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BRINGING INNOVATION TO ONGOING WATER MANAGEMENT



Final portfolio of actionable research problems / challenges exploitation and development

March 2019

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Horizon 2020 Societal challenge 5: Climate action, environment, resource efficiency and raw materials

BINGO

Bringing INnovation to onGOing water management – a better future under climate change

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Deliverable 6.7 - "Final portfolio of actionable research problems/challenges exploitation and development" was prepared by CYI, KWR, LNEC, NTNU, IWW with support from their stakeholder partners under WP6 ("Ensuring Excellence and Actionable Research"), within Task 6.3 – "Actionable Research Lab", led by CYI. In this report we see how the CoPs together with their actionable climate-water measures evolve in different ways at the six research sites. Between January 2018 and March 2019 a total of 12 CoP events were organized in Cyprus, Germany, Spain, Netherlands, Norway and Portugal. The final portfolio of actionable research problems and challenges summarizes the activities undertaken for problem-solving cooperation by the CoPs at the six research sites and reflects on successes and barriers for the implementation of actionable measures. The CoPs provided a forum to researchers and stakeholders across the six research sites to interact and co-produce knowledge, which was valuable for BINGO research but also for strengthening stakeholders' capabilities to address climate change challenges, for increasing climate-water awareness and for operational research. BINGO research teams have already undertaken follow-up actions to maintain the regular communication channels, interaction and cooperative research on climate-water adaptation options with stakeholders.

Evidence of accomplishment

Report



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ACRONYMS

Bergen K	Bergen Kommune
CoP	Community of Practice
CYI	The Cyprus Institute
IACO	I.A.CO Environmental and Water Consultants Ltd
IWW	Rheinisch-Westfälisches Institut für Wasserforschung gemeinnützige GmbH
KWR	KWR Water B.V.
LNEC	Laboratório Nacional de Engenharia Civil
NTNU	Norwegian University of Science and Technology
SSM	Soft Systems Methodology
WDD	Water Development Department
Wupperverband	Wupperverband Körperschaft des öffentlichen Rechts



1. INTRODUCTION

An important objective of BINGO is to create a collaborative approach for co-production of knowledge to address complex issues related to climate change. Active communities of practice (CoP) have been created to support the cooperation between researchers and practitioners at each research site. Following the steps of BINGO's CoP road-map, a series of workshops has been facilitated at the six research sites: (a) the setting of the scene and the establishment of a common understanding of the water-climate risks, (b) preparedness and (c) the identification and evaluation of actionable measures for addressing some of these risks/problems. D6.3 "Interim report from communication outcome from the six research sites" gives a detailed description of the first three workshops.

The fourth workshop, which was reported in D6.6 "Interim portfolio of actionable research problems and challenges", was devoted to identify together with local stakeholders complex/unsolvable problems that need to be addressed. An actionable research lab was designed to "solve the unsolvable", based on the Soft Systems Methodology (SSM) principles (Gasson, 1994; Checkland and Poulter, 2010; Burge Hughes Walsh, 2015). During the fourth workshop, action plans were developed to follow up on the unsolvable challenges. In Badalona the fourth workshop was held in January 2018 and is therefore described in detail in the current report.

The current report summarizes the activities undertaken for problem-solving cooperation by the CoPs at the six research sites between January 2018 and February 2019. Each Research Site chapter starts with a short summary of the actions defined in D6.6; presents final lists of actionable measures for addressing water problems related to climate change; and reflects on the evolution and future of the CoPs.



2. VELUWE RESEARCH SITE

2.1. Revisit of first Actionable Research Lab

The CoP meeting of November 7th, 2017 took place in the visitor centre of Staatsbosbeheer in Nunspeet. The main objective of the workshop was to define actions that everyone can do in the short term to contribute to the solution of the unsolvable problem and to discuss the continuation of this CoP.

The participants identified the following actions:

- Bekenstichting (Brooks Foundation, environmental organization): to provide information on status of brooks and streams and to analyse possible causes for droughts
- KWR: to study the water balance of the Veluwe in collaboration with Vitens, the Province and the Regional Water Board.
- Staatsbosbeheer (National Forest Authority): to study the effect of transition to small vegetation or CO₂ storage through biomass.
- LTO (Agriculture and Horticulture Organization (Union)): to link the BINGO results to the work in the Deltaplan Agrarisch Waterbeheer (water management program by LTO)
- Land owners association: to inform land owners on latest findings regarding the issue.
- Province: to ensure an integrated and encompassing approach. The province is working on a knowledge document about the Veluwe, together with Vitens and the Waterschap Vallei en Veluwe (Regional Water Board)
- Province to seek further involvement of municipalities.

One of the issues at the Veluwe is that responsibilities are separated, without one organization having the ultimate responsibility. However, the province is identified as the primary risk owner and will take action to maintain an integral vision on this issue.

The participants acknowledge that much of the disparity in (perceived) interests is due to a lack of knowledge and information about the effects of droughts. Therefore, each of the participants will inform its members or stakeholders about the issue, based in part on the results of the BINGO project.

Province, Vitens, Water Board and KWR will make further steps on this issue, involving the other stakeholders when necessary; the CoP will meet in about six months for an update. The group has decided to continue the work of the CoP beyond the BINGO project. The CoP will then meet every six months and discuss a concrete case with the



relevant stakeholders. Everybody is asked to think about other actors that need to be involved.

2.2. CoP Activities, January 2018 – February 2019

The Veluwe CoP has its 5th meeting at June 19th, 2018 at Hotel Haarhuis te Arnhem. The objectives of the meeting were to share the latest BINGO-results, in particular the hydrological modeling results and its effect on the measures that have been selected. The second objective is to decide on criteria for the socio-economic analysis of the adaptation measures. The third objective is to report back on the actionable actions identified in the 4th CoP meeting.



Figure 1. Fifth Veluwe CoP meeting

BINGO Results

Henk-Jan van Alphen (KWR) gave a short overview of the main results at the five other research sites in BINGO. Sjoerd Rijpkema (Vitens) presented the results of the hydrological modeling for the Veluwe.

Criteria for evaluation of measures

The broad range of criteria identified in the 3rd CoP meeting is being presented to the CoP, asking them to weigh their relative importance by assigning scores (0 to 10). The scores of all participants are then added. It shows the environmental criteria are



weighted heavier than socio-economic criteria. This can partly be explained by the composition of the stakeholder group. More information on this can be found in D5.3 (due in June 2019).

Evaluation of actionable actions

The participants went over the list of actionable actions and together reviewed what has been done in relation to the issues.

Sector		Name	Number of	Role in the
			participants	workshop
R&I (Publi	c and Private)	KWR	4	E
Policy Bodies	Supra-Municipal level*	Province of Gelderland, Waterschap Vallei & Veluwe	3	P/S/A
Policy Bodies	National level			
Utilities –	Water companies	Vitens	3	E/S/P/A
Sector Organizations		Bosgroep Midden Nederland, Bekenstichting, Stichting Natuur- en Milieuzorg Noordwest Veluwe, Gelders Particulier Grondbezit, Hogeschool van Hall Larenstein	5	A/S

Table 1. Sectors and roles of workshop participants

*Collection of municipalities

** Stakeholders affected by the problematic conditions of the complex issue: A Policy makers responsible for designing, approving, implementing solutions: P Stakeholders relevant to the solutions development: S Experts: E

2.3. Final Portfolio of Actionable Measures

With regard to the actions from D6.6, the following can be reported:

Mr Zeeman of the Bekenstichting has raised the issue within the Water Authority to improve its measurements of the flow-rates in the brooks and streams. To achieve more coordination between stakeholders, he has also started to participate in the process Aanvullende Regionale Strategische Grondwatervoorraden (Additional Regional Strategic Groundwater Resources) in which the Bekenstichting was not yet participating.



KWR, Vitens and the Provincie Gelderland have jointly increased their knowledge of the Veluwe water balance by studying historical land use at the Veluwe and its effect on the water balance. The results have been shared with the CoP participants

The Province has dissiminated the Veluwe knowledge document to the CoP, Water Authority, Vitens, Bekenstichting, consultancy firms and internally. BINGO-results are used in the process Additional Regional Strategic Groundwater Resources. Municipalities are also connected in this process. The socio-economic analysis of BINGO will bring the facts on costs and benefit more clearly into the discussion on the management of the Veluwe. It will also help in the discussions on and the weighing of biodiversity, climate change, groundwater management and tourism development in the future.

The CoP has not planned any specific new actionable measures. The CoP will continue to meet, and when the need for new actionable measures comes up, the approach used in BINGO can prove a useful tool.

2.4. How did the CoP evolve

For the duration of the BINGO project, the CoP has been more or less consistent in meetings every six months. There is a core group of the BINGO participants together with the Water Authorities, Organisation of Private Land Owners, Bekenstichting, and nature management organizations that attends every meeting. Municipalities and special interest groups such as tourist organisations and agricultural boards attended less consistently but are being involved through communication activities.

The Veluwe CoP has been mostly about **sharing knowledge and perspectives** and working on the tasks presented by the different BINGO work packages (mostly WP4-5-6). The actionable measures have also been mostly about developing and sharing knowledge and **involving stakeholders in different collaborative platforms** to address policy issues. This fits well within the Dutch political culture, not so much focused on individual actions, but on weighing interests and perspectives to come to policy solutions (the so called 'polderen'). BINGO has contributed to that by **making groundwater a more prominent topic in the overall management of the Veluwe** and **involving local stakeholders in different policy platforms**.

On June 19th, the CoP will have its final meeting within the BINGO project. It will be a larger event where the results of BINGO will be presented to a regional audience of policy makers, professional, scientist and politicians. We will organize several break-



out sessions on hydrology, policy and governance, stakeholder involvement and the drought of 2018.

2.5. The future of the CoP

Currently, the Province, Water Authority Vallei & Veluwe and water company Vitens are preparing a proposal for the Dutch Science Organisation (NWO) Fund for more scientific research on the behaviour of the transpiration of vegetation in situ, the behaviour of the deep unsaturated zone and the behaviour of groundwater flow. The inputs and involvement of the BINGO CoP will be an asset in this proposal. The direct involvement of stakeholders in BINGO has paved the way to continue this involvement in the future.



3. BADALONA RESEARCH SITE

3.1. Revisit of first Actionable Research Lab

The M28 workshop Solving the unsolvable took place in Badalona in January 2019. Aquatec organized it in collaboration with CETaqua and Ajuntament de Badalona. Twenty-five persons attended the workshop in total (Table 2).

The main objectives of the workshop were:

- to keep stakeholders updated about BINGO progress and results
- to define issues and future actions of climate change adaptation measures in Badalona
- to identify stakeholders and actors involved in the implementation of adaptation measures
- to propose ways to test/evaluate the performance of the selected adaptation measures
- to list advantages and disadvantages or critical aspects related to the implementation of the selected adaptation measures
- to plan/roadmap the necessary implementation activities

Sector		Stakeholder	Role in the workshop**	Number of participants
D 2 I / Dublic /	and Brivata)	Aquatec	O; E	3
rai (rubiica	and Frivale)	CETaqua	O; E	1
		Universitat Politècnica de Catalunya	E	1
	Municipal level	Ajuntament de Badalona	O; S; A; P	13
Policy Bodies Municipal level [*]	Supra-	Àrea Metropolitana de Barcelona (AMB)	S; P	1
	Diputació de Barcelona	S; P	1	
	level [*]	Agencia Catalana de l'aigua (ACA)	S; P	1
Utilities – Wa companies	ater	Aigües de Barcelona	S	4
			TOTAL	25

Table 2.	Sectors	and	roles of	of work	shop	participants	3
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*Collection of municipalities

** Stakeholders affected by the problematic conditions of the complex issue: A Policy makers responsible for designing, approving, implementing solutions: P Stakeholders relevant to the solutions development: S Experts: E Organizer: O



The workshop was divided into 4 main sessions. The main sessions were:

- 1. Registration of participants and welcome. An opening speech was given by the Major of Badalona followed by an overall introduction speech from Aquatec's representatives.
- 2. General overview on the objective and tasks of the BINGO project, explanation of the workshop's objectives and detailed presentation on the technical progress of the Badalona case-study (focused on WP2, WP3 and WP4)
- 3. Group discussion:
 - Presentation of the adaptation measures selected at the previous workshop for the Badalona case-study.
 - All the participants were asked to contribute to the following points:
 - 1. Actors/stakeholders involved in the implementation of the measures
 - 2. How can we test/evaluate the performance of the solution?
 - 3. Positive/advantages and negative/disadvantages/critical aspects related to the implementation of each measure
 - 4. Planning/roadmap of the implementation process
 - All the topics were discussed and assessed to achieve a first qualitative assessment.
- 4. Information about the next Badalona WP3 meeting, closing remarks and next steps

Figure 2. Workshop introduction by the Major of Badalona (Left); Group discussion (Right)





The outcomes of the group discussion for each of the adaptation measures that were selected at the M22 workshop are summarised in the following Tables.

Table 3. Adaptation measure 1: Increase of the number of sewer inlets to increase the capacity of the surface drainage system

1	- An estimated cost was provided by the Drainage Master Plan (to be updated in the framework of BINGO)		
Action plan			
	Pros - Reduction of surface runoff that was identified to be a problem - Exploit the capacity of the sewer (the sewer was detected not to work at full capacity while substantial surface runoff was occurring)		
Pros and cons of the adaptation measure	Cons- Economic costs of the construction and maintenance - Cleaning management: how to clean, how often, costs - Construction interference with daily activities in the neighbourhoods 		
How to test/evaluate the performance of the solution	 Desktop studies, computational modelling Pilot testing Field work: interviewing locals, getting feedbacks from citizens 		
Stakeholders and actors involved	 Department of Mobility and Public Spaces Department of Urban Development Department of Environment and Sustainability Private companies: consulting, maintenance, construction, manufacturers, cleaning. Inhabitants affected by the construction, maintenance and possible malfunctioning of the system Catalan Water Agency (ACA). It allocates funds and discuss the levels of competences Local research centres with deep knowledge about the hydraulic efficiency of these elements 		

Table 4. Adaptation measure 2: Implementation of new detention basins and increase of sewer's pipe capacity*

Stakeholders and actors involved	 Department of Mobility and Public Spaces Department of Urban Development
	- Department of Environment and Sustainability
	- Private companies: consulting, maintenance, construction,
	manufacturers, cleaning.
	- Inhabitants affected by the construction, maintenance and possible
	malfunctioning of the system



	 Catalan Water Agency (ACA). It allocates funds and discuss the levels of competences Management of the basin Civil protection Research centres 		
How to test/evaluate the performance of the solution	- Desktop studies, computational modelling		
Pros and cons of the adaptation measure	Cons - Economic costs of the construction and maintenance - Cleaning management: how to clean, how often, costs - Construction interference with daily activities in the neighbourhoods - Phreatic pollution due to network exfiltration - High costs to filter/remove solid waste (dead animals, electronics, plastic, matrasses, trash) from the sewer network and to dispose it to a controlled landfill		
	Pros - Reduction of combined sewer overflows - Reduction of the flood risk		
Action plan	 An estimated cost was provided by the Drainage Master Plan (to be updated in the framework of BINGO) Legal support and regulations Codes of design 		
Furthers	- Alternative solution to a basin: a solid retention system/deposit		

* Detention basins and increase of sewer's pipe capacity were discussed together in this workshop as they were considered to be related to each other (despite the fact that they were identified as different adaptation measures at the previous workshop)

Table 5. Adaptation measure 3: Implementation of Sustainable Urban Drainage Systems (SUDS)

Stakeholders and actors involved	Department of Mobility and Public Spaces Department of Urban Development Department of Environment and Sustainability Private companies: consulting, maintenance, construction, manufacturers, cleaning. nhabitants affected by the systems Datalan Water Agency (ACA) Private sector Research centres		
How to test/evaluate the performance of the solution	 Desktop studies, computational modelling Pilot testing Field work: interviewing locals, getting feedbacks from citizens 		
Pros and cons of the adaptation measure	Cons - Limited space due to very dense urbanization - Urban regulations do not promote SUDS - Low political support - Maintenance management: how to, how often, costs		
	Pros - Reduction of combined sewer overflows - Reduction of flood risk - Multi-disciplinary benefits related to: heat waves, biodiversity, air and water quality, amenity, attractive neighbourhoods		
Action plan	- An estimated cost was provided by the Drainage Master Plan (to be updated in the framework of BINGO)		



 Legal support and regulations Codes of design Guidelines for public/private responsibilities, ownership, maintenance responsibility 	
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Table 6. Adaptation measure 4: Implementation of an early warning system (EWS)

Stakeholders and actors involved	 Network operators Emergency services Local Police and Civil Protection Citizens (actors and beneficiaries) Third companies: consulting, mobile operators. Research centres 		
How to test/evaluate the performance of the solution	 Pilot testing (only related to specification of the system) Field work: interviewing locals, getting feedbacks from citizens 		
Pro and cons of the	Cons	 Increase of 112 calls and feeling of potential harm 	
adaptation measure	Pro	- Reduce the vulnerability of citizens and buildings	
Action plan	 Development of the key elements of the EWS (models, maps, etc.) in the framework of BINGO Definition of the steps to implement EWS in the framework of BINGO Definition of the cost of its implementation in the framework of BINGO 		
Furthers	 Provide flood hazard and risk maps of the city for several return period rainfall/runoff events. Provide warnings in different languages Manage the consequences of false alarms 		

3.2. CoP Activities, January 2018 – February 2019

Once the action plan/roadmap for the selected adaptation measures was defined in M28 workshop, a couple of CoP meetings were performed to agree/validate the decisions and partial results obtained along the BINGO roadmap.

This is the summary of both meetings:

CoP meeting-1

- Date: 23/10/2018 (from 9'00 to 14'00 approx.)
- Objectives:
 - 1. Review of D4.4 results
 - 2. Review of the methodology and validation of the results of the risk assessment for pedestrians and vehicles in case of urban floods







- 4. Delimitation of the 4 adaptation measures being selected in the M28 workshop
 - Inlets increase
 - Sustainable Urban Drainage Systems



- Increase of sewer's pipe capacity + retention tanks
- Early warning system (for flooding and CSO)
- Main results:
 - Identification of the limitations of the current protocol used for beaches closure due to CSO and proposal of modification due to BINGO results to be validated in the following CoP meeting;
 - The adaptation measures: (a) inlets increase, (b) increase of sewer's pipe capacity and (c) addition of retention tanks, will be merged in a single one named as "Inlets increase and overall increase of the drainage and retention capacity of the network";
 - Exact definition of the Inlets increase and overall increase of the drainage and retention capacity of the network measure. It was decided to include the measures defined in the Urban Drainage Master Plan of 2012:
 - 12.427 new inlets
 - 9.478 m of new pipes
 - 4 mixed (anti-flooding + anti CSO) retention tanks with a total volume of 150.000 m³
 - 10 anti-CSO retention tanks with a total volume of 82.000 m³
 - For the adaptation measure of Sustainable Urban Drainage systems it was decided to consider only the typology of SUDS suitable to the characteristics of Badalona, i.e., pervious pavements, infiltration areas/trenches and green roofs;
 - Regarding the early warning system it was decided to consider a tool for flooding and CSOs events.

CoP meeting-2

- Date: 18/12/2018 (from 9'30 to 14'00 approx.)
- Objectives:
 - 1. Validation of the hazard and risk maps for pedestrians and vehicles developed for T1, T10, T100 and T500
 - 2. Validation of the proposal of location for the adaptation measure on SUDS
 - Validation of the proposal of a new bathing water quality protocol to be used by the Badalona city council
- Main results:



- Minor comments on the hazard and risks maps were done regarding the inaccuracy of some results due to recent works in the urban surface. It was agreed to update the maps with these recent upgrades. The final maps will be directly used by the city council (civil protection department).
- The city council made some modifications on the initial proposal for SUDS locations considering more realistic potential implementations.
- The modification of the existing bathing water quality protocol was accepted. The city council will analyze in detail how to implement it in the following bathing seasons.



Figure 3. COP meeting-1 (Left); COP meeting-2 (Right)

Table 7 presents the attendees of both workshops who were the same.

Sector		Stakeholder	Role in the workshop**	Number of participants
R&I (Public and Private)		Aquatec	E	3
		CETaqua	E	1
Policy Bodies	Municipal level	Ajuntament de Badalona	A; S; P	7
	Supra- Municipal level*	Àrea Metropolitana de Barcelona (AMB)	S; P	1
Utilities – Water companies		Aigües de Barcelona	S	1
			TOTAL	13

*Collection of municipalities

** Stakeholders affected by the problematic conditions of the complex issue: A Policy makers responsible for designing, approving, implementing solutions: P



Stakeholders relevant to the solutions development: S Experts: E

3.3. Final Portfolio of Actionable Measures

Actionable measures

The final portfolio of Actionable Measures resulted from M28 workshop and the subsequent CoP meetings consist of a list of 3 measures. This is a summary of them:

- Inlets increase and overall increase of the drainage and retention capacity of the network. In order to increase the inlet capacity to the drainage system, conveyance and retention of stormwater runoff, the number of inlets and the capacity of the existing sewer system must be increased by adding new inlets, new pipes (sewers) and some retention tanks. This includes:
 - 12.427 new inlets
 - 9.478 m of new pipes
 - 4 mixed (anti-flooding + anti CSO) retention tanks with a total volume of 150.000 m³
 - 10 anti-CSO retention tanks with a total volume of 82.000 m³
- 2. Nature Based Solutions, implementation of SUDS (Sustainable Urban Drainage Systems). SUDS are drainage systems that mimic natural drainage by managing potential flooding and protect watercourses and rivers by using natural treatment processes. This is why they are considered as a typology of Nature Based Solutions. There are four main benefits that can be achieved by SUDS: water quantity, water quality, amenity and biodiversity. SUDS can take many forms, both above and below ground. Some examples include: green roofs, pervious pavements, bioretention systems, swales, wetlands, soakaways, infiltration basins, etc. For Badalona, the typology of SUDS selected according to its feasibility of implementation (available space, rain characteristics, maintenance costs, etc.) are: infiltration areas/trenches, pervious pavements and green roofs.
- 3. **Early Warning System.** The early warning system is a technological solution to reduce vulnerability (particularly the exposure), to anticipate problematic situations (floods and Combined Sewer Overflows (CSOs)) and to automatically launch the corresponding emergency protocols to avoid impacts on citizens,



beaches or public assets. This includes weather forecast, automatic flood risk mapping, estimation of beaches' affection by pollution, communication interfaces, mobile applications, etc. The emergency protocols could imply: closure of beaches, traffic restrictions, building's protection, etc.

Planning

An estimation of the implementation cost of the measures will be provided in the framework of BINGO project as well as the results of their potential implementation in terms of risk reduction and thus in direct and indirect benefits for the risk owner, the Badalona City Council. With these results, the City Council will have quantified arguments to decide on their implementation or at least to prioritize between them.

Responsibilities

The Badalona City Council has the end responsibility to select the adaptation measures to be finally implemented. This is something that has not been decided yet. It is expected that the results of BINGO project (mainly the cost-benefit analysis currently being performed) will help to prioritize the implementation of the measures and to give the necessary quantitative arguments to support them and to obtain the necessary funding for their development.

Accordingly, the exact time horizon for their implementation is not yet available.

3.4. How did the CoP evolve

The Badalona CoP evolved through the different activities gradually into an effective tool. The number of attendees was satisfactory in all workshops, with around 25 attendees on average, and with representatives of local stakeholders and upper administrative levels such as the Catalan Water Agency or the provincial government. This wide representativeness allowed the involvement of key persons in both the decision-making process that affects the evolution of the project, and the dissemination of the project results.

The contribution of local stakeholders was crucial to focus on the research and to validate the project results ensuring its profitable use at local level (Badalona city Council). The role of high-level stakeholders (administrations, research centers, etc.) was also crucial for the dissemination and replication of the results.

One issue worth pointing out is that the CoP cooperation was effective through the face-to-face meetings (workshops and other meetings). The use of a communication



platform such as Basecamp did not provide any improvement in the established cooperation given that it was not really used by the stakeholders.

3.5. The future of the CoP

Once the BINGO project is finished, the plan is to keep track of the implementation process of the measures as well as of its impact in Badalona. The CoP will be dissolved, but the contacts will remain.



4. BERGEN RESEARCH SITE

4.1. Revisit of first Actionable Research Lab

The M28 Workshop "Solving the Unsolvable" was held in Bergen November 16th, 2017. In Bergen, the municipality is continuously working towards a sustainable stormwater management, which entails a shift from traditional buried stormwater systems towards a more surface-based and local stormwater handling. Finding the necessary area for such solutions is a difficult task in densely populated urban areas and requires expert knowledge on the existing system at hand. It also requires that the reason for the area demand is properly communicated to relevant stakeholders such as spatial planners and private property owners. Due to this, Bergen K has initiated a web-portal where the public can share and geo-tag pictures of water-observations in their surroundings. This information gathering serves two purposes: 1) To gather information about water ways, flow directions and existing infrastructure to increase system understanding and knowledge, and 2) to raise public awareness of stormwater and related challenges. The wicked problem selected for the M28 workshop was *"How to succeed with public involvement?"*, i.e. how to get the public to use the web-portal.



Figure 4. Layout of the developed web-portal



Through group- and plenary sessions for problem definition and solving, the M28 workshop resulted in an implementation plan ready to be carried out and criteria for measuring success were defined.

The main actions were:

- 1) Engaging residents and target groups,
- 2) Planning and executing events that raise awareness and promote the web-portal,
- 3) Promoting the web-portal internally in the municipality,
- 4) Securing a good domain for the web-portal.

Number of pictures received through the web-portal and number of focus groups engaged were, amongst others, defined as success criteria and targets were set. Detailed actions and a complete description of the M28 workshop is given in BINGO D6.6 "Interim portfolio of actionable research problems/challenges exploitation and development".

4.2. CoP Activities, January 2018 – February 2019

On March 18th, 2019, the last official workshop and CoP activity 'Up to the CoP' within the BINGO framework at the Bergen research site was held. The objectives of the workshop were to disseminate latest BINGO results, follow up plans from the M28 workshop and evaluate the overall CoP evolution and project participation. Stakeholders from relevant agencies of the municipality were invited and present at the workshop, in addition to a few new participants from the Agency of Water and Sewage Works (Bergen K) who were curios on the results of the BINGO project (Table 8).

Agenda

- Introduction to the BINGO project (NTNU) and revisiting previous CoP activities (NTNU)
- Evaluating plans and actions decided in M28 workshop (Plenary discussion)
- Results and outcomes of participating in the BINGO project (Bergen K)
- Latest research and results in BINGO (NTNU)
- Evaluation of BINGO participation / CoP (Plenary discussion)

In addition to bringing all stakeholders up to speed on latest BINGO activities and results, the plenary sessions resulted in 1) an updated implementation plan for the 'wicked problem' "How to succeed with public involvement?" (rendered in Section 4.3),



2) a discussion and common understanding of how the CoP has evolved (presented in Section 4.4) and 3) suggestions for keeping the CoP alive after BINGO (Section 4.5)

Sector		Number of participants	Role in the workshop
R&I	Norwegian University of Science and Technology (NTNU)	2	Facilitator / organizer
City of Bergen	Agency for Water and Sewerage Works	(9)	Organizer
	Agency for Planning and Building Services	(3)	Participant
	Department of Climate, Culture, and Business Development	1	Participant

Table 8. Sectors and roles of workshop participants

Figure 5. Presentation and discussion of BINGO solutions



4.3. Final Portfolio of Actionable Measures

The 'wicked problem' addressed in the M28 workshop (report in BINGO D6.6) was *"how to succeed with public involvement?"* and most of the actions defined (as solution to this) was based on communicating the developed web-portal. Throughout the last year, many pictures have been received through the web-portal, but not as many as



targeted. A strong correlation between communication efforts and received contributions from the public is observed.

Bergen K has visited students at one of the local schools in the Damsgaard area and asked them to test the web-portal. The feedback from the young test group was that the web-portal is difficult and cumbersome to use. According to the students, a mobile application, or simply calling and reporting to the municipality, would be easier than logging into the web-portal. This feedback has been valuable, but it has resulted in a lower effort in promoting the web-portal to the public than what was initially planned in the M28 workshop. The idea of a digital platform for public engagement is, however, not rejected, and Bergen K wish to further develop the digital solution. In addition to providing the municipality with valuable information about drainage system infrastructures and conditions during rain events, a digital communication tools is beneficial for educational purposes and allows the public a greater impact on their surroundings. Furthermore, the data collected can be useful to other agencies and operational departments of the municipality.

Actionable measures

It was there for concluded in the final workshop "Up the CoP" to continue the commitment to the initiative and the following actionable measures were suggested:

- Continue collaboration with local schools
- Revise the objectives and functional requirements of the digital communication platform
- Explore existing applications and/or offers from suppliers
- Build / launch new application
- Implementation plan from BINGO D6.6

4.4. How did the CoP evolve

Overall, the CoP has strengthened and facilitated the communication internally in the municipality, across municipal agencies and between the municipality and the public. All stakeholders agree that the CoP has **promoted knowledge and relations to other agencies and employees in the municipality** such that interdisciplinary collaboration has become easier. Interdisciplinary collaboration is inevitable in the work towards climate adaptation, and the CoP has provided a scene for creating a common understanding of this, along with a common understanding of the challenges and solutions. The CoP has been **a meeting point** for establishing the necessary relations



needed to collectively work on climate adaptation. The results of BINGO communicated at CoP events, and to all stakeholders, will be used in future works of the municipality such that a holistic urban planning can be achieved. Another positive side-effect of working together in CoP and research projects is that is sends a signal to the city government that the work of the municipal agencies is provident. This may **increase their momentum at the political level**.

For some stakeholders it was difficult to pin-point individual benefits from participating the in the BINGO organized CoP workshops. One identified cause of this, is that although interdisciplinary and holistic planning has become easier, are still struggling with bridging the gap between the results of the research and highly detailed urban plans and stormwater management. In the BINGO project, Bergen K has had a limited budget and increasing the Municipality's use of internal resources in other projects could potentially help overcome this is in the future. Furthermore, impacts, such as better communication and strengthened collaborations, are more 'hidden' than physical measures implemented at sites and they grow slowly over time. Highlighting and exemplifying how this has evolved over time might motivate stakeholders to continue prioritizing CoP as a working method. The reflections at the end of the workshop revealed several "hidden" benefits of the CoP, benefits that the participants did at first not link to BINGO, but in the reflections it became clear that BINGO and the CoP had been a vehicle to make it happen. This showcased the importance of reflections of the process and outcome in order to become aware of indirect and more hidden outcomes.

4.5. The future of the CoP

There are no concretized plans to continue the CoP officially. Bergen K is, however, currently participating in another project, BEGIN (<u>https://northsearegion.eu/begin/</u>), where their budget is higher and where many of the same challenges treated in BINGO are being addressed. BEGIN is even more implementation-focused, and several of the BINGO CoP stakeholders are already involved in this project. The temporal overlap of the two projects creates a natural bridge between the two and a continuation of the collaborative approach is secured.



5. TROODOS RESEARCH SITE

5.1. Revisit of first Actionable Research Lab

The 'unsolvable' problem in the Troodos research site discussed in the M28 Workshop was about the role of desalinated water and groundwater in securing the domestic water supply of rural communities in the downstream area of Peristerona Watershed under climate change.

The Water Development Department (WDD) developed the Vasilikos Western Nicosia Conveyor Water Supply Project to improve the security of potable water supply in Nicosia and 28 communities in western Nicosia (including downstream Peristerona area). The main impacts of the solution are: (a) access for rural households to continuous and good quality water supply, (b) increase in water price for rural households, (c) increased cost of the water losses of the local distribution network (non-revenue water) for the communities.

Several complementary actions to improve the effectiveness of the desalination supply measure were discussed among the participants, including:

- the use of treated sewage water (reuse of reclaimed water) for irrigation for alleviating the pressures on water resources and increase the water availability for domestic uses;
- the installation of water saving equipment for both domestic and irrigation water use for saving water;
- the maintenance and repair of the water distribution systems for minimizing leakages and water losses;
- the strict implementation of restrictions on borehole drilling for regulating groundwater extraction.

All participants agreed that the net outcome of the desalination measure is positive for the communities and inhabitants of Nicosia, and that the reduced abstraction of groundwater could improve the quantitative and qualitative status of the aquifer. However, further research should be conducted on the implementation of the measure and the above complementary actions to optimize water management and water use.



5.2. CoP Activities, January 2018 – February 2019

A CoP workshop entitled 'Discussing adaptation options for securing domestic and irrigation water supply in the downstream area of Peristerona Watershed under climate change' was organized in Peristerona on 20 February 2019. In total, 12 persons attended the workshop (Table 9).

The objectives of the workshop were:

- to keep stakeholders updated on the BINGO process and activities
- to discuss the desalination measure and three additional measures for domestic and irrigation water supply
- to define follow-up actions

Sector		Number of participants	Role in the workshop [*]
R&I (Public and Private)		2 (Cyl)	0
Policy Bodies	Municipal level	3	A, S
Utilities – Water companies		1	P, E
Utilities – Irrigation associations		4	A, S
Sector Organizations		2	E

Table 9. Sectors and roles of workshop participants

Stakeholders affected by the problematic conditions of the complex issue: A Policy makers responsible for designing, approving, implementing solutions: P Stakeholders relevant to the solutions development: S Experts: E Facilitators: O

Figure 6. Overview and updates of BINGO activities (left); Presentation of adaptation measures (right)





The workshop consisted of three main parts. In the first session of the workshop, Elias Giannakis (Cyl) gave a short overview and updates of BINGO activities, supported by a powerpoint presentation, and outlined the objectives of the workshop. Christos Zoumides (Cyl) gave a short presentation of the four adaptation measures for improving water supply and water use management.

The selected adaptation measures for ensuring the continuity of domestic water supply to rural households are: (a) the use of desalinated water for the downstream communities of the Peristerona Watershed, (b) the maintenance of groundwater recharge systems along the Peristerona River. The selected adaptation measures for ensuring a sustainable management of irrigation water supply are: (a) the adoption of irrigation scheduling decision support systems to improve irrigation water use efficiency, (b) the use of treated sewage water for irrigation in the downstream communities of the Peristerona Watershed.

In the second session of the workshop, the participants scored the selected four adaptation measures against 7 criteria for irrigation use and 8 criteria for domestic water supply used, which had been selected by the stakeholders during the BINGO M22 workshop 'Participatory Evaluation of Climate Change Adaptation Measures'. Finally, in the third session of the workshop, the participants discussed follow-up actions to achieve the objective of securing domestic water supply and improving irrigation water use management (see Section 5.3).

For the domestic water supply sector, groundwater recharge systems were more preferable to participants compared to the use of water desalination. For the irrigation sector, irrigation scheduling technologies were more preferable to participants compared to the use of treated sewage water. However, several concerns were raised (see Section 5.3).

5.3. Final Portfolio of Actionable Measures

Water desalination

One of the main concerns of stakeholders regarding the use of the desalinated water is the financial viability of the project. Community councils, which are the local water supply authorities, can select the source of water (i.e., desalinated water vs groundwater) for domestic use at their own discretion. However, taking into account (a) the pressures the households will exert towards the use of groundwater due to the



lower price, and (b) the lack of technical expertise in communities to manage and support the requirements of the project, several concerns were raised regarding the demand for desalinated water. Community leaders noted that citizens will be willing to pay the increased price of desalinated water because it will ensure access to continuous and good quality water supply. However, citizens should be more aware about the impacts of climate change on water resources to better appreciate the importance of securing the domestic water supply. WDD could organize together with the local communities, workshops to increase citizens' awareness about climate change risks and challenges. Moreover, the provision of technical support to local communities from WDD is required for the proper management and operation of the measure. One alternative solution could the establishment and operation of district-level water supply authorities by the Water Board of Nicosia to overcome the abovementioned barriers and allow an integrated management of water supply.

Groundwater recharge systems

Regarding the groundwater recharge systems (i.e., check dams), the community leaders mentioned that the institutional/governance framework for the maintenance of the check dams is not clear. Local communities are responsible for the removal of sediment and the WDD is responsible for the maintenance of the gabion structure. However, the communities don't have the financial resources to properly maintain the check dams, while when interventions in the riverbed are required they need to ask permission from the WDD; as a result, most of the times these systems are not properly maintained. Better coordination between the WDD and local community councils is required to overcome these administrative obstacles.

Use of treated sewage water for irrigation

For the irrigation water use, the majority of the farmers participating in the workshop mentioned the need for farmers to have access to treated sewage water, which is by far the lowest-cost water source for irrigation.

Irrigation scheduling technologies

Farmers also agreed that irrigation scheduling technologies currently cannot be adopted by the farmers because of (a) the high establishment and operational cost, (b) the presence of low-cost water supply sources. Participants suggested two solutions to overcome these barriers: (a) the government should provide financial incentives for the uptake of these technologies through the increase of the subsidy rates from the Rural Development Programme of Cyprus, (b) a collective action for sharing the high costs.



5.4. How did the CoP evolve

During BINGO lifetime, two main instruments were used in the Troodos research site to establish an integrated and participatory approach to climate risks and challenges, namely:

(a) participatory workshops (M8, M15, M22, M35), enabling stakeholders' participation in critical tasks along the project implementation

(b) actionable labs (M28), oriented to address together with stakeholders critical 'problems' based on a design thinking approach

All workshops and the actionable lab were conducted in a participatory manner that strengthened the trust and collaboration among the participants and fostered a mutual learning process among scientific and non-scientific stakeholders. Efforts were made to secure the presence of both internal (community leaders and farmers) and external (government officers and researchers) participants. Four out of the five workshops and actionable labs were conducted in the research site in order to maximize the participation of community leaders and farmers, i.e., risk owners, and create a relaxed and trustful working atmosphere. The timing of the workshops, that is, late afternoon – early evening, was primarily determined by the availability of the local participants, including the community leaders, who have other day time jobs, and farmers. Sharing meals after the end of the workshops also facilitated informal discussions and exchange of experiences among different stakeholders.

In general, the stakeholders in Peristerona Watershed considered as most effective means of keeping alive the established communications channels and collaboration process, the regular organisation of meetings and workshops (e.g., every 6-9 months). On the contrary, the stakeholders showed little interest in using the Basecamp. The majority of both farmers and community leaders (local stakeholders) are older than 60 that may partially explain their lack of interest in the use of such communication tools.

Lessons learnt from the CoP in Cyprus:

(1) The **active participation and cooperation of stakeholders** during the workshops and actionable labs revealed their willingness to better understand the risks of climate change, share their perceptions and discuss different adaptation options on how to confront these risks.


(2) The regular interaction between local community leaders, farmers, government officers and researchers can contribute to a **better understanding of the water-climate risks** at the region. Local stakeholders provide in this mutual learning process the empirical information regarding the actual conditions and practices of water resources management in the region for both irrigation and domestic water supply sectors, while the government officers explain the policy background and resource issues and the researchers present scientific evidence of the impacts of climate change on water resources and the cost effectiveness of adaptation options.

(3) The main discomfort expressed in the CoP was related to the complex and multidisciplinary nature of climate change. Both community leaders and farmers stated that the **government has to support them** in order to improve their ability to withstand the impacts of climate change through the provision of adequate financial, human and technical resources.

5.5. The future of the CoP

All stakeholders acknowledged that the future could be better for the region with better organization and public awareness on water conservation. We are committed to seek competitive funds for new research projects to maintain the most effective, according to stakeholders' preferences, communication channel, that is, the regular organization of meetings and workshops. Already, within our WATER JPI INNOMED (Innovative Options for Water Resources Management in the Mediterranean) Project, which started in June 2017, we continued the cooperation and meetings with the agricultural stakeholders. Considering the structure and organization of future workshops, the aim is to have a representative sample of stakeholders covering all relevant disciplines such as agriculture, water, environment and economy.



6. WUPPERVERBAND (Wupper Association (WA)) RESEARCH SITE

6.1. Revisit of first Actionable Research Lab

The M28 workshop for the two Wupper case studies "DE1 – Not enough water" and "DE2 – Too much water" was held on the 10th of November, 2017. Besides general discussions on the case study contents and contexts, the major aim of the workshop was the determination of potentially suitable adaptation measures for both cases.

First of all, the major risks and hazards for both case studies were determined. For DE1 these are especially changes in the precipitation distribution, increasing water demand with increasing heat and dry periods as well as increased demands on aquatic ecology affecting the Große Dhünn reservoir. DE2 instead, concentrates on urban floods in the city of Wuppertal due to a concentration of precipitation. For both cases, the major advantages have been stated, which were:

- already existing necessary data,
- already running discussions of many types of measures,
- ongoing investigations in a suitable context and
- good transferability for other regions.

Afterwards, potential adaptation measures were determined by the workshop participants. Examples are the reduction of outflows from the dam, water savings on customer side or the reduction of line losses for DE1 and the use of public areas as retention areas, the acquisition of suitable land by the municipalities or the education of people affected by existing risks for DE2. Furthermore, for both case studies relevant stakeholders and parties to be included in the upcoming work were identified and agreed on, data availabilities were evaluated and potential hurdles for the implementation of adaption measures were summarized.

Finally, the participants of the workshop agreed on an outlook on pending work and next steps. IWW got the task to provide two short documents, one document for each of the case studies containing the outcomes of this workshop. Furthermore, workshops on both case studies in a smaller frame were planned for 2018. Thus, the M28 workshop at the Wupper research site set an important basis and framework for the further ongoing investigations the BINGO WPs 4 & 5.



6.2. CoP Activities, January 2018 – February 2019

Workshop 1

Date: 04.06.2018

Title: DE2 – Prioritization concept for adaption measures for urban flood events (1)

Objectives: The main objective of the workshop was the presentation and discussion of a concept that defines how different adaptation measures could be evaluated and prioritized with respect to costs and efficiency, including monetary and non-monetary parameters.

Activities: Due to an urban flood event that occurred few days before the workshop (29.05.2018), the necessity of an evaluation and prioritization concept for adaption measures was underlined. Furthermore, fact sheets for different hotspots in the city of Wuppertal that might be vulnerable to urban floods were presented. Based on these discussions, IWW presented a first concept for a cost-effectiveness analysis (CEA) considering both, monetary and non-monetary parameters. This concept allows the prioritization of different potential adaptation measures. The workshop participants discussed the concept and agreed on the different parameters that should be included in the CEA.

Plans: At the end of the workshop plans for the pending work were set. It was agreed that all participants have a closer look on the presented CEA methodology and give feedback to IWW. Furthermore, the date for the next workshop was set.

Conclusions: The workshop participants agreed on the methodology to conduct the CEA as presented by IWW for the prioritization of different potential adaptation measures. Furthermore, a set of potential non-monetary parameters for the CEA was determined.

Workshop 2

Date: 10.07.2018

Title: DE2 - Concept of priorities for urban flood events (2)

Objectives: Determination of a weighting methodology of the different parameters that shall be investigated in the CEA for the DE1 case study.

Activities: At the beginning of the workshop the updated fact sheets for the different hotspots were presented. IWW presented the methodology how the weighting of the



parameters should be realized. Afterwards, this methodology was applied by all participants during the workshop.

Plans: At the end of the workshop IWW shortly presented the next step in the prioritization concept. The participants in the workshop were asked to give feedback after the workshop with regard to open questions and comments to the prioritization concept.

Conclusions: At the end of the workshop, the parameters that should be part of the CEA were weighted (a percentage value was assigned to each parameter indicating its weighting).

Workshop 3

Date: 20.09.2018

Title: DE2 - Concept of priorities for urban flood events (3)

Objectives: Update on the project progress, presentation and discussion of the final CEA concept considering the parameter weighting of the last workshop

Activities: At the beginning of the workshop the participants had a general discussion on the project progress. After that, remaining data requirements and potential data sources were identified by the stakeholders based on an updated presentation of the fact sheets. At the end of the workshop, IWW presented an updated version of the CEA that was adapted to limitations in data availabilities.

Plans: After the participants of the workshop agreed on the updated CEA concept, the next step would be the final data collection for and conduction of the CEA.

Conclusions: The participants agreed with the CEA concept that should be applied for the DE2 case study. Participants that could support the CEA by the provision of data agreed to deliver the necessary data.

Workshop 4

Date: 14.01.2018

Title: Adaptation to climate change for the case study "DE1 - Not enough water"

Objectives: Determination of final layout of adaption measures, methodologies to determine the costs and effectiveness of the respective measures, determination of data requirements and availabilities for the socio-economic analysis.



Activities: At the beginning of the workshop, the participants agreed on the final measures that were planned to be investigated in D5.3. Afterwards, it was discussed how the expected effectiveness of each measure could be evaluated. This was followed by a discussion on the cost determination for the measures.

Plans: Based on the results of the discussion, IWW would conduct the socio-economic analysis. For this purpose, the WV would support IWW in close collaboration, especially with regard to data requirements and open questions. Furthermore, the WV would conduct further models to determine the respective measure's effectiveness.

Conclusions: All participants agreed on the concept for the socio-economic analysis and the final set of the investigated adaptation measures was defined.

Sector	Number of participants	Role in the workshop**		
	Workshop 04.06.2018			
R&I (Public and Private)		4	S, E	
Policy Bodies	Municipal level	1	A, P	
Policy Bodies	Municipal level	3	A, P	
Utilities – Water companies		2	A, P	
Utilities – Water companies		2	A, P	
Engineering Office		1	S, E	
Sector Organizations		4	A, P, S, E	
	Workshop 10.07.2018			
R&I (Public and Private)		3	S, E	
Policy Bodies	Municipal level	1	A, P	
Policy Bodies	Municipal level	2	A, P	
Utilities – Water companies		1	A, P	
Engineering Office		1	S, E	
Sector Organizations		3	A, P, S, E	
	Workshop 20.09.2018			
R&I (Public and Private)		2	S, E	
Policy Bodies	Municipal level	1	A, P	
Policy Bodies	Municipal level	2	A, P	
Utilities – Water companies		1	A, P	
Engineering Office		1	S, E	
Sector Organizations		4	A, P, S, E	
Workshop 14.01.2019				

Table 10. Sectors and roles of workshop participants



R&I (Public and Private)	2	S, E
Sector Organizations	4	A, P, S, E

*Collection of municipalities

** Stakeholders affected by the problematic conditions of the complex issue: A Policy makers responsible for designing, approving, implementing solutions: P Stakeholders relevant to the solutions development: S Experts: E

6.3. Final Portfolio of Actionable Measures

The original planning according to previous CoP meetings and the documentation in D6.6 was to prepare discussion documents (working papers, each about two pages). These have been prepared and discussed throughout 2018 and early 2019. Also the plan was to continue in smaller working groups, evolving out of the CoP with all stakeholders involved. The final actions due are to analyze the collected data on adaptation measures and gather final data sets from stakeholders (e.g. final simulations of the water level in the Große Dhünn reservoir including adaptation measures).

The final list of adaptation measures under analysis are for the case of flooding in the city of Wuppertal ("too much water"): *Line protection, retention basin and technical protection at buildings.* For the case of raw water shortage ("not enough water") the final list includes: *Reduction of low water elevation downstream of the reservoir, pipe connection between Große Dhünn reservoir and Kerspe reservoir, use of alternative sources or ways to absorb water deficit* (like bank filtration from another catchment or water saving measures). The mentioned measures are currently in the final stage of analysis. Final data packages are expected to be delivered early April by the Wupperverband and the final analysis is expected to be finalized by the end of April in cooperation between IWW and the Wupperverband.

6.4. How did the CoP evolve

Throughout the project the CoP helped to **establish multidisciplinary working groups** on the two most important issues for the Wupperverband: Urban Flooding in Wuppertal as well as Raw Water Shortage in the Große Dhün reservoir. In 2018, the problems became visible, since a flooding in Wuppertal happened. Moreover, during 2018 the water levels in the Große Dhün reservoir but also in other regional reservoirs, dropped significantly. These events raised the interest of stakeholders participating in



the additional workshops of the CoP. Besides these formal meetings bilateral working contacts also evolved from BINGO, essential for the final steps in the project, especially in BINGO's Work Package 5. These bilateral contacts helped to overcome barriers in data collection, which was not always possible to pursue during discussions in the formal meetings with several stakeholders at once. In summary, **the CoP gave multiple stakeholders facing the same risks a forum to discuss and work on adaptation strategies and measures**. Evolving group discussions where helpful to define common objectives and define common indicators to evaluate adaptation measures. The evolving bilateral contacts in addition to that helped to gather necessary data for the BINGO project.

6.5. The future of the CoP

The collaboration of the CoP's participants represented a valuable contribution to the results gained in BINGO so far. However, during the work on the two Wupper case studies, a broad set of potential subsequent in-depths investigations could be identified. The BINGO CoP that was established for the Wupper case study represents a suitable starting point for these further investigations. As the work on future problems will again require the close collaboration of a variety of stakeholders from R&D institutions, governmental authorities, NGOs or similar, the existence of the CoP can significantly facilitate the beginning of any pending work.



7. TAGUS RESEARCH SITE

7.1. Revisit of first Actionable Research Lab

The first Tagus CoP Actionable Lab (WS M28) took place late in 2017 (16th November) and was devoted to explore the following issue: "*How to push the topic Hydric Resources Management into the Political and Public Agenda?*" (# *institutional;* #*communication,* # *citizenship,* # *schools....*)". In this first approach, participants explored "What would it mean to have the Hydric Resources Management into the Political and Public Agenda?" from the perspective of farmers, citizens, policy makers, decision makers and regulators.

Then four roadmaps were designed and explored (i) For a *General Politica*l Agenda; (ii) For a *Political Agenda in Tagus Site*; (iii) For a General *Public Agenda*; and (iv) For a *Public Agenda in Tagus Site*. Each of those roadmaps stressed already some posible actions to be developed, engaging the several stakeholders (see Figure 7)

Figure 7. Briefing from WSM28 Roadmaps





For a P	olitical Agenda in Tagus Site
1	To stress a "regime pact" around water issues in the region
2.	To reduce conflicts of use stress by a join force to overlap legislation struggles
	and responsibilities' clarification (i.e. in Vale Real)
3	To promote a discussion at the region around the social and economic values of
0.	water
4.	To discuss the irrigation qualification and possible investments in water storage
	capacity
5.	Mapping possible Mini-Hydric solutions implementation
For a (General Public Agenda
1	To propose the integration of "water issues" in the school curricula (in a similar
	way as to recycling issues)
	a. Training on "water issues" for teachers
	b. Didactic and friendly learning materials production
2.	To promote an "H2-School Context" (engaging all school community towards a
	more efficient water use)
3.	To promote "H2 Weeks" for children and families (i.e. Summer Camps) near
0.	water spots (i.e. Castelo de Bode Dam, rivers) and around water diverse uses
	experiences (i.e. agriculture)
А	To promote a Senior H2-School
5	To engage utilities in promoting a "Water Saving" National Context
5.	To promote a "Water Cycle Citizen Curator" Price, sponsored by the President of
0.	Republic
7	To promote "water issues" near "water sports" activities
7. Q	To onsure more investment from public and private actors in water
0.	communication and awareness-raising programs
For a F	Public Agenda in Tagus Site
1.	To promote a "Water Day" in local schools ("Our Water, Our River")
2.	To promote public visits/tours to the Tagus River and its water infrastructures
3.	To prepare a multimedia product around water issues, resources and uses in the
	region
4.	To implement a "Water GEOcaching" in the region
5.	To promote public debates around water issues joining different actors (water
	utilities, citizens, farmers, researchers,) "let's talk about water!"
6.	To promote an integrated awareness-raising Campaign - "Save Water, Save your
	Day" (advertising panels, ATM machines, water bills, local radios and press,
	municipal newsletters; social networks, morning TV programs,)



This workshop gained a lot from former co-productions and established interactions between participants. It also took place in a moment in Portugal and Lezíria do Tejo where the whole population was still debating the large impacts of big fires during summer 2017. Also, a severe "drought" conditions were announced by public authorities and emergency initiatives were stimulating a public debate. Therefore, this actionable lab attracted even more the interest of stakeholders.

7.2. CoP Activities, January 2018 – February 2019

The second Actionable Lab session (WSM48) took place in 12th October 2018 devoted to "*Make it Happen in Tagus Basin*" and engaged 26 participants from 12 organizations.

Sector		Name	Number of participants	Role in the workshop**
R&I (Public and Private)		LNEC – National Laboratory for Civil Engineering SPI – Portuguese Society for Innovation	11	E
Policy Bodies	Municipal level	CIMLT – Lezíria do Tagus Inter-Municipal Community	3	S
Policy Bodies	Supra-Municipal level*	ARHTO – Tagus and West River Basin District Administration	1	S
Policy Bodies	National level	DGADR – Agriculture and Regional Development National Board IH – Hydrographic Institute	3	S
Utilities – Water companies		EPAL – Lisbon Water Supply Utility	3	P (1) S (2)
Sector Organizations		ABL – Loures Beneficiaries and Irrigation Association ABLGVFX – Lexíria Grande of Vila Franca de Xira Beneficiaries and Irrigation	5	A&S

Table 11. Sectors and roles of workshop participants



Association	
COTR- Operational and	
Technological Center	
for Irrigation	
CAP – National	
Confederation of	
Farmers	
FENAREG – National	
Federation of Farmers	
and Irrigation	
Association	

*Collection of municipalities

** Stakeholders affected by the problematic conditions of the complex issue: A Policy makers responsible for designing, approving, implementing solutions: P Stakeholders relevant to the solutions development: S Experts: E

Agenda

This second session of the actionable lab aimed (i) to refresh BINGO so far WP results and CoP co-productions; (ii) to identify key feasible action to put in practice (making happen) from CoP previous Roadmaping; and (iii) to make a flashback of CoP experience and to set a pos-BINGO Agenda (see Figure 8).

Figure 8. Tagus WSM48 Agenda

WS M48 – 12 th October 2018
9.30h – Welcome & Housekeeping
9.45h – WS Housekeeping
10.10h – BINGO so far…
10.30h – Back to Roadmaps
10.50h – Exploring solutions to make it happen key actions
12.20h – Commitments & Detailed Collective Agenda
13.00h – Lunch Break
14.30h – BINGO CoP Flashback
15.00h – Forecasting BINGO experience transfers
15.35h – Lessons to Spread and Pos-BINGO Agenda
16.00h – Farewell Cofee & Testimonials Videos collection

The workshop took place in a very participative way, and the results ensure that the network of contacts and commitments can continue in the future, giving rise to new



collaborations and shared goals and actions. However, some threats posed by climate change may not be locally resolved, and the participants have this clear notion.

The BINGO project was also developed for bringing closer together <u>the scale of</u> <u>solutions to the scale of local problems</u> and, in this commitment perspective, it was easier for each participant to feel motivated to act, since the outcome to be produced must also express the usefulness of a joint action facing specific problems of local economic sectors or the sustainability of territories and all human daily activities.

The commitment that calls for a more prominent political engagement concerns a water Task Force and mobilizes an agenda programming that is no longer specifically local or regional, reflecting an influence for action that reaches national decision-making levels.

In the "Bingo so far" session the project team presented the main forecasts for the Tejo Basin region due to the expected impacts of climate change and also summarized the reasons for the exposed susceptibility of various economic sectors and society in general.

The availability of water may not be problematic (based on the decadal predictions). However, uncertainties in the medium term should be a concern. For instance, the saltwater intrusion in the upper region of the Tagus estuary depends mainly on the river flow and very low river discharges may be problematic for the agriculture in this region. Also, the risk of salinization increases if the periods of drought can cover several consecutive years. In relation to agricultural land inundation, forced by spring tides and severe storm surges, a significant change in the severity is not expected, however, for the dyke overflown consequence the severity can increase for very low likelihood scenarios (return period over 100 years).





Figure 9. Tagus "Bingo so far..." moment

Therefore, the major susceptibilities can be due to the lack of exclusive storage regulation capacity, considering water resources management. There is also a significant uncertainty regarding the potential increase demand due to client's behavior during extreme episodes.

Then, participants refreshed and reviewed the previous measures road mapping coproductions for a political and public agenda and identified (by a shopping technique) in a common wall paper, the ones that participants considered more relevant and feasible. The wall panel also allowed that the results are immediately visible, showing the focusing tendencies regarding certain measurements (see Figure 10).





Figure 10. Shopping relevant and feasible measures to develop together

The policy level (general and local) of action was the privileged level (recruiting more than half of the choices on the part of the participants (see Table 12 and Figure 11). If we take into account the weighted measures above the general mean, we find that these measures focus on government measures to support investment, the inventory of water uses and needs, the requalification of infrastructures (through the initiative of the local political agenda), and organizational aspects as well as the defense of a debate at local level. However, the public level of defended measures expresses other type of action, focusing more sensitizing aspects. Only the need for debate is pointed up as consensual regarding the priorities for both levels of action (general and local).



Type of measure and measures	Shopping	%/total	Mean
GENERAL POLICY AGENDA	25	36	4
1. Ministers' meeting on water issues	0		
2. Activate the National Water Council	4		
3. Review current legislation using Design Thinking techniques	2		
4.Task Force on water involving the media, political associations and citizens' organizations	5		
5. Encourage the Ministry of the Environment for an exhaustive inventory of the uses and availability of water	6		
6. Encourage the Ministry of Economy to promote an Investment Program (start-up on water and technological innovation for real-time monitoring)	5		
7. Invite the actual President of the Republic Marcelo (very popular in Portugal) to a BINGO workshop	3		
LOCAL POLICY AGENDA	14	20	3
8. Political agreement on water management in the region	0		
9. Clarification of legislative responsibilities and legal blockages (the example of the Royal Vala)	1		
10. Promotion open debate at regional level on the social and economic value of water	7		
11. Investment for requalification of the irrigation system and storage of water	6		
12. Mapping of possible mini-hydric infrastructures in the region	0		
GENERAL PUBLIC AGENDA	15	22	2
13. Introduction of the topic "water" in school curricula (it is required teacher training and friendly didactic resources)	4		
14. H20 Prize in schools (eco schools)	1		
15. Program entitled "Week dedicated to water" for families and children (School holidays program, tours and experiences in agriculture)	7		
16. Senior Program H20 School	1		
17. Contest on saving water with the involvement of utilities	0		
18. Prize «Citizen Curator / ambassador of the water cycle, with the involvement of the current President of the Republic	1		
19. promotion of water issues requiring sport activities and the water resource	0		
20. Information and awareness campaigns involving public and private funding	1		
LOCAL PUBLIC AGENDA	15	22	3
21. Promoting Water Day in local schools	2		
22. Organization of public visits to Tagus Basin and infrastructures for raw water capitation, treatment and distribution	6		
23. Multimedia product about water matters, resources and uses of water in the region	2		
24. Water Geocaching in the region	1		
25. Public and open debates «Let's talk about water»	4		
total	69	100	3

Table 12.	Results of	Shopping	Measures to	develop
10010 121		enopping	1110000100100	

Figure 11. Shopping Results by typology of measures



Measures' voting

Considering that each measure could receive a total of three votes, if (and only if) the distribution of the choices were absolutely equitable, it is also interesting to verify the measures less scrutinized by the preference of the participants.



In relation to the least voted measures (with zero choices), we highlighted the local measure focusing on the commitment (obviously at an inter-municipal level and involving other entities) for water management. This non-preference and *marginalization* of this type of measure denounces, perhaps, that the territorial and organizational division of political competences can be an obstacle to take into account.

The need for investment is felt at the local and general level, and related to infrastructures, not to promote knowledge or awareness. Awareness, moreover, is a cross-cutting need, particularly linked to the school context. Of course, the local level reflects more localized and incisive aspects of intervention, a more focused debate on regional issues and the requalification of regional water infrastructures. However, funding for regional infrastructures will have to be addressed at a supra-regional level (despite this need of funding is pointed at the local level), since political commitment at the regional level is seen as critical.

These considerations reveal that water issues, while appealing to physical interventions and new infrastructures or requalification of existing ones, highlight the political aspects of the commitment and the importance of the political agenda as a mobilizing factor of society. In fact, expressing the political agenda (general and local) 56% of the priorities for action, it is important to consider that the management of water uses and needs is not only resolved promoting physical measures or new infrastructures (curiously, the mapping of possible new mini-hydric expressed no preference of choice). What is really in focus, and what stakeholders expressed more forcefully (by the preferences and marginalization of certain solutions), is the degree of commitment, political and pubic, and the promotion of awareness and debate. Curiously, the initial workshops of the BINGO project have built this **shared framework** of references (about climatic change and regional impacts), and stakeholders are now able to equate the measures they can effectively take to practice.

Measures in practice

Participants were then invited to rethink their alliances and to choose the measures they will put into practice. The debate proved to be quite fruitful, and the various references were expressed on a tree-shaped wall panel (see Figure 12).



Figure 12. Concrete measures ideation



The tree symbolizes the possibility of various spring ramifications, but the debate began to focus on issues of **public awareness**, **the uncertainty** of forecasting scenarios, and the importance of each social actor to act in the **social space** of their direct influence.

This moment of preparing the mobilization of concrete measures for collective action was, however, a *turning point* revealing that stakeholders were then focusing on their real capacity for action and influence.

7.3. Final Portfolio of Actionable Measures

In this way, there were 4 commitments assumed by the stakeholders around four tangible action to develop together, as following (the enunciated content reflects the reformulation as developed by stakeholders) – see Table 13.

Table 13. Final Portfolio of Actionable Measures

1. TASK FORCE (measures 4 and 5)

Opportunities and objectives:

- Policy briefing and meeting with the ministry of the environment
- A government council
 An inter-ministerial commission regarding an exhaustive inventory of the uses and availability of water supplies;
- Meetings with parliamentary groups.



2. OPEN DEBATE (measures 10 and 25)

Opportunities and objectives:

- Debates 'Let's talk about water'
- Multimedia Product
- Contacts with local radios
- Muppies in local supermarkets

(these objectives should be mobilized taking into account the opportunity of WATER DAY, March 22)

3. GUIDED TOURS (measures 15 and 22)

Opportunities and objectives:

- Link the water issues to citizenship one in school sessions
- Exhibition of **BINGO Video** in schools
- Guided tours to water infrastructures and local rivers (where does the water come from? Come and visit our river)

(these objectives should be mobilized taking into account the opportunity of WATER DAY [sessions at school], and guided tours will be held the following day, March 23rd, involving the families of the children)

4. SCHOOL ACTIVITIES (measures 13 and 21)

Opportunities and objectives:

- Video exhibition of partners and managers of the water sector (EPAL, ADP ...)
- School Games alluding to water issues
- Specific class session in a local school (Azambuja / Santarém)
- **Exposition** alluding the Water Day

(these objectives should be mobilized taking into account the opportunity of WATER DAY, March 22, and in close association with others events such as Guided Tours and the Open Debates – see above)

Three of these four actions are mostly focus on the public agenda (and especially the local public agenda) -2. launching local debates, 3. guided tours and 4. school activities - even the political agenda was mainly address by mobilizing a Task Force around a Policy Brief to present and disseminate near national policy bodies.

These commitments required the direct mobilization of stakeholders, and during the session, for each set of actions, two participants were indicated to animate and facilitate ongoing activities to "make them happen".

While Action 1 – "*Policy Brief Task Force*" and Action 4 – "*Schools Activities*" are still under construction, Action 2 – "*Open Debates*" and Action 3 – "Guided Tours" already took place last 23th March in Valada (in the Tagus River Basin), engaging LNEC, CIMLT, EPAL, DGADR and SPI in the animation of a very participated Open day - "BINGO meets Tagus" (see Figure 13).



Figure 13. Concrete measures ideation



This event was held in a local public space near the river where families use to make picnics and spend time together. From 10.00 in the morning till 17.00 in the afternoon, several activities were set up: visits to the Water Treatment Station (around) and the Valada Water Capture Spot; several Speed Talks with population around BINGO results with the involvement of the several stakeholders; a BINGO game; several animation activities around water and climate change challenges and a children spot where these ones were invited to make illustrations to a shared panel (see Figure 14).





Figure 14. BINGO meets Tagus - 23th March 2019









7.4. How did the CoP evolve

In Tagus River Basin there were 6 CoP workshops, all of them enabling both focusing on BINGO issues and ongoing tasks, mutual stakeholders relationships enhancement and a series of (more) general commitments around a collective and shared awareness and knowledge around water and climate change challenges.

Participants were asked about what was really relevant with the CoP experience and stressed the following topics:

- Valorization of the network of contacts
- Promotion of adaptive measures under uncertainly context
- Strengthening water governance
- Exchange of experiences
- Responses adapted to climate change
- BINGO partners will play an active role in irrigation planning over the next 30 year
- Endowment of agricultural crops



- Evolution of irrigation systems
- Scenarios and analysis of the groundwater availabilities should be replicated in other regions
- Mini-hydro and other infrastructures are opportunities to compete for financing
- Cross-analysis between BINGO results and national water resources investment planning
- Contingency plans should have better information (shifting agricultural crops for not losing profitability)

Finally, testimonies were made with local project partners to express their perceptions (Figure 15) on two key aspects:

- 1. To what extent has the BINGO project reinforced the understanding of the impacts of climate change on water resources and their management?
- 2. What was the great *take-away* you got of the project for yourself?



Figure 15. Workshop testimonies

In general, the testimonies emphasize the common experience exchanges, which has **contributed to a more detailed understanding of the impacts of climate change**, particularly on an adjusted scale to crop agricultural needs and irrigation forecasts (as referred by stakeholders localized at the local level) and understanding each stakeholders' concerns and role to address join actions.



The greatest *take-away* was expressed in the opportunity to continue to **exchange experiences and information**, improving shared common knowledge, and to keep going in the relationship nursed during the CoP experience. The *community of practices* was also a community of knowledge production, and it is hoped that the network of contacts can be projected in the future and lead to new collaborations.

The collaborative environment of the Workshop provided a **trans-institutional debate on proactive measures**. This debate was also marked by tensions and cleavages not neglected between public and policy sphere, local and general levels, but also by the distance between *dream* and *reality*, expectations and real commitments.

The capacity of implementation forced a review of resources for common action and of effective political influence leading to an adjustment of stakeholders' expectations, which forced the rejection of certain measures in spite of their previous high score and manifest interest (for example, the requalification of hydric infrastructures and irrigation system that require an appropriate financing).

This adjustment of expectations is not negative, because it calls for a real and close commitment oriented towards the plausibility of its implementation in collective actions, mobilizing immediate resources of influence and accessible political and institutional contacts.

Main identified constrains were the difficulty to ensure the presence of the decision and political level in a constant way during all CoP interactions. That's why the policy brief task force has been identified as a CoP task to develop still during the BINGO period. A possible way to overcome this constrain in further projects may be to schedule "High Level" meetings around "Project so far..." interim results in order to build a more ongoing strength bridge between co-produced research and the decision makers, ensuring their interest and commitment with actionable actions.

7.5. The future of the CoP

After BINGO CoP experience, most stakeholders expressed already their intention to keep in contact and to keep going celebrating and up-to-dating their mutual relationship around mutual and shared actions. One of the main add-value of the joint action already resulted in 23th March event was that "it was possible" and very "rewardable", and that this kind of activities can be replicated. The local population and community that participated in this event also valued a lot this kind of "knowledge" share and



transfer and challenged the BINGO team to develop further initiatives and toolkits near the youngest and school audiences. This reinforced the Action 4 – "School Activities" and the development of the "BINGO Game" towards a youngest public.



8. CONCLUSIONS

A final portfolio of actionable measures for addressing water problems to climate change was developed in Deliverable 6.7. This report summarizes the activities undertaken by the Communities of Practice (CoPs) across the six research sites to collaboratively provide solutions to their specific challenges and reflect on their evolution and future. Between January 2018 and March 2019 a total of 12 CoP events were organized in Cyprus, Germany, Spain, Netherlands, Norway and Portugal. Different organizations led the CoP activities across the six research sites in collaboration with various stakeholders, focusing on different types of solutions to their specific climate-water problems.

In Troodos research site (Cyprus), a research institute supported by an SME collaborated with local stakeholders (community leaders and farmers) to investigate solutions for securing the domestic water supply of rural communities and ensuring a sustainable management of irrigation water supply. Desalinated water for domestic water supply will ensure a reliable and continuous potable water supply for the downstream communities, however, the price of the water for rural households will increase. Farmers supported the use of treated sewage water, which is the lowest-cost water source for irrigation and stressed the need for the subsidization of irrigation scheduling technologies. Follow-up actions with agricultural stakeholders on irrigation water management have already been put in place.

The increased climate-water awareness achieved by the CoP in Cyprus was also observed by the Veluwe CoP (Netherlands). The actionable measures in the Veluwe CoP, led by a water research institute, in cooperation with a water supply company and the provincial authorities, were mainly about developing and sharing knowledge and involving stakeholders in various collaborative platforms to address policy issues. These efforts, which fit well within the Dutch political culture, made groundwater management a more prominent topic in the overall management of the Veluwe.

In Bergen (Norway), a university worked together with the municipality on urban water management. The CoP strengthened the communication capacities of the municipality with the general public and established the necessary framework for collectively addressing climate change challenges. The CoP experience and co-produced knowledge will be utilized by the municipal agencies for formulating sustainable urban development strategies. In Badalona (Spain), the research on urban flooding under



climate change was taken to an operational level. Here a water management company collaborated with the city council authorities on urban flooding and flood protection and mitigation measures. The actionable measures were technical solutions (e.g., Sustainable Urban Drainage Systems, Early Warning Systems); the estimation of their costs and benefits will provide the city council the necessary information for prioritizing their implementation. The CoP in Wupper research site (Germany), where a research institute collaborated with a water management association, also focused on operational research. The final list of actionable measures includes technical solutions for both the case of urban flooding (e.g., network protection, retention basin) and drought (e.g., pipe connection between reservoirs).

Finally, in Tagus (Portugal), the collaborative approach of the CoP mainly aimed at increasing awareness of the impact of climate change on water resources through measures such as school activities and launching of local debates. Most of the stakeholders expressed their intention to keep the established communication channels alive and to put more emphasis on the mobilization of young people through activities in schools. The main identified constraint in Tagus was the difficulty to secure the presence of 'high-level' policy and decision-making persons during all CoP interactions. Thus, future CoP activities should better link co-produced research with policy makers in order to ensure their commitment to support the actionable actions.

The CoP interaction between researchers and stakeholders was valuable for all parties involved across research sites. The CoP experience in Badalona stresses the importance of local stakeholders for the validation and exploitation of the scientific results as well as that of high-level stakeholders for the dissemination and replication of the results. Similar results were reported in Troodos research site, where the interaction between local community leaders, farmers, government officers and researchers contributed to a better understanding of the water-climate challenges in the region. In Wupper research site, the CoP gave a forum to stakeholders facing the same risks, to discuss and work on adaptation strategies and measures providing in parallel valuable contributions to BINGO research.

The knowledge co-production through the interaction of researchers with stakeholders during the CoP events and the establishment of regular communication channels was acknowledged across all research sites as an important element for adaptation to climate change. BINGO research teams are currently seeking national and European competitive funds for new projects to maintain the regular interaction and cooperative research on climate-water adaptation measures with stakeholders.



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ANNEX I - LIST OF WORKSHOPS PARTICIPANTS

List of Veluwe workshop participants

5^{de} Stakeholdersbijeenkomst BINGO-Veluwe, 19 juni 2018 ORGANISATIE NAAM Prov. Gelderlan Tem Speli KWR B. Voortman Suzanne Duie Prov. Gelderland Ws Vallei en Velune Almer Bolman Bosquep midde nederland Rino Jang Stefanie Pflug KWR hogschool Ven Hall havenstein Rd B ot Jolyn van Engelenburg Vitens Mark de Vries Vitens Wom Leoman Bekenstickling Marjolein van Huijgevoort KWR Siberd Rijpkana KWR



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niet getekend, wel aanweng:	
René Holdert	
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List of Badalona workshop participants

WORKSHOP PARTECIPATION



Badalona, 26/01/2018

Nom	Entitat	Signatura
CARLES BAGUENA COAC	COL-LEGI OFICIAL ARQUITECTES DE CATALUNYA	Mis
ANNA MASSAGUÉ OLIVELLA	AIGÜES DE BARCELONA	/HAR
ALEJANDRO CHACÓN APARICIO	AIGÜES DE BARCELONA	the t
ALBERT PÉREZ CAPILLA	AIGÜES DE BARCELONA	2.0
EDUARD BOSCH LLADÓ	AIGÜES DE BARCELONA	Edin Dans
ESTER AGELL MAS	GENERALITAT	Atto:
LAIA SOLER SERRA	DEPUTACIÓ DE BARCELONA	atara
LUCA LOCATELLI	AQUATEC	baill, luger
EDUARDO MARTINEZ-GOMARIZ	CETAQUA	Theher
ANGEL VILLANUEVA BLASCO	AQUATEC	
MANUEL GÓMEZ VALENTIN	UPC	
BENIAMINO RUSSO	AQUALOGY	Bei-Rin
ÀLEX MAÑAS BALLESTÉ	REG. BDN PRÒSPERA SOSTENIBLE	and the second se
RAMON ORTÍ	NETEJA URBANA	R. OLE
PERE LLUÍS VEGUÉ	URBANISME	
JOSEP LEDO SECO	URBANISME	thed)
PEP MONTES	ECOLOGIA URBANA	AS
GREGORI MUÑOZ-RAMOS	CAP SERVEI MEDI AMBIENT	i Attal
TOÑO GÉREG ANGULO	ESPAIS NATURALS	I R
M ^A LLUÏSA FORCADELL	ن LABORATORI-ECOLOGIA	wellowise-
ELENA GOZALO	ECOLOGIA URBANA	TO
KEVIN JURADO	ECOLOGIA URBANA	A
JUAN CARLOS FORCEN	CLAVEGUERAM	- CAL
AÏDA LLAURADO	ASSESSORA BDN PRÖSPERA SOSTENIBLE	TATA
ALBERT MONTERO	ECOLOGIA URBAND	·VI AI
FORM MORTINES	Ecologis VRBOM	and -
MARIONADETORRES	ACA	tugity
tester luigbarraca	PROTECCIÓ UNIL	al.
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List of Bergen workshop participants

NTNU: Tone M. Muthanna & Erle Kristvik

City of Bergen:

- Byrådsavdeling for Byutvikling, Bymiljøetaten (Parkseksjonen og Vegdriftsseksjonen)
 - Jan Ove Strand og Frode Krydsby
- Byrådsavdeling for Byutvikling, Plan og Byggesak (Plan)
 - Ingunn renolen
- Byrådsavdeling for Byutvikling, Vann- og avløpsetaten (Direktør, Stab, Myndighetsavdelingen, Markedsavdelingen, Prosjektavdelingen, Planavdelingen)
 - Magnar Sekse (delvis), Martin Opdal, Jac Van Geel, Gunn Eklund
 Breisnes, Sigrid Teige Øye, Per Lasse Reinertsen, Beate Høgh, Hogne
 Hjelle (delvis), Nazia Zia, Marit Aase
- Byrådsavdeling for Klima, kultur og næring, Klimaseksjonen
 - o Per Vikse

Absent due to calender conflict:

Mary Økland, BSBI Byrådsavdeling for sosial, bolig og inkludering.

Eva Brit Isager, Byrådsavdeling for Klima, kultur og næring, Klimaseksjonen

Anne Britt Storheim, Byrådsavdeling for Byutvikling, Bymiljøetaten ved Parkseksjonen



List of Troodos workshop participants

BING	BINGO a better future under	Κατάλογος Συμμετεχόντων Ημερίδα Προγράμματος ΒΙΝGΟ 20 Φεβρουαρίου 2019 (Περιστερώνα, Λευκωσία)
6	CLIMATE CHANGE	Συμμετέχοντες

A/A	Όνομα	Φορέας	Υπογραφή
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Χρηματοδοτείται από την Ευρωπαϊκή Επιτροπή στο πλαίσια του Προγράμματος Έρευνας και Καινοτομίας HORIZON 2020 Αριθμός Συμβολαίου: 641739



List of Wupperverband workshop participants

Termin zum Hochwasser-Prioritäten-Konzept der Stadt Wuppertal, 10.07.2018

Teilnehmer:

Bücker, Ute	Stadt Wuppertal
Luppus, Frank	UWB, Stadt Wuppertal
Nobis, Hubert	UWB, Stadt Wuppertal
Lorza, Paula	Wupperverband
Vollmer, Fabian	IWW
Strehl, Clemens	IWW
Massing, Christian	WSW
Mittelstädt, Robert	Hydrotec
Koukolitschek, Ursula	Wupperverband
Scheibel, Marc	Wupperverband
Heinenberg, Daniel	Wupperverband



List of Tagus workshop participants

WORKSHOP FAZER ACONTECER NA BACIA LNEC, 12 outubro 2018	DO TEJO	BINGO abetter future under CLIMATE CHANGE
Lista de Presenças		
Instituição	Nome	Assinatura
Administração da Região Hidrográfica do Tejo e Oeste / Agência Portuguesa do Ambiente	Helena Alves	Alderalis
Associação de Beneficiários da Lezíria Grande de Vila Franca de Xira	Maria Caeiro	Maria Manuela Lopos Caerro
Associação de Beneficiários de Loures	João Filipe Alves Moreira	y. Thrin
CAP - Confederação dos Agricultores de Portugal	Alexandra Brito	Alwandoaishte
CIMLT	Alexandra Machado	Al Add
CIMLT	Ana Garcia	Ana Gozcia
CIMLT	Natacha Oliveira	Watasha Oliveria
CMETOC - Marinha	Luís Quaresma	
COTR - Centro Operativo e de Tecnologia de Regadio	Gonçalo Rodrigues	Gaucolo Dochques.
DGADR	Alberto Freitas	AD
EPAL	Ana Margarida Luís	ster
EPAL	Basílio Martins	BLA
EPAL	Patrícia Duarte	Paturcia Dunity.
FENAREG - Federação Nacional de Regantes de Portugal	Carina Arranja	CAr



Instituição	Nome	Assinatura
ICNF	Gonçalo Germano	
Instituto Hidrográfico	Martha Guerreiro	Marth Guerriso
LNEC	Ana Estela Barbosa	In 5kg Bruss
LNEC	André Fortunato	
LNEC	Fernanda Rocha	Frode
LNEC	João Lutas Craveiro	p= luoz C/-
LNEC	Manuel Oliveira	Mroinin
LNEC	Marta Rodrigues	
LNEC	Paula Freire	Parlets La.
LNEC	Rafaela Matos	Rept non
LNEC	Teresa Viseu	• •
Município de Chamusca	Evelina Maria Cebola Mendes	
Município de Santarém	Andreia Lopes	
SPI	Rita Andrade	RisArdeade.
LWEC	Quariz Jol Freitas	Hearin for harten
DGADR	PEDRO DAIN.	Peetro Enits


ANNEX II – WORKSHOPS PRESENTATIONS

Veluwe workshop presentations













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CONTACTS	
Thank you!	
BINGO	
Henk-Jan van Alphen	BINGO a britter future under CLIMATE CHANGE
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	11



Badalona workshop presentations







Introducció i benvinguda

WORKSHOPS PROJECTE BINGO	OBJECTIU
M8-Objectius	Identificació/percepció dels riscos derivats del canvi climàtic pel sistema de drenatge urbà de Badalona
M15-Preparació	Està Badalona preparada per fer front als reptes derivats del canvi climàtic? Quines mesures d'adaptació s'haurien de considerar?
M23-Avaluació d'alternatives	Adaptació de Badalona al canvi climàtic
M28 (M33)- Implementació d'actuacions	Proposta de testeig d'actuacions Realització d'un roadmap de les actuacions
M40/M48 Transferència	Avaluació i transferència de resultats



The BINGO project has received funding from the European Union's Horizon 2020 Research and Innovation programme, under the Grant Agreement number 541739.

Progrés – Gener 2018

workshop del projecte BINGO Badalona, 26 de Gener de 2019

@EU_BINGO













 Aquestes incerteses avui en dia en tracten mitjançant l'adopció de diferents escenaris (Representative Concentration Pathways (RCP))















4 – WP2: F	rojeccions	climàti	ques		V //	4	A		
WP2 Freie U	niversität	Berlin	Q	uin ar	nàlisi h	nem fe	t?		
	Cond.	19			Predice	cions clin	nàtiques	desenal	s
					1	VIKLIP	1979	-2015	
					2	2.2 km	2015	-2024	
 Necessite 	m pluges d	e projec	te	Sailer Sai	n 100 1	, man ,	5	and from the second	• ¹⁸⁴⁶
i per a dife	calen les co	rbes ID	etorn F		* , ^{an} ,	na yana y	ar	for "C	, ^{dipal}
 Les corbe 	s IDF actual	s de		in in	n yan y	~~~	HA)	Conferences	
l'observa	tori Fabra s	ón			E C	500	A.C.	ex o	• ¹⁰⁰⁰
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de Fabra	actuals i po	der vali	dar	atur da	·	- Mark	fa	aya 2018	2010
els result	ats facilitats	per la F	UB	100 100	/.	···· e ^{***} .Sin / }	ha yana y	www.jaa	_{joten} 2
					11	Y/1	1		
Badalona c	as d'estud	i		R			A	JX	
4 – WP2: Pr	ojeccions c	limàtiq	ues				AL	ILA	
	1000	V					9		
WP2 Freie Uni	versität	Berlin	Qu	in anà	alisi he	em fet	?		
500	-4080P		rie	ulcuons	cimaciq	ues uese			
450 Anà	lisi de series	de pluj	ja histò	riques 1	1979-20	15		- IDF fabra T	5
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100	the e							x28y42 T10	0
50	****					iiii		x28y42 T50	a
0 2	40	6	0	80	100	12	20		
		Duratio	n (mm)						26
			100	4	N	YVD		11.1.1	/
Badalona o	as d'estud	li		1			A		
4 – WP2: Pi	ojeccions	climàtic	ues		8.14	2	A		
MDD Faile U		Backin	0	uin an	àlici b	om fot	-2		
WP2 Freie Un	wersitat en	Berun	Pre	ediccions	climàti	ques des	enals		
5 10 2 482% 402%	15 20	25	30	35	40	45	50	55	60
5 288% 236%	219% 204%	198%	196%	194%	192%	188%	184%	181%	178
10 247% 201% 25 218% 177%	187% 174% 166% 154%	169%	168% 149%	166% 147%	164% 146%	161% 143%	158% 140%	155% 137%	152
100 196% 159%	149% 138%	134%	134%	133%	131%	128%	126%	123%	1219
182% 147%	138% 128%	125%	124%	123%	122%	119%	117%	114%	112
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	e la						OF blra 730		
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- climàtiques (CORDEX) ofertes per la FUB no són suficients per construir corbes IDF d'una o dues hores. S'està treballant per comparar les series de pluja històriques amb les futures i en cas d'obtenir un increment sistemàtic en intensitat es construiran les corbes IDF després de realitzar un procés de downscaling temporal.
- La incertesa dels models és molt gran, per tant no podem quedar-nos amb els resultats d'un únic model.
 ³⁰



Badalo WP3: A	na cas c nàlisis in	l'estudi itegrat del ci	cle d'aigua			HX/
Model a	coplat 10	D/2D (InfoWo	rks ICM de Inne	ovyze)		
				368 km de 62 sobree 4 comport 1 dipòsit (i Caracteriti embornals en experin	e xarxa i 11 ixidors es 33,000 m ³) zació hidrà c ("Gully 20 nents de la	338 pous ulica del)" nodes) basada iboratori
	MDT amb n de cel·l	a	Malla 2D no Istructurada amb 79141 cel·les	352 infi	2 zones d Itració 20	
Badalor WP3: An Calibració	i <mark>a cas d</mark> iàlisis int per episo	'estudi tegrat del cic di extrems	le d'aigua		~	
1. Selecc	ió dels epi	sodis:				
	Data F	Precipitació Inten (mm)	isitat màxima 20min (mm/h)	Intensitat màxi (mm/h	ma 5min)	Funció
22	/08/2014	25.5	42.6 (T=0.4)	74.4 (T=0	.6)	Calibració
28	/07/2014	46.5	56.4 (T=0.8)	91.2 (T=0	.8)	Calibració
03	/10/2015	34.1	81 (T=2.1)	122.4 (T=:	.1)	Calibració
16	/06/2016	24.6	60.3 (T=0.8)	105.6 (T=	.9)	Validació
2. Tractar 3. Calibra	ment de le ació quanti Superficie	s series de dad tativa i validació Coeficient de nuositat (sm ¹⁰)	es 5 dels episodis sel Model hidrològic de pèrdues	eccionats Tipus de	Infiltració	Infiltració
Ca	mers i teulats	0,016	Fixed	Impermeable		
	Permeables	-	Horton	Permeable	20 mm/h	7,2 mm/h
Badalor WP3: An Localitzad	na cas d nàlisis in ció d'algur	l'estudi tegrat del cio ns sensors (14	cle d'aigua limnimetres i 3 r	oluviometre	s)	
1	¥ر_ >	-h			1	120.000

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- 1. Selecció de les conques
 - Conca Maria Auxiliadora (85% Àrea impermeable)
 - Conca Riera Canyadó (40% àrea impermeable)
- 2. Instrumentació de les DSUs
- Comparació entre dades mesurades i dades simulades (calats, forma del limingrames, etc.) per alguns episodis seleccionats

1	
22	And We want
. 🔶	
lanyadó km²	

Data	Precipitació (mm)	lmix (20min) (mm/h)	lmix (5min) (mm/h)	Funció
05/06/2017	1,5	2,4	4,8	Calibració
08/08/2017	13,8	21.9	27,6	Calibració
12/08/2017	5,2	21,6	40,8	Calibració





Mesures de DSUs en temps real



45



supervisió d'AQUATEC		
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		Prosterio and
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	- hor -	
942 538 U28 949		PR 446 246
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We are be be	24 24 34 30	16 26 264
supervisió d'AQUATEC	ures en temps real desenvolupada	per 201, sola la
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		a brown	
			N
Ruppo et al.	Montorización cuantitativa y cualitativa de	alvios en redes de alcantariliado a través de un	emiliana and an and an
de ultra-bajo e	consumo		JIA 2017 Linea Tematica XX
	050/2×1/		
		1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	
Monitoriza	ción cuantitativa y c	ualitativa de alivios en	redes de alcantarillado
	un eletoma do ultra	-haio consumo	
a traves de			

Russo, B. ^{a1,b1}, Ortega, A.^c, Sánchez, J. C.^b, López A^{d1}, Ortega J.^{d2}, Guasch R.^{a2}, Montes J.^e

48









Capa activa (2*D ₅₀)	Î	Processos d'erosió
Capa sedimentació	\Rightarrow	Processos de sedimentació
Capa matriu	\Rightarrow	Capa sense creixement
Capa passiva (no erosionable)	⇒	Límit d'erosió

54

93













































Danys a vehicles

Inudation Claims for Vehicles in Badalona Municipality







Badalona cas d'estudi	xtrems
Danys a vehicles	aucino //
$\begin{array}{c} \begin{array}{c} & & & & & & & & & & \\ & & & & & & & & $	2002 6 1999
0.0 C P	0 2 4 6 8 10
Metodología para la evaluación de daños a vehicul inundaciones en zonas urbanas Damage assessment methodology for vehicles exposed to Martinez-Gomariz, E.*, Gómez, M.*, Russo, B.*14, Sánchez, P.*	os expuestos a flooding in urban areas ² y Montes, J.A.° 87
CONTACTES	
Badalona cas d'estudi	♦ AQUATEC
Beniamino Russo (<u>brusso@aquatec.es</u>) Luca Locatelli (<u>luca.locatelli@aquatec.es</u>)	CETAQUA CENTRO TECNOLÓDICO DEL AGUA
Eduardo Martínez (eduardo martinez@cetaqua.com)	
www.projectbingo.eu	Projectbingo.eu
BINGO PARTNERS	
LAROARTONIO NACIONAL KOUR METERIO METERIO MERINA CIVIL MERINA MERINA	ersität Wellerin Berlin
	EPAL Gruee Aguas de Portugal
Ajuntament de Badalona Rigües de Algues de Barcelona	WUPPERVERBAND IC Wasser, Menuch und Unweit Drovincie Gelderland
The BINDO project has received funding from the Europ	pean Union's Horizon 2020 89



	Ordre del dia	AX
09:00	Introducció i benvinguda	
09:15	Progrés projecte BINGO	
10:45	Pausa cafè	
11:15	Discussió grupal	

Conclusions i següents activitats

Final

12:30

13:00

90






Conclu	sions WS3		X		A	X	
Demner	o della problemes	100.00	W COLAK V		2 et al 11 a		
র হ	Prepa	iració del p	Sistema de oer a reduir	clavegueram			
Objectil genera	Inundacions urbanes	ls i		DSUs	als.		
	econòmics	" ["]	RII media	mbientals i ec	onòmics		
		У		Û	\searrow		
Åmbits	Reducció del risc sobre persones i vehicles	ducció danys nòmics re béns pietats	Reducció del risc dels banyistes	Reducció dels impactes econòmics sobre el turisme, i altres activitats derivades	Evitar pèrdua confian l'Ajuntar v	r la a de ça a ment	
				(iv)		4	
Conclusions WS3 Definició de actuacions							
	F	itxes o	d'actua	cions			
		om octuació	Chi	active 3	- hite		
	Mesura 1 N Descripció	eteja carrers	Objectius	RI, RII Ambit i,	^{ii, iii, iv, v}	Descripció de	
	Si n	el responsable é: dicar l'àmbit	s l'Ajuntament		l	l'actuacio	
Responsable de l'actuació	(s) >		11 10 10 10				
	Altres actors implicats	Grau implie 1 = r	cació (1, 2, 3) mínim				
		3= n	nàxim				
Valorar el cos possibles font	t i Finançament de Ci I'actuació Fr	ost de l'actuació	ent	ordre de mag	nitud .		
	Marc legal				{	Legislació, normatives	
Indicar avantatges i	Avantatges				'		
desavantatge	s Indiander	A B	c	D Altre	8		
	Indicadors						
	Esp	ai per a la pun	ituació de les actu	acions proposades		5	
Conclus	sions WS3		1		LI.	XI A	
Definició	o de actuacions	11/	AV		Al.		
Num	Mesura d'adaptació	Llist	at de fitxes a	amb 16 mesu	es d'adap	otació	
1	Neteja carrers Augment embornals	D'a	cord amb la	discussió i els	vots dels		
3	Control erosió conques	stak	eholders, le	s mesures fina	alment se	leccionades	
4	Neteja de lleres	han	sigut:	a a litat warne (Mooura	adaptesiá ()	
5	Trampes de sediments		Sistemes d'a	lerta anti-inun	idacions (Mesura 15)	
7	SUDs		SUDS (Mes	ura 7)			
8	Sistemes emmagatzematge		Augment em	bornals (Mesi	Jra 2)		
9	Ampliació capacitat col·lectors existents	u	Sipusits de l'				
10	Millora estructures anti-DS existents	U		-			
11	Dipòsits de retenció						
12	Trampes de sediment a la xarxa		2.2	A MARKET	1 and	8.	
13	Tractament DSUs		1	C CALLA	312 5		
14	Barreres anti-inundació						
15	Sistema d'alerta Inundacion Sistema d'Alerta DSLIs	15		7.35		6	
10	statema a Alerca DOUS						



Mesura 2	Augmen	t embori	nals	Objectius	RI	Àmbit	1, 11	
Descripció	Increme superfici	nt del nú ial a la xa	mero d'em rxa de clav	bornals actua egueram	s incremen	tat la capacitat de ca	aptació d'escorrenti	
	Ajuntam	ent				The second	S MARTIN AN	
Responsable	Àmbits i • Badal d'Espa Àrea d	mplicats: ona Habit ais Públic d'Urbanis	table → Àr s i Mobilita me	ea it /				
Altres actors implicats	Gra	au implic	ació (1, 2, 3	3)				
Empresa constructora		3	2		1			
Finançament de	Cost de	l'actuació	6	Estin	iat amb el P	'la Director		
l'actuació	Fonts de	finançar	ment	Parti	Partida pressupostària			
Marc legal	Pla Direc	tor de Sa	anejament:	actuacions p	ioritàries			
Avantatges	Evita escorrentia superficial durant episodis extrems, el deteriorament del mobiliari públic i augmenta la seguretat de les persones.							
Inconvenients	Caldrà fe col·lecto	er obres a rs per au	a la via púb gmentar-n	lica i molt pro e la capacitat.	bablement	haurà d'anar acomp	anyat de canvis de	
	-				- C			
	A	В	c	D		Altres		

Mesures seleccionades

Mesura 7	SUDs	Objectius	RI,RII	Àmbit	i, ii, iii, iv, v		
Descripció	Sistemes de drenat en el terreny l'aigua teulades verdes, ba	ge urbà sosten I de pluja evita ses de retenció	ible (basa nt que aqu ó, rases d'i	des en la n Jesta arrib Infiltració,	atura) que permeten infiltrar o retenir i a la xarxa de clavegueram. Tipologies: paviments porosos, etc.		
	Ajuntament			Section Section			
Responsable	Àmbits implicats: • Badalona Habital d'Espais Públics i Àrea d'Urbanism • Badalona Prospe → Àrea de Medi Sostenibilitat	ble → Àrea Mobilitat / e ra i Sostenible Ambient i					
Altres actors implicats	Grau implicac	6					
Emp. constructora	2						
Finançament de	Cost de l'actuació		> 1M€				
l'actuació	Fonts de finançame	nt	Pressu	oost munic	tipal, subvencions europees		
Marc legal	Normatives municip	oals, Plans de G	iestió del	Risc d'Inur	ndacions		
Avantatges	Reducció del volum, cabal i contaminació de l'aigua d'escorrentia. Possibilitat de recàrrega d'aqüífers. Beneficis ambientals, socials i estètics.						
Inconvenients	Requeriment d'espa	ai, a vegades re	quereixer	pre-tract	ament i un elevat manteniment.		
In diamateria	A B	с	D		Altres		
indicador5	3 2	3	3				

12 ALA

Mesures seleccionades

Mesura 9	Augment capacitat xarxa	Objectiu s	RI	Àmbit	1, 11		
Descripció	Substitució dels col·l xarxa.	ectors existe	ents pe	r tal d'incre	ementar la capacitat hidràulica de		
	Ajuntament		1	A STAN	IN A MARKED		
Responsable	Àmbits implicats: • Badalona Habitabl d'Espais Públics i M Àrea d'Urbanisme	e → Àrea Mobilitat /					
Altres actors implicats	Grau implicació	(1, 2, 3)		-	A		
Empresa constructora	1				11 12		
Finançament de	Cost de l'actuació		Estimat amb el Pla Director				
l'actuació	Fonts de finançamen	ıt	Partida pressupostària				
Marc legal	Pla Director de clave	Pla Director de clavegueram (prioritàri aprovar-ho)					
Avantatges	Permet l'assimilació reducció de l'escorre	Permet l'assimilació de major quantitat d'aigua a la xarxa i per tant suposa una reducció de l'escorrentia superficial i augment de la seguretat de les persones.					
Inconvenients	Interrupció del tràns	it i altres me	olèsties	durant la i	realització de les obres.		
	A B	(2	D	Altres		
indicadors		2		2			



Mesura 11	Dipòsits de	e retenció	Objectius	RI, RII	Àmbit	1, 11, 111, 1v, v		
Descripció	Desenvolu	pament de	dipòsits de reter	nció de pluv	vials a la xarxa	de clavegueram		
	Ajuntamen	nt	N	-	-			
Responsable	Àmbits imp • Badalon d'Espais Ambient	plicats: a Habitable Públics i M t+Urbanism	→ Àrea obilitat + Medi e		THE			
Altres actors implicats	Grau implicació (1, 2, 3)							
Explotació/mante niment	Empresa e	2 Empresa explotació i AMB (antiDSU)						
Finançament de	Cost de l'a	ctuació		Elevat				
l'actuació	Fonts de fi	nançament		Concessió, impostos				
Marc legal	Pla Directo	r de Saneja	ment					
	Mesura efectiva si es controla òptimament. Pot servir per evitar inundacions i/o DSUs. Permet que la secció dels col·lectors aigües avall sigui menor.							
Avantatges	Permet qui	e la secció o	lels col·lectors a	igües avall :	sigui menor.			
Avantatges Inconvenients	Mesura ete Permet qui Requerime	e la secció c ent d'espai e	leis col·lectors a levat, costos de	construcci	sigui menor. ó, explotació i	manteniment elevats		
Avantatges Inconvenients	Mesura ete Permet qui Requerime	e la secció c ent d'espai e B	lels col·lectors a levat, costos de C	construcci	sigui menor. ó, explotació i /	manteniment elevats Altres		

Llistat de mesures

Mesura 15	Sistemes d'a	alerta anti-i	inundacions	Objectius	RI	Àmbit	i, ii
Descripció	Desenvolup coordinació	ament d'un <mark>en situació</mark>	sistema d'ale d'emergència	erta primerenca a a: tancament zon	inti-inun les inund	dació que avi lables, avís a l	si i serveixi de a població, etc
Responsable	Ajuntament civil	- Departam	ent Protecció	-		-	
Altres actors implicats	Grau	implicació	(1, 2, 3)			Ç	311
							1
				-			e
Finançament	Cost de l'act	uació		<100k€ (a niv metropolità)	el local) (o 100k€-1M€	(a nivel
de l'actuació	Fonts de fina	ançament		A. 1			
Marc legal	Directiva eu	ropea d'inu	indacions (ob	ligació d'incloure	amb els	plans de ried	d'inundacions
Avantatges	Permet prev	Permet preveure una inundació i mitigar les seves conseqüències.					
Inconvenients	Requereix d alertes.	Requereix de l'existència d'una o varies persones responsables per la recepció de les alertes.					
	A	В	С	D		Altres	
Indicadors	-						

Implementació d'actuacions

- Definició de tots els actors implicats i el seu paper
- Proposta de testeig d'actuacions

Activitat grupal

Realització d'un full de ruta de implementació de les actuacions













Part 1 (WP4): De 9 a 11'00 aprox.

- Revisió resultats entregable 4.4
 - o Repàs metodologia avaluació del risc per vianants i vehicles
 - o Criteris
 - Avaluació del risc
- Nivell acceptabilitat risc
- Revisió mapes de risc
 - Inundacions persones
 - o Inundacions edificis
 - Inundacions vehicles
 - o CSO: dies amb risc inacceptable/platja

2



Part 2 (WP5): De 11'00 a 14'00 aprox.

- Mesures d'adaptació
 - 1. Increment embornals, nous col·lectors i nous dipòsits
 - 2. SUDS
 - 3. Renaturalització àrees de capçalera
 - 4. Early Warning System

Quantes i a on?

Següents accions



BINGO WP5. Proposal of SUDS adaptation measures in Badalona for the cost-benefit analysis.

Contenido

BINGO	WP5	5. Proposal of SUDS adaptation measures in Badalona for the cost-benefit analysis	1
1.	Туре	es of SUDS	2
2.	Prop	posed location of the SUDS	4
2	.1.	Infiltration trenches/biofilters	5
2	.2.	Bioretention gardens/ rain gardens	7
2	.3.	Permeable pavements	8
2	.4.	Detention ponds / retention ponds / Detention basins	9
3.	QUE	STIONS:	1



Study of the effects of Combined Sewer Overflows on the bathing sea water quality of Badalona

1. Introduction and aim

Combined Sewer Overflows (CSOs) at Badalona (Figure 1) compromise the bathing water quality up to few days after each episode. CSOs occurs 3 to 9 times every bathing season and generally at rainfalls with a depth larger than approximately 2 mm (BINGO D4.4).

This study quantifies the duration of sea water pollution at the beaches of Badalona after CSO. Particularly, it correlates the duration of insufficient bathing sea water quality with the quantity of rainfall. Furthermore, it show how these results can be used to improve the current management of the bathing sea water quality of Badalona.



Figure 1. Plan view of Badalona with some of its beaches.



Bergen workshop presentations





Com	nunity of	Practice	(CoP)
Organisere sa	mspillet mellom ulike (aktører som har intere	sser i prosjektet
Roadmapping:			
Scoping	- Ram - Fors - Ider - Eksi	imer, grenser og mål for j tålse av status quo itifisere relevante aktører sterende utfordringer	prosjektet. r
Forecasting	- Visjo - Ekst - Foru	on om bærekraftig utvikli rapolere gjeldende trend itse potensielle barierer	ing Ier inn i fremtiden
Backcasting	- Tenl min - Hva	e tilbake fra fremtidig so st et mellomliggende ste må til for å nå målene fo	enario til i dag (med g) r fremtiden?
Transfer	- Ove - Info aktg	rsette identifiserte tiltak rmasjon, anbefalinger, m Irer, etc.	til handling ilepæler, ansvarlige
WS M8: «Setting the scen VA-etaten 18.02.2016 Perceptions of climate risks in Bergen	1. «Settin **	ng the sco	ene»
W	1. «Settir	ng the Sce	ene»
Drikk	Drikkevann		rvann
Muligheter	Risikoer	Muligheter	Risikoer
 Nok vann Kombinere drikkevannsforsynin g og vannkraft Styre fosyning fra kilder avhenging av vannkvalitet 	 Dårlig dimensjoneringsgru nnlag Vannmangel 	 Separering av avløp/overvann Helhetlig planlegging Åpne overvannsløsninger 	 Urbane flommer fra intens nedbør Urbanisering på bekostning av grøntarealer Dimensjoenring med hensyn på økt nedbør Involvere kritisk personell til riktig tid

6









 Det styrende prinsippet er tverrfaglighet. Bergen ligger litt foran ift blågrønne løsninger. Viktig å aldri slippe disse prinsippene eller å slutte å «selge» de.

11

WS 2. «Are we prepared?»

"Governance gap"	Tiltak	Suksessfaktorer	Mulige interessekonflikter
integrering av strategisk overvannsplan i kommuneplanens arealdel	Få et den strategiske overvannsplanen vedtatt politisk	At den strategiske overvannsplanen er vedtatt før kommuneplanens arealdel vedtas.	Flomveier som hensynssoner: konflikter med veieiere Avsetting av areal i bebygde områder.
Avklaring: Ansvar og finansiering overvannløsninger (NOU 2015:16)	Bruke de mulighetene vi har til å påvirke		
Økt kunnskap: klimaendringer og konsekvenser for overvann vannforsyning - sårbarhet	Delta i prosjekter som HORDAKLIM og BINGO Bre kunnskapen: Få inn overvannsproblematikk på arenaer som allerede eksisterer	Være synlige, selge inn ideene God oversikt over aktuelle aktører (hvem trenger vi å ha med) Liste over konferanser	
Detaljering/Implementering: Strategiske planer til taktiske/operasjonelle planer	Utvikle / ta i bruk analytiske verktøy og modeller	Har folk som forstår modellene Klarer å utnytte mangfoldet i gruppen til å designe det nye overvannssystemet på Damsgård Må opp i takt	Mangel på kompetanse og ressurser Annen byutvikling 'stjeler' ressursene





WS 3. "Yes We Are!"

Tiltak (ID)	Beskrivelse	
мі	Reservoarer og flomveier for utjevning av flomtopp (ved ekstrem nedbør og fare for ødeleggelser/skader)	
MII	Beboerinnvolvering for innhenting av informasjon	
мш	Separering av fellessystem	
MIV	"Takrenneprinsippet" - Løvstien: separat vannvei for å lede rent vann fra fjell til fjord	
мv	Kontinuerlig måling av vannkvalitet (resipient)	
MVI	Blågrønne overvannsløsninger	
M VII	Redusere infiltrasjon/innlekk til avløpssystem og antall ulovlige påkoblinger	14

WS 4. «Solving the Unsolvable»

4. «Solving the unsolvable» November 2017

Hvordan lykkes med beboerinnvolvering?
1. Problemformulering
2. Idémyldring: hva er mulige

- løsninger?
- 3. Planlegging av løsningen







































FUB Decadal predictions - BINGO D2.9





7

9

FUB Decadal predictions - BINGO D3.4





Sammenligning av metoder for disaggregering av FUB data

WP2

5 min	49. 1 Hour
	B Martine and Martin
JEMANJJASOND	⁹ JFMAMJJASON
No. / New	**************************************
JFMAMJJASOND	JEMANJJASON
J F M A M J J A B O N D	S FMAMJJASON
\sim	5
JFMAMJJABOND	SJEMAMJJASON









WP3









Simulering: Antall hendelser





Simulering: Driftstid



20





street from Watershed B, T= 25 year street from Watershed B, T= 100 year Figure 7- Hazard potential in the street for watershed B with a 100 year return period.



WP4	
	24
WP4 - Risiko	
RUSK = MAZARD X XXXXXXXX X SUBCEPT X REALIEN	
Frekvens- og konsekvensanalyse av uønskete hendelser Hendelser sortert på Sårbarhetsanalyse • Varighet Eksponering • Timing (årsstid) • Mottakelighet • Timing (tid på døgnet) • Kapasitet	
	25
WP4 - Risiko	

Frekvensanalyse uønskede hendelser

							Nu	nber of	Events (M	ax year)							% [max year]
Season>				Sun	nmer							w	inter	CSO active % of year			
Sewage level->		Low				н	¢1			Lo	w		High				
Duration-	ciánia	15m- 1h	1- 5h	-	citaria	15an- 18	5-68	xth	-ci fanin	15m- 25	148	×ik	citization	13a- 23	246	xlà	
Event ID	51.1	SL2	SL3	SL4	SH1	SH2	SHB	SH4	WL1	WL2	WL3	WL4	WHE	WH2	WHB	WHA	DY





WP5







BINGO D5.4 - Identifiserte 'Governance needs'

- Risikoanalyser
- Ansvarsfordeling nasjonalt / regional / lokalt
 - Nasjonale retningslinger
 - Strategi for overvann inn i kommuneplanens arealdel
- Styrke samarbeid på tvers av fagfelt

Municipal M	faster plan	
Municipal sub-plar	ı: spatlal planning	Municipal sub-plan: Stormwater + strategy
Master plan: Drinking water	Master plan: Wastewater	

WP5: Pågående arbeid



Finding cost-effective solutions for climate change adaptation in Bergen using extensive climate, economic and spatial data

Clemens Strehl¹, Erle Kristvik² and Juliane Koti¹ ¹IWW Water Centre, Moritzstr. 26, 45476 Mülheim an der Ruhr, Germany c.strehl@iww-online.de.j.kctl@iww-online.de ²Department of Civil and Environmental Engineering, NTNU, 7491-Trondbeim, Norway erle.kristvik@ntnu.no

IWW INTRU 33

32









WS 5. "Up the CoP"

land are ranned have highly canad), be for early pe bitend ty difficult in dense unla areas

Catchersel characteristics runoff volume A, Roat, V (susciff, ET

Accessible for maintenance inflow vehicity BP

V(ranef), Berge events Interception

Hight of south, best for time to past ratio that the OA, used builting design sout dogs south of the table of dogs International States of St

Sizing factors Available area, russoff volume

Other design factors

37

36







Troodos workshop presentations



_ Πρόγραμμα Εργαστήριου

- 17:00 17:10 Καλωσόρισμα
- 17:10 17:20 Επισκόπηση δραστηριοτήτων προγράμματος BINGO
- 17:20 17:40 Παρουσίαση μέτρων προσαρμογής για την ύδρευση και άρδευση
- 17:40 18:20 Πολυκριτηριακή ανάλυση των μέτρων προσαρμογής
- **18:20 18:40** Διάλειμμα Καφές
- 18:40 19:00 Επόμενα βήματα Ερωτήσεις
- 19:00 19:15 Συμπεράσματα Αξιολόγηση

THE CYPRUS INSTITUTE



- Ερευνητικό Πρόγραμμα στα πλαίσια του Ορίζοντα 2020 της Ευρωπαϊκής Επιτροπής
- Διάρκεια: 2015 2019
- Στοχεύει στην παροχή πρακτικών γνώσεων και εργαλείων στους χρήστες και διαχειριστές νερού, στους λήπτες αποφάσεων και στους φορείς χάραξης πολιτικής
- Βελτίωση των κλιματικών μοντέλων για καλύτερη κατανόηση των προκλήσεων της κλιματικής αλλαγής
 - → Ξηρασία (Ποταμός Περιστερώνας)
 - → Πλημύρες (Πεδιαίος Ποταμός)
- Πέραν της Κύπρου, στο Πρόγραμμα συμμετέχουν άλλες πέντε χώρες: Πορτογαλία, Ισπανία, Γερμανία, Ολλανδία και Νορβηγία





I.A.CO Ltd



Αξιολόγηση επιπτώσεων των κλιματικών αλλαγών στη Θερμοκρασίας



Αξιολόγηση επιπτώσεων των κλιματικών αλλαγών στη βροχόπτωση





Θερμοκρασία

WRF/CESM/RCP8.5 Annual Temp

1986-201 2036-206 2071-210

24

23

22 °C 21

20

15

11

Βροχόπτωση

8

8









περιοχή της λεκάνης Περιστερώνα





Εκτίμηση μελλοντικών επιπέδων εισροής στο φράγμα ελένχου ροής της Ορούντα













Παρακολούθηση ροών νερού στο δάσος σε συνεργασία με το Τμήμα Δασών



Ενεργή συμμετοχή εμπλεκομένων φορέων

- Εμπλοκή των χρηστών νερού για καλύτερη κατανόηση των προκλήσεων που αφορούν τους υδάτινους πόρους
- Διερεύνηση και ιεράρχηση μέτρων προσαρμογής και διαχείρισης των κίνδυνων όπως η ξηρασία





1η Συνάντηση: Φεβρουάριος 2016

- Αναγνώριση κίνδυνων σχετικά με τις κλιματικές αλλαγές
 - Άρδευση
 - Ύδρευση
- Η ξηρασία (μείωση βροχόπτωσης) αποτελεί το βασικότερο κίνδυνο για τις δυο αυτές χρήσεις νερού στις κοινότητες του Ποταμού Περιστερώνας








Συνεντεύξεις: Ιούνιος 2016

- 6 συνεντεύξεις σχετικά με την πολιτική και τη διακυβέρνηση των υδάτινων πόρων
 3 κοινοτάρχες (ύδρευση), 2 αρδευτικά τμήματα, 1 κοινοτάρχης (ανακυκλωμένο)
- Πολίτικες & αρμοδιότητες: ξεκάθαρες & δουλεύουν σωστά
- Εξάρτηση από υπόγειο νερό για ανάγκες άρδευσης & ύδρευσης
- Υδρευση: επαρκείς ποσότητες για κάλυψη αναγκών, επιπλέον γεωτρήσεις για έκτακτη ανάγκη. Η ζήτηση στη Κάτω Μονή είναι στα όρια της προσφοράς.
- Ανακυκλωμένο νερό: νέα πηγή για άρδευση

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2η Συνάντηση: Σεπτέμβριος 2016

 Αναγνώριση και ιεράρχηση υφιστάμενων και πιθανών μέτρων αντιμετώπισης της ξηρασίας

Depropriet	Yananahana	Incap	Equito	*10**
Σωστήματα εξοικονόμησης κερού στο νακάκωση	V	X	V	
Συννήρηση και οκόνγημονισμός των δικτώμα Βανσμής γιανο	×	V	×	
Συστήμηση συλλογής Ιμβριον υλάτων	x	×	1	••
Χρήστ αντεκνελωμένου νερού για δοξεινητ χώρων προσίνοι	×	V	V	•
AppAdructy	×	X	×	
Ολοκληρωμένη δαχείριση κημοτροφικών απηβλήτων	×	X	r.	
Exceptionsky, subcollayerschipting, schookuniterskip, statuturiog,	X	1	X	
Βολείωση της συνεργασιής εμπλειτόμενων φαρίων	1	Ý	V	
			4	
		1		

3^η Συνάντηση: Μάιος 2017

- Θέματα διακυβέρνησης των μέτρων αντιμετώπισης της ξηρασίας (ρόλοι, αρμοδιότητες, πόροι)
- Καθορισμός κριτηρίων για την αξιολόγηση των κοινωνικοοικονομικών επιπτώσεων των μέτρων προσαρμογής







- Η διερεύνηση του ρόλου του νερού αφαλάτωσης στην διασφάλιση της παροχής νερού ύδρευσης στις κοινότητες
- Ανάλυση επιπτώσεων του συγκεκριμένου μέτρου
- Η αναγνώριση και διερεύνηση
 πιθανών συμπληρωματικών λύσεων





Οι στόχοι της σημερινής συνάντησης είναι:

- Συζήτηση και ανάλυση των επιλεγμένων μέτρων προσαρμογής στην κλιματική αλλαγή για την εξασφάλιση της ύδρευσης και άρδευσης για την κατάντη περιοχή του Ποταμού Περιστερώνα
- Μέσω:
 - Πολυκριτηριακής ανάλυσης των μέτρων προσαρμογής
 - Εκτίμησης κόστους-οφέλους των μέτρων προσαρμογής









Τεχνολογίες προγραμματισμού άρδευσης





- Στόχος: βελτιστοποίηση άρδευσης και εξοικονόμηση νερού
- Εγκατάσταση αισθητήρων υγρασίας εδάφους σε αρδευόμενο ελαιώνα και πατατοφυτεια
- Συνεχής παρακολούθηση υγρασίας εδάφους
- Εγκατάσταση αγρο-μετεωρολογικού σταθμού και συνέχεις λήψη δεδομένων (θερμοκρασία, βροχόπτωση, κτλ.)
- Μετρήσεις άρδευσης (ρολόι)
- Ο προγραμματισμός άρδευσης στοχεύει στην μείωση της απώλειας νερού
- 10-20% εξοικονόμηση νερού
- Κόστος εγκατάστασης ~ €3,000 / τεμάχιο
- → 0,90 m³ ανά επενδυόμενο ευρώ

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Τεχνολογίες προγραμματισμού άρδευσης





- Εντοπισμός απωλειών με βάση την υδατο-ικανότητα εδάφους, ταχεία απορροή της άρδευσης λόγο χαρακτηριστικών εδάφους
- Προγραμματισμός άρδευσης: συχνότερες αρδεύσεις με μικρότερες ποσότητές (ώρες)

Τεχνολογίες προγραμματισμού άρδευσης



- Εντοπίστηκε διατήρηση αυξημένης υγρασίας στα βαθύτερα εδαφικά στρώματα (40 εκ.)
- Η πιθανή μείωση στις ώρες άρδευσης να αυξήσει την υγρασία στα ανωτέρα στρωματά του εδάφους οπού βρίσκεται το ριζικό σύστημα της πατάτας
- Περαιτέρω παρακολούθηση και προγραμματισμός άρδευσης



Χρήση νερού αφαλάτωσης: Επέκταση του δικτύου ως τις κατάντη κοινότητες της λεκάνης απορροής Περιστερώνα



Χρήση νερού αφαλάτωσης: Επέκταση του δικτύου ως τις κατάντη κοινότητες της λεκάνης απορροής Περιστερώνα

Τέλη	παροχής νερού ύδρ	σευσης		
Υδατοπρομήθεια	Χρηματοοικονομι κό κόστος €/m³	Περιβαλλοντικό & Κόστος Πόρου €/m³	Ολικό Κόστος €/m³	Τελική Τιμή για τα
Ενιαίο Σύστημα Νότιου Αγωγού (ΚΥΕ Λευκωσίας, Λεμεσού και Λάρνακας – Αμμοχώστου)	0.77	0.05	0.82	νοικοκυριά ≈ 1€/m³

Αγωγός Βασιλικού -Λευκωσίας

- Το κόστος κατασκευής της επέκτασης του αγωγού στη Δυτική Λευκωσία (28 κοινότητες περιλαμβανομένων της Περιστερώνας και του Αστρομερίτη) είναι 11.4 εκ. €, με ετήσιο κόστος συντήρησης 117,000€.
- Το κόστος παροχής του νερού αφαλάτωσης στις κοινότητες της Περιστερώνα και του Αστρομερίτη (κατανάλωση νερού ≈ 266,815 m3 (2015) είναι περίπου 267,000€.
- Η προεξόφληση της αξίας της επένδυσης του μέτρου για 30έτη (περιλαμβανομένου του κόστους κατασκευής και συντήρησης) είναι 4,458,000, που αντιστοιχεί σε 1.5 m³ αφαλατωμένου νερού ανά επενδυόμενο ευρώ στο συνκεκριμένο μέτρο.

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Χρήση ανακυκλωμένου νερού για άρδευση

- Το μέτρο αυτό αφορά την μεταφορά ανακυκλωμένου νερού από την μονάδα επεξεργασίας λυμάτων στον Αστρομερίτη για την άρδευση γεωργικής γης
- Το κόστος κατασκευής κατά προσέγγιση ανέρχεται σε 185,000€ (σταθμός άντλησης αρδευτικού νερού & δίκτυο σωληνώσεων) και το ετήσιο κόστος συντήρησης περίπου 2,000€.
- Τιμή ανακυκλωμένου νερού ≈ 0.12€/m³.
- Η προεξόφληση της αξίας του μέτρου ανέρχεται σε 210,000€ → 24 m³ ανά επενδυόμενο ευρώ στο συγκεκριμένο μέτρο







Στόχος για ύδρευση: Παροχή πόσιμου νερού στα νοικοκυριά της κάθε κοινότητας Παρακαλούμε όπως ψηφίσετε από **1 (μικρή/αρνητική επίδραση)** έως **5 (υψηλή/θετική επίδραση)** την

Παρακαλουμε οπως ψηφισετε από 1 (μικρη/ αρνητικη επιοραση) εως 5 (υψηλη/ θετικη επιοραση) την επίδραση των παρακάτω 8 κριτηρίων στα μέτρα προσαρμογής για την παροχή πόσιμου νερού στα νοικοκυριά

	Κριτήριο	Περιγραφή κριτηρίου	Συντελεστής στάθμισης	Αφαλάτωση	Μικρά φράγματα εμπλουτισμού υπόγειων υδάτων
1.	Ποιότητα νερού ύδρευσης	ικανότητα να πληρούνται τα πράτυπα ποιάτητας που αφορούν το πάσιμο νερό	4.7		
2,	Σχετικότητα	Κατά πόσο τα μέτρα ανταποκρίνονται, στον στόχο	3.9		
3.	Κοινωνική αποδοχή	Ικανότητα των μέτρων να ανταποκρίνονται στις προσδοκίες και να είναι αποδεκτά από τη κοινωνία και τους χρήστες νερού	3.9		
4.	Κλιματική ευρωστία	λεανότητα των μέτρων να έχουν κανσποιητικό αποτέλεσμα τόσο σε χρονιές ξηρασίας αλλά και πολυσμβρίας	3.8		
5.	Εφωτότητα	Δυνατότητα εφαρμαγής των μέτρων υπό τις τρέχουσες φυσικές, τεχνικές, κανονιστικές ή οργανωτικές συνθήκες	3.8		
б.	Ουανομική ευρωστία	Δυνατότητα των μέτρων να έχουν ικανοταιητικό αποτέλεσμα σε μεταβαλλάμενες οικονομικές συνθήκες	3.8		
7.	Ευελιέjα	Δυνατότητα των μέτρων να ανταποκρίνονται σε μεταβαλλόμενες συνθήκες ζήτησης νερού	3.8		
8. Cy	Τεχνική ετοιμάτητα PRUS LITTE	Δυνατότητα εφαρμαγής των μέτρων με σχετική ευκολία (π.χ. εύκολη κατάρτιση τεχνοιών για τη αυκή δαχετά	3.5		

Στόχος για άρδευση: Εξασφάλιση δίκαιης, αποτελεσματικής και βιώσιμης διαχείρισης της παροχής νερού άρδευσης

Παρακαλούμε όπως ψηφίσετε από **1 (μικρή/αρνητική επίδραση)** έως **5 (υψηλή/θετική επίδραση)** την επίδραση των παρακάτω 7 κριτηρίων στα μέτρα προσαρμογής για την άρδευση

	Κριτήριο	Περιγραφή κριτηρίου	Συντελεστής στάθμισης	Ιύγχρονα συστήματα άρδευσης	Χρήση ανακυκλωμένου νερού
1.	Σχετικότητα	Κατά πόσο τα μέτρα ανταποκρίνονται σταν στάχο	3.9		
2.	Οικανομική ευρωστία	Δυνατότητα των μέτρων να έχουν ωανοποιητικό αποτέλεσμα σε μεταβαλλάμενες σωσνομικές, συνθήκες	3.8		
3	Κλιματική ευρωστία	δαυότητα των μέτρων να έχουν κανοποιητικά αποτέλεσμα τόσο σε χρονιές ξηρασίας αλλά και πολυομβρίας	3.6		
4.	Εφωτότητα	Δυνατότητα εφαρμαγής των μέτρων υπό τις τρέχουσες φυσικές, τεχνικές, κανανιστικές ή οργανωτικές συνθήκες	3.6		
5.	Κοινωνική αποδοχή	Ικανότητα των μέτρων να ανταποκρίνονται στις προσδοκίες και να είναι αποδεκτά από τη κοινωνία και τους χρήστες νερού	3.5		
5.	Ευελιξία	Δυνατότητα των μέτρων να ανταποκρίνονται σε μεταβαλλόμενες συνθήκες ζήτησης νερού	3.3		
7.	Τεχνική ετοιμότητα	Δυνατότητα εφαρμογής των μέτρων με σχετική ευκολία (π.χ. εύκολη κατάρτιση τεχνικών για τη συντήρηση του ούστῆματος)	3,3		



Wupperverband workshop presentations





Workshop

Inha	alt
	Projekt BINGO Übersicht Rückblick Workshops und Konsens
	 Zeitschiene und nächste Schritte Diskussion



Konsens in Stakeholderrunde

 U.a. Fallstudie "zu viel Wasser", Stadtgebiet

Stadtwerke

Wuppertal Arbeit in Kooperation mit Wupperverband / IWW / Stadt Wuppertal / Wuppertaler



Weitere Arbeiten seit letztem Stakeholderworkshop

- Bilaterale Gespräche/Treffen zur Ausarbeitung der Fallstudien
- Vorschlag eines Fallstudiengebiets (Hotspots Mirker Bach)
- Erarbeitung eines Diskussionspapiers zum Fall
- Synergietreffen mit Hydrotec









- · Welche Bewertungskriterien sind aus Ihrer Sicht relevant?
- Wie benoten wir Kriterien ohne Simulationsgrundlage in BINGO? (semi-quantitative Risikoeinschätzung, Expertenkonsultation etc.)

Abgeleitete Aufgaben

- Heute: Definition Bewertungskriterien
- Festlegung Organisation und Zeitschiene
 - Input Hydrotec (z.B. Datengrundlage je Hotspot)
 - Input weitere Stakeholder

Offene Fragen

 Impuls Leitfrage: Welche Bewertungskriterien sind aus Ihrer Sicht relevant?











Inhalt

- 1. Konzept zur Priorisierung von Maßnahmen
- 2. Kosten-Wirksamkeits-Analyse
- 3. Weiteres Vorgehen und Verantwortlichkeiten
- 4. Diskussion

Konzept zur Priorisierung von Maßnahmen

Ziel des Konzepts:

- Unterstützung beim Entscheidungsprozess hinsichtlich der Umsetzung spezifischer Hochwasserschutzma
 ßnahmen (im Rahmen dieser Praxisstudie im Einzugsgebiet des Mirker Bachs)
- Aufstellen einer Priorisierung umzusetzender Maßnahmen auf Grundlage von Gefährdungs- sowie Kosten-Wirksamkeits-Analysen
- Bereitstellen einer Systematik zur Übertragung auf andere Fallstudien





Zensus-Daten)

Der Anzahl betroffener Infrastrukturen (Verschneidung der

Überflutungskarten mit GIS-Daten zur Lage der Gebäude)

<u>ش</u>











- 1. Konzept zur Priorisierung von Maßnahmen
- 2. Kosten-Wirksamkeits-Analyse
- 3. Weiteres Vorgehen und Verantwortlichkeiten
- 4. Diskussion





indikotor	bener ungennere						
€ Maßnahme-	Barwert der Kosten je Maßnahme						
kosten	(Investitionen + jährlicher Betrieb)						
€↓ Vermiedene Schadenskosten	Differenz aus Anzahl betroffener Wohngebäude x Erwartungsschaden OHNE Maßnahme zu MIT Maßnahme						
Betroffene	Differenz aus Anzahl betroffener Einwohner						
Einwohner	OHNE Maßnahme zu MIT Maßnahme						
Betroffene kritische	Differenz aus Anzahl betroffener Einrichtungen						
Infrastrukturen	OHNE Maßnahme zu MIT Maßnahme						



Normierung der nicht nicht-monetären Risikoreduktion

- Vergleichbar machen zwischen Hotspots
- Beste Reduktion bekommt 100 % zugewiesen, alle anderen erhalten Prozentzahl in Relation zum Ergebnis der besten Ma
 ßnahme

Gewichtung der Ergebnisse • Heranziehen der

Workshop-Ergebnisse als

Gewichtungsfaktoren Indikator "Anzahl betroffene Einwohner" sowie "Anzahl betroffene Infrastrukturen" erhalten

beide 50%







Offene Fragen

- Können neben Karten zu HQ₁₀₀ Ereignissen auch Karten mit höheren/geringeren Jährlichkeiten bereitgestellt werden?
- Wie verändert der Klimawandel die Eintrittswahrscheinlichkeit betrachteter Ereignisse?
- Ist weiterer Input an Hydrotec zur Finalisierung der Steckbriefe mit allen relevanten Daten notwendig? Falls ja, wer liefert bis wann welchen Input?
- Bis zu welchem Termin kann Hydrotec eine finale Version der Steckbriefe liefern?
- Müssen weitere nicht-monetäre Indikatoren berücksichtigt werden, falls ja: Mit welchen Größen/Indikatoren sollen diese quantifiziert werden?
- Sollen auch Kombinationen mehrerer Maßnahmen einer Kosten-Wirksamkeits-Analyse unterzogen werden?

Workshop	M	11	11	1
and the second se	and the second se			

Inhalt

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		IIVV/V/	
DE ENGENHARIA CIVIL	InterSus	Freie Universität	
THE CYPRUS INSTITUTE	I.A.CO Ltd	EPAL Grupo Aguas des Portu	
Ajuntament de Badaio	Aigües de Barcelond	Vitens	WUPPERVERBAND





→ Basis: Simulationen basierend auf 10 unterschiedlichen Klimaszenarien der FU Berlin





ofe Dühr Aunga (GDT)

- Reduktion ökologischer Mindestwa erabfluss: Mit der Ge gsbehörde in der Dis-. sion: Reduktion der Niedrigwasserführung von 1.000 l/s auf 700 l/s am Referer Manfort [1]
- Notwerbundsystemvariante 1 (mit 2 Subvarianten): Vernetzu and "WEST": Vergrößerung des Einzugsgebietes (Machbarkeit: Dierriehtungen in das Einzugsgebiet der GDT bzw. der angeschl iberprüfungen) für pot isenen Wasserversore orgungs

- Überleitung von der Kenspe-Talsperre in die Vorsperre GDT (Druckrohr) Überleitung von der Neyvy[Zschbach Talsperre ihi zum Wasserwerk Schürholz des WVV (Konzeptstudie EWRI) [1] hundengstematent zu Überleitung aus der Kenspe-Talsperre an die Eschbachtalsperre berleitung aktivieren [1] hungesrakratent Verteilung ansichen BTV und WVV [1] wasser verschneiden mit der Rohwasserentnahme aus der GDT (2 Subvarianten): Nar bei Bedart Grundwasser verschneiden bzw. auf als alternative Rohwasserres-source matzen Grundsätlich / immer im Regelbetrieb Grundwasser verschneiden (Mitschrift Treffen NW-Nugenverband 29.9.17). Manerkung übese Untervariante ist nach dem Aten Stakeholdewerkslog ggf micht mehr neiseunt

Maßnahmenvorschläge aus Diskussionspapier "Zu wenig Wasser"



Folie aus 4. Stakeholder WS (10.11.2017)











Risikoanalyse aus D4.4

icemerio title	Scenario description [rainfall and water delivery from GDT]	Event [No. per scenario]	Dur [de	ation	Shortage volume [Mio. m ²]	Consequenc e: Shortage volume per day [Mio. m ²]	No. of days with volume SDT< threahold [%]
TOHIN RS LU INT - WU	"Rainy" and 42			141	591	4.2	4.29%
bit.	Mm ³ /a	3	2	- 4	2	0.4	0.12%
			8	12	9	0.7	0.37%
		-		7	2	0.3	0.21%
		3	5	237	945	4.0	7.21%
				161	2,281	14.2	4.90%
TOHN R7 LU Ist -WU	"Less rainy" and 42	3	£	118	345	2.9	3.59%
ist	Mm ³ /a		2	31	42	1.3	0.94%
		-	5	151	1,185	7.9	4.60%
		1	4	854	13,196	15.5	25.99%
TOHN RE LU ML-WU	"Dry" and 42 Mm²/a		i.	193	816	4.2	5.87%
ht		8	2	159	903	5.7	4.84%
			5	1508	26,834	15.7	48.93%
TOHN RILU MI -WU	"Rainy" and 38						
2	Mm ² /e			77	305	5.1	2.34%

Simulation der Wirksamkeit

Risikoanalyse aus D4.4

connario titla	Scenario description (rainfall and water delivery from GDT]	Event [No. per scenario]	Di [d	unation lays]	Shortage volume [Mio. m ²]	Consequenc e: Shortage volume per day [Mio. m ²]	Likelihood: No. of days with volume GDT< threshold [%]	Beide Parameter (Wahrscheinlichkeit & Konsequenzen) werden durch die potentiellen
TOHN RI LU HE -WU	"Rainy" and 42		1	141	591	4.2	4.29%	resentt
at	Mm ¹ /a		2	4	2	0.4	0.12%	Beschike
			3	12	9	0.7	0.37%	
			4	7	2	0.3	0.21%	
			5	237	945	4.0	7.21%	
			6	161	2,281	14.2	4.90%	
TOHN R7 LU ML-WU	"Less rainy" and 42		1	118	345	2.9	3.59%	
st	Mm ² /a		2	31	42	1.3	0.94%	
			3	151	1,185	7.9	4.60%	
			4	854	13,195	15.5	25.99%	
TOHN RELUES -WU	"Dry" and 42 Mm²/a		1	193	816	4.2	5.87%	
st			2	159	903	5.7	4.84%	
			3	1608	26,834	16.7	48.93%	
DHN R1 LU bt -WU	"Rainy" and 38							
2	Mm ³ /a		1	77	395	5.1	2.34%	







Tagus workshop presentations

5ª Oficina (M28)

a whole







... a esta Oficina!



















que pode distribuir como entender para seleccionar a(s) ações a reter para fazer acontecer

Use o critério de "feasibily"

































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ANNEX III – PARTICIPANTS EVALUATION

Evaluation of Badalona workshop

Total number of responses: 9

Average evaluation for each of the questions

Rating scale: 1= poor, 2= sufficient, 3= medium, 4=good, 5=very good

1. Meeting preparation and logistics	
Meeting information provided in advance (e.g. dates, venue, agenda)	3
Meeting venue (adequacy of the room where the meeting took place)	4
Materials distributed during the meeting to support the sessions	4
Comments: (optional)	

2. Overall assessment of the meeting	
Attainment of the objectives of the meeting (the objectives of meeting were met)	4
Positive and collaborative atmosphere among participants	4
Duration of the meeting (1=totally inadequate; 5=adequate)	4
Opportunity for individual participation and input in the meeting	4
Comments: (optional)	

3. Evaluation of the sessions	
Clarity of presentations/speakers	4
Discussions (moderation, conclusions reached)	4
Comments: (optional)	

II. In your opinion, what were the <u>most positive</u> and <u>less positive</u> aspects of the meeting?

Positive:



- Group activity with positive attitude and interest from the different participants
- Recap of previous workshops
- Presentations directed also to non-technical profiles

Negative:

- Decrease in participation at the last part of the workshop
- Information about the workshop was provided only a week in advance

III. What suggestions do you have for future meetings?

- There is a need for more explanation from the municipality, particularly about expectation and actions resulting from the BINGO project.


Evaluation of Bergen workshop

We had planned to do an evaluation form, however in the end of the workshop we had a very nice reflection time around the table where we discussed feedback and what we had learnt from the CoP, and its positives and negatives. The summary from the reflections are written in the comment sections for each question under.

1. Meeting preparation and logistics

Meeting information provided in advance (e.g. dates, venue, agenda)

Meeting venue (adequacy of the room where the meeting took place)

Materials distributed during the meeting to support the sessions

Comments:

Overall the participants found the organization and frequency of meetings to be good. They liked to have this final follow up meeting to summarize the CoP experience. The invitations were sent by email, which was ok with all participants. The timing, ½ after lunch was ok.

2. Overall assessment of the meeting

Attainment of the objectives of the meeting

Positive and collaborative atmosphere among participants

Duration of the meeting (1=totally inadequate; 5=adequate)

Opportunity for individual participation and input in the meeting

Comments:

The meeting gave a nice and informative summary of the BINGO outcomes for Bergen, and how these results had been and could be extended. The meeting atmosphere was good, with overall very good participation.

3. Evaluation of the sessions

Clarity of presentations/speakers

Discussions (moderation, conclusions reached)

Comments:

We had only one common session, where the presentation was given in an informal way with discussion and questions from the participation as we went along. It was an open discussion and



reported by the participants as a good way to communicate the outcomes.

II. In your opinion, what were the <u>most positive</u> and <u>less positive</u> aspects of the meeting?

Most positive:

- The workflow internally in the city between the different departments and with some end-users have become easier. BINGO as a project has placed the issue of climate change, urban stormwater and flooding on the political agenda, which has opened new doors in terms of a higher level of problem understanding from the political side. This has also resulted in opportunities to make changes that has been really positive for the city.
- Seeing more than one side to an issue after the common discussion in the CoP meetings.
- Enabling a more direct communication line by the networking in the CoPs.

Most negative:

It was a general reflection from several that should be clearer throughout the project and process where the BINGO project has contributed to the cities work. However, it was also reflected on the benefits were there in more ways than that they saw initially.

III. What suggestions do you have for future meetings?

There was a general positive feeling among the participants to the CoP way of working and it was suggested that it could be continued in future projects.



Evaluation of Troodos workshop

Ten workshop participants completed the evaluation questionnaires. Individual scores are given below each question (1: inadequate - 5: very good). The average score is given in bold next to the question; S = stakeholder

1. Meeting preparation and logistics											
Meeting information provided in advance (e.g. dates, venue, agenda)										4.5	
5	5	5	4	5	3	4	5	4	5	4.0	
Meeting venue (adequacy of the room where the meeting took place)											
4	5	5	5	5	4	5	5	4	5	4.7	
Materials distributed during the meeting to support the sessions											
5	4	5	4	5	4	5	5	5	5	4./	
Comments: S01: Very interesting presentations S03: Very useful and interesting meeting S06: The government should maintain the check dams											

2. Overall assessment of the meeting											
Attainment of the objectives of the meeting										4.2	
5	4	5	4	5	2	4	5	4	5	4.3	
Positive and collaborative atmosphere among participants											
5	5	5	4	5	3	5	5	5	5	4.7	
Duration of the meeting (1=totally inadequate; 5=adequate)											
4	5	5	4	5	3	5	5	5	5	4.0	
Opportunity for individual participation and input in the meeting											
4	5	5	5	5	4	5	5	5	5	4.8	
Comments: S03: We gained valuable information from the organizers of the meeting S05: I enjoyed the meeting											

3. Evaluation of the sessions												
Clarity of presentations/speakers												
5	5	5	5	5	4	5	5	4	5	4.8		
Discussions (moderation, conclusions reached)												
5	5	5	4	5	4	5	5	5	5	4.0		
Comments:												



II. In your opinion, what were the <u>most positive</u> and <u>less positive</u> aspects of the meeting?

Most positive:

S08: We learnt a lot and we recognised the need for adaptation to climate change impacts

S09: It is very positive that local people, i.e., community leaders and farmers are interested to know and adapt to climate risks and challenges

S10: The biggest achievement of this meeting was that participants were challenged to think about how to cope with drought risks and evaluate potential adaptation measures.

Most negative:

S06: Astromeritis, Katokopia and Pano Zodia communities should have attended this meeting because they use water from Serraxis river to irrigate their fields

S09: More stakeholders should have attended such an interesting meeting

III. What suggestions do you have for future meetings?

S09: More stakeholders, both local and external, should attend such meetings

S10: It would be good more stakeholders from various backgrounds/disciplines to attend these meetings

D6.7 Final portfolio of actionable research problems/ challenges exploitation and development March 2019



Evaluation of Tagus workshop

	WSM8a (N=23)	WSM8b (N=14)	WSM15 (N=21)	WSM22 (N=24)	WSM28 (N=30)	WSM48 (N=17)	Total (mean)
1. Preparation and Logistics	()	()	()	()	(()	(,
Provided information in advance (e.g. date, location, schedule)	3,82	3,93	4,33	4,33	4,23	4,53	4,20
Contacts and Welcome	4,64	4,50	4,85	4,71	4,57	4,88	4,69
Room layout (adequacy to the meeting)	4,45	4,50	4,35	4,63	4,30	4,59	4,47
Materials support provided at the workshop	4,64	4,57	4,55	4,57	4,14	4,41	4,48
2. Session Dynamics							
Achievement of meeting objectives	4,35	4,14	4,20	4,35	4,00	4,29	4,22
Collaborative environment between participants	4,78	4,64	4,67	4,78	4,73	4,82	4,74
Meeting length (1=completed innadequated; 5=adequate)	4,57	4,46	4,24	4,39	4,03	4,56	4,38
Chance to participate and to contribute to the results of the meeting	4,57	4,57	4,43	4,74	4,47	4,53	4,55
3. Session Outputs							
Relevancy of addressed topics	4,65	4,17	4,52	4,59	4,72	4,47	4,52
Clarity of presentations/tasks/facilitators	4,57	4,67	4,48	4,45	4,31	4,41	4,48
Richness of debate (moderation, conclusions, co-produced results)	4,35	4,17	4,52	4,68	4,24	4,41	4,40
Relevance and add value to your activity	4,19	3,67	4,00	3,82	4,03	3,94	3,94
4. General Appraisal							
General evaluation of the meeting	4,57	4,10	4,41	4,54	4,27	4,41	4,38

D6.7 Final portfolio of actionable research problems/ challenges exploitation and development March 2019





D6.7 Final portfolio of actionable research problems/ challenges exploitation and development March 2019



Summary:

- Tagus BINGO CoP was assessed at the end of each workshop interaction regarding the following topics, using a 5 levels scale (from less to high satisfaction)
 - 1. Preparation and Logistics
 - Provided information in advance (e.g. date, location, schedule)
 - Contacts and Welcome
 - Room layout (adequacy to the meeting)
 - Materials support provided at the workshop
 - 2. Session Dynamics
 - Achievement of meeting objectives
 - Collaborative environment between participants
 - Meeting length (1=completed inadequate; 5=adequate)
 - Chance to participate and to contribute to the results of the meeting
 - 3. Session Outputs
 - Relevancy of addressed topics
 - Clarity of presentations/tasks/facilitators
 - Richness of debate (moderation, conclusions, co-produced results...)
 - Relevance and add value to your activity
 - 4. General Appraisal
 - General evaluation of the meeting
- The global and general evaluation of BINGO CoP workshop was very positive to all the topics under evaluation and consistent all along the different interactions:
 - The most valued assets were the "Collaborative environment between participants", "Contacts and Welcome" and the "Chance to participate and to contribute to the results of the meeting" with very good scores (above 4,5 in all interactions).
 - The "Relevancy of addressed topics" was also a topic that deserved an overall very good score, with evidence to the first actionable Lab.
 - The less relative scored topic was the "Relevance and added value to your activity" in all interactions, even always with a positive good score, balancing between 3,67 and 4,19.