BRIGAID

Stocktaking Report WP2-4

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Preface

This report presents the work that has been performed by BRIGAID partners to identify and select innovations for the first innovation development cycle. The work presents a joint effort of WP2 (Floods), WP3 (Droughts) and WP4 (Extreme weather). The report will be uploaded in the EU portal three times, as separate deliverables: D2.1, D3.1 and D4.1. However, the content of these three deliverables is identical.

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Chapter 1: Introduction

Background: BRIGAID's objectives

Studies from the IPCC indicate that Europe is particularly prone to risks of river and coastal floods, droughts resulting in water restrictions and damages from extreme weather events such as heat waves and wildfires. Evidence is now ever stronger that damages from these natural hazards will increase. Evaluations also show a huge potential to reduce these risks through adaptation strategies. Although there is no lack of research institutes and entrepreneurs such as start-ups that develop innovative solutions, only 6% of the European companies are capable of testing and demonstrating their innovations. Many fail to complete the innovation development cycle due to a lack of resources in terms of funds, knowledge of testing and networks to engage with end users and investors early on.(1) BRIGAID aims to help innovatiors to overcome these limitations by bridging this gap that is sometimes also referred to the valley of death (see Figure 1).

[1] European Commission (2013). Commission staff working document, Impact Assessment - Part 1. Accompanying the document Communication from the commission to the European Parliament, The Council, the European economic and social committee and the Committee of the regions. An EU Strategy on adaptation to climate change.

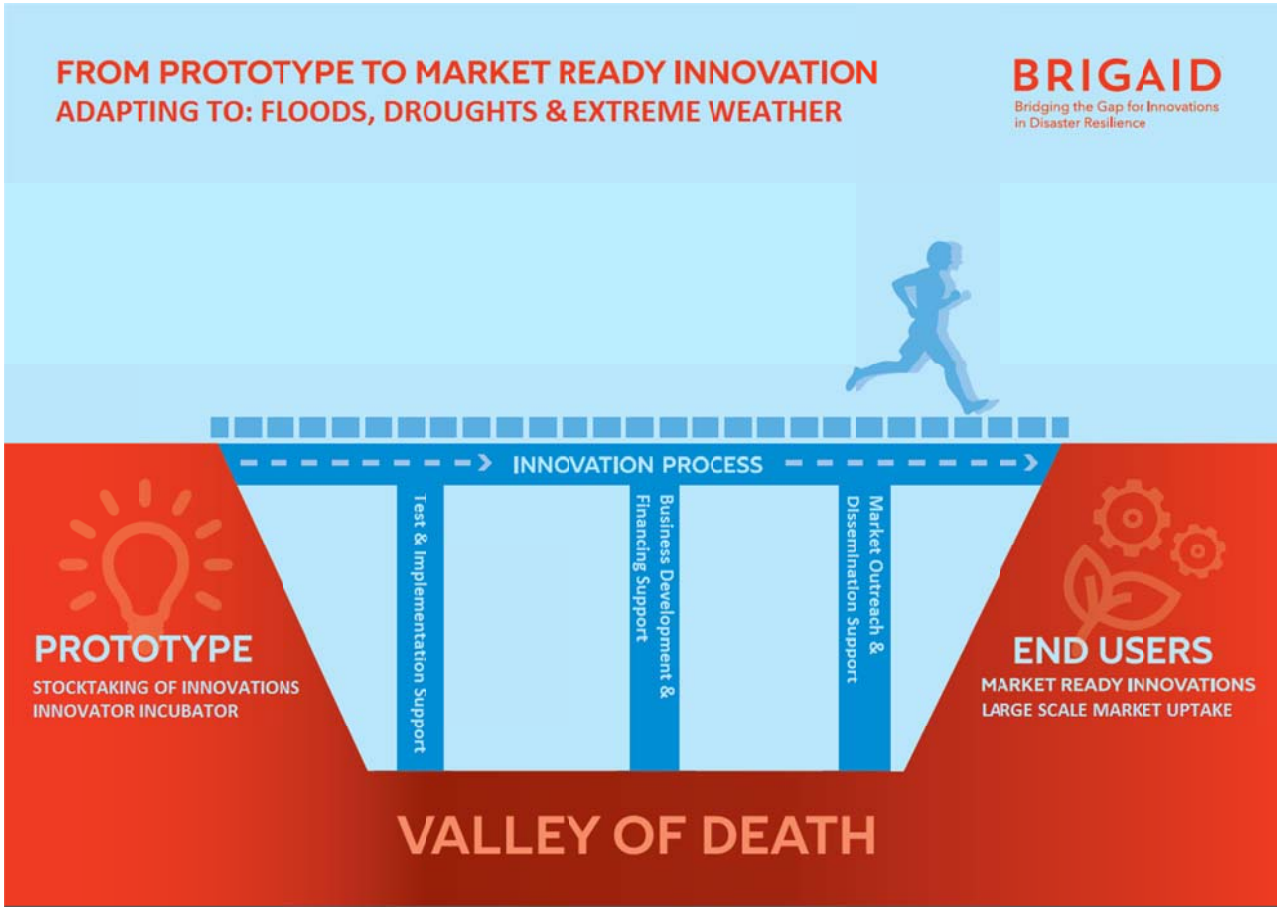


Figure 1. BRIGAID's conceptual approach with three types support for innovations.

This 'gap' refers to a combined lack of methodologies and support that are needed to turn already existing innovations into complete and market ready products. **BRIGAID's ambition is to provide structural, ongoing support for innovations in climate adaptation by developing an innovative mix of methods and tools, that should become a standard for climate adaptation innovations. To achieve this, BRIGAID follows a 2-layered approach:**

- First, BRIGAID's unique mix of methods and tools consists of three elements; 1) a framework that evaluates the effectiveness of innovations and the organizational and governance requirements, 2) a business development and financing model for climate adaptation innovations and 3) an online interactive platform that presents innovations and connects innovators, end users, qualified investors, and grants and fiscal incentives advisors throughout Europe.

- Second, these methods and tools are validated in the project by reviewing 75-100 promising innovations on floods, droughts and extreme weather, improving the 35-50 most promising ones, and bringing the top 20-30 innovations with the highest socio-technical and investment readiness to the market.

Why Stocktaking?

BRIGAID consortium partners work on the improvement of their own innovations throughout the project. To maximize BRIGAID's impact, project partners will perform regular stocktaking with the aim to identify and select additional innovations from *outside* the consortium for support in reaching the market (which refers to layer 1). Moreover,through stocktaking BRIGAID enables to test the methods and tools on a wide range of innovations to find a stardard for developing climate adaptation innovations (which refers to layer 2).

BRIGAID comprises three overlapping innovation cycles (Figure 2). Within these cycles, innovations are selected, validated and demonstrated, and launched to the market. Stocktaking is performed at the start of each innovation cycle. Stocktaking means that BRIGAID identifies promising innovations in climate adaptation, and consults with the owner(s) whether further improvement within BRIGAID is expedient and desirable.

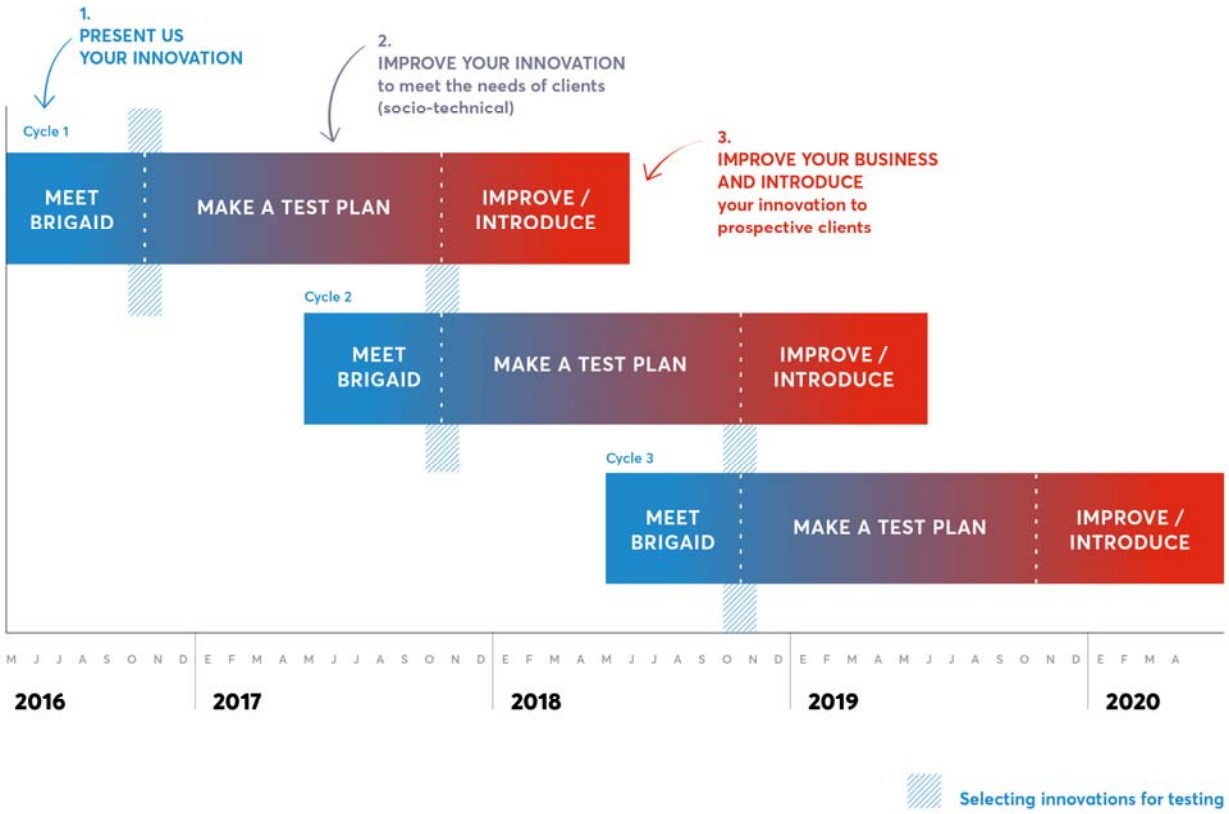


Figure 2. The three innovation cycles with stocktaking ("meet BRIGAID") at the start of each cycle.

Targets for stocktaking

Table 1 presents the targets for stocktaking. BRIGAID strives to describe 75-100 innovations over the course of the project (3 innovation cycles), and select 35-50 for testing, validation and demonstration. So, per innovation cycle at least 25 (75/3) will be described and 12 (35/3) will be selected for testing and improvement.

In each cycle, these numbers reflect a mix of innovations from consortium partners and non-consortium partners. The share of innovations from consortium and non-consortium partners will

vary over the three innovation cycles. In Cycle 1, most identified innovations will come from consortium partners. In Cycle 2 and 3 a larger share will enter BRIGAID through stocktaking. These numbers will be updated during each of the three stocktaking phases (see Chapter 5 for an update after the stocktaking phase of Cycle 1).

Table 1. Target contribution of the stocktaking process in BRIGAIDs overall goals.

	total	**average per cycle**	Cycle1	Cycle2	Cycle 3
Identification for description Identify innovations (TRL4-8) on floods, droughts and extreme weather	**75-100**	**25-33**			
Consortium partners	±30	±10			
Stocktaking	45-70	15-23			
Selection for testing Select the most promising innovations for further testing, validation and demonstration	**35-50**	**12-17**			
Consortium partners	±25	±8			
Stocktaking	10-25	3-8			

Scope of this report and reading guide

This report explains the methodology for stocktaking innovations from outside the consortium, and reports the results for the first innovation cycle. For clarity and completeness, we also include the innovations from consortium members that will be tested in Cycle 1. The report is structured as follows:

- Chapter 1: Introduction
- Chapter 2: Stocktaking methodology
- Chapter 3: Identified innovations in Cycle 1
- Chapter 4: Pre-selected innovations in Cycle 1
- Chapter 5: Lessons learned and outlook to Cycle 2 and 3

Chapter 2: Stocktaking methodology

Which innovations are eligible?

BRIGAID aims to bring existing innovations (from European companies) to the market and therefore focuses on improving existing innovation prototypes that reduce risks of floods, droughts and/or extreme weather events (see Table 2). These innovations can be a fixed or mobile structure, a software-IT product, or a methodology. An 'existing innovation' means that at least a prototype should be available. On the *Technological Readiness Level* (TRL) scale a prototype should at least have reached TRL 4, which means that separate components have been put together and the first complete innovation prototype has undergone basic functional tests to evaluate its performance. A complete overview of TRL levels is provided in Appendix 1.

Table 2: definitions of floods, droughts and extreme weather used within BRIGAID. Definitions based on the European Environment Agency (2010).[2]

Hazard type	Definitions adopted in BRIGAID
Floods	• Coastal floods resulting from high sea water levels and wave impact that exceed flood protection levels; these hydraulic conditions are caused by storm surges. • River floods resulting from discharges that exceed flood protection levels; the high-river discharges are caused by heavy precipitation in the river basin. • Other types of floods are classified under extreme weather events (see below)
Droughts	• A sustained and extensive occurrence of below average water availability, whether atmospheric, surface, or ground water caused by climate variability. Droughts can result in water scarcity when the drought conditions cause long-term imbalances between water availability and demands.
Extreme weather	• Heatwave: a prolonged period of excessively hot, and sometimes also humid, weather relative to normal climate patterns of a certain region. • Wildfires: an uncontrolled fire in an area of combustible vegetation that occurs in the countryside. Fire ignition and spread are both enhanced by cumulated drought, high temperature, low relative humidity and the presence of wind. • Storms: natural events characterised by strong winds, often in combination with heavy precipitation (e.g. heavy rainfall, hail, etc.). • Heavy precipitation: rainfall events that result in 1) (urban) floods due to exceedance of drainage capacity, and 2) flash floods, defined as rapid flooding of low lying areas, generally within a few hours after a heavy rainfall events such as thunderstorms.

[2] European Environment Agency (2010). Mapping the impacts of natural hazards and technological accidents in Europe. An overview of the last decade. EEA Technical report No 13/2010.

Overall workflow for stocktaking

The flow chart in Figure 3 depicts the workflow for stocktaking. The process is organized into 3 stages: 1) dissemination and recruitment, 2) description and dialogue, and 3) selection.

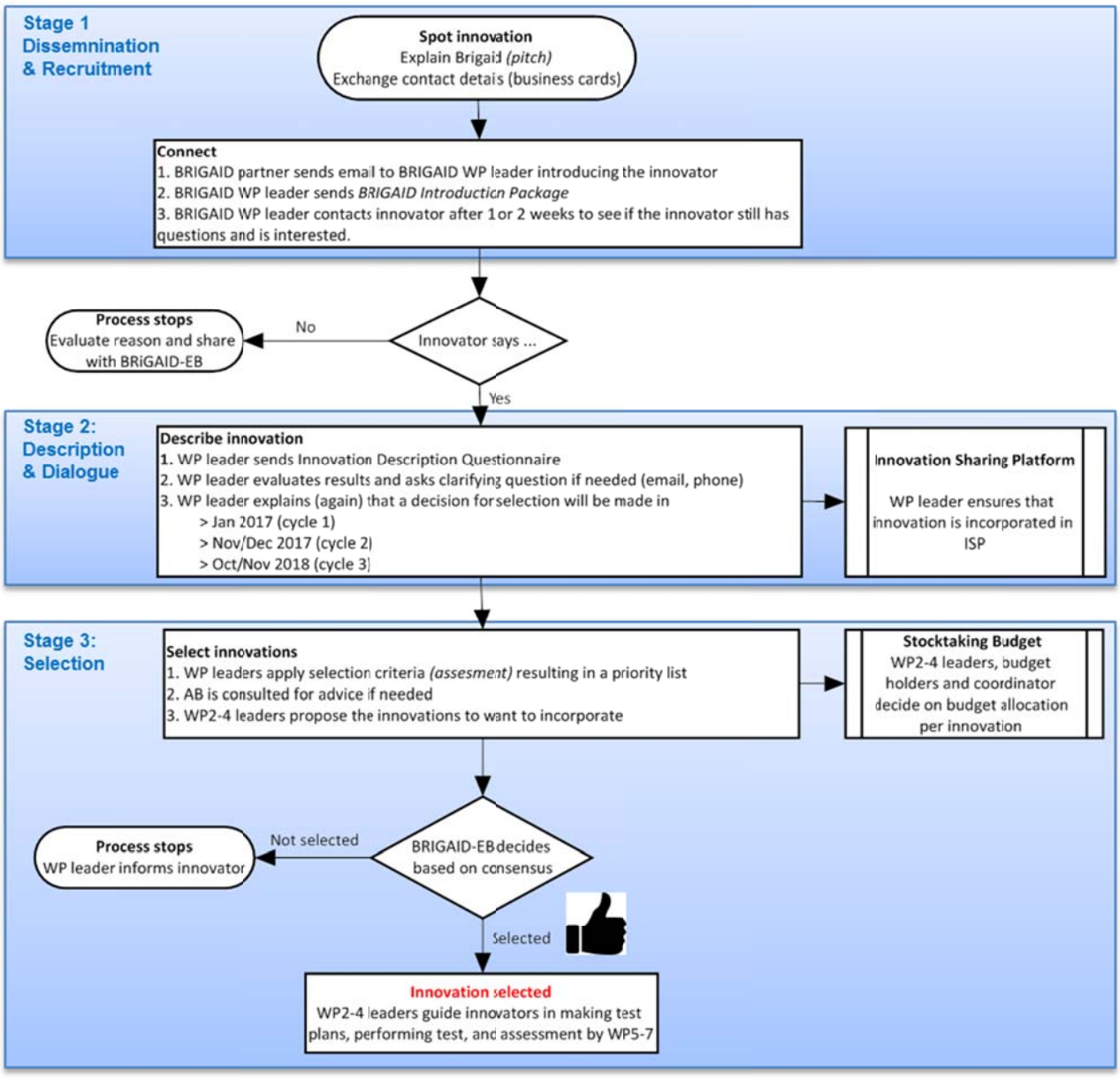


Figure 3. Flow chart showing the stocktaking process.AB = Advisory Board, EB = Executive Board, ISP = Innovation Sharing Platform, WP = Work Package.

Stage 1: Dissemination and recruitment

Stage 1 consists of identifying/detecting an innovation, capturing the attention of the innovator and connecting him/her to the project. Innovations on floods (WP2), droughts (WP3) and extreme weather (WP4) are identified by all BRIGAID partners.

The project coordinator (DUT) and WP2-4 leaders (HKV, FW, KUL) have a special responsibilty to connect with organizations and networks. BRIGAID distinguishes four main target groups on various geographical scales (Figure 4) . BRIGAID partners approach these target groups based on existing contacts, proximity and responsibility. Innovators (home country and/or abroad) and regional/local technology centers and incubators are contacted by all partners, while the contact with EU sister projects or innovation platforms/partnerships/clusters is lead by BRIGAID's coordinators and WP leaders. An extensive list of these target groups is internally available through BRIGAID's Sharepoint.

Partner	WP leader	WP2	WP3	WP4
1. DUT	Coordinator	•		•
2. HKV	WP2 leader	•	•	•
3. FW	WP3 leader		•	
4. KUL	WP4 leader			•
7. UNIBO		•	•	
8. DAPP		•	•	
9. THETIS		•		
11. MIGAL			•	
12. AQUA/APA		•	•	
13. ICA		•	•	•
14. NTPA		•	•	•
15. GRED				•
16. SPECTRUM		•		
17. UCL				•
18. ISA			•	•
19. GIFF				•
21. NAAR		•		
22. UTCB		•	•	

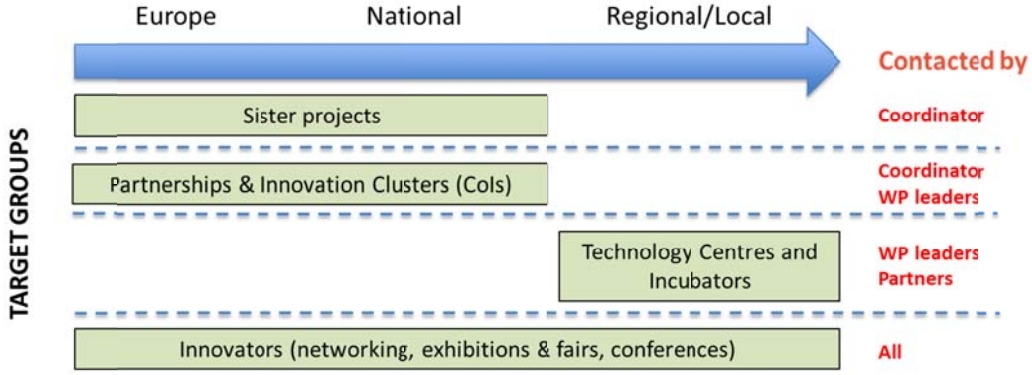


Figure 4. Partners involved in the stocktaking process (upper left table), target groups for stocktaking (lower picture) and examples of target groups (upper right picture).

The following means support this process:

- An online video is being prepared,[3] providing a 1 minute pitch of BRIGAID. This pitch can be shown by any BRIGAID partner to an innovator;
- The website BRIGAID.eu explains the project to different target groups. The page http://brigaid.eu/new_engage-as-an-innovator/ explains how BRIGAID supports innovations and how an innovator can get involved in the project;
- Uniform messages through research and social networks (ResearchGate, LinkedIn, Twitter: @brigaid_eu);
- The email address climate-innovation@brigaid.eu has been established for interested innovators. Incoming emails are handeld by WP2-4 leaders;
- The Innovator Welcome Pack (see Appendix 6) is ready to be sent to interested innovators and explains in more detail what BRIGAID offers and what it asks from innovators, and how the different steps are being organized.

Stage 2: Description and dialogue

Innovators interested in receiving BRIGAID's support are asked to fill out the (online) *Innovation Description Questionnarie*. The provided information serves two purposes:

1. To provide a general description of the innovation; this information will also be included in BRIGAID's *Climate Innovation Window*[4], which presents innovations online to interested end users, beneficiaries and investors;
2. To provide information that is used to evaluate the innovations based on several criteria, which forms the basis for the selection of innovations that receive further support from BRIGAID (see 'Stage 3').

The questionnaire is organized in four sections with closed and open questions about the general characteristics of the innovation, the current technical and social readiness, the potential impacts on the market, and the testing requirements as planned by the innovator (Table 3).The complete questionnaire is included in Appendix 2.

Table 3. Structure of the Innovation Description Questionnaire (short version adopted during the stocktaking phase).

Section	Items surveyed
General characteristics	Name, vision & typology; Short description; Hazard(s) mitigated; Innovator contact details
Innovation readiness	Current TRL and reasons; Expected testing timeframe and TLR improvement after BRIGAID action
Innovation and market impacts	Added value; Potential clients and end-users; Unitary costs and additional requirements
Testing requirements & Closing questions	Brief description of testing plan (location, activities); Stocktaking budget requirements (if applicable); Type of support expected from BRIGAID

[3] The video is currently being prepared and expected to be available in the Spring of 2017.

[4] The BRIGAID Climate Innovation Window is the name of the Innovation Sharing Platform (ISP). The acronym 'ISP' is sometimes being used in etnernal BRIGAID documents. The ISP is a formal deliverable in WP7 (due in M12).

During the description process, WP2-4 leaders guide the innovators and answer the questions that may emerge. At the same time, WP2-4 leaders check the quality of the responses and, if required, invite innovators to solve inconsistencies or information gaps.

Stage 3: Selection procedure

The selection procedure is a two-stage process.

- Pre-selection: based on a multi-criteria assessment the innovations are ranked and shortlisted
- Final selection: pre-selected innovators are requested to submit a 2-page test proposal including a specification of the required test budget, which is approved or declined by BRIGAID.

Pre-selection

From the registered innovations, BRIGAID selects the most promising innovations for further testing and improvement. This is done at the end of the stocktaking phase by rating the innovations on the following criteria:

1. Readiness. Three components are evaluated, i.e. technical, social and market readiness;
2. Qualitative criteria: Testing feasibility, Innovator vision, and Promissing value;
3. Green components or nature-based solution.

Innovations receive 1 (min) to 5 (max) points on the Readiness criteria and 1 (min) to 3 (max) points on the other Qualitative criteria. The resulting “Grey Score” therefore ranges from 2 (1+1) to 8 (5+3) points. Innovations that have green components or are nature-based receive a bonus of 10% or 25%, respectively, on top of the Grey Score. So, the resulting “Green Score” ranges from 2 to 10 points (8*1,25).

Initial scoring is performed by one WP leader (WP2 leader for flood innovations, WP3 leader for drought innovations, WP4 leader for extreme weather innovations). These three WP leaders compare and discuss the scorings of all innovations in detail to prevent inconsistencies in the application of the criteria and scoring. If needed, scores are adjusted. The result of this process is then submitted to the Executive Board for a last round of questions and comments. If no objections are raised, the scores are approved

The innovations are subsequently ranked from high to low. During the first innovation cycle,[5] innovations that obtained a score lower than 5, were not considered for further support. This means that Grey innovations need to score at least 5 points out of 8 on the Readiness / Qualitative criteria. Green innovations have the advantage that they receive a bonus, so they require at least 4 points (in case of 25% bonus) out of 8. WP2-4 leaders contact the innovators to explain the outcome of the scoring.

[5] The procedure will be evaluated and updated before selection in the second stocktaking cycle, based progress in the project and particularly in the Test and Implementation Framework (TIF, WP5) and the Market Analysis Framework (MAF, WP6).

Final selection

Pre-selected innovators are then requested to complete a 2-page Test Proposal form in which testing activities and budget requirements are specified (see Appendix 3). Testing proposals need to show that tests will lead to a significant improvement of the innovation's readiness, and are practically feasible (test location, required budget, complexity, etc). Based on the Green Score and the 2-page Testing Proposal, the Executive Board makes a final decision on which innovations are finally selected, and how the stocktaking budget is allocated among the selected innovations. This could be all shortlisted innovations or a sub-set. If needed, the Advisory Board may be asked for advice. The budget allocation is specified in a standardized contract developed by the Coordinator (TU Delft), and is to be signed by the BRIGAID budget holder and the innovator.

The complete method including an explanation of the criteria, the scoring and calculation of the "Grey" and "Green" scores is described in detail in Appendix 4.

Chapter 3: Identified innovations in Cycle 1

This chapter describes the innovations that have been identified and formally registered during the first stocktaking cycle. The list comprises innovations from BRIGAID consortium partners and non-consortium partners. The latter group enters the project through the procedure described in the previous chapter.

Goal versus realization

In total, 30 innovations were identified. As shown in Table 4, a majority of 20 innovations originates from consortium partners, and 10 innovations were identified from external partners through stocktaking. So the overall number is in line with the average number that was aimed for per cycle (25-33). During this first innovation cycle, identification and description efforts were focused more on internal than external innovations. The reason is that the stocktaking strategy, methods and communication material had to be developed during the first year of the project. With these means now in place, the second stocktaking cycle can more strongly focus on external innovations.

Table 4: Numbers of identified innovations.

	Goal		Realized in Cycle 1				
	Total	Average per cycle	**Total**	Floods	Drought	Extreme weather	Multi hazards*
Consortium partners	±30	±10	**20**	7	7	4	2
Stocktaking	45-70	15-23	**10**	3	3	4	0
Total	**75-100**	**25-33**	**30**	**10**	**10**	**8**	**2**

**Multi hazards is an additional catageory for innovations that address mutiple hazards. For instance, innovations that allow to store rain water for use in periods of water scarcity.*

Innovations from consortium partners

Table 5 presents an overview and short description of the innovations from consortium partners. These innovations cover a wide range in terms of innovation typologies and hazards. For instance, a number of innovations focus on monitoring (3, 4, 10, 11, 15, 18) using sensory systems such as airborne and underwater drones, GNSS antennas, satelite and glass fibre for the purpose of monitoring, early warning and/or forecasting. A few systems provide hazard information (2, 8) that can be used to define adaptation measures, while others also assist in the development, planning and evaluation of adaptation strategies (1, 9, 19, 20). There are also a number of innovations that aim directly to reduce the exposure to damaging events by using (flexible) flood barriers (5-7) and green roofs (17), mechanical or IT-smart technologies for saving water and improving crop water status (12-14), or treatment technologies for reusing dairy wastewaters (16).

A more detailed description of these innovations is available in the BRIGAID Climate Innovation Window.

Table 5: Innovations from consortium partners.

Nr	Name	Short description	Organization	Hazard
1	Techniques and methods for climate change adaptation in urban areas	A solution guide for flood mitigation and climate change adaptation in urban areas, applied for one case study in Bucharest (Romania) was developed under the Leonardo da Vinci funded programme, “3C for Cities” (2013-2015). The developed model was used for overcoming the knowledge gap for the specialist in this domain through training and workshops, facilitating the communication in between various type of institutions.	UTCB	Multi hazards
2	eEM-DAT	Expanded EM-DAT disaster database to the European level. CRED will adapt the EMDAT global database for the EU level, increasing the resolution to district (admin 3) and state (admin 2), by collecting more detailed data. This tool will be called eEM-DAT (European EM-DAT), and will be tested in 3 or 4 pilot countries.	UCL	Multi hazards
3	Drone system for early warning	System for early warning and monitoring composed by: on site sensors (e.g. along a river); an automated warning system; a fleet of drones that can perform a variety of monitoring tasks providing data to the DSS.	D'Appolonia	River floods, Extreme precipitation, Drought
4	Early Warning Dike Sensor System	Base of implementation of an alarming-warning system of the floodable objectives located inside of some dammed enclosures witch show o failure risk during some exceptional floods.	Aquaproiect S.A. - Romania	River floods
5	Blitz Cofferdam	This emergency dam will be used for flood protection on rivers for urban area, farmland and other zones where there is the "1/100 safety protection area " designated by "Hazard and flood risk maps" compiled by NAAR	Spectrum Construct SRL	River Floods
6	Flip-Flap cofferdam	Flip-Flap Cofferdam is designed to prevent floods in urban areas. It can be used as boardwalk (walkway) around the clock. When flood emergency arises it is raised in vertical position and locked into the concrete gutter. In this position it acts just like a regular flood protection wall. Material is PVC sheet piles.	Spectrum Construct SRL	River floods
7	OBREC	Overtopping BReakwater for Energy Conversion. OBREC was developed and	University of Bologna	Coastal floods

Nr	Name	Short description	Organization	Hazard
		patented by the Second University of Naples, IT. It consists of a rubble mound breakwater with a front reservoir designed to capture the overtopping waves in order to produce electricity.		
8	MyFloodRiskProfile	The tool assesses local flood risk for individuals and (mainly) companies. Based on the probability and impact of available flood scenarios Additionally it provides an indication of the (cost) effectiveness of risk reduction measures	HKV Consultants	River & Coastal Floods
9	Toolkit Method (TM)	It is a GIS based expert system aimed at providing a synthetic general evaluation of the feasibility of a protection strategy against flooding for a historic city. Such strategy may include different kinds of technical and technological solutions and their mutual combinations which are site specific.	Thetis S.p.A.	Extreme precipitation, River & Coastal Floods
10	Flying Sensors for Drought and Disease	“Flying Sensors for Drought and Disease” provide farmers with up-to-date information on drought and disease risk, based on the latest weather forecasts, imagery from satellites and Flying Sensors ("drones"), and soil water model simulations.	FutureWater	Drought
11	InfoDROUGHT	A fully-integrated satellite-based web-mapping service for the operational monitoring of drought impacts	FutureWater	Drought
12	IRRINET	An operational expert system which provides real-time (daily) information on the best irrigation practices (scheduling and water volumes) and their economic benefits. Started in 984, IRRINET is currently used by farmers in the Emilia-Romagna region (Italy) and 6 other regions of Italy.	University of Bologna	Drought
13	Food Vertical Farming	Development of a new growing system for food vertical farming. Goal is to overcome the constraints of hydroponic systems for food vertical farming, in terms of resource efficiency, in order to address the droughts issue and to enhance the deployment on the market.	D’Appolonia	Drought
14	Soil modelling machine	Technology and innovative solution for better utilization of water from rainfall for crops and fruit trees. The innovation provides an	S.C. AQUAPROIECT S.A.	Drought

Nr	Name	Short description	Organization	Hazard
		agricultural equipment for soil modeling used to retain the rainfall.		
15	Bathymetry measurements with Fishfinders	Use of low-cost devices (fishfinders) to measure bed levels, process the data into bathymetric maps and make the data easily available for the user. This creates a low-cost alternative for bathymetric surveys, so frequent depth information will be accessible to authorities or shipping companies in case of droughts or floods.	HKV Consultants	Drought, River flood
16	Dairy wastewaters treatment	A system consists of 3 modules that treat dairy wastewaters. The first module of nanocomposites reduces that TSS to levels below 100 mg/l, the second module of aerated cells reduces the COD to levels lower than 250 mg/l while the third module of wetland consits of specialized substrates and halophytes the will reduce the SAR levels that would permit irrigation.	MIGAL - Galilee Research Institute	Drought
17	Green infrastructure for collecting runoff in urban areas	The innovation is an adaptive methodology for urban areas to mitigate pluvial floods, by adopting green infrastructure solutions, by combining urban planner criteria with engineering approaches for collecting runoff	Univ. of Arch. & Urban Planning "Ion Mincu", Bucharest	Extreme precipitation
18	Water vapour GNSS monitoring & heavy rain nowcasting	Water vapour GNSS monitoring at high spatial resolution to support probabilistic heavy rain nowcasting. Low-cost GNSS receivers and antennas are used to deploy spatially dense networks of units capable of monitoring the integrated content of atmospheric water vapor with high spatial and temporal resolutions.	Geomatics Research & Development (GReD) srl	Extreme precipitation
19	Active Eco-Wildfire Management System -	Innovative method to planning and execution of Strategic Forest Fuel Management and Prescribed Burning techniques in forests to reduce risk of wildfire.	GIFF Lda	Wildfires
20	DSS for wildfires	An approach to improve wildfire forecast in context of drought conditions. The decision support tool monitors and assesses the risk of wildfires. Outputs can be incorporated in Apps or platforms for decision support in forest planning, forest management and wildfire management.	Centro de Ecologia Aplicada "prof. Baeta Neves"	Wildfires

Innovations from non-consortium partners (stocktaking)

Innovations from external organizations have been identified from platforms and personal networks / contacts of BRIGAID partners (Table 6). Also these innovations cover a broad range of typologies including planning and evaluation of adaptation measures (1), sensory measurement systems (4), software systems that estimate and/or present hazard data for monitoring, control and communication (5, 6), innovations that reduce impacts of floods (8, 9) or extreme precipitation (10), systems to promote water saving (2), or increase the efficiency of water use in agriculture (3).

A more detailed description of these innovation is available in the BRIGAID Climate Innovation Window.

Table 6: Innovations identified from external organizations (stocktaking).

Nr.	Name	Short description	Hazard	Organization	Identified through
1	SCAN	Software tool to evaluate and optimize water management strategies in the light of climate change and other trends such as the increasing urbanization, population growth and water demand. The tool can be used to analyze the integrated water system, while focusing primarily on hydrology and hydraulics (rivers, floodplains and urban drainage systems).	River floods, Extreme precipitation	Sumaqua	KU Leuven
2	EVAPO-CONTROL	A recyclable floating module to reduce water evaporation and algae growth in open reservoirs.	Drought	Arana Water Management	Technical Univ. of Cartagena
3	Water from Heaven	Drinking water made of rain from own roof. Sustainable water purification and storage for dry seasons.	Drought, Extreme precipitation	Water Innovation Consulting	HKV & KU Leuven
4	ARIEL	ARIEL is a microwave radiometer-processing system able to provide remote soil moisture (SM) data without additional ground-based infrastructure. ARIEL can be placed on-board aircrafts, drones or ground vehicles.	Drought	Balam Ingenieria de Sistemas	FutureWater
5	PrHo	A calibrated FAO-based software for the estimation of actual evapotranspiration and water requirements of greenhouse-grown vegetable crops.	Drought	Fundación Cajamar	FutureWater
6	GIS-WRAP	GIS Weather Simulation-Risk Awareness Platform for the management, processing and advanced visualization of atmospheric and satellite data, and	Extreme weather	MeteoGrid	FutureWater

Nr.	Name	Short description	Hazard	Organization	Identified through
		auxiliary spatial variables. GIS-WRAP allows the analysis of historical, current or foreseen extreme events in a 3D mode. A specific app allow its use in mobile devices.			
7	Floating cities with positive impact	Integrated floating city concept: urban development, ecological development, nutrient/CO2 recycling, food/energy production on water and monitoring with underwater drones.	Floods	Blue21	KU Leuven & TUD
8	SLAMdam	SLAMdam is a temporary flood defender filled with water. A stable base to fight flooding with water.	Floods	SLAMdam	VP Delta
9	TubeBarrier	The TubeBarrier is a temporary embankment; quick and easy to deploy to prevent floods and in case of industrial leakage or water storage. TubeBarrier uses water to block the rising water, is small to store and can be easily be installed over hundreds of meters by just two persons.	Floods	TubeBarrier	VP delta
10	HYDROVENTIV	The Hydroactive Smart Roof System; modular trays device for retaining and dissipating rain water on roof, with outflow control delayed, piloted by a remote system control for optimizing water resource.	Extreme precipitation, Drought	Le PRIEURE	KU Leuven

Chapter 4: Pre-selected innovations in Cycle 1

This chapter explains the outcomes of the pre-selection procedure, based on a multi-criteria assessment (step 1 of the selection procedure, see Chapter 3).The final selection (step 2 of the selection procedure) is out of scope here, because the 2-page test proposals and budget allocation takes place in the test phase. The final selection for testing is explained in the deliverables 2.2, 3.2 and 4.2, which are due in M21.

Innovations from consortium partners

Innovations from the BRIGAID consortium members are not subjected to a selection procedure. BRIGAID partners follow their own planning to test and improve their products throughout the four year project. From the 20 BRIGAID innovations (see Chapter 3, Table 5), 10 are planning to test and improve their products thoughout Cycle 1. These are listed in Table 7.

Table 7. BRIGAID innovations planning to test and improve their product in Cycle 1.

Nr.	Name	WP2	WP3	WP4
1	Flip Flap Dam	●		
2	OBREC	●		
3	MyFloodRiskProfile	●		
4	Flying Sensors for Drought and Disease		●	
5	InfoDROUGHT		●	
6	Soil modelling machine		●	
7	Water vapour GNSS monitoring & heavy rain nowcasting			●
8	eEM-DAT			●
9	DSS for wildfires			●
10	Active Eco-Wildfire Management System			●

Innovations from non-consortium partners (stocktaking)

The ten innovations identified from non-consortium partners were assessed according to the selection procedure described in Chapter □.Table 8 presents the scoring for assessment criteria.

Results show that 7 innovations received a score higher than 5. These innovations were shortlisted for pre-selection. When the innovators were informed, nr.7 (SlamDam) indicated they were unable to participate at this point, due to other priorities (being a SME in the gardening business they were unable to put sufficient effort in the project with the spring season coming up).

So, eventually 6 innovations were finally pre-selected and will be requested to make a testing plan proposal with budget requirements. Their test plan and the allocated test budget will not be

discussed here; it is part of Deliverables 2.2 – 3.2 – 4.2 (due in month 21, discussing the test plans and test results).

Table 8. Results of the selection procedure.

Name Company	TRL	Readiness Scores				Qualitative Score				Grey Score	Nature-Based Bonus	Green Score	Outcome
		Technical	Social	Market	Total	Test feasibility	Innovator vision	Promising innovation	Total				
1. EVAPO-CONTROL *ARANA WM*	5	4	4	3,500	3,875	3	3	2	2,667	6,542	25%	**8,177**	SELECTED
2. HYDROVENTIV *Le PRIEURE*	5	4	3	3,000	3,500	2	3	2	2,333	5,833	25%	**7,292**	
3. ARIEL *BALAM Ingenieria de Sistemas*	5	4	3	5,000	4,000	2	2	2	2,000	6,000	No bonus	**6,000**	
4. Water from Heaven *Water Innovation Consulting*	5	4	3	2,000	3,250	2	2	2	2,000	5,250	10%	**5,775**	
5. SCAN *Sumaqua*	5	4	2	2,500	3,125	2	3	2	2,333	5,458	No bonus	**5,458**	
6. TubeBarrier *TubeBarrier*	5	4	2	2,000	3,000	2	3	2	2,333	5,333	No bonus	**5,333**	
7. SLAMdam *SLAMdam*	5	4	3	2,000	3,250	2	2	2	2,000	5,250	No bonus	**5,250**	
9. PrHo *Fundación CAJAMAR*	5	4	3	1,000	3,000	2	2	1	1,333	4,333	No bonus	**4,667**	NOT SELECTED
8. GIS-WRAP *METEOGRID*	4	3	3	1,500	2,625	2	2	2	2,000	4,625	No bonus	**4,625**	
10. Floating cities *Blue21*	4	3	2	1,000	2,250	1	2	1	1,333	3,583	10%	**3,942**	

Brief explanation of pre-selection results

This section provides a brief overview of the arguments underpinning the scores. The details of the assessment are included in Appendix 5.

Readiness. All innovations are at TLR5, which means that the innovation has been realistically tested, totally or partially, in a laboratory or simulated environment. Previous testing activities have been performed or are in progress and new technological improvements have been made as a result of the tests conducted on the first prototypes; this was the case for half of the innovations (1, 4, 5). The remaining ones are currently in the market (2, 3, 6), but more tests are being planned in the framework of BRIGAID. In all cases, social barriers, which may hinder the market outreach, have been identified through direct interviews with end users or stakeholders. Differences in

market readiness have been found among the selected innovations: both market and business strategies have been well developed by 1 and 3, while they were only roughly defined for the other innovations.

Qualitative criteria: *Feasibility*/*Vision*/*Promising*. Most of the innovations represent inspiring technological improvements over concepts or solutions already available in the market (1, 3-5). Innovation 2 consits on a novel rainwater harvesting technology that can be coupled to an existing adaptive solution (green roofs), while innovation 6 (mobile flood barrier) can replace the usage of an “old technology” (sand bags) in certain situations. The testing plans proposed by innovators aim to evaluate the most relevant Key Performance Indicators identified by BRIGAID to guarantee a soft transition along the readiness level scale. Testing feasibility reaches a high level for innovations 1, 2 and 6, as technological improvemens of the original prototype were already identified and implemented after previous tests. However, innovations 3-5 seem to require more guidance and support from the BRIGAID team. Innovators 1, 2, 5 and 6 have shown a clear vision for getting a market ready product, while for 3 and 4 this vision is weak or requires more attention.

Green/Nature-based components. Innovations 1 (floating modules for reducing water evaporation made with recyclable material) and 2 (a ‘smart’ mutifunctional roof system) received a 25% bonus over the Grey Score. Innovation 8 (harvesting system to collect and treat rainwater for drinking and reuse) was moderately bonused (Grey Score was increased by 10%).

Chapter 5: Lessons learned and outlook to Cycle 2 and 3

Lessons learned

The points below highlight the main issues addressed during the first stocktaking cycle, difficulties found and improvements that need to be made in the next stocktaking phase

Stocktaking strategy. During the first innovation cycle, external innovations were identified through the BRIGAID's network (fourth level in Figure 4) and directly recruited through invitation letters. This option was considered the most appropiate for Cycle 1 due to the lack of a consolidated and fully integrated strategy during the recruitment phase, and because more emphasis was put on the BRIGAID innovations. In parallel with the identification and description, and the support provided to potential candidates, a stocktaking-selection strategy and BRIGAID's marketing material (video, welcome package for innovators, web and social network means) were developed and tested. During Cycle 2, all these means will be employed in order to effectively spread BRIGAID's services and hence, capture the attention of a larger spectrum of target groups (technological centres and incubators, partnerships and clusters).

Description of the innovations. During Cycle 1, innovators where asked to fill out the innovation description questionnaire. The questionnaire consisted of 40 items, which aimed to capture the general characteristics of the innovation, the testing results already available or still in progress, the market and financial strategy adopted, the expected effectiveness and social impacts of the innovation, and other questions. Feedback received from the innovators led to the conclusion that the questionnaire was too long and questions were not always relevant given the development phase of the innovation (e.g., detailed questions about market strategy). The survey will therefore be re-designed. During Cycle 2 and 3, a two-step approach is being adopted:

- The Cimate Innovation Window Questionnarie: This is a short questionnarie consisting of 14 items aiming to provide a general description of the innovation. The items of the questionnaire are based on Waterwindow (see waterwindow.org), which forms the basis for the BRIGAID Climate Innovation Window. When the innovator and BRIGAID both agree that the provided information is sufficient and correct, the data willl be published in the online platform.

- The Innovation Selection Questionnaire: This survey is filled out only by innovators who wish to receive further support from BRIGAID. The survey captures information required to score the innovations on Technical, Social and Market Readiness, and on the extent to which testing is feasible, the innovator has a clear vision for making progress and the extent to which the innovation is promising.

Pre-selection of external innovations. The strategy adopted during Cycle 1 resulted in 10 identified external innovations. An in-depth assessment was made for each of these innovations, with detailed arguments for all the scoring factors. This number of innovations has been considered as appropriate for an in-depth assessment. However, the scoring procedure should be objectively automatized during Cycle 2 because a higher number of external innovations is

expected to undergo the selection procedure. This will be supported through the Innovation Selection Questionnaire.

Failed recruitments. During Cycle 1, several innovators which approached BRIGAID or were approached by BRIGAID were finally not considered for the selection process. In those cases, the reasons of why they failed, and which actions were adopted, are shown in Table 9.

Table 9. Failed innovations detected, and actions adopted, during the 1st innovation cycle.

Company/Institution (Country)	Innovation	Mean of contact. Reason of decline	Action
CCHS-CSIC (Spain)	Live Fuel Moisture Content (LFMC)	Recruited by networking. Innovator finally declined due to time constraints and because the innovation does not aim to be commercial solution.	BRIGAID will inform about project progress. Innovator has been included in the BRIGAID's contact list.
Area Engineering SRL (Italy)	Tiny House B.E.S.D.	Recruited by networking. Innovation (green housing solution) is out of the scope of BRIGAID. Some components could be tested once TIF and MAF are strongly developed.	BRIGAID invites innovator pay more attention on singular components and submit a proposal to Cycle 2.
	Agile Energetics Island	Recruited by networking. Out of scope of BRIGAID.	Rejected.
Earthen dams – MAR solution (The Netherlands)	Innovator	Recruited by networking. Methodological approach still far from the minimum TLR requirement.	Innovator is invited to contact with others in order to increase the TRL and evaluate a common strategy.
Veenweiden: underwater drainage (Belgium)	Underwater drainage concept	Promising innovation, but internal planning fitted better with timing of Cycle 2	Invited to participate in Cycle 2.
AVISE (Alert and Surveillance of Floods and Droughts) (Spain)	The Foundation for Climate Research	Innovator approached BRIGAID (through an external innovator). First contact with BRIGAID was very close to the Cycle 1 deadline.	Invited to participate in Cycle 2.

Outlook to innovation cycle 2

Table 10 shows the numbers of innovations identified and selected in Cycle 1, and the remaining targets for Cycle 2:

- Identification: 30 innovations have been identified, which leaves a total target of 45-70 innovations for Cycle 2 and 3;
- Selection: 6 external innovations have been pre-selected for testing and 10 internal (BRIGAID) innovations are planning to test and improive their products in Cycle 1, which leaves a total target of 19-34 innovations for Cycle 2 and 3.

These numbers indicate that BRIGAID is on track, but a strong focus is needed on recruitment of external innovations in Cycle 2.

Table 10. Target contribution of the stocktaking process in BRIGAIDs overall goals.

	Total	**Average per cycle**	**Realized in Cycle 1**	**Target for Cycle 2 & 3**
Identification for description Identify innovations (TRL4-8) on floods, droughts and extreme weather	**75-100**	**25-33**	**30**	**45-70**
Consortium partners *Stocktaking*	±30 45-70	±10 15-23	20 10	
Pre-selection for testing Select the most promising innovations for further testing, validation and demonstration	**35-50**	**12-17**	**16**	**19-34**
Consortium partners *Stocktaking*	±25 10-25	±8 3-8	10 6	

Appendix 1: TRL scale

TRL	Main	Description
1	Basic principles observed.	Scientific research begins to be translated into applied research and development (R&D). Examples might include paper studies of a technology's basic properties.
2	Technology concept formulated.	Invention begins. Once basic principles are observed, practical applications can be invented. Applications are speculative, and there may be no proof or detailed analysis to support the assumptions. Examples are limited to analytic studies.
3	Experimental proof of concept.	Active R&D is initiated. This includes analytical studies and laboratory studies to physically validate the analytical predictions of separate elements of the technology. Examples include components that are not yet integrated or representative.
4	Technology validated in lab.	Basic technological components are integrated to establish that they will work together. This is relatively "low fidelity" compared with the eventual system. Examples include integration of "ad hoc" hardware in the laboratory.
5	Technology validated in relevant environment.	Fidelity of breadboard technology increases significantly. The basic technological components are integrated with reasonably realistic supporting elements so they can be tested in a simulated environment. Examples include "high-fidelity" laboratory integration of components.
6	Technology demonstrated in relevant environment.	Representative model or prototype system, which is well beyond that of TRL 5, is tested in a relevant environment. Represents a major step up in a technology's demonstrated readiness. Examples include testing a prototype in a high-fidelity laboratory environment or in a simulated operational environment.
7	System prototype demonstration in operational environment.	Prototype near or at planned operational system. Represents a major step up from TRL 6 by requiring demonstration of an actual system prototype in an operational environment (e.g., in an aircraft, in a vehicle, or in space).
8	System complete and qualified.	Technology has been proven to work in its final form and under expected conditions. In almost all cases, this TRL represents the end of true system development. Examples include developmental test and evaluation (DT&E) of the system in its intended weapon system to determine if it meets design specifications.
9	Actual system proven in operational environment (competitive manufacturing).	The solution is used successfully in a structurally operational environment. The user can and wants to recommend the solution to other water managers.

Appendix 2: Innovation Description Questionnaire

INNOVATION DESCRIPTION QUESTIONNAIRE

1. Welcome to the Innovation Description Questionnaire!

Dear BRIGAID Innovator,

You have entered the Innovation Description Questionnaire.

If you have multiple innovations, please take a separate questionnaire for each innovation.

The questionnaire contains 40 questions, which take about 20 minutes to answer. All answers will be handled confidentially (i.e., none of the information that you have provided will be dissemanted outside BRIGAID without your permission).

We look forward to your answers!

Kind regards,

WP2: Teun Terpstra (t.terpstra@hkv.nl)
WP3: Sergio Contreras López (s.contreras@futurewater.es)
WP4: Patrick Willems (patrick.willems@kuleuven.be)

INNOVATION DESCRIPTION QUESTIONNAIRE

2. INNOVATION CHARACTERISTICS

1. What is the name of the innovation?

2. Please provide a short, 2-line description of your innovation.

3. Who is the contact person for the innovation in your organization?

Name

Company

Email Address

Phone Number

4. What type of organization are you? Select all that apply.

- [ ] Multinational or Subsidiary / Daughter Company
- [ ] University or Institute
- [ ] Small or Medium Enterprise (max. 250 employees)
- [ ] Start-Up company
- [ ] Spin Out company
- [ ] Other (specify)

5. Do you develop the innovation in cooperation with other organisations? Select all that apply.

- [ ] Multinational or Subsidiary / Daughter Company
- [ ] University or Institute
- [ ] Small or Medium Enterprise (max. 250 employees)
- [ ] Start-Up company
- [ ] Spin Out company
- [ ] Other (specify)

6. Does your organization have previous experience in climate-related risk management?

- ◯ No
- ◯ Yes (please give details):

7. Which climate related risk does your innovation mitigate (select all that apply)?

- [ ] **River floods:** fluvial floods resulting from discharges that exceed flood protection levels; the high-river discharges are caused by heavy precipitation in the river basin.
- [ ] **Coastal Floods:** resulting from high sea water levels and wave impact that exceed flood protection levels; these hydraulic conditions are caused by storm surges
- [ ] **Droughts:** sustained and extensive occurrence of below average water availability. Resulting in water scarcity when drought conditions cause long-term imbalances between water availability and demands.
- [ ] **Heatwave:** prolonged period of excessively hot, and sometimes also humid, weather relative to normal climate patterns of a certain region.
- [ ] **Wildfires:** uncontrolled fire in an area of combustible vegetation that occurs in the countryside. Fire ignition and spread are both enhanced by cumulated drought, high temperature, low relative humidity and the presence of wind.
- [ ] **High winds speeds:** resulting in damage to buildings, (critical) infrastructure networks and other objects
- [ ] **Hail:** resulting in damage to buildings, (critical) infrastructure networks and other objects (typically vehicles)
- [ ] **Heavy precipitation / pluvial floods:** rainfall events that result in 1) (urban) floods due to exceedance of: drainage capacity, and 2) flash floods, defined as rapid flooding of low-lying areas, generally within a few hours after heavy rainfall events such as thunderstorms.
- [ ] **Other** (specify)

8. To what extent does your innovation have the following characteristics? Please provide details.

Fixed structure? (if applicable, give details on size, location, appearance, materials, visual impact and any possible impacts on public accessibility during use)

Mobile (deployable) object/components? (if applicable, give details on how quickly it can be deployed, where it would be stored when not in use, how it is installed and removed, and what the operational costs of deployment are)

Software or IT-product / components? (if applicable, give details its purpose, the information that is processed, user interface / presented information)

If not a fixed/mobile object or IT product, how would you decribe the main feature of the innovation? (e.g., a method / approach / serious game)?

Does your innovation have any ecosystem based or 'green' aspects?

Does the innovation anticipate or require any human behavioural changes (e.g. responding to warnings)

Are there any other characteristics that you would like to mention?

9. Please provide a short summary of how your innovation works

INNOVATION DESCRIPTION QUESTIONNAIRE

3. INNOVATION TESTING

10. Please indicate the current Technology Readiness Level (TRL) of the innovation:

- ◯ **TRL 1. Basic principles observed.** *Scientific research begins to be translated into applied research and development (R&D). Examples might include paper studies of a technology's basic properties.*
- ◯ **TRL 2. Technology concept formulated.** *Invention begins. Once basic principles are observed, practical applications can be invented. Applications are speculative, and there may be no proof or detailed analysis to support the assumptions. Examples are limited to analytic studies.*
- ◯ **TRL 3. Experimental proof of concept.** *Active R&D is initiated. This includes analytical studies and laboratory studies to physically validate the analytical predictions of separate elements of the technology. Examples include components that are not yet integrated or representative.*
- ◯ **TRL 4. Technology validated in lab.** *Basic technological components are integrated to establish that they will work together. This is relatively "low fidelity" compared with the eventual system. Examples include integration of "ad hoc" hardware in the laboratory.*
- ◯ **TRL 5. Technology validated in relevant environment.** *Fidelity of breadboard technology increases significantly. The basic technological components are integrated with reasonably realistic supporting elements so they can be tested in a simulated environment. Examples include "high-fidelity" laboratory integration of components.*
- ◯ **TRL 6. Technology demonstrated in relevant environment.** *Representative model or prototype system, which is well beyond that of TRL 5, is tested in a relevant environment. Represents a major step up in a technology's demonstrated readiness. Examples include testing a prototype in a high-fidelity laboratory environment or in a simulated operational environment.*
- ◯ **TRL 7. System prototype demonstration in operational environment.** *Prototype near or at planned operational system. Represents a major step up from TRL 6 by requiring demonstration of an actual system prototype in an operational environment (e.g., in an aircraft, in a vehicle, or in space).*
- ◯ **TRL 8. System complete and qualified.** *Technology has been proven to work in its final form and under expected conditions. In almost all cases, this TRL represents the end of true system development. Examples include developmental test and evaluation (DT&E) of the system in its intended weapon system to determine if it meets design specifications.*
- ◯ **TRL 9. Actual system proven in operational environment (competitive manufacturing).** *The solution is used successfully in a structurally operational environment. The user can and wants to recommend the solution to other water managers.*

11. Briefly explain why the innovation is at the indicated TRL level and the extent to which your innovation has been tested (max 200 words):

12. When do you plan to start with your first test within BRIGAID?

- ◯ Test cycle 1 (May 2017 – November 2017)
- ◯ Test cycle 2 (April 2018 – October 2018)
- ◯ Test cycle 3 (March 2017 – September 2017)

Other (please specify)

13. What is your preferred test location, and what needs to be arranged to get acces (e.g., rental contract, staff)?

Name	
Location	
Arrangements	

14. What do you expect will be the resulting TRL level after these tests?*See question 10 for a more detailed explanation of TRL levels.*

- ◯ TRL 1. Basic principles observed
- ◯ TRL 2. Technology concept formulated
- ◯ TRL 3. Experimental proof of concept
- ◯ TRL 4. Technology validated in lab
- ◯ TRL 5. Technology validated in relevant environment
- ◯ TRL 6. Technology demonstrated in relevant environment
- ◯ TRL 7. System prototype demonstration in operational environment
- ◯ TRL 8. System complete and qualified
- ◯ TRL 9. Actual system proven in operational environment (competitive manufacturing)

15. If your innovation is an object or structure, what are the minimum and maximum conditions (e.g., a water depth) that the innovation should be able to resist when it is ready (TRL9)?

INNOVATION DESCRIPTION QUESTIONNAIRE

4. INNOVATION MARKET

16. Have you conducted a market analysis or similar research for this innovation or another in the past?

- ◯ No
- ◯ Yes (please give details):

17. Do you know of any competing products/services?

- ◯ No
- ◯ Yes (please give details):

18. What do you think is the added value and/or main differentiating element of your own innovation?

19. Direct users are the persons/organisations purchasing and deploying the innovation. Who are the (potential) direct users of your innovation?

Public entities, namely:

Private entities, namely:

Citizens, namely:

Others, namely:

20. How did you finance the development of the innovation so far? Select all that apply.

- ☐ Own resources
- ☐ Private funding
- ☐ Public funding
- ☐ Other (please specify)

21. How much will it cost a direct user (client) to rent or purchase and then maintain the innovation, per unit, over time?

Rental price:

Purchase price:

Maintenace costs:

22. Besides the costs, are there any requirements that direct users (clients) need for effective implementation?

Maintenance, namely:

User support, namely:

Training, namely:

Regulatory reforms, namely:

Other, namely:

23. How much are the production costs and the revenues of the innovation, per unit, over time?

Costs

Revenues

24. Are there any geographical areas that you specifically aim for with market introduction?

In my home country, namely:

In other European regions, namely:

Beyond Europe, namely:

25. Why have you focused on these geographical areas? *(If necessary, give multiple reasons)*

- [ ] Proximity (distance)
- [ ] Known contacts
- [ ] Identified need
- [ ] Familiar language
- [ ] Familiar with policy and regulations
- [ ] Other (please specify)

26. Do you anticipate a phased market approach? I.e. first approach your easiest/closest market to then enlarge to other geographical areas?

No, because:

Yes. Please explain how you plan to follow this phased market approach (with estimated time per phase):

27. End beneficiaries are the persons/organisations benefiting from the deployed innovations, who may not be directly using them. Who are the (potential) end beneficiaries of your innovation?

Public entities, namely:

Private entities, namely:

Citizens, namely:

Others, namely:

28. Have you consulted or engaged any direct users and end beneficiaries already?

Direct end users, namely:

End beneficiaries, namely:

29. Are you planning to approach additional direct users and end beneficiaries?

Direct end users, namely:

End beneficiaries, namely:

INNOVATION DESCRIPTION QUESTIONNAIRE

5. INNOVATION IMPACTS

30. Does the innovation release any materials into the environment (e.g. chemicals, sprays, powders etc.)?

- ◯ No
- ◯ Yes (please give details):

31. What kind of positive, or negative, environmental impacts might your innovation have (over its lifecycle)?

Positive impacts

Negative impacts

32. Could there be any (other) possible unintended side effects associated with your innovation (e.g. could your innovation displace where risks are located)?

- ◯ No
- ◯ Yes (please give details):

33. Do you see any challenges in terms of the acceptance of the innovation in society?

- ◯ No
- ◯ Yes (please give details):

34. Who would be liable in the event that the innovation fails in its objective when deployed?

INNOVATION DESCRIPTION QUESTIONNAIRE

6. CLOSING QUESTIONS

35. Which part of the business innovation cycle do you need more support with from BRIGAID?

	Not all	In home country	Abroad	Home country and abroad
Improvement of the technology and testing	○	○	○	○
Identifying social and organizational needs of direct users and end beneficaries	○	○	○	○
Making a qualitative & quantitative market analysis (market size, clients, competitors, etc.)	○	○	○	○
Additional funding during BRIGAID	○	○	○	○
Marketing material (banners, pitch deck, meetings, etc.)	○	○	○	○
Exposure to clients	○	○	○	○

If relevant, please provide details:

36. Does the development and market introduction of your innovation require any funds after BRIGAID has finished?

Yes (please give details)

No

37. Are there partners within BRIGAID that you cooperate with, or do you see chances for future cooperation?

Yes (please give details)

No

38. In the fall of this year (2016), WP5-7 will perform a quick scan on so-called front-runner innovations. This serves to develop the WP5-7 methods (socio-technical readiness, market analysis, funding needs, market outreach), and to help the innovators to advance their products in an early stage. Would you be interested to participate as front-runner innovation?

○ yes

○ no

Additional comment:

39. What are your:

main objectives to measure success within BRIGAID?

main expectations from BRIGAID?

40. Is there any other information that you want to share, that was not covered in this questionnaire?

Appendix 3: Initial test plan and budget request template for pre-selected innovations

The purpose of this template is to have a clear picture of:

- *the tests that will be performed and to what extent these test help to improve the innovation (e.g., in terms of TRL)*
- *the technical feasibility of these test given the test facilities and equipment*
- *the financial feasibility given the estimated costs and the available budget from BRIGAID and other sources*

In BRIGAID, the following costs are eligible:

- ***Testing****: eligible costs include the purchase of specific equipment, renting of test facilities, logistics for moving innovations to the test sites, etc.;*
- ***Improving innovations****: include material costs related to repairing or improving prototypes.*

In BRIGAID, the following costs are <u>not</u> eligible*:*

- ***labour costs*** *of the owner or developer team (e.g. compensation for time spent on improvements);*
- ***travel costs*** *of the owner or developer team (e.g. compensation for train/plane/hotel costs).*

The total budget requested should be as low as possible and fully transparent.

Disclaimer: *Filling in this template does not entitle the subscriber to allocation of any budget from BRIGAID. Budget allocation of BRIGAID will depend on the quality and cost of the requests submitted for the selected innovations.*

Innovation	
Company	
Estimated total cost for testing the prototype (in €)	
BRIGAID's budget requested	
% BRIGAID's budget vs total cost	
Own financial resources (in €)	
Other external sources (in €)	

1. Test plan

Please briefly describe your test plan as detailed as possible (in about 1-2 pages) following the headings below. From the provided information it should be clear to what extent the innovation will be improved and to what extent the tests are technically feasible.

Goal of the tests (what do you want to achieve in terms of improving the innovation):

The tests that you want to perform (e.g., testing reliability/performance of certain components and/or certain failure mechanisms):

The test facilities and any equipment you would need:

2. Justification of BRIGAID's budget

Please specify the items for which BRIGAID's budget is requested and justify briefly why.

3. Additional sources and others

If applicable, please provide details on owned or additional external budget already available or that is being requested from other sources.

4. Other comments

Please provide here any other comment or item you would like to make (e.g. time scheduling, costs per task, etc.

Appendix 4: Selection strategy

In the GA (Annex 1, DoA Part B, page 14) and in the Internal Report "Stockaking Process" the following selection procedure has been proposed:

1. Based on preliminary data, a technical and social score is assigned to each innovation.
2. A overall score is computed as the product of technical and social scores;
3. The overall score is divided by the reported development costs to arrive at a total score;
4. Innovations are ranked based on their total score (a higher score is better than a lower score) and other qualitative criteria regarding: a) business potential and impact on economy, b) testing feasiblity, c) ethical issues, d) innovator enthusiasm, e) 'green' solutions and internal balance between innovation typologies and hazards covered
5. Advice from the Advisory Board (only if it is required)

The selection procedure – especially steps 1 to 4 – is being further improved in each of the three rounds of stocktaking (M1-12; M16-22; M27-33). The improvement of the description questionnaire from which quantitative information is retrieved will go hand in hand with the development of the TIF. In the first round of stocktaking the TIF is not expected to be ready for a complete, quantitative assessment. Prioritizing and selecting innovations therefore will be done based on expert judgment, while in the second and third round more detailed, quantitative procedures will be available.

This section further details the criteria, their scoring and the calculation of an overall score. The scoring and calculation procedure slightly deviates from the procedure initially proposed in the DoA/Stocktaking Process report, due to ongoing insights while detailing the procedure.

The procedure is applied to rank innovations, as a basis for the selection of the most attractive innovations for BRIGAID. The procedure will be evaluated after each round of stocktaking and will be updated before the next stocktaking round, based on ongoing work in the project.

Criteria for assessment of innovations

All criteria are scored on Likert-type scales, based on expert judgment. Expert judgment is performed by the WP2-4 leaders based on information that innovators provided through the Innovation Description Questionnaire, and through direct contacts (email, phone,meetings, etc.) with the innovators. Appendix 2 provides insight in the IDQ questions that were used in scoring the innovations on the criteria. Assigning higher scores means that an innovation fits better with BRIGAID's goals. In this paragraph the scoring of the following criteria is explained in detail:

1. Three types of Readiness: Technical, Social and Market Readiness
2. Other qulitative criteria: testing feasibility, innovator vision and promising innovations
3. Nature-based innovations

1. Readiness indicators

BRIGAID defines three types of readiness that are important for the succesful development and market introduction of an innovation: technical, social and market readiness. These readiness types are therefore applied in the selection of innovations.

Technical readiness

Technology Readiness Levels (TRLs) are a metric used to assess the maturity of an innovation. In BRIGAID, Technical readiness is defined as the performance of an innovation to reduce climate-related risks, as shown in field tests and operational environments. To evaluate the technical readiness of an innovation, we focus here on its technical reliability. Technical reliability describes the likelihood that an innovation fulfills its intended functionality during its intended lifetime. By definition, reliability is the probability of successful operation, which can also be expressed as the complement of the probability of failure during operation. For example, the reliability of a temporary flood barrier (TFB) is evaluated by determining the probability that the TFB fails to retain water levels to its design height (and safety level); or, the reliability of a flood warning system (FWS) is evaluated by determining probability that the FWS fails to predict flooding or to achieve the intended lead time prior to a flood. As relibability of an innovation increases, aslo its TRL increases.

BRIGAID supports innovations that are at TRL4 or higher and require further improvement in terms of technical, social and market readiness. For the selection of innovations we assign a score on 1-5 scale based on the TRL. Innovations with TRL 4-6 receive the highest scores as they match best with BRIGAID's ambitions, i.e., to support testing in the lab, in a relevant environment or in a simulated operational environment.

The TRL specifies which activities are undertaken at the stated level.	**TRL**	**Score**
TRL 1. Basic principles observed. **TRL 2.** Technology concept formulated. **TRL 3.** Experimental proof of concept. *BRIGAID does not support innovations that are at TRL1-3.*	1-3	n.a.
TRL 4. Technology validated in lab. Laboratory testing of prototype component or process. Design, development and lab testing of innovation components are performed. Here, basic innovation components are integrated to establish that they will work together. This is a relatively "low fidelity" prototype in comparison with the eventual system.	4	3
TRL 5. Technology validated in relevant environment. Laboratory testing of integrated system. The basic innovation components are integrated together with realistic supporting elements to be tested in a simulated environment. This is a "high fidelity" prototype compared to the eventual system.	5	4
TRL 6. Technology demonstrated in relevant environment. Representative model or prototype system, which is well beyond that of TRL 5, is tested in a relevant environment. Represents a major step up in a technology's demonstrated readiness. Examples include testing a prototype in a high-fidelity laboratory environment or in a simulated operational environment.	6	5
TRL 7. System prototype demonstration in operational environment. Integrated pilot system demonstrated. Prototype is near, or at, planned operational system level. The final design is virtually complete. The goal of this stage is to remove engineering and manufacturing risk.	7	2
TRL 8. System complete and qualified. System incorporated in commercial design. Innovation has been proven to work in its final form under the expected conditions. In most of the cases, this level represents the end of true system development.	8	1
TRL 9. Actual system proven in operational environment (competitive manufacturing). System ready for full scale deployment. Here, the innovation in its final form is ready for commercial deployment.	9	n.a.

Social Readiness

Social readiness is the extent to which the innovation is accepted by direct end users and end beneficiaries. Acceptance may be hampered due to a mismatch between the innovation and the requirements of direct users (maintenance, training/user support, embedment in policy, etc.), due to existing positive attitudes towards current practice and lack of confidence in the new technology (e.g., because the innovation is new and has not been proven yet) or due to concerns in the sector and/or in society especially when the innovation has (perceived) negative side effects on health, ecology, or spatial quality.

Ideally, an innovation's technical, social and market readiness are improved simultaneously. If this is not the case, one risks that additional requirements need to be incorporated ad hoc in the technical design. This means that all social readiness requirements that influence the technical design need to have been incorporated at TRL6, and need to be identified and addressed beforehand, at TRL4-5. In the selection of innovations, stronger past efforts to identify, document and improve social readiness are positively rewarded. We assign a score on 1-5 scale as follows:

Social Readiness	Score
Potential social readiness requirements not identified	1
Potential social readiness requirements identified (desk study)	2
Potential social readiness requirements validated among direct users (interviews, survey)	3
Potential solutions to social readiness requirements (if any) identified and designed.	4
Potential solutions to social readiness requirements (if any) tested and validated with direct end-users / beneficiaries.	5

Market Readiness

Market Readiness is the potential of an innovation to develop a solid business case and to attract clients and investors. Market Readiness can be defined in four underlying dimensions[6]:

- Technical: the extent to which the innovation is technically ready. This has been considered separately under Technical Readiness.
- Social: the extent to which the innovation is socially ready. This has been considered separately under Social Readiness.
- Strategy: the extent to which a market strategy has been defined. This includes several items such as identification of target customers, market, competitors.
- Finance: the extent to which a financial strategy has been defined. This includes several items such as price, revenue and profit forecast, and funding of development and scaling up.

Since Technical and Social Readiness are dealt with separately, we use Market Strategy and Financial Strategy as indicators of Market Readiness. Market Readiness is calculated as the average of Market Strategy and Financial Strategy.

[6] See the Market Readiness Scan that was applied to the Frontrunner Innovations, developed by TFC (acronim?).

Market Strategy: extent to which innovator has developed a market strategy which includes a description of target markets, market size, potential customers, competitors, and a strategy to achieve short and long term goals.	Score
A market strategy has not been thought about yet.	1
A market stratregy has been thought about but not been put on paper yet.	2
A rough market strategy has been put on paper.	3
A detailed market strategy has been put on paper using etsblished methods (e.g., CANVAS).	4
A detailed market strategy has been put on paper and is currently being executed.	5

Financial Strategy: extent to which innovator has developed a financial strategy which includes having a product price strategy, price, revenue and profit forecasts, and having arranged capital/funds for the further development, testing and scaling-up of the project.	Score
A financial strategy has not been thought about yet.	1
A financial stratregy has been thought about but not been put on paper yet.	2
A rough financial strategy has been put on paper.	3
A detailed financial strategy has been put on paper	4
A detailed financial strategy has been put on paper and is currently being executed.	5

2. Other qualitative criteria

Other criteria include the business potential, feasibility if testing, the innovator's vision and the extent to which an innovation is seen as 'promising'. The background for these criteria is as follows:

- Testing feasibility: BRIGAID focuses in particular on TRL4-6 and therefore testing feasibility is regarded an important criterion. Testing feasibility is the extent to which testing and improvement of the innovation to reach the next Technical and Social Readiness levels is feasible, given the required resources such as expertise, test facilities, equipment, funds and network.

- Innovator's vision: BRIGAID supports innovators but the innovator is responsible for pushing the innovation towards the market. Vision is understood as the extent to which the innovator has a clear strategy to improve the innovation and push it forward in and beyond BRIGAID to reach the market.

- Promising value: some innovations catch attention immediately, because they are completely new, inspiring, unorthodox and seem 'spot on' because of their high potential to reduce climate related risk (i.e., high effectivess). Such innovations may be less easy to develop because there are no similar examples that have straightened the development path before them. BRIGAID aims to support those promising innovations and scores them higher to increase their chance of being selected.

Each of these criteria is assessed on a 1-3 scale, as indicated below. The overall score for qualitative aspects is calculated as the average of the three criteria.

Testing feasibility	Score
No detailed test plan for further improvements is made, but it seems reasonable to expect that test resources are in reach of the innovator and BRIGAID	1
A rough test plan is made and documented including rough estimations of required resources; required resources are in reach of the innovator and BRIGAID	2
A full test plan is available, with detailed requirements and arrangements; BRIGAID only has to review the test plan, allign details with the TIF and provide (co)funding.	3

Innovator vision	Score
Innovator hardly expresssed a vision to develop the innovation into a market ready product; next steps are taken ad hoc and in an opportunisticly.	1
Innovator has a rough vision to develop the innovation into a market ready product; next steps for impovement are roughly known but not planned and acted upon.	2
Innovator has a clear vision to develop the innovation into a market ready product; next steps for impovement are known in detail and carefully planned and acted upon.	3

Promising value	Score
Innovation is a variation on other, previously established, innovations and not particularly new or more effective than others..	1
Innovation has some new and inspiring aspects, and seems to have greater potential than its competitors to reduce climate related risk.	2
Innovation is totally new, unorthodox and inspiring and seems to have great potential to reduce risk.	3

3. Nature-based aspects

Nature-based solutions to societal challenges are solutions that are inspired and supported by nature, which are cost-effective, simultaneously provide environmental, social and economic benefits and help build resilience. Such solutions bring more, and more diverse, nature and natural features and processes into cities, landscapes and seascapes, through locally adapted, resource-efficient and systemic interventions. See https://ec.europa.eu/research/environment/index.cfm?pg=nbs

BRIGAID rewards innovations that are ‘nature-based’. The EU strives for solutions that are sustainable and nature-based. In particular, the EU Research and Innovation policy agenda on Nature-Based Solutions and Re-Naturing Cities aims to position the EU as leader in ‘Innovating with nature’ for more sustainable and resilient societies. To stimulate the development of such solutions, BRIGAID gives a bonus to innovations that are sustainable and nature-based.

Nature-based aspects	Score
Solution is not nature-based and does not explicitly incorporate sustainability or eco-friendly aspects	1
Solution incorporates some sustainable / eco-friendly aspects	2
Solution is nature-based and/or focuses explcitly on sustainable / eco-friendly aspects (e.g., re-use of water, production of green energy)	3

Innovations in category 1 receive no bonus on their total score, while innovations in categories 2 and 3 receive a 10% and 25% bonus on their total score, respectively.

Calculation of overall score for selection of innovations

Based on the scores on individual criteria, a 'Grey Score' and 'Green Score' are computed, as follows:

Grey Score = Average (Readiness Score, Qualitative score)
with
Readiness Score = 0,50*Technical Readiness Score +
0,25*Social Readiness Score +
0,25*Market Readiness Score
Qualitative Score = (0,33*Testing Feasibility Score +
0,33*Innovator Vision Score +
0,33*Promising Innovation Score)

Green Score = Grey Score * Nature-Based Bonus
With
(1) No nature-based aspects: Grey score*1,00 (No bonus)
(2) Some nature-based aspects: Grey score*1,10 (10% Bonus)
(3) Nature-based / strong focus on green aspects: Grey Score*1,25 (25% Bonus)

The Readiness score is scaled 1-5 (min-max) and the Qualitative Score 1-3 (min-max). So the Grey Score is scaled 2-8. Including the Nature-based Bonus the highest score is therefore 10 points.

Further note:

- The Readiness indicators weight heavier than the Qualitative indicators because the three types of Readiness are regarded is the fundamental pillars for sucessful market introduction.
- Technical Readiness is weighted higher (0,50) than Social and Maket Readiness (0,25) because in the current phase of BRIGAID Social and Market Readiness indicators are not fully developed yet. These weights may be update in Cycle 2 and 3. The weights do not mean that Social and Market Readiness are less important.
- The qualitative criteria are weighted evenly, so each of these three indicators is regarded of equal importance.

Selection of innovations

Next step is to select the innovations that are considered for inclusion in BRIGAID. This is done in a 3-step procedure:

1. Cut-off score: innovations that received a Green-score of 5 or higher are shortlisted;
2. Test proposal: shortlisted innovations are requisted to write a 1-page proposal describing the tests they want to perform and to specify the required funds;
3. EB-decision: based on the Green-score and the test proposal / required funds the BRIGAID Executive Board decides which of the shortlisted innovations will be included in BRIGAID.

Cut-off score
All innovations below the cut-off score '5' will not be considered for inclusion. This means that Grey Solutions need to score at least 5 points out of 8 on the Readiness / Qualitative criteria. Green Solutions have the advantage that they receive a bonus, so they require at least 4 points (in case of 25% bonus) or 4,5 (in case of 10% bonus) out of 8.

Test proposal
Shortlisted innovations are requested to make 2-page test proposal and specify the required budget/needs. BRIGAID provides a template (see Appendix 3).

Test plans need to show that tests will lead to a significant improvement of the innovation's technical and social readiness, and is practically feasible (test location, required budget, complexity, etc). BRIGAID offers external innovators a small budget for testing and improving their innovations. About 450.000 euro is available over three innovation cycles; about 150.000 euro per cycle. Since BRIGAID aims to improve 35-50 innovations including about 25 from within the consortium, BRIGAID aims to stocktake and improve roughly 10-25 innovations from external innovators.

BRIGAID will evaluate the test plan and requested budget. The following will be considered herein:

- Best Value: BRIGAID may act as the sole funder or as a cofunder. Acting as cofunder has the advantage that a larger budget is available. In some cases this is a necessity due to expensive tests that BRIGAID cannot support on its own. In other cases this is a luxury because it enables to perform more extensive testing and to make larger steps forward (e.g. from TRL4 to 7). Being a co-funder may have the disadvantage that BRIGAID has less influence and control over the steps that are taken.

- Maximum Grant: A conservative estimation is that about 15-20 keuro euro is available per innovation. The total amount of money that is granted to innovators needs to be evaluated against the number of innovations that BRIGAID requires to meet its own objectives (testing and improving 35-50 innovations) throughout the project lifetime. A maximum grant for innovations depends on these evaluations.

EB-decision
Based on the Green Score and the 2-page Test Plan the Executive Board will decide which of the innovations will be included in the project. This could be all shortlisted innovations are a sub-set. If needed the Advisory Board will be asked for advice. The budget allocation is specified in a contract to be signed by the BRIGAID budget holder and the innovator. A standardized contract is developed by TU Delft.

Innovation Description Questionnaire (IDQ) questions used to assess innovations on the evaluation criteria

Innovations have been evaluated on the criteria described in Appendix 1. The criteria have been scored based on the following information

- The Innovation Descriptionn Questionnaire (IDQ). The numbers in the table below refer to the IDQ-items (see Appendix 2)
- Personal contacts with the innovator through conversations and email.

Item	Questions in IDQ
Technical Readiness Level	10-11
Social Readiness Level	22, 28-33
Market Strategy	16-17, 24-26, 29
Financial Strategy	21, 23
Testing feasibility	12-13, + additional info (testing framework and budget requirements) surveyed to and provided by innovators
Innovator Vision	Owned BRIGAID assessment-
Promising Innovation	17-18
Nature-based bonus	8, 11

Appendix 5: Results of the selection method for external innovations in Cycle 1

This Appendix provides a detailed overview of the scores and the arguments that underpin them. The overview is presented in three separate tables:

- General description, Grey Score and Green Score (the final result of the scoring);
- Readiness score (Technical, Social, Market readiness);
- Qualitative criteria (Testing Feasibility, Innovator Vision, Promising Value).

GENERAL DESCRIPTION, GREY SCORE AND GREEN SCORE

Name	Company	Description	WP	Current TRL	Grey Score	Nature-based Bonus	Green Score
EVAPO-CONTROL	ARANA-WM S.L.	A recyclable floating module to reduce water evaporation and algae growth in open reservoirs.)	WP3: Droughts	5	6,542	1,25	8,177
HYDROVENTIV	Le PRIEURE	The Hydroactive Smart Roof System: modular trays device for retaining and dissipating rain water on roof, with outflow control delayed, piloted by a remote system control for optimizing water resource. StormWater Management and Monitoring - Reuse rainwater for irrigation - Cool down the building and the surrounding area - Promote urban biodiversity	WP4: Extreme weather	5	5,833	1,25	7,292
ARIEL	BALAM Ingenieria de Sistemas	ARIEL is a microwave radiometer-processing system able to provide remote soil moisture (SM) data without additional ground-based infrastructure. ARIEL can be placed on-board aircrafts, drones or ground vehicles.	WP3: Droughts	5	6,000	1	6,000
Water from Heaven	Water Innovation Consulting (WIC)	Drinking water made of rain from own roof. Sustainable water purification and storage for dry seasons	WP4: Extreme weather	5	5,250	1,1	5,775
SCAN	Sumaqua	Software tool to evaluate Climate AdaptatioN strategies. A tool to evaluate and optimize water management strategies in the light of climate change and other trends (such as the increasing urbanization, population growth and water demand,…). The tool can be used to analyze the integrated water system, while focusing primarily on hydrology and hydraulics (rivers, floodplains and urban drainage systems).	WP4: all hazards	5	5,458	1	5,458
TubeBarrier	TubeBarrier	The TubeBarrier is a temporary embankment; quick and easy to deploy to prevent floods and in case of industrial leakage or water storage. The TubeBarrier use water to block the rising water, is small to store and can be easily be installed over hundreds of meters by just two persons.	WP2: Flooding	5	5,333	1	5,333
SLAMdam	SLAMdam	SLAMdam is a temporary flood defender filled with water. A stable base to fight flooding with water.	WP2: Flooding	5	5,250	1	5,250
PrHo	CAJAMAR Foundation	A calibrated FAO-based software for the estimation of actual evapotranspiration and water requirements of greenhouse-grown vegetable crops.	WP3: Droughts	**5**	4,333	1	4,667
GIS-WRAP	METEOGRID	GIS Weather Simulation-Risk Awareness Platform for the management, processing and advanced visualization of atmospheric and satellite data, and auxiliary spatial variables. GIS-WRAP allows the analysis of historical,	WP4: Extreme weather	**4**	4,625	1	4,625

GENERAL DESCRIPTION, GREY SCORE AND GREEN SCORE							
Name	**Company**	**Description**	**WP**	**Current TRL**	**Grey Score**	**Nature-based Bonus**	**Green Score**
		current or foreseen extreme events in a 3D mode. A specific app allow its use in mobile devices.					
Floating cities	Blue21	Integrated floating city concept: urban development, ecological development, nutrient/CO2 recycling, food/energy production on water and monitoring with underwater drones	WP2: Flooding	4	3,917	1,1	4,308

READINESS SCORES

Name	Technical Readiness Score	Comment	Social Readiness Score	Comment	Market Strategy	Financial Strategy	Market Readiness Score	Comment	Readiness Score
EVAPO-CONTROL	4	Tested in laboratory conditions and in a small relevant environment (small water reservoir) since July'16.	4	User needs and requirements identified through direct interviews. Technological improvements have been adopted to include those requirements and hence increase social acceptance.	3	4	3,500	Solution highly demanded. There is a detailed business-case based on standard tools (PEST, SWOT, Strategy-CANVAS). A market and exploitation plan has been focused at the regional/national level. Cost and profit criteria have been included during the design and production phase.	3,875
HYDROVENTIV	4	The original TRL was 9, but after a telcon with the innovator it became clear that there existing system has a TRL 9 but the innovation proposed in an updated system that takes the downstream sewer capacity into account based on a sensor and real-time regulation; this has not been tested yet; therefore TRL 5	3	For 4 years we have been involved in Storm Water Management segment and we have multiplied the contacts with water and construction actors, participated to Congress and Exhibitions, and have elaborated for our original product a marketing and commercial plan to access to the market, now triggered. Insights in barriers to acceptation: efficiency in urban flood mitigation of green roofs raised some questions (limited storage); a more advanced system is proposed to increase the efficiency by regulation using sewer sensor for measuring the sewer capacity; City of Antwerp has expressed high interest to have one installed and tested on one of their public buildings.	3	3	3,000	High potential for selling to both private building owners and public authorities; Strong attention these days to the importance of green roofs; Business plan and market analysis has been done before for existing innovation; need to change is based on experience	3,500
ARIEL	4	The technology has been tested in small relevant environment (field testing campaign). More testing is required to demonstrate its readiness at relevant and operational environments.	3	Potential users and beneficiaries have been surveyed. Social barriers have been qualitatively identified.	5	5	5,000	Detailed market strategy available and being executed. Financial strategy well defined. The company is member of the ESA Business Incubation Center & Climate-KIC Accelerator. There is a well-defined fundraising strategy..	4,000
Water from Heaven	4	Two prototypes are tested in different environments: 1) first pilot was installed at Ecovillage Boekel in February 2016 and is still running; 2) second pilot as performed at the Heijmans One (a mobile house). Heavenly water together with the Tesla power wall made this house utility independent.	3	Starting to deploy on one person's houses. Insights in barriers to acceptance: Investment and maintenance are for the house owner; Legal constraints reg. treated rain water for consumption depend on country	2	2	2,000	Good potential for selling to both private building owners, but mainly to public authorities owning buildings with large flat roofs; Previous market analysis unclear	3,250

READINESS SCORES

Name	Technical Readiness Score	Comment	Social Readiness Score	Comment	Market Strategy	Financial Strategy	Market Readiness Score	Comment	Readiness Score
SCAN	4	The models underlying the tool have been validated in theoretical experiments and were compared to other existing and commercially available modelling approaches (i.e. a proof-of-concept). The results of these tests have been published in international scientific journals. In addition, the models were already incorporated in several smaller scale projects (i.e. validation in relevant settings).	2	The valorization potential was evaluated extensively by the Flanders Innovation & Entrepreneurship Agency (Belgium). This evaluation indicated that the demand for this technology is present and increasing rapidly. Therefore, they judged this innovation & technology as "viable" for broad exploitation and commercialization, which lead to the Sumaqua incubation project.	3	2	2,500	The valorization potential was evaluated extensively by the Flanders Innovation & Entrepreneurship Agency (Belgium). This evaluation indicated that the demand for this technology is present and increasing rapidly. Therefore, they judged this innovation & technology as "viable" for broad exploitation and commercialization, which lead to the Sumaqua incubation project.	3,125
TubeBarrier	4	TRL5; The innovation is currently being sold with the current state of development: however, the following aspects are still to be studied and improved. 1) Materials and sustainability, 2) the step to industrial production, 3) ground fixation to best available method, 4) increased barrier height, 5) insight in overtopping stability with waves, 6) lateral movement of water, 7) stability with drift wood conditions, 8) ability to persist flash floods, 9) business model improvement (sales, lease constructions or service model/ investors), 10) corner constructions.	2	Maintenance and training needed, not clear whether Tubebarrier provides this. Social and institutional acceptance of alternatives of the sand bag are still necessary.	2	2	2,000	There is a large potential but the sector also tends to stick with sand bags. A market analysis has not been performed but they are following the demand; current sales volume unknown to BRIGAID. They use their sales revenues to finance improvements. This is more of an ad hoc strategy than a fully developed financial strategy that looks ahead and carefully plans actions.	3,000
SLAMdam	4	TRL5; SLAMdam has now a height from 67 cm high and officially by TUV stop 50 cm of water (TRL8). With this project we want to test our bigger dams. from 1 meter and 1.30 high. And hope the SLAMdam can stops more than 1 meter water.	3	For the smaller dams free / online training is provided in large tenders; interviews with previous customers (after sales) have given insights, but it is yet not clear to BRIGAID what these insights are. There is resistance towards flexible flood barriers because direct users stick to sand bags. It is not clear what the exact psychological concern is and which solution is effective in changing this attitude	2	2	2,000	there is a large potential but the sector also tends to stick with sand bags. A market analysis has not been performed but they are already selling their smaller barrier, sales volume unknown to BRIGAID. They use their sales revenues to finance improvements. This is more of an ad hoc strategy than a fully developed financial strategy that looks ahead and carefully plans actions.	3,250
GIS-WRAP	3	Some components (fire simulation, wind simulation) partially tested in relevant environments. Technological improvements are still required. The cloud-WMS is still not ready.	3	Public agencies and regional authorities have shown a high interest in the tool. Its management requires specific training.	1	2	1,500	Market and cost-benefit analyses have been not performed. A product price strategy has been thought but not put on paper yet. Fundraising has been adopted through research calls and in collaboration with universities and research centers.	2,625

READINESS SCORES

Name	Technical Readiness Score	Comment	Social Readiness Score	Comment	Market Strategy	Financial Strategy	Market Readiness Score	Comment	Readiness Score
PrHo	4	TLR5. Software calibrated and validated for certain crops and local conditions (SE Spain). The software is internally used for research applications. Testing plan aims to calibrate and validate its technical reliability for other crops and conditions.	3	Solution designed to cope with identified local requirements and with the engagement of direct users.	1	1	1,000	Innovator aims to provide the solution with no cost (open-license software). No previous marketing plan exists.	3,000
Floating cities	3	The innovator states in the IDQ that the concept is at TRL 6. This would mean that they have tested their concept of a floating city, but at the same time they state that "Floating foundations are already proven technology. The integration and symbiosis among different floating functions is however something that still needs to be tested". So they might be anywhere between TRL2 and 6. To be checked. For now we consvatively estimate this concept at TRL 4.	2	Is a large integrated concept; highly sustainable because it integrated many disciplines, but this complexity is at the same time a weakness for getting it sold to regional authorities: "Integrated concept towards more resilient and resource-efficient cities, promoting circular economy, creating new jobs, improving the livability and quality in cities. The impacts will be both on a local and global scale."	1	1	1,000	highly integrated, hence complex, concept, may be difficult to get it sold to regional authorities; no market analysis done yet; business plans still highly unclear.	2,250

QUALITATIVE SCORES

Name	Testing feasibility	Comments	Vision	Comments	Promising	Comments	Qual. Score
EVAPO-CONTROL	3	Testing activities already performed (in lab) or well planned (operational environment).Most of BRIGAID's performance indicators are covered (technical reliability, reusability and effectiveness). Tests are being partially supported by technological centers or technical university.	3	Clear vision to develop a market ready product. A set of different prototype is available..	2	Concept and technology is not new, but engineering and design improvements have been adopted. Technology extremely demanded in drought and water-scarcity prone regions.	2,667
HYDROVENTIV	2	High interest by City of Antwerp, on one of their public buildings; potential to combine with scenario analysis based on urban drainage model for entire city of Antwerp, hence to extrapolate the impact to the scale of the entire city	3	Had already 3 telcons with innovator; keeps requesting about the status of his file, so is very enthousiastic; all signs are there to make this a succesful testing	2	Greenroofs in itself are not so inspiring, but the proposed new concept of regulation based on sewer system monitoring is totally new	2,333

QUALITATIVE SCORES

Name	Testing feasibility	Comments	Vision	Comments	Promising	Comments	Qual. Score
ARIEL	2	Mechanical integration and radiation tests (anechoic chamber); Interference tests; Calibration; Testing and Validation at field scale. The testing phase cover a wide range of exercises which requires external facilities. A preliminary testing and cost plan has been submitted.	2	Member of the ESA Business Incubation Center & Climate-KIC Accelerator. Clear vision but social barriers (e.g. low penetration rates into the market) need to be solved.	2	Concept and technology not new, but new components have been included. Two certificates of technological excellence from the H2020 SME Instrument.	2,000
Water from Heaven	2	Two pilots already in progress; we may rely on these results; so benefit for another case is unclear; there might however be interest by City of Antwerp, to install on one of their public buildings; System is mobile and can be installed rapidly	2	Had one telcon with the innovator; was a bit sceptical about the help BRIGAID may provide, but wants to give it full support	2	Interesting concept to produce drinking water from rain water at individual building level but not fully new because one similar system appears to exist	2,000
SCAN	2	Testing for city of Antwerp proposed	3	Ethusiastic young enterpreneur originating from KU Leuven; showing high interest in BRIGAID	2	Idea of use of meta-models exists, but approach is novel and alternative, meeting shortcomings of existing tools	2,333
TubeBarrier	2	Testing a higher barrier and ground fixation in Flood Proof Holland is feasible, but impacts of waves is not feasible in FPH. Might need additional location to test waves impact.	3	As a startup company the financial are always a bit critical; as might be expected, we are very eager to be part of BRIGAID. To ensure or collaboration we are more than willing to invest our hours and effort. We hope to also find some financial coverage for costs not directly associated with our own business / product development related to BRIGAID.	2	Alternatives to sand bags exist but have not been adopted by end-users. So, promising in a way that old technolgy is replaced with more efficient and new concept	2,333
SLAMdam	2	Testing the higher barrier in Flood Proof Holland is feasible, but impacts of waves is not feasible in FPH. Need for additional location to test waves impact.	2	Had a 1,5 hour face-to-face talk with the two partners. They were enthusiastic to be involved, but since then we did not have contact	2	Alternatives to sand bags exist but have not been adopted by end-users. So, promising in a way that old technolgy is replaced with more efficient and new concept	2,000
GIS-WRAP	2	The fire risk simulation component has been tested during the summer 2016 in Spain (Madrid region). Additional validation is aimed at other locations (Levante region) and different state conditions (urban-forest interface).	2	The innovation was submitted very close to the deadline and not enough details could be retrieved. The survey was not completely filled out.	2	Similar tools are available in the market. The novelty roots in the ability to combine warning and forecasts in the same management system.	2,000
PrHo	1	Company has its own test facilities in different places. Because of previous experience, the testing chain is well established.	2	Local applicability.	1	Similar solutions exists in the market.	1,333

QUALITATIVE SCORES							
Name	Testing feasibility	Comments	Vision	Comments	Promising	Comments	Qual. Score
Floating cities	1	Can be implemented for a coastal city, e.g. Rotterdam. Innovator will apply the concept, but needs data and information from the city + interest by the city to implement (parts of) the plan later	3	Had one telco (Patrick) with the innovator; Barbara was very motivated but realized some of the difficulties	1	Maybe a '2'?	1,667

Appendix 6: Innovator Welcome Pack

BRIGAID

BRIDGING THE GAP FOR INNOVATIONS
IN DISASTER RESILIENCE

INNOVATOR WELCOME PACK

You are an innovator we are interested in working with!

That is why you received this welcome pack

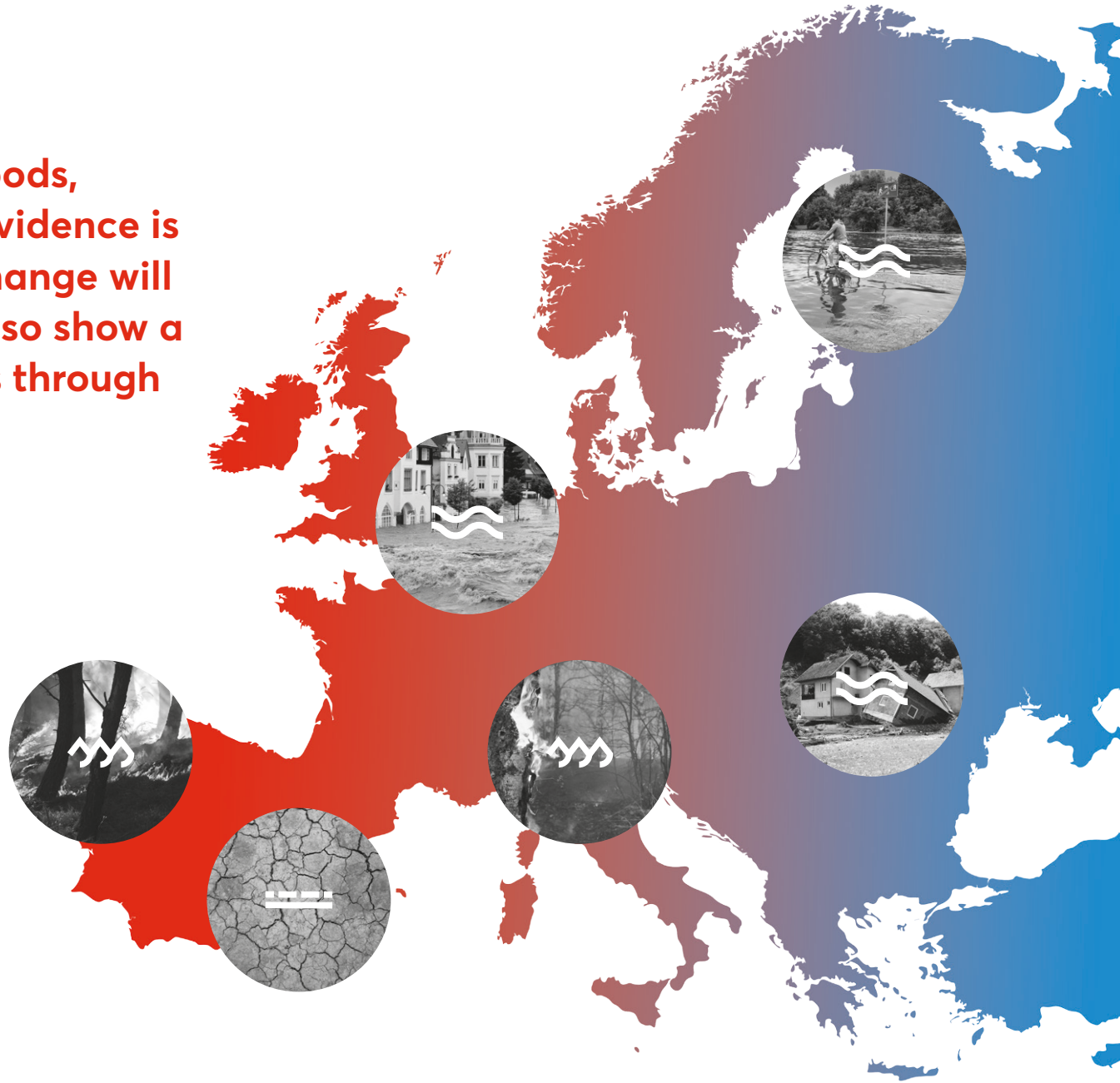
BACKGROUND

Europe is particularly prone to floods, droughts and extreme weather. Evidence is now ever stronger that climate change will increase damages. Evaluations also show a huge potential to reduce the risks through adaptation strategies.

Although there is no lack of entrepreneurs that develop innovative solutions, only 6% of the European companies are capable of testing and demonstrating their innovations.

This is often related to a lack of:

- Resources for testing and improving innovations
- Incorporation of end user requirements in the design and business model
- Capacities to identify and engage with wide spread network of potential customers



BRIGAID

WHAT IS BRIGAID?

BRIGAID is a 4-year project (2016-2020) under EU Horizon2020.
We aim to effectively bridge the gap between innovators and end-users in resilience to floods, droughts and extreme weather.

INNOVATION PROCESS
Plan, Test and Market

PROTOTYPE

Stocktaking of innovations
Innovator Incubator

VALLEY OF DEATH

END USERS

Market Ready Innovations
Large Scale Market Uptake

BRIGAID

WHY YOU?

DO YOU HAVE AN INNOVATION that has the potential to reduce risks from natural hazards such as floods, droughts, storms, rain or wildfires?

ARE YOU EAGER TO IMPROVE YOUR INNOVATION, make it fit with needs of end users, and meet with prospective clients?

If so, you could be interested in getting involved in our initiative.

BRIGAID!

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BRIGAID FOR INNOVATORS

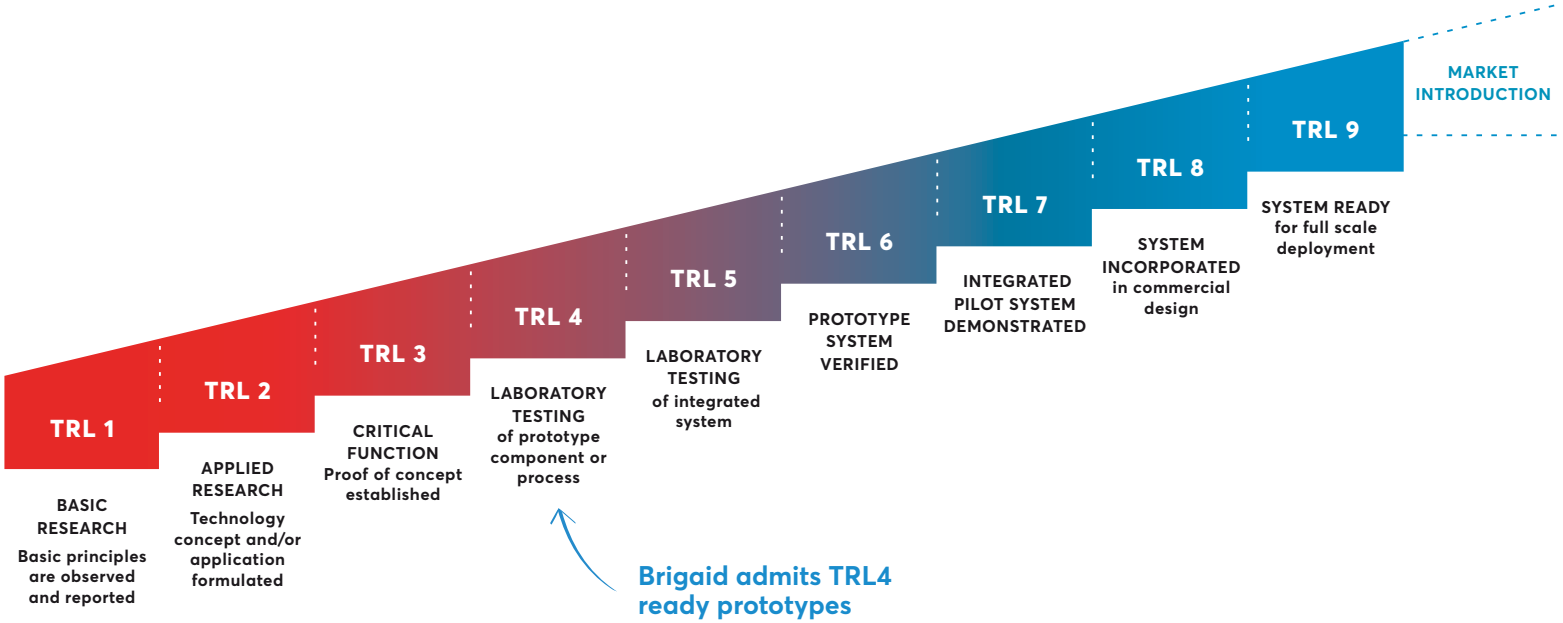
What BRIGAID basically expects from innovators is passion to push their innovation to the market!

BRIGAID supports start-ups and SME's who have:

- **Physical solutions:** Structural, software-IT, etc.
- **Social solutions:** Educational, behavioural, etc.
- **Institutional solutions:** Economic, governance, etc.

BRIGAID seeks solutions that:

- **are aimed to reduce risks** of floods, drought & extreme weather
- **are at least TRL4** (prototype ready for testing)
- **require** further testing and improvement



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BRIGAID aims to become the quality label for the development of innovations for climate adaptation and risk reduction from climate-related disaster impacts in Europe and beyond.

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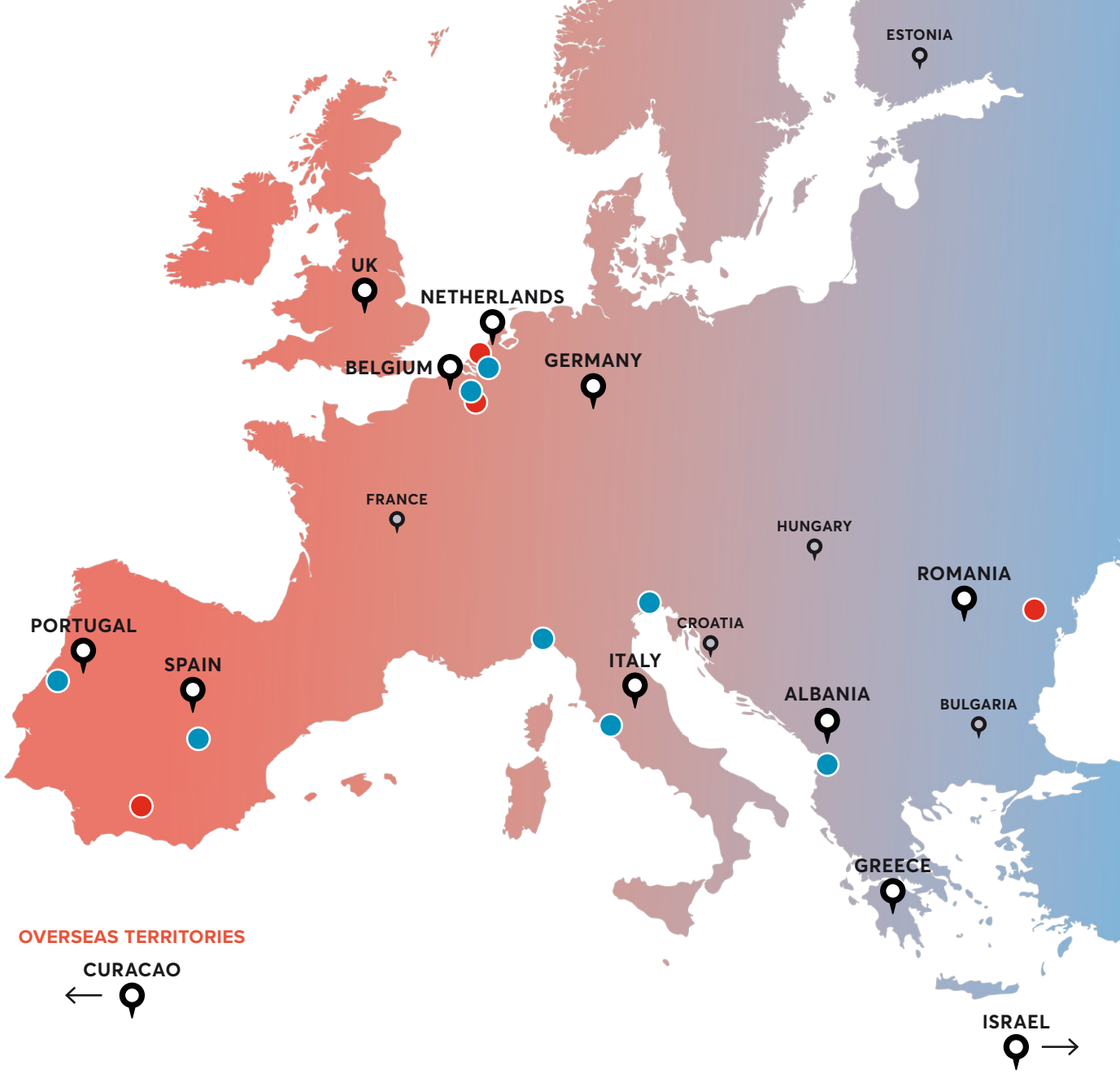
WHAT IS OUR ADDED VALUE?

BRIGAID offers state of the art knowledge of climate risk, science-based methods and funding opportunities to improve innovations by:

- Performing tests, evaluating results and making improvements.
- Incorporating needs of clients in the design and business model.
- Putting innovations in the spotlight



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BRIGAID TEST SITES

- Controled Test & Demonstration Sites
- Operational Test & Demonstration Sites

BRIGAID PARTNERS

- Home Country Partner

BRIGAID SUPPORTING PARTNERS

- Home Country Partner Support Letter

WHAT DOES BRIGAID?

The goal is to advance the technical, social and market readiness of innovations simultaneously. This smoothens the development path, because technical, social and market requirements can be incorporated in the design, business model and market approach early on.

LEVEL	DESCRIPTION OF TECHNICAL READINESS	TECHNICAL	SOCIAL	MARKET
Level 1	Basic Research	✓	✓	✓
Level 2	Applied Research	✓	✓	✓
Level 3	Critical function, proof of concept established	✓	✓	✓
Level 4	Laboratory testing of prototype component or process	✓	✓	✓
Level 5	Laboratory testing of integrated system	✓	○	✓
Level 6	Prototype system verified	✓	○	○
Level 7	Integrated pilot system demonstrated	✓	○	○
Level 8	System incorporated in commercial design	○	○	○
Level 9	System ready for full scale deployment	●	●	●
> Level 9	Market Introduction	●	●	●

BRIGAID supports innovations from TRL 4 to 8:

- **TECHNICAL READINESS:** resources (knowledge, small funds) for testing and improving innovations
- **SOCIAL READINESS:** indentifying end user requirements, potential social acceptance barriers
- **MARKET READINESS:** developing a solid business case, putting innovations in the spotlight to attract clients and investors

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TECHNICAL READINESS

Technical readiness is the performance and effectiveness of an innovation to reduce climate-related risks, as shown in field tests and operational environments. BRIGAID assists in defining and performing the required tests to improve an innovation.

We provide test guidelines to innovators to identify and advance an innovation's Technical Readiness:

REUSABILITY

The temporary- or permanent-nature of the innovation, measured by whether (parts of) an innovation is designed for single or repetitive use and how durable the structural components of the innovation are. It also provides information about the long-term operation and maintenance requirements over the lifetime of the innovation.

RELIABILITY

The performance of an innovation during a hazard event, related to failure of either:

- **The technical components:** e.g., failure of a structure.
- **or human / behavioral activities:** e.g., installing mobile parts.

Reliability is identified through fault tries and evaluated in tests.

TECHNICAL EFFECTIVENESS

The (designed) risk reduction potential of an innovation. In BRIGAID, risk is defined as a function of probability, exposure, and vulnerability.

Risk reduction can be obtained by reducing either:

- **The probability of exposure.**
- **or the consequences of a hazard.**

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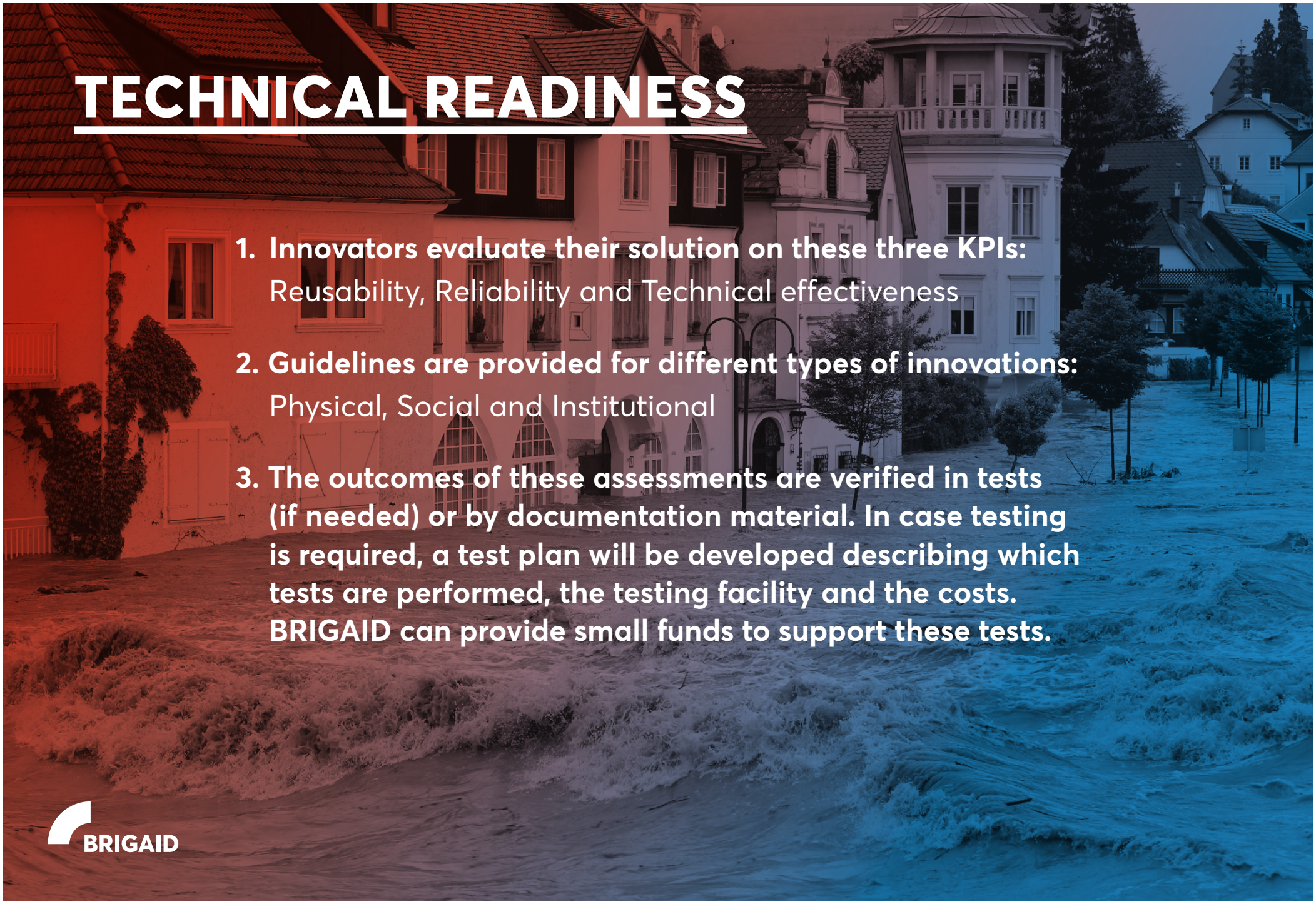

TECHNICAL READINESS

1. **Innovators evaluate their solution on these three KPIs:**
   Reusability, Reliability and Technical effectiveness

2. **Guidelines are provided for different types of innovations:**
   Physical, Social and Institutional

3. **The outcomes of these assessments are verified in tests (if needed) or by documentation material. In case testing is required, a test plan will be developed describing which tests are performed, the testing facility and the costs. BRIGAID can provide small funds to support these tests.**

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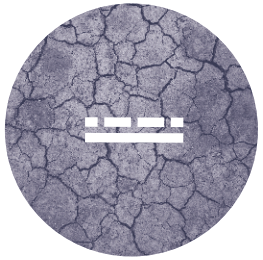
SOCIAL READINESS

Social Readiness is the extent to which an innovation complies with public and private end users' priorities and needs, as well as the organizational and governance requirements.

The uptake of innovative solutions is often hampered due to a lack of attention in the innovation cycle for the degree to which institutions (policy and decision makers) and societies would want to implement an innovation. Hence, social evaluation is best not left as a filter at the end of the development of a technology, but should accompany and provide input to the choices made along the way, and be accounted for in defining the organizational and institutional needs.



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MARKET READINESS

Market Readiness is the potential of an innovation to develop a solid business case and attract investors.

BRIGAID performs an assessment of the different geographical regions within Europe on the basis of their vulnerability to climate change and the willingness of their societies to implement (innovative) adaptation measures with you.

Based on this information, innovators will be guided in developing their business case:

MARKET ANALYSIS

Innovators will be supported in applying a structured suite of market analysis tools (the web based tool box "MAF+") to further define and segment the market for their innovation.

This will endorse the innovator with the necessary know-how to evaluate the attractiveness of each target segment on the basis of, inter alia, market size and growth rate calculation and competitive analysis.

FUNDING

To make a financially solid business case, BRIGAID will assist the innovator in identifying additional funds for further development of the innovation and guide the submission of funding applications, if required.

MARKET OUTREACH

BRIGAID will support the market outreach of innovations through the specific involvement of end-users and the creation of the online platform: BRIGAID WINDOW.

This climate innovation sharing platform will be the meeting place and "virtual" shopwindow for innovations and investors, and will be released in May 2017. Additionally, BRIGAID will develop marketing material (e.g., pitch decks) and disseminate this material to target groups.

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WHAT HAPPENS WHEN YOU ENGAGE WITH BRIGAID?

1. REGISTRATION

You will be offered to register your innovation in the online platform BRIGAID Climate Innovation Window.

BRIGAID will actively bring this platform to the attention of potential end users and investors across Europe. Registering your innovation means you will fill out a short questionnaire to describe your innovation.

2. SUPPORT

BRIGAID will ask registered innovators if they are interested in support for further testing and marketing their innovations.

Innovations will be selected at three points in time (jan '17, dec '17, nov '18). In this selection procedure we will ask additional questions to identify the potential impacts of the innovation (e.g., damage reduction)

3. TEST PLAN

Selected innovators will be asked to develop a test plan, under the guidance of BRIGAID partners.

The test plan follows a format to make sure that all required tests are performed in order to improve the technical, social and market readiness simultaneously.

4. EVALUATION AND GUIDANCE

Test results will be evaluated, further needs will be identified and guided if possible:

Submitting funding applications, improving the business plan, etc. Under the guidance of BRIGAID partners, updates to the innovation may be proposed and support provided to the re-evaluation of the extended innovation.
The innovation will be promoted at EU level.

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BRIGAID'S WORKFLOW

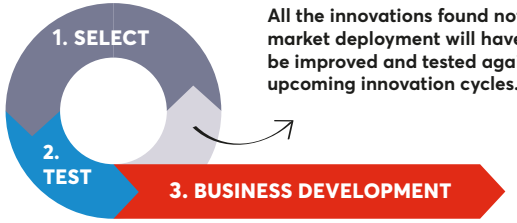
Brigaid's planned cycles

2016

2017

2018

Cycle's Process



All the innovations found not to be ready for market deployment will have the chance to be improved and tested again in the upcoming innovation cycles.

Cycle's Phases

IDENTIFICATION & SELECTION

Solution's Standard Description

- Technical Readiness
- Social Readiness
- Market Readiness

Developed Solutions (TRL4-5) by Brigaid partners and by external innovators

25-34
SELECTED & DESCRIBED INNOVATIONS

All solutions featured on the online climate sharing platform: BRIGAID Window

TESTING

Test and implementation framework

- Improvements (testing budget)
- Physical implementation at testing facilities
- Overall performance

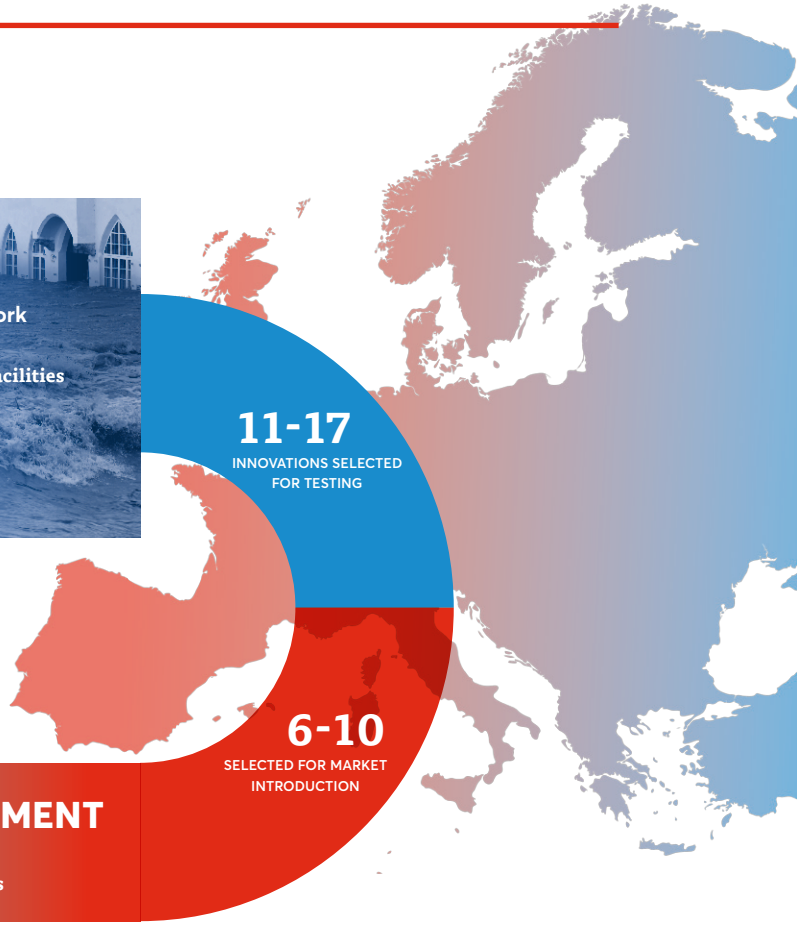
11-17
INNOVATIONS SELECTED FOR TESTING

Market Analysis
Investment and Financing
Marketing and Dissemination
(TRL8-9)

6-10
SELECTED FOR MARKET INTRODUCTION

BUSINESS DEVELOPMENT

- Individual business models
- Funding and investment opportunities



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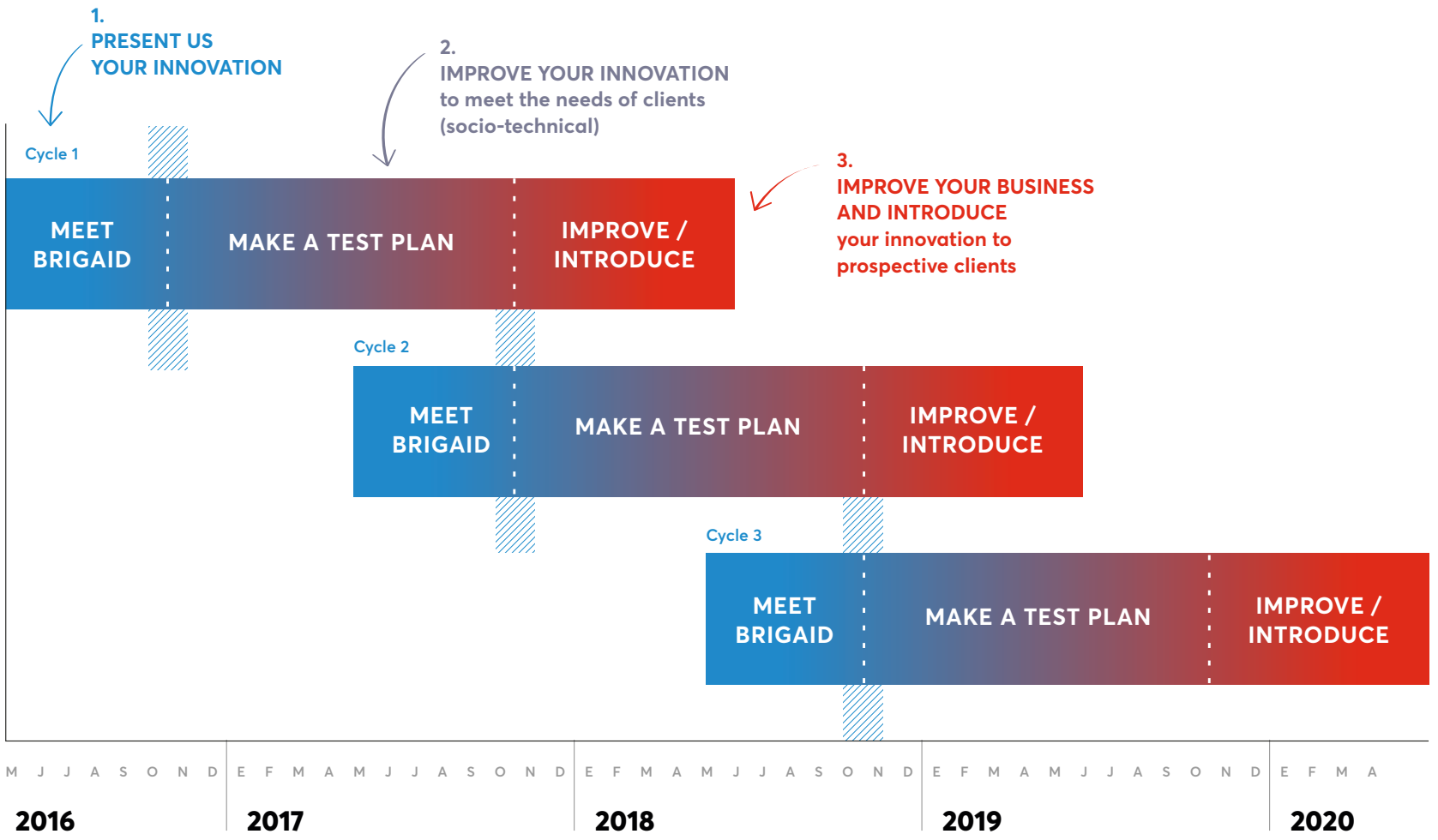
BRIGAID'S TIMELINE



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BRIDGING THE GAP FOR INNOVATIONS IN DISASTER RESILIENCE

www.brigaid.eu

#brigaid #H2020 #EASME

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