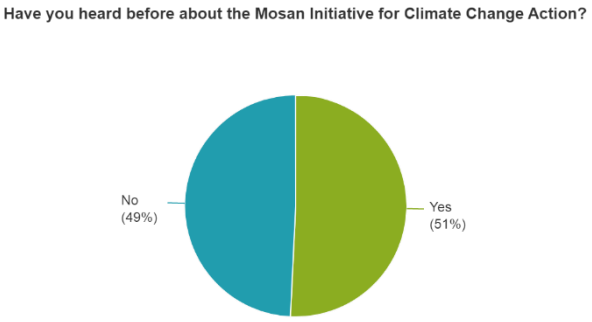
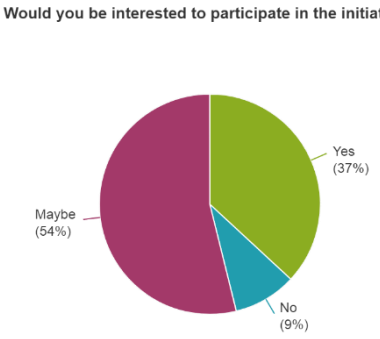


Figure 19.Priorities for international cooperation

Reactions to MICCA

Half of the respondents have heard of the initiative before, mostly through the participation to meetings (either in the context of the international Meuse Commission or held by the EPAMA) – see opposite.





As shown in the figure opposite, **half of the respondents** might be interested to participate in the initiative (maybe), and **more than a third** is interested.

Expectations from such an initiative include:

- **Reaching agreements** on:
  - the distribution of the Meuse water at (extremely) low discharges
  - the management of dams and reservoirs to limit the effects of low water
  - attuned discharge permits to low discharges
- More generally, **promoting the concerted management** of low water levels and floods on an international scale
- **Developing a real-time warning system** for flash floods in the tributaries of the Meuse
- Providing **methodological support** (e.g., for downscaling the IPCC large-scale scenarios to local climate scenarios) and enabling the success of local initiatives (e.g., taking effective measures to combat erosion and landslides, especially in the Ardennes)
- Coordinating and structuring **ongoing initiatives** across the basin (joint implementation of projects, measures and water management)
- **Sharing feedbacks** of mitigation/adaptation actions to the CC in order to multiply them on the large watershed, sharing knowledge with other research groups and practitioners on the Meuse basin (e.g., climate change, sediment dynamics of the Meuse at catchment level, etc.)
- Adopting an **international plan co-constructed** with various organizations (States, institutions, communities, companies, associations...), thinking about how we can jointly guarantee or finance future solutions for drought, water quality and safety, with a follow-up of indicators that would make it possible to observe progress year after year
- Working at a **field actor level** (complementarity with the IMC) …

A principle of work should be to **build on previous experiences and existing structures/organisations** and avoiding creating new overlapping structures or projects. A condition to make it concrete is to set up a (digital) **platform** for sharing knowledge and information and a **program** for working visits and training.

One of the **preconditions** to make the initiative successful is to show the added value for the different stakeholders (what do they get from it), in order to mobilise them effectively.

Network facilitation (with a clear steering) is another condition, along with the appropriate financial resources (for e.g., through setting a participation of all member states within the Meuse River basin, according to capacities), as well as delivering concrete projects and solutions on the field / achieving visible and practical results.

According to another respondent, it must remain an initiative that proposes and does not set policies, which must remain the prerogative of states.

Most importantly, mutual trust and understanding is identified as a foundation for international cooperation.

When asked about their potential inputs to such an initiative, respondents seem to be keener to contribute with **knowledge**, indicate having **limited time** to invest and do not know about **money** inputs (Figure 20).

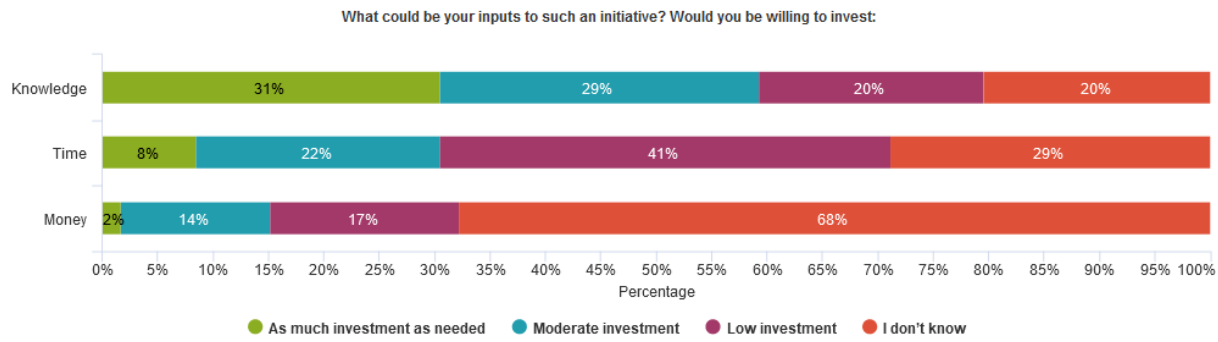


Figure 20. Possible inputs to MICCA

Other possible inputs include:

- A contribution through the cartographic work of characterization of the waterways already carried out on the Meuse and its tributaries with regard to the Black Stork
- If MICCA is in line with the objectives of the Freshwater Delta Program, its reserved budget for the period 2022-2027 for international cooperation to prevent drought/water shortages could be put to contribution
- Bridging the gap between Deltares and MICCA with regard to river dams' design
- Dissemination of information and communications at the international level (IMC, network of international commissions, European Commission, INBO, UNECE), or reaching more local stakeholders (e.g., reaching citizens and companies that are customers to drinking water companies – to be discussed with their communication department)
- Provision of appropriate expertise / data, including the network of experts from the drinking water sector and from the Clean Meuse Water Chain partnership; the use of a river quality model (Pegase) to validate the measures proposed by the stakeholders before implementing them; knowledge from Deltares, e.g., from AMICA or on fish migration and/or sediment transport
- Possibly a financial input

Other: general feedback and comments

Some general feedback was provided as well by respondents. Some asked to be kept informed about the initiative, others made further suggestions. There was an information about an event where MICCA could be presented (Programmabureau Maasregio is organising a Meuse Rendez-vous on March 31, 2022).

3. Multi-variable analysis

The flat sorting of variables based on the total sample is completed by a multi-variable analysis.

A proposed approach is to cross the following variables:

- **Countries of work and types of organisations**
- **Countries of work and scales of work**

The idea is to analyse if there are any significant differences from one country to the other in terms of types of organisations and scales of work regarding water & climate change stakeholders (see figures below).

Additionally, the following variables are also crossed:

- **Scales of work and climate change issues**
- **Types of organisations and areas of expertise and interest**

The results are presented in the following paragraphs.

Figure 21. Types of organisations per country

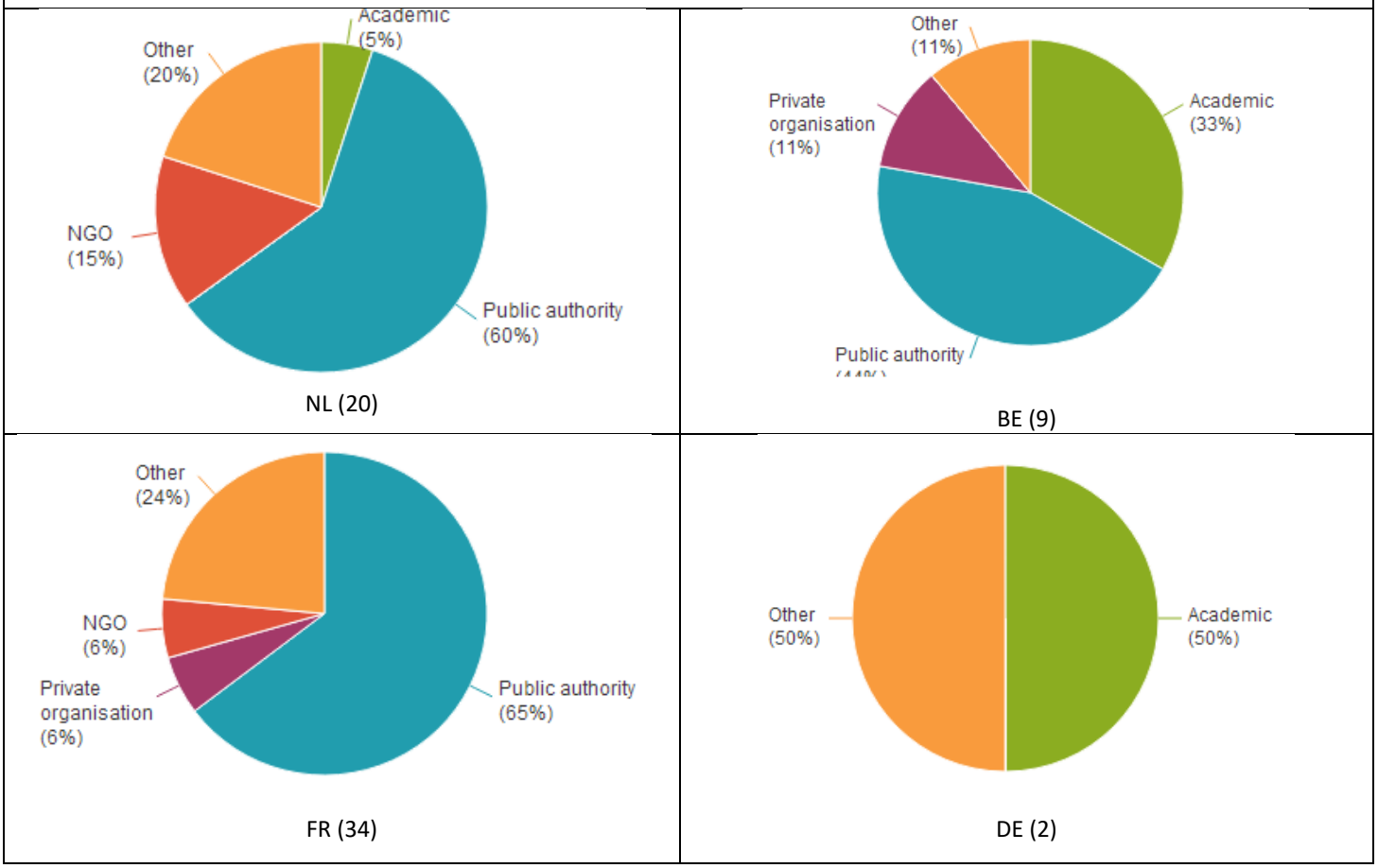
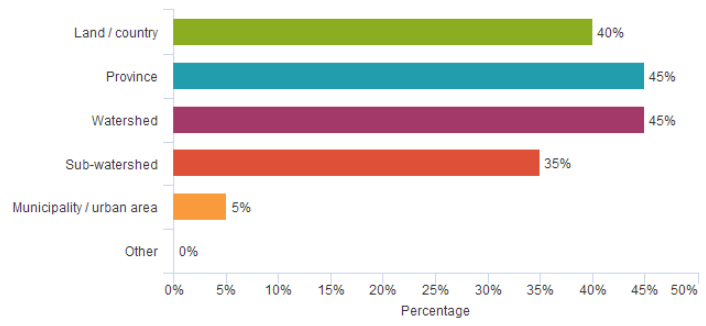


Figure 22. Scales of work per country



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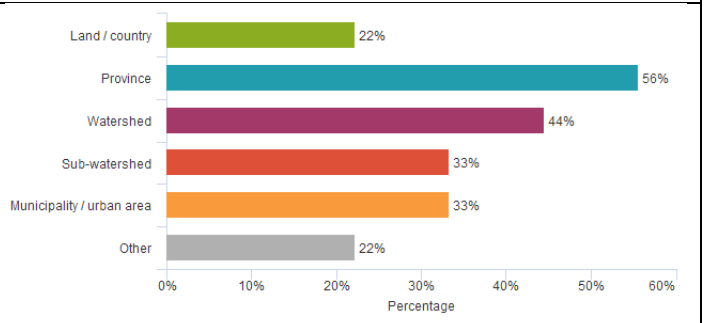
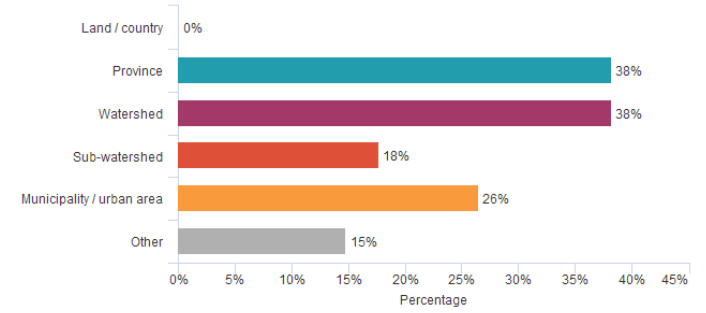
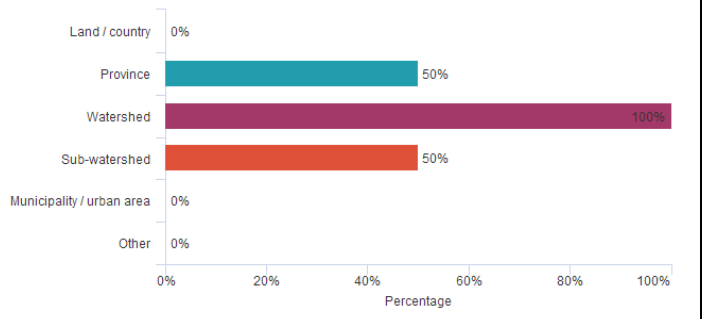


BE (9)



FR (34)



DE (2)

These results need to be interpreted with caution as the samples vary from one country to another (see Figure 11). In particular, the number of respondents working in Germany is too low to be considered as significant.

The absence of **academic stakeholders** among the French respondents can be highlighted. **Private organisations** are represented only in France and Belgium. **Public authorities** remain the most represented type of organisation in the Netherlands, Belgium and France (however no representant from a German public authority has responded).

In terms of the scale of intervention, the **national /country level**, while concerned by almost half of the Dutch respondents, is not among the French respondents' scales of work. The "**province**" and "**watershed**" scales concern the majority of respondents, all countries combined. More respondents work at **sub-watershed level** in the Netherlands and Belgium than in France.

Concerning the **crossing of the scales of work and the most important negative impacts** of climate change perceived, statistically, the correlations are not significant.

The values shown in

Table 7 are the means of the classifications by impact significance, as a ponderation was applied (from 1 for “I don’t know” to 5 for “high impact”). Without considering the first 3 lines and the last 3 lines, which in most cases correspond to the highest and lowest scores, we looked at the fourth highest and fourth lowest scores, per scale (in columns).

Table 7. Multiple cross of scale and climate change issues

	AT WHICH SCALE DO YOU MAINLY WORK?						
	LAND / COUNTRY	PROVINCE	WATERSHED	SUB-WATERSHED	MUNICIPALITY / URBAN AREA	OTHER	TOTAL
Drought, lack of water	4.4	4.6	4.8	4.6	4.3	4.6	**4.6**
Flooding, extreme rainfalls	4.4	4.4	4.6	4.6	4.4	4.8	**4.5**
Impact on water quality	3.8	4.1	4.4	4.1	3.7	4	**4.1**
Modification of rainfall patterns	3.7	**4.2**	**4.2**	3.8	3.8	**4.1**	**4.0**
Heatwaves	**4.2**	4.1	3.9	3.7	**3.9**	3.6	**4.0**
Increased water demand	3.9	**4.2**	**4.2**	3.5	3.5	3.4	**3.9**
Loss of aquatic biodiversity	3.6	4.1	3.9	3.8	3.4	3.9	**3.8**
Change of land-use	**3.2**	3.7	3.9	3.8	3.7	3.4	**3.7**
Erosion, ground movement	3.6	3.8	**3.3**	3.6	**3.9**	3.3	**3.6**
Increased energy demand	**3.2**	**3.5**	3.6	3.4	3.7	**2.1**	**3.4**
Navigation problems (low water levels)	3.7	3.7	3.5	**3.1**	**3.1**	**2.5**	**3.4**
Sanitary crisis	3	3.3	3.3	2.9	3.2	3	**3.2**
Shrinkage-swelling of clays	2	3.1	2.7	2.3	3	2.5	**2.7**
Marine submersions	2.6	2.7	3.0	2.3	2.2	1.9	**2.6**

At the **national scale**, the fourth highest score is attributed to heatwaves, and the fourth lowest scores equally to changes of land-use and increased energy demand.

At **province level**, the modification of rainfall patterns and the increased water demand stand out as important concerns. Increased energy demand corresponds to the fourth lowest score, suggesting it is not treated in priority at that scale.

Concerning the **watershed level**, the fourth highest score is equally attributed to the modification of rainfall patterns and increased water demand, similarly to the province level. The score for erosion and ground movement is quite low.

There are no significant tendencies at the **sub-watershed level**, only navigation issues have the fourth lowest score.

Not surprisingly, **municipalities and urban areas** are mostly concerned with heatwaves and erosion / ground movement. Navigation problems had a low score at that scale.

A further line of investigation concerned the crossing between **the types of organisations, and the areas of expertise and interest**.

Among the areas of expertise, 5 options were given: water management from quality and/or quantity aspects, aquatic biodiversity protection, climate change adaptation and mitigation. As a reminder, underrepresented categories were NGOs, private organisations, and academic (cf. Figure 12), therefore, results must be interpreted with caution as they are not statistically significant.

Concerning **water quality** (Figure 23), the most salient results are the following:

- Private organisations declare having no expertise (67%)
- Academic stakeholders deem to have a high level of expertise (60%), followed by NGOs (at 50%)
- Other types of organisations estimate their level of expertise as moderate at 47%

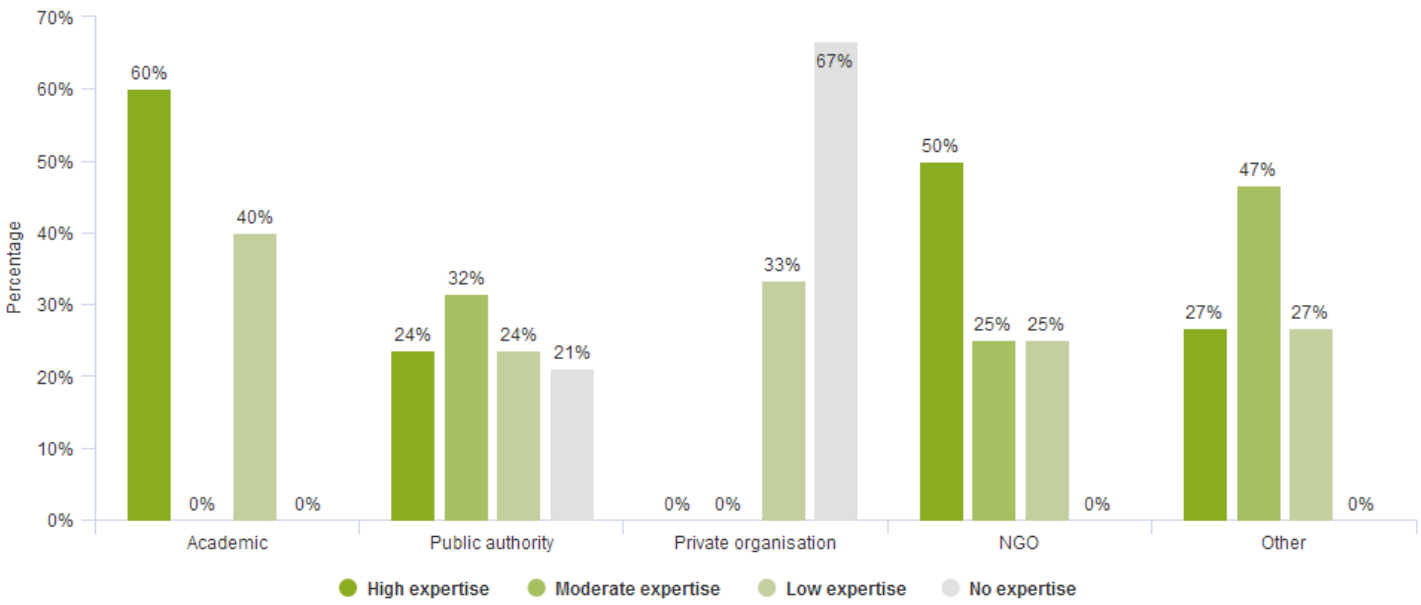


Figure 23.Multiple cross between types of organisations and expertise on water management (quality)

Concerning **water quantity** (Figure 25), the following observations can be made:

- 80% of the academic organisation declare having a high level of expertise, as well as 45% of the public authorities who answered
- Half of the NGOs declared having no expertise, and half of the other types of organisations deem to have a moderate level of expertise

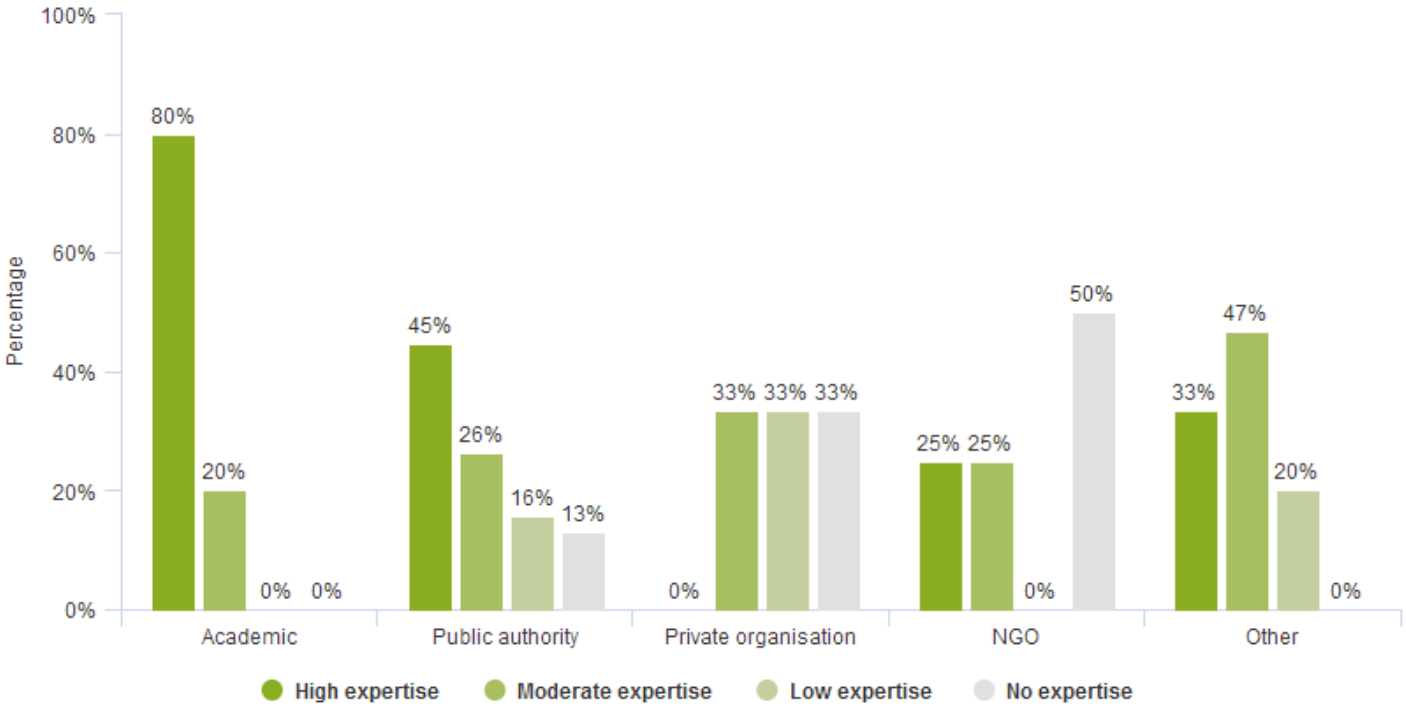


Figure 25. Multiple cross between types of organisations and expertise on water management (quantity)

Concerning **aquatic biodiversity protection** (Figure 24), 67% of private organisations declare having a low expertise, half of the NGOs a high expertise, while the same proportion of academic and public authorities respectively consider they have no expertise and moderate expertise. Half of the other types of organisations consider their level of expertise on the matter as moderate.

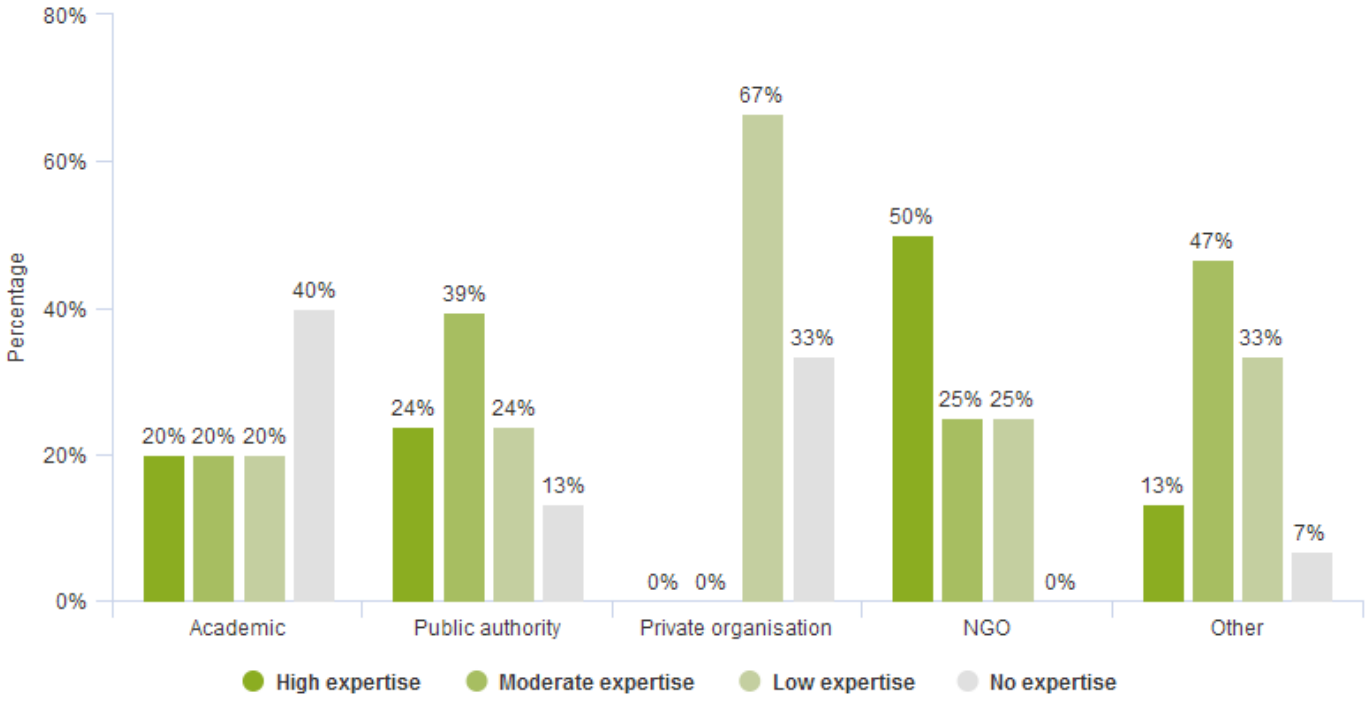


Figure 24.Multiple cross between types of organisations and expertise on aquatic biodiversity protection

Climate change mitigation is mostly addressed by other types of organisations (53% at moderate expertise). Once more, NGOs and private organisations have very few respondents, so the results are not statistically significant. 40% of public authorities consider having a moderate level of expertise.

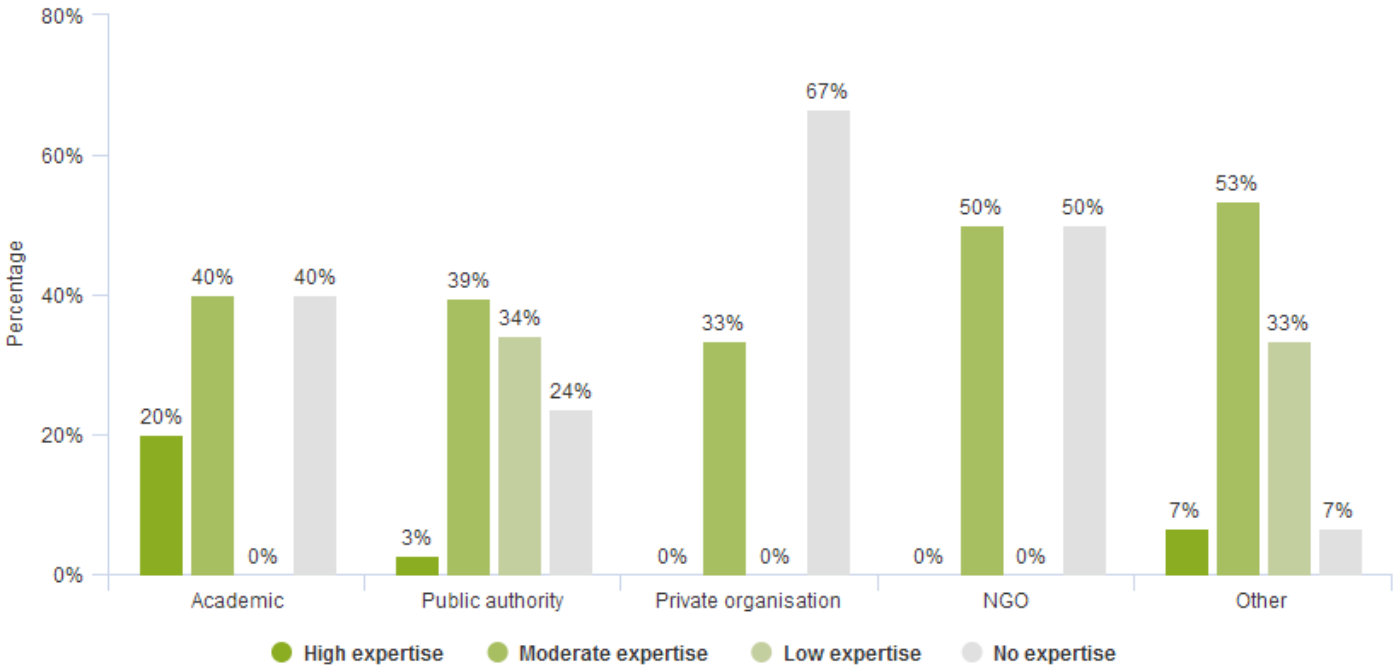


Figure 26.Multiple cross between types of organisations and expertise on climate change mitigation

There are no strong discriminations for expertise levels on **climate change adaptation**, as the figure below shows. Most public authorities (50%) consider having a moderate level of expertise on the subject. Academic public is distributed between high (60%) and moderate (40%) expertise.

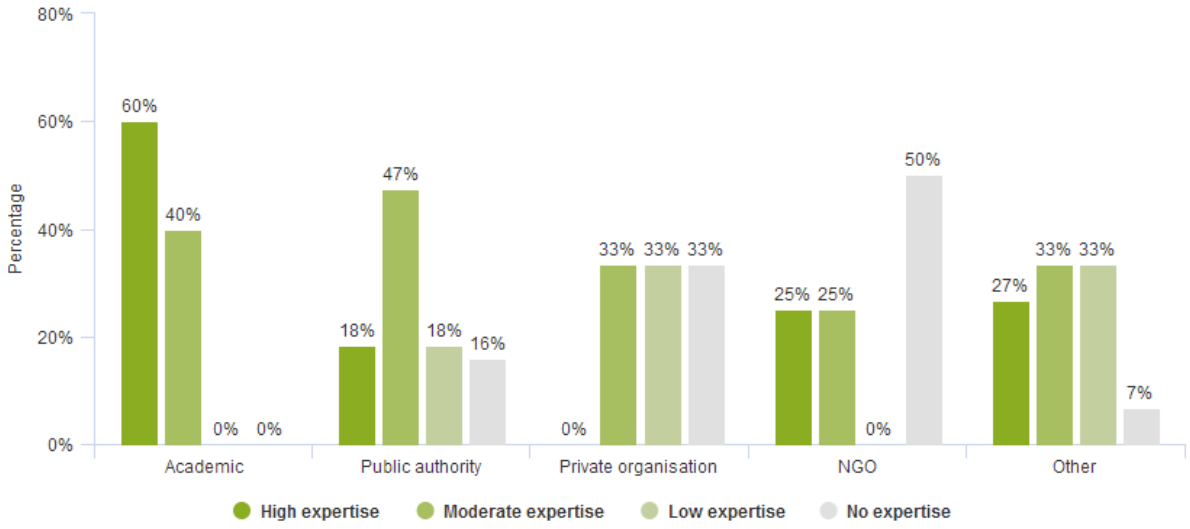


Figure 27.Multiple cross between types of organisations and expertise on climate change adaptation

A similar exercise was carried out for the **areas of interest**:

- Water, climate change and urban planning
- Water, climate change and agriculture
- Water, climate change and land use / infiltration measures
- Natural protections against floods and low water
- Water, climate change and public procurement

Public authorities are generally interested by all the mentioned topics, however the level of interest is mostly very high for "Water, climate change and land use / infiltration measures", and "Natural protections against floods and low water" (see table below).

Table 8. Topics of interest for public authorities

	THE TYPE OF YOUR ORGANISATION:			
	PUBLIC AUTHORITY			
	NO INTEREST	LOW INTEREST	MODERATE INTEREST	VERY HIGH INTEREST
Water, climate change and urban planning	8%	18%	**45%**	29%
Water, climate change and agriculture	11%	16%	**45%**	29%
Water, climate change and land use / infiltration measures	8%	11%	39%	**42%**
Natural protections against floods and low water	3%	0%	34%	**63%**
Water, climate change and public procurement	18%	24%	**47%**	11%

The highest rate was attributed to "very high interest", concerning natural protections against floods and low water in the "**Other**" category of organisations.

Table 9. Topics of interest for other organisations

	THE TYPE OF YOUR ORGANISATION:			
	OTHER			
	VERY HIGH INTEREST	MODERATE INTEREST	LOW INTEREST	NO INTEREST
Water, climate change and urban planning	**47%**	20%	27%	7%
Water, climate change and agriculture	33%	**47%**	20%	0%
Water, climate change and land use / infiltration measures	40%	**47%**	13%	0%
Natural protections against floods and low water	**73%**	20%	7%	0%
Water, climate change and public procurement	27%	**33%**	27%	13%

Regarding the last three categories of organisations, the number of respondents is low, so it is not very relevant to do statistics. However, results are sown in the following tables.

Table 10. Topics of interest for academic organisations

	THE TYPE OF YOUR ORGANISATION:			
	ACADEMIC			
	VERY HIGH INTEREST	MODERATE INTEREST	LOW INTEREST	NO INTEREST
Water, climate change and urban planning	40%	40%	20%	0%
Water, climate change and agriculture	60%	40%	0%	0%
Water, climate change and land use / infiltration measures	80%	20%	0%	0%
Natural protections against floods and low water	80%	20%	0%	0%
Water, climate change and public procurement	20%	20%	40%	20%

Table 11. Topics of interest for private organisations

	THE TYPE OF YOUR ORGANISATION:			
	PRIVATE ORGANISATION			
	VERY HIGH INTEREST	MODERATE INTEREST	LOW INTEREST	NO INTEREST
Water, climate change and urban planning	0%	**67%**	0%	33%
Water, climate change and agriculture	33%	33%	0%	33%
Water, climate change and land use / infiltration measures	**67%**	0%	0%	33%
Natural protections against floods and low water	**67%**	0%	0%	33%
Water, climate change and public procurement	0%	**67%**	0%	33%

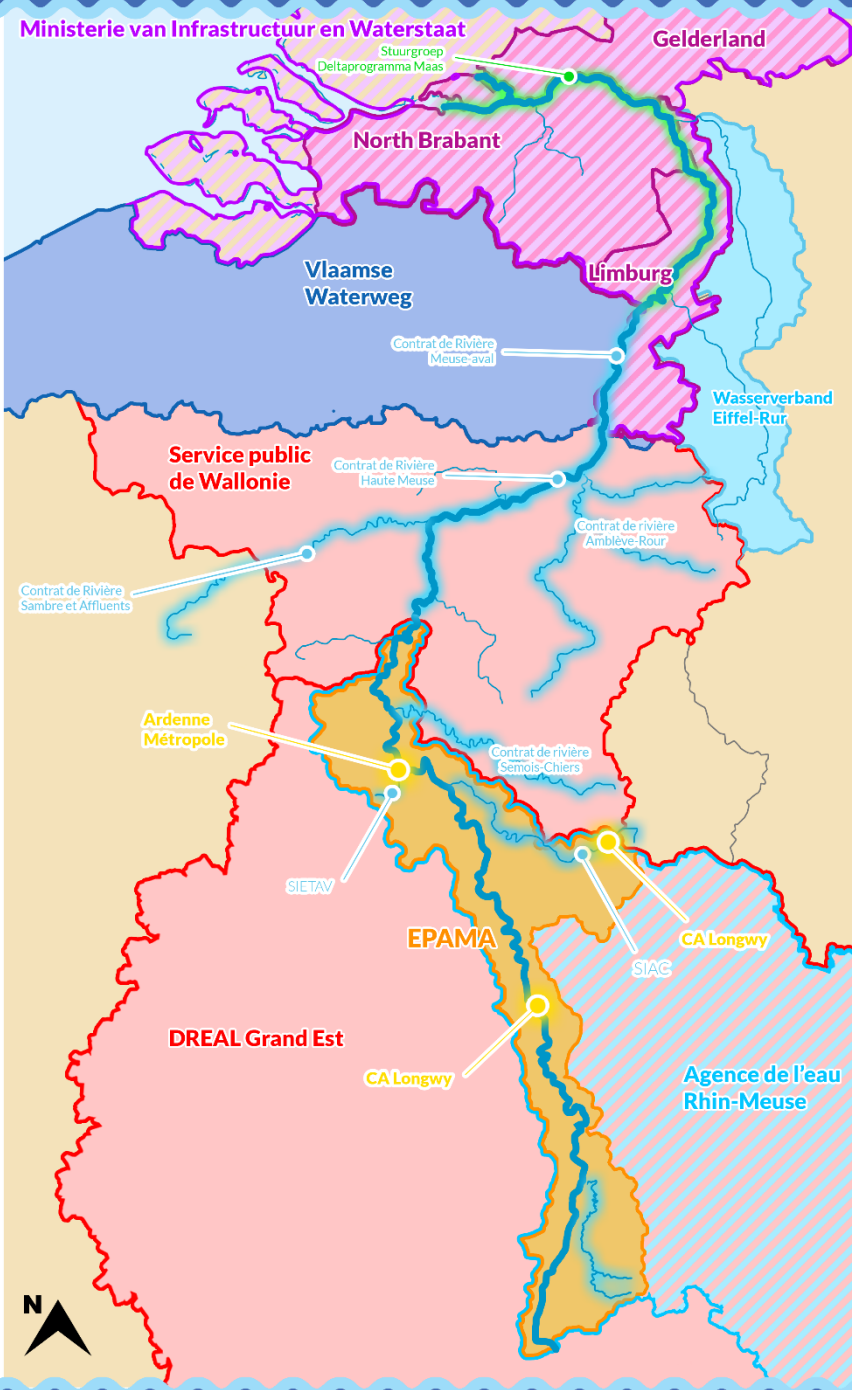
Table 12. Topics of interest for NGOs

	THE TYPE OF YOUR ORGANISATION:			
	NGO			
	VERY HIGH INTEREST	MODERATE INTEREST	LOW INTEREST	NO INTEREST
Water, climate change and urban planning	50%	0%	50%	0%
Water, climate change and agriculture	**100%**	0%	0%	0%
Water, climate change and land use / infiltration measures	25%	**50%**	25%	0%
Natural protections against floods and low water	25%	**50%**	25%	0%
Water, climate change and public procurement	0%	25%	**75%**	0%

Integrated River Basin Management (IRBM)

1

Developments aimed at preserving, regulating or restore the hydrological characters or geomorphology of watercourses (retention, slowing and flood drainage; protective dams; flood storage lockers, etc)



Stakeholders of the Meuse international river basin

- National public actor
- Regional public actor
- Provincial public actor
- Other public actor
- Water board
- EPAMA

- Water board
- Interest group

- Local authority

EPAMA EPTB Meuse

ACTeon environment

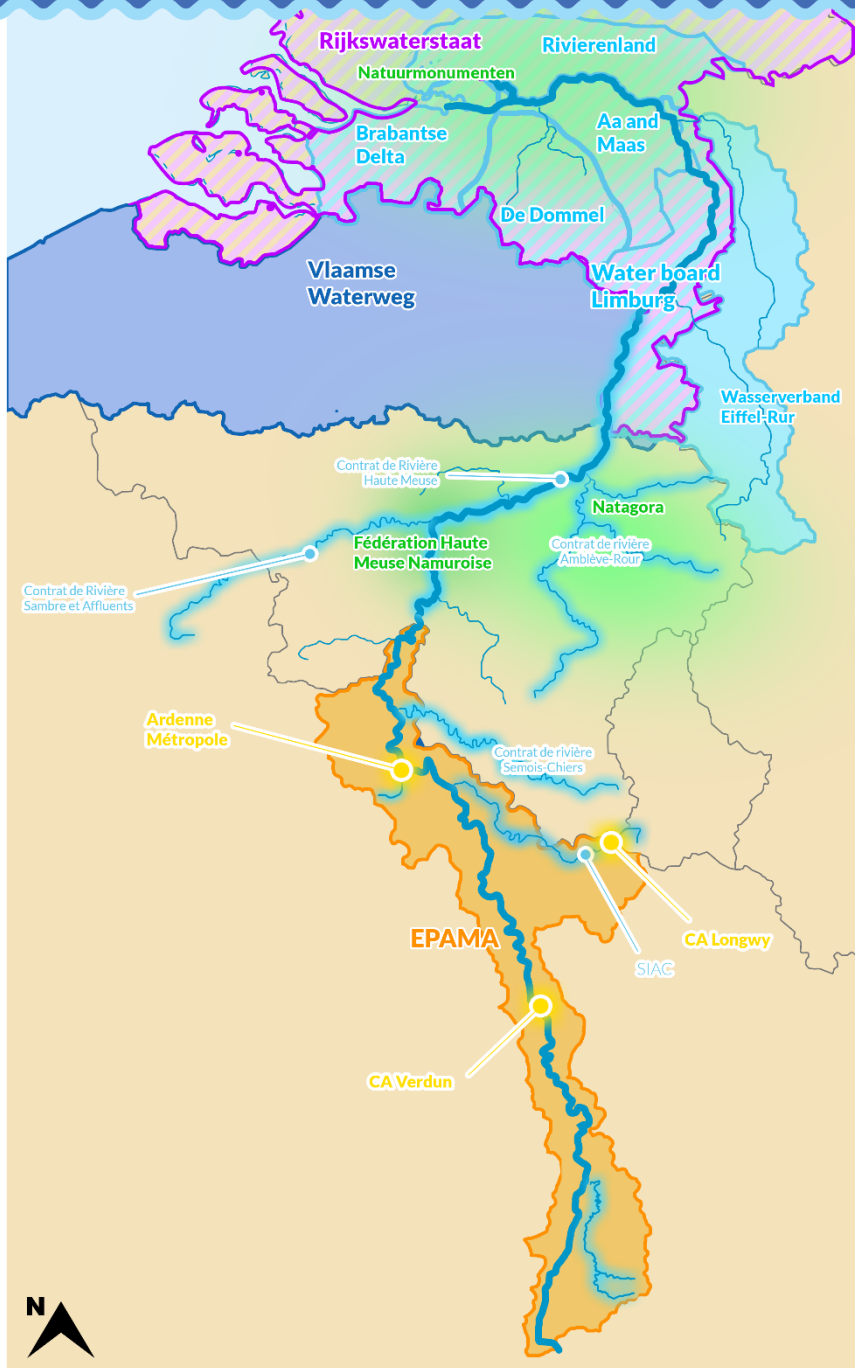
This map displays the current knowledge about stakeholders' roles on the Meuse basin, it is subject to modifications and evolutions. Version produced on May 2nd 2022.

2022 - Data collected for Mosan Initiative for Climate Change Action (MICCA), led by EPAMA - Map created by ACTeon

River management and restoration

2

Regular maintenance of the watercourse with the purpose of keeping it in his profile of balance, to allow the natural flow of the waters and to contribute to its good condition environmentally friendly or, where appropriate, to its good ecological potential.



Stakeholders of the Meuse international river basin

- National public actor
- Regional public actor
- Provincial public actor
- Other public actor
- Water board
- EPAMA

- Water board
- Interest group

- Local authority

EPAMA EPTB Meuse

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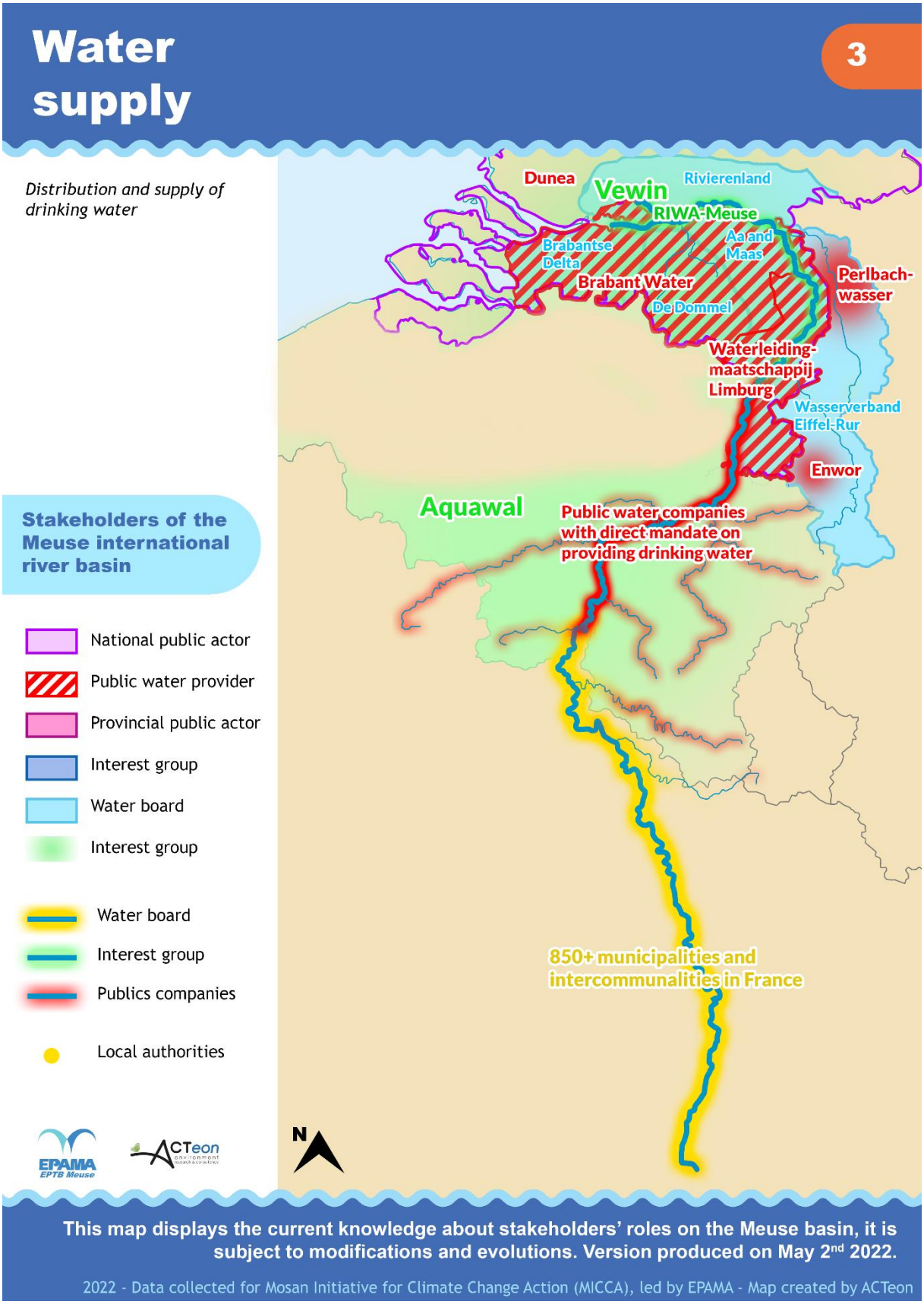
Water supply
3
Distribution and supply of drinking water
Dunea
Vewin
Rivierenland
RIWA-Meuse
Aa and Maas
Brabantse Delta
Brabant Water
De Dommel
Perlbach-wasser
Waterleiding-maatschappij Limburg
Wasserverband Eifel-Rur
Enwor
Aquawal
Public water companies with direct mandate on providing drinking water
850+ municipalities and intercommunalities in France
Stakeholders of the Meuse international river basin
National public actor
Public water provider
Provincial public actor
Interest group
Water board
Interest group
Water board
Interest group
Publics companies
Local authorities
EPAMA EPTB Meuse
ACTeon
N
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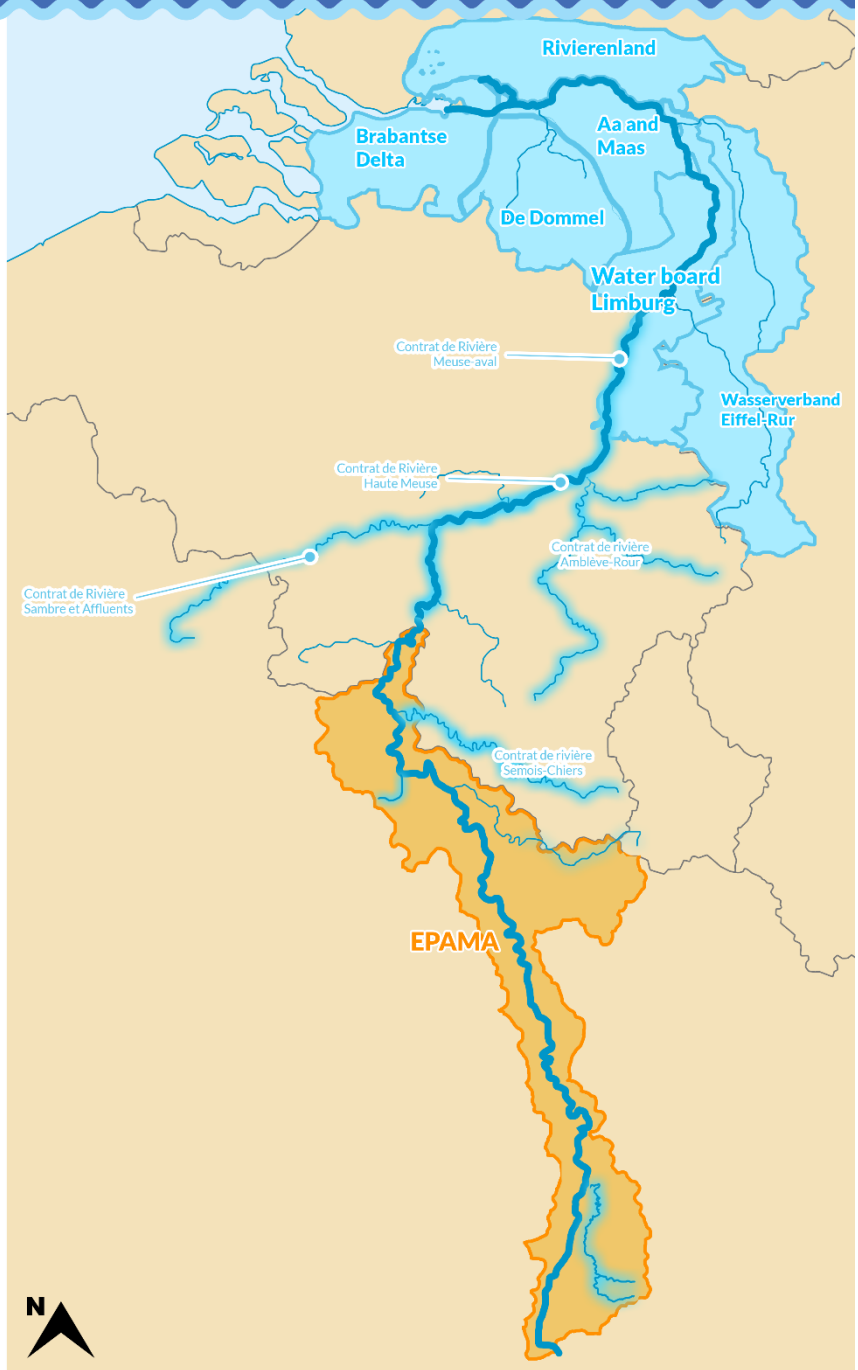
Rainwater and runoff management, fight against erosion

4

Urban stormwater management, etc.



Stakeholders of the Meuse international river basin

- National public actor
- Regional public actor
- Provincial public actor
- Other public actor
- Water board
- EPAMA

- Water board
- Interest group

- Local authority

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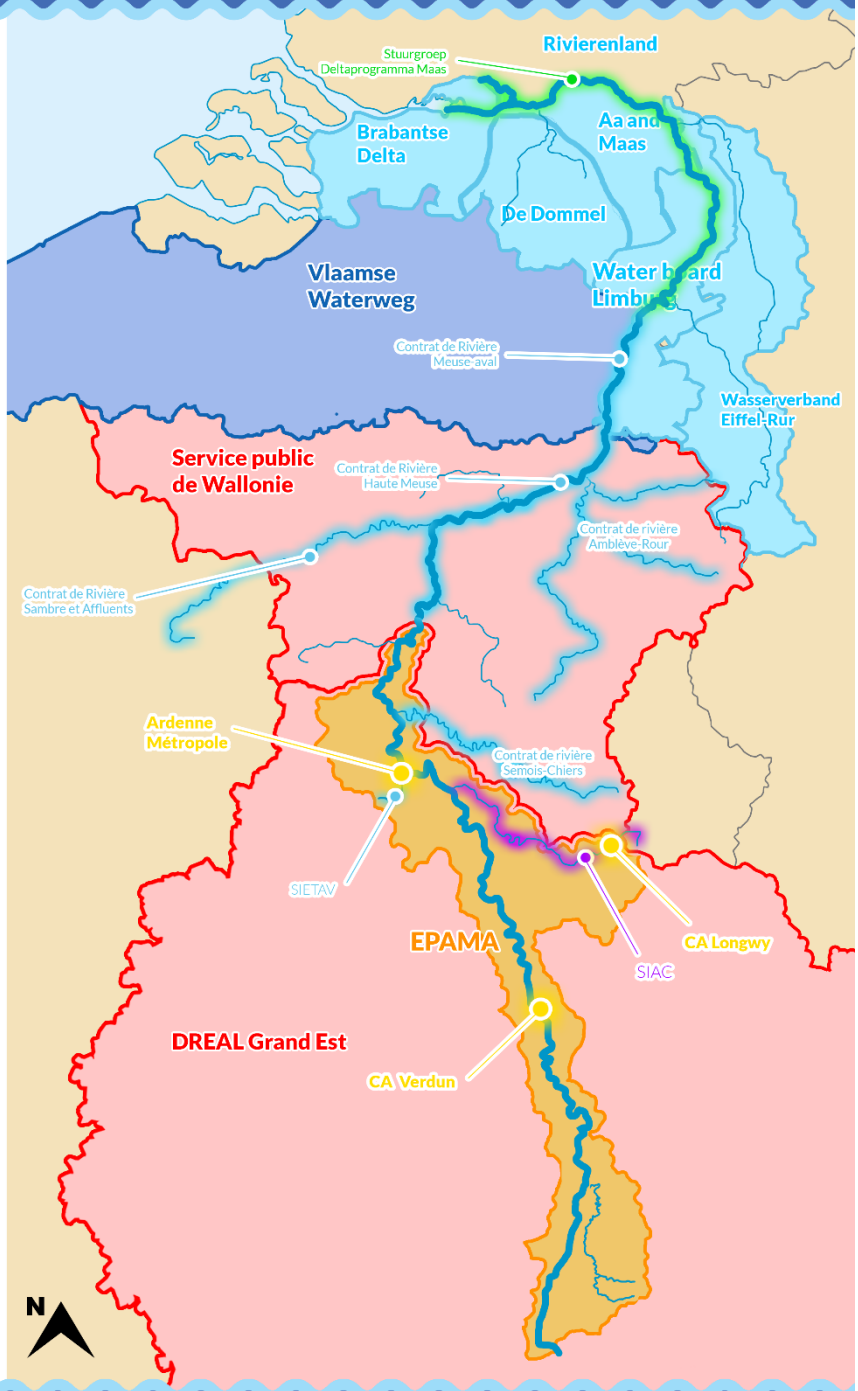
Floods management

5

Creation, management and regularization of protection works against floods and the sea, operations of integrated management of the coastline



Stakeholders of the Meuse international river basin

- National public actor
- Regional public actor
- Provincial public actor
- Other public actor
- Water board
- EPAMA

- Water board
- Interest group

- Local authority

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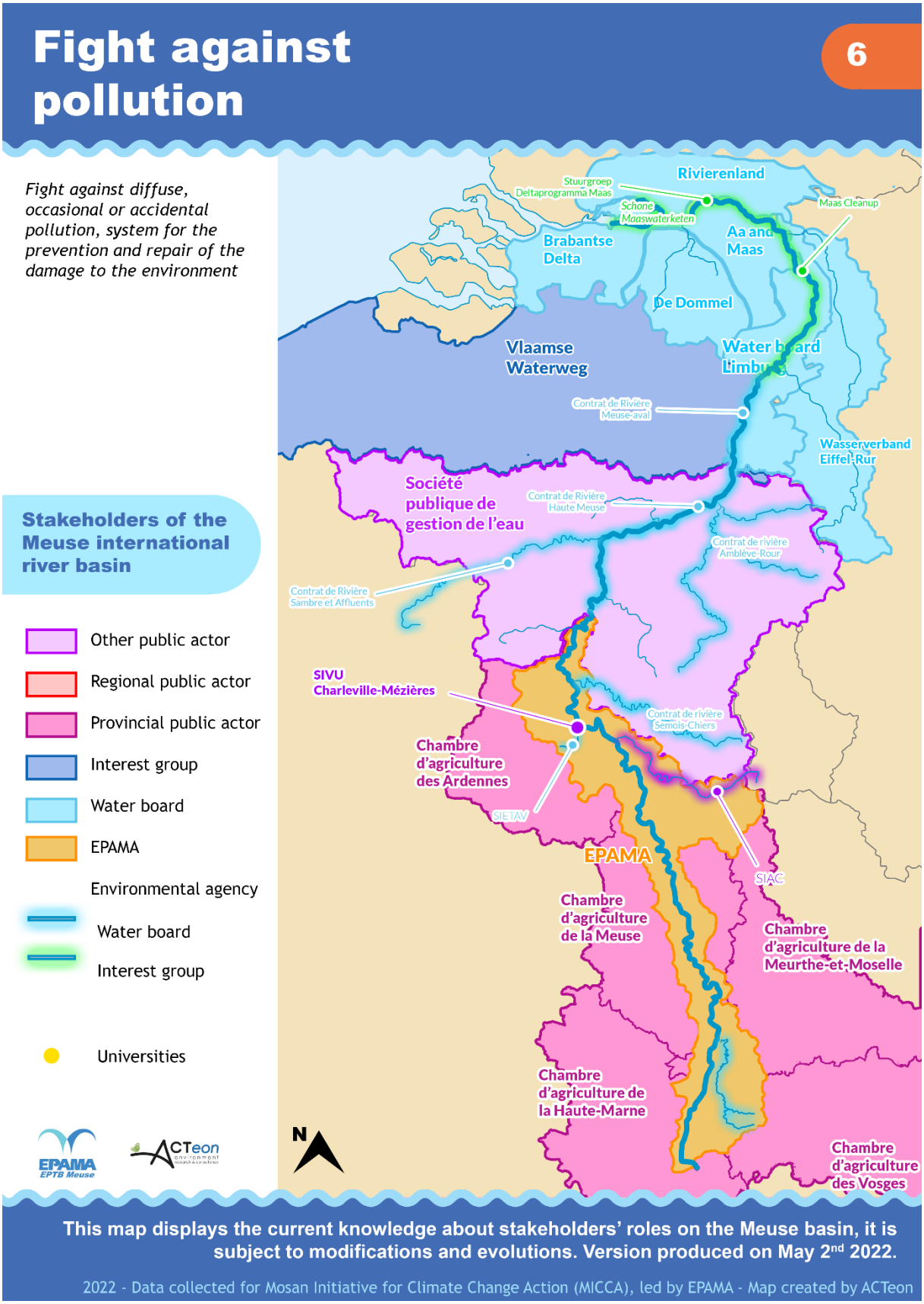
Fight against pollution

6

Fight against diffuse, occasional or accidental pollution, system for the prevention and repair of the damage to the environment



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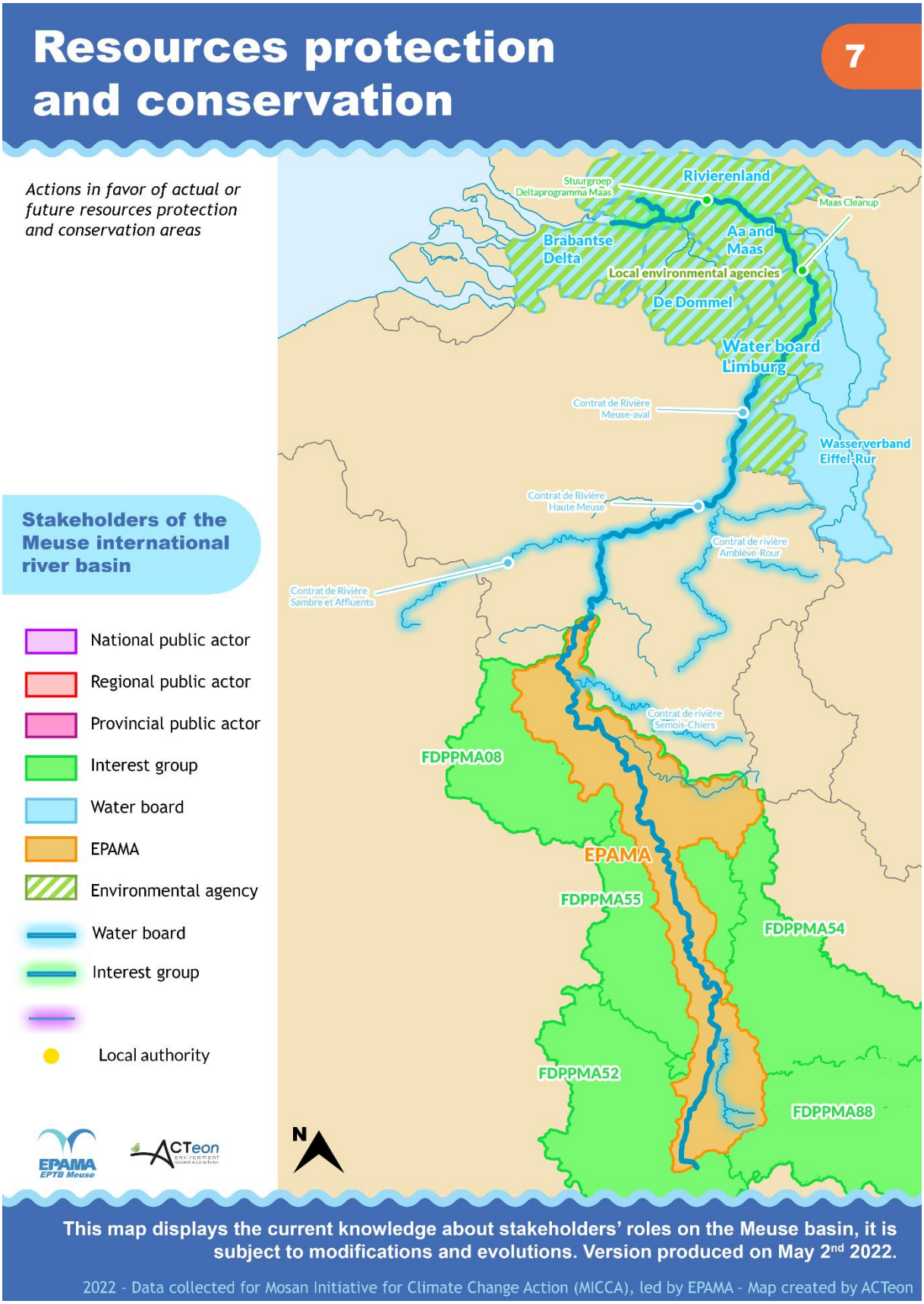
Resources protection and conservation
7
Actions in favor of actual or future resources protection and conservation areas
Stakeholders of the Meuse international river basin
National public actor
Regional public actor
Provincial public actor
Interest group
Water board
EPAMA
Environmental agency
Water board
Interest group
Local authority
Stuurgroep Deltaprogramma Maas
Rivierenland
Maas Cleanup
Brabantse Delta
Aa and Maas
Local environmental agencies
De Dommel
Water board Limburg
Contrat de Rivière Meuse-aval
Wasserverband Eifel-Rur
Contrat de Rivière Haute Meuse
Contrat de rivière Amblève-Rour
Contrat de Rivière Sambre et Affluents
Contrat de rivière Semois-Chiers
FDPPMA08
EPAMA
FDPPMA55
FDPPMA54
FDPPMA52
FDPPMA88
N
EPAMA EPTB Meuse
ACTeon
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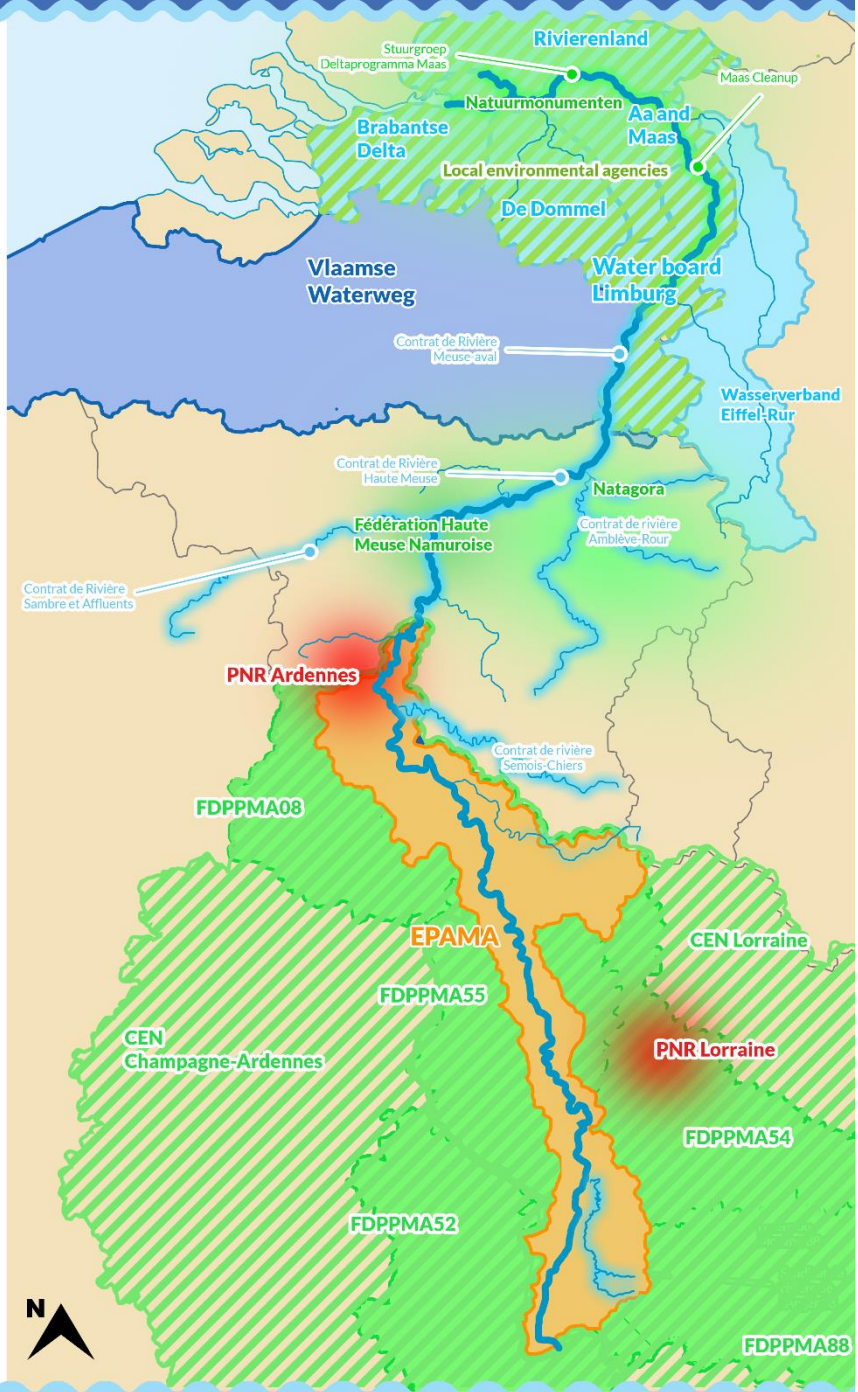
Aquatic ecosystems protection and restoration

8

Maintenance of watercourses, hydromorphological restoration of watercourses and water bodies, protection of wetlands and restoration of degraded wetlands, restoration of ecological continuity, sediment transport, dead arms, morphological restoration or renaturation of watercourses



Stakeholders of the Meuse international river basin

- Other public actor
- Regional public actor
- Provincial public actor
- Interest group
- Water board
- EPAMA
- Environmental agency
- Water board
- Interest group
- Regional public actor
- Local authority

EPAMA EPTB Meuse

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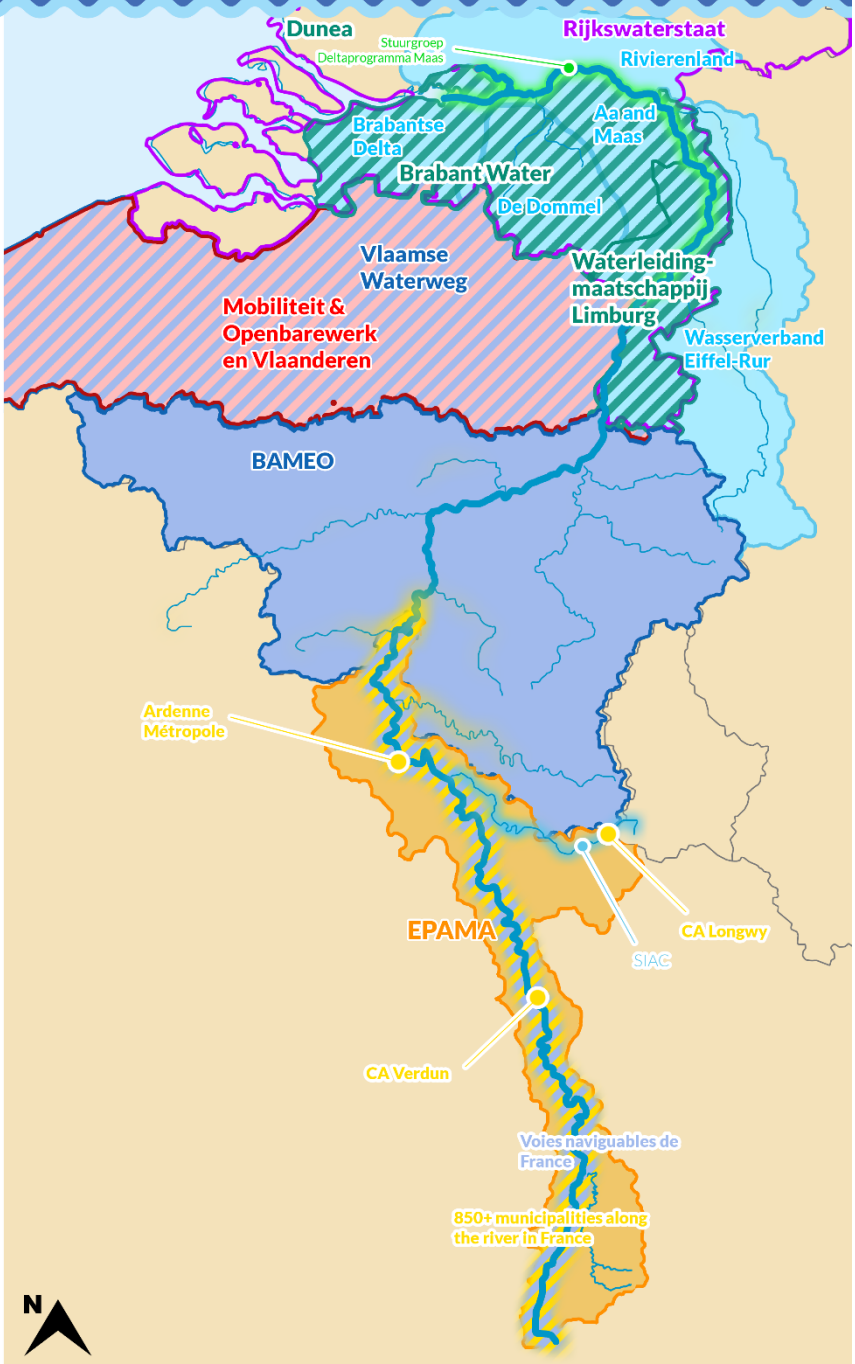
Hydraulic infrastructures

9

Management of water line management structures: dams for drinking water, navigation canals, hydraulic development for leisure activities, hydroelectricity, low water support structures



Stakeholders of the Meuse international river basin

- National public actor
- Regional public actor
- Public water provider
- Provincial public actor
- Other public actor
- Water board
- Environmental agency

- Water board
- Interest group
- Public companie
- Wastewater utility

EPAMA EPTB Meuse

ACTeon environment

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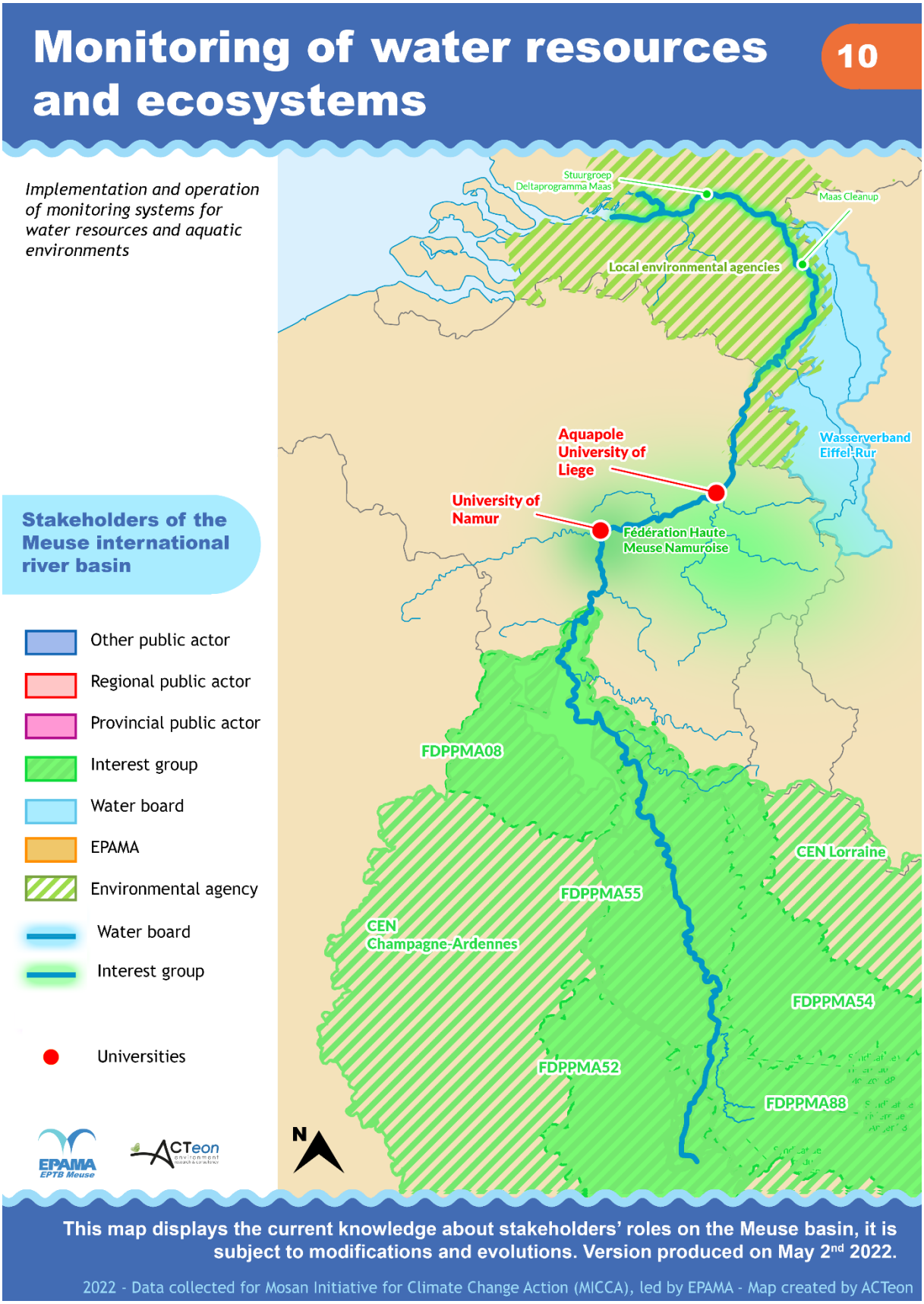
Monitoring of water resources and ecosystems

10

Implementation and operation of monitoring systems for water resources and aquatic environments



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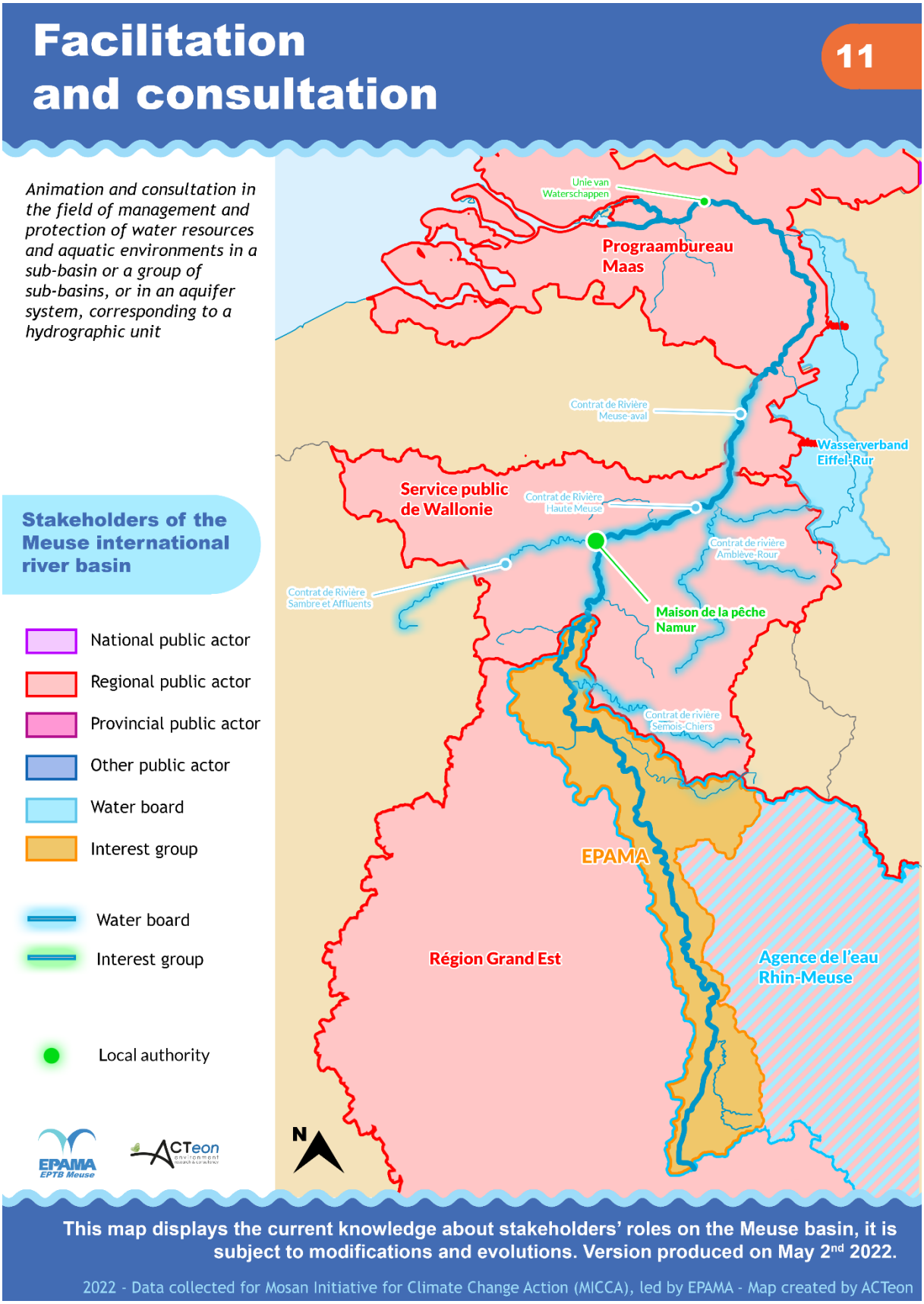
Facilitation and consultation

11

Animation and consultation in the field of management and protection of water resources and aquatic environments in a sub-basin or a group of sub-basins, or in an aquifer system, corresponding to a hydrographic unit



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