



The HuT

Approaches to transfer DRR innovations

Deliverable D5.1

DEVELOPED WITHIN

WP5 Transferability and scalability, T5.1 Overview of existing knowledge

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1. Technical references

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- * PU = Public
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1.1. Document history

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3. Transfer and scaling of disaster risk reduction solution and innovation

Disaster Risk Reduction (DRR) innovations in science and technology are key enablers for sustaining informed decision-making for managing disaster risks in general. DRR solution and science-based innovation focusing on single or multiple hazards are inevitable measures to be applied by communities, stakeholder, and governance to protect from adverse effect of climate change efficiently and effectively. The HuT project develops DRR solutions acting synergically across three domains of expertise: human-centred DRR, governance and policy, science and technology (so-called The HuT nexus). The Nexus should enable the cross transfer of experiences and expertise not only to other demonstrators and participants but beyond it and the end of the Project by capitalizing the participation of well-consolidated organization active in the different domains of DRR. Enabling the pathways for innovations' transfer and scaling starts with analysis of existing frameworks, which is the objective of this report. The report aims to describe the processes to transfer and scaling, and modify existing frameworks in relation to multi-hazard DRR-innovation,

The report was prepared in following steps. Firstly, the review of grey and peer-reviewed literature was focused on: understanding the process of transfer and scaling of innovation. We focused primarily on disaster risk related innovations, and as secondary we reviewed transdisciplinary literature. We also reviewed the basic verbs occurring in relation to transfer and scaling based on the most common dictionaries (Oxford, 2023; Cambridge, 2023; Meriam, 2023; Collins, 2023). Secondly, we analyzed the transfer routes and scalability pathways defined in the project. Afterwards, we compared The HuT transfer routes with published approaches, and defined the glossaries and transfer process to observe within The HuT. The description of different steps of the amplifying process is provided. The results of the review are presented jointly in following chapters.

3.1. Existing frameworks on scaling and transfer

Knowledge transfer has a paramount importance for DRR, especially in the preparedness phase of the risk cycle. Knowledge transfer can be considered as a separate process, and as part of the DRR innovation spreading. Concepts of transfer and up/scaling have different meanings depending on the discipline and context (Kuhlicke et al., 2021). For purpose of this report we review the literature on knowledge transfer in DRR (3.1.1) and DRR innovation scaling (3.1.2) separately. Section 3.1.3 examine different terms used in describing the processes of transfer and scaling.

3.1.1. Knowledge transfer in DRR

Innovative ways of working collaboratively and knowledge sharing approaches are needed to achieve progress in DRR transfer. The term "knowledge" was habitually used to describe data, information, intelligence, skills, experience, expertise, ideas, intuition, insights, lessons learned, best practices, etc. Three forms of knowledge were identified - explicit, tacit and implicit knowledge (Seneviratne et al., 2010). Explicit knowledge was stated in detail and is termed as codified or formal knowledge. Tacit knowledge was that which is understood, implied and exists without being stated. It was housed in the human brain and might be culturally or identity dependent. Implicit knowledge is that which could be expressed but had not been.



Transfer of knowledge to prepare DRR was a crucial and effective contribution for the preparedness phase. Knowledge was created during the preparedness phase by developing books/methods/data (e.g., development of the Term of Reference of disaster mitigation programs, historical disaster data, disaster mitigation books, and government regulations). Additionally, the transformation of tacit knowledge from previous disasters into explicit knowledge to prepare for the next disaster took place (Kusumastuti et al., 2021). The knowledge transfer included (i) knowledge transfer among the same type of stakeholders (e.g., humanitarian organization), or (ii) different types of stakeholders (e.g., from the government to communities) (Sharing Innovations to Improve Implementation and Reporting of the Sendai Framework for Disaster Risk Reduction 2015-2030, n.d.).

Knowledge management played a crucial role in DRR providing the right knowledge, in the right place, at the right time (Kaklauskas et al., 2009). Multiple authors investigated the process of sharing and transferring knowledge to improve decision-making related to DRR (CHAPTER 5 TRANSFERABILITY OF KNOWLEDGE AND INNOVATION ACROSS THE WORLD; Korja, 2009; Kaklauskas et al. 2009). Kusumastuti et al., (2021) provided a framework on transferring knowledge in communities consisting from following steps: (i) knowledge transfer towards the community, characterized by one-way (incl. informing), or two-ways (incl. participating) interactions. (ii) Transfer among the community (among its members) include community sharing, community planning, and community practice.

Educational practices are part of knowledge management. (Kaklauskas et al., 2009; Seneviratne et al., 2010). Kelman et al., (2012) strengthened importance of indigenous knowledge for developing, testing DRR and early warning system (EWS). Communities have been recognized to be the center of emergency plans and DRR (Doocy et al., 2012). They should be supported by institutionalized capacity building programs. Network strengthening among experts, managers and planners across sectors, and between regions supported capturing, organising, sharing and reusing the DRR – related knowledge (Kaklauskas et al., 2009).

Knowledge management and transfer as described in literature is reflected within The HuT-nexus, and as such it is considered a part of DRR innovation transfer/scaling.

3.1.2. DRR Innovation scaling

The process of increasing the solutions/ initiatives impact in addressing sustainability challenges has received increasing attention in research (Lam et al., 2020). Commonly, the term “scaling” or “upscaling” has been used to describe spatial expansion of information/knowledge gathered in a particular place across different scales and thus increasing its impact (e.g., Kunin et al., 2018, Norton et al., 2018; Artmann and Sartison, 2018). Quality or degree of impact (so-called “amplification”) is important for other authors (Kuhlicke et al., 2021). Great thematic overlap, using the same terms with different meanings can lead to confusion. “Frameworks often describe different processes with similar terms and similar processes with different terms” (Lam et al., 2020, p. 10).

The frameworks provided by Lee Moore et al. (2015), the RECONNECT project (Naber et al., 2017; Kern et al., 2019; Lam et al., 2020, Kuhlicke et al., 2021) and Rodriguez et al. (2020) discussed different processes related to innovation scaling. The frameworks are compared in Table 1.

Lee Moore et al. (2015) worked with social innovation, defined as follows. “Social innovation is ‘any initiative, product, program, platform or design that challenges, and over time changes, the defining routines, resource and authority flows, or beliefs of the social system in which the innovation occurs’”. They addressed three types of spreading of innovation and its impact: (i) scaling out, (ii) scaling up, (iii) scaling deep. RECONNECT project focused on the spread of



innovation related to different aspect of nature based solution (NBS). Main strategies related to the three types of spreading were as follows. **Scaling out** is in principle impacting greater numbers, spread or reach wider impact. Main strategy is deliberate replication – spreading geographically and to greater numbers while protecting the integrity and fidelity of innovation. Its scaling principles is to disseminate principles with adaptation to new context via co-generation of knowledge, leveraging of social media and knowledge platforms (it is sometimes called “open scaling”). **Scaling deep** refers to impacting cultural roots. Culture plays important role in shifting public domains, change must be deeply rooted in people, communities, and cultures. Main scaling strategy is spreading cultural ideas and reframing stories to change beliefs and norms. Intensively share knowledge via learning communities, platforms and participatory approaches. Important is to invest in transformative learning, networks and communities of practice. **Scaling up** is influencing law and policies. The roots of social problems transcend particular places, thus innovative approaches must be codified in laws, policies, institutions. Main scaling strategy are policy or legal change efforts by new policy developing, partnering and advocacy.

Table 1: Comparison of scaling processes

Type	Aims	Relation to similar concept
Scaling out	Replication and dissemination, increasing number of people or communities impacted	<ul style="list-style-type: none"> • Similar to the idea of expansion and diffusion as outlined by Kern et al. (2019) • Similar to the idea of replication and accumulation as outlined by Naber et al- (2017) • Similar to the idea of growing, replicating, transferring and spreading as outlined by Lam et al. (2020) • Similar to the idea of scaling out/replication as outlined by Rodriguez et al. (2020) • Similar to the idea of scaling out as outlined by Moore et al. (2015)
Scaling deep	Aims at impacting and changing rules and value (participatory process)	<ul style="list-style-type: none"> • Similar to the idea of horizontal upscaling as outlined by Kern et al. (2019); • Similar to the idea of scaling deep as outlined by Lam et al. (2020); • Similar to the idea of scaling deep as outlined in Moore (2015)
Scaling up	Producing changes in laws, policies, institutions or norms	<ul style="list-style-type: none"> • Similar to the idea of transformation and/or vertical upscaling as outlined by Kern et al. (2019). • Similar to the idea of transformation as outlined by Naber et al. (2017). • Similar to the idea of scaling up as outlined by Lam et al. (2020). • Similar to the idea of scaling up/ structural as outlined by Rodriguez et al. (2020) • Similar to the idea of scaling up as outlined by More et al. (2015)
	Resource allocation to support implementation	<ul style="list-style-type: none"> • Similar to the idea of hierarchical upscaling as outlined by Kern et al. (2019). • Similar to the idea of scaling down/ allocation as outlined by Rodriguez et al. 2020



Naber et al. (2017) discussed four different patterns of upscaling regarding sustainable energy innovations: (iv) growing, (v) replication, (vi) accumulation, and (vii) transformation. **Growing** refers to a dynamic in which an experiment continues and more actors participate in the experiment or market demand increases – the experiment grows in size or activity. **Replication** takes place when the main concept of an experiment is used in other locations. When the experiment is explicated in other geographical locations or contexts, (local) knowledge of the initial experiments can be used in other locations. **Accumulation** means that an experiment gets linked to other experiments. In this process, intermediary organizations play a key role in facilitating interaction between experiments that exist simultaneously. When the lessons learned in experiments at different locations are compared and aggregated, the experiments can contribute to a more stable technological trajectory at the global niche level. **Transformation** is a pattern, which does not refer to geographical or physical scaling; it is rather concerned with how experiments start to shape the wider institutional context.

Kern et al. (2019) explored the role of cities in EU multilevel climate governance. They focused on the integration of local initiatives in polycentric networks of actors at different scales and the process of how cities drive both climate change mitigation and adaptation activities. Different forms of upscaling were summarized into the following types of upscaling: (viii) horizontal, (ix) vertical, (x) hierarchical and (xi) embedded upscaling. **Horizontal upscaling** included twinning, polycentric networking, and its main function was knowledge transfer. **Vertical upscaling** was an interplay / interdependence between innovation taking place and the policy level. Polycentric networking and scale bypassing (directly to EU) were its main forms, and lobbying, representation, funding its main functions. **Hierarchical upscaling** took place when national or regional associations forcing the interested parties to consider/reread standards set by governmental bodies. Main functions were lobbying, representation. **Embedded upscaling** referred to hybrid governance with multiple governing authorities on different scales. Main forms were polycentric networking, new networking from regions to EU level, meta-networks, territorial networks, functional networks. Main functions were links to different governance levels on different scales.

Rodriguez et al. (2020) studied facilitation of inclusive innovation. They outlined four different directions of scaling. Firstly, scaling up or structural scaling – was defined as producing changes in laws, policies, institutions, or norms. Secondly, scaling out or replication was defined as geographically replicating or broadening the range or scope of good practices. The first two directions to scale occur ‘when authorities at high levels of government were persuaded that an approach adopted at a lower level of government was worthy of replication (horizontally) at the same level or (vertically, upward) at higher levels, when donors drew the same conclusion, or both. Third type of scaling they recognized was scaling in or organizational scaling: ensuring organizations have the capacity to deliver the type and number of good practices required. This third ‘direction’ was similar to the ‘spontaneous diffusion’ dimension and was also called ‘spontaneous’. Last type of scaling – scaling down or allocation – was defined as resource allocation to support implementation.

Lam et al. (2020) identified three key processes through which sustainability innovation spread. Those are (xii) amplifying within, (xiii) amplifying out, and (xiv) amplifying beyond (Figure 1). The three categories consist of three processes (Table 1). According to Lam et al. 2020 (p.16) **amplifying within** consists of processes increasing the impact of one specific initiative, for example stabilizing its existence (prolonging impact) or speeding up the way it impacts (i.e., accelerating impact). **Amplifying out** is a process which can be dependent or independent. Dependent amplifying out is processes that create initiatives dependent on existing initiative. This subcategory includes growing and replicating. Growing happens when an existing initiative’s impact range increases in similar context. Replicating happens when an existing initiative is



replicated into a dissimilar context. Independent amplifying out refers to a process that creates initiatives independent of the original one. This can happen by transferring the initiative to another place with a similar context. Another possibility is to spread the principles of an existing initiative to **Amplifying beyond** include processes that generally seek to increase their impact to reach higher institutional levels (scaling up) or by scaling deep to change values. Processes of amplifying beyond are different from the other categories. To increase the impact, values and mind-sets referred to the ‘scaling deep’ should be changed and adapted to the local contexts.

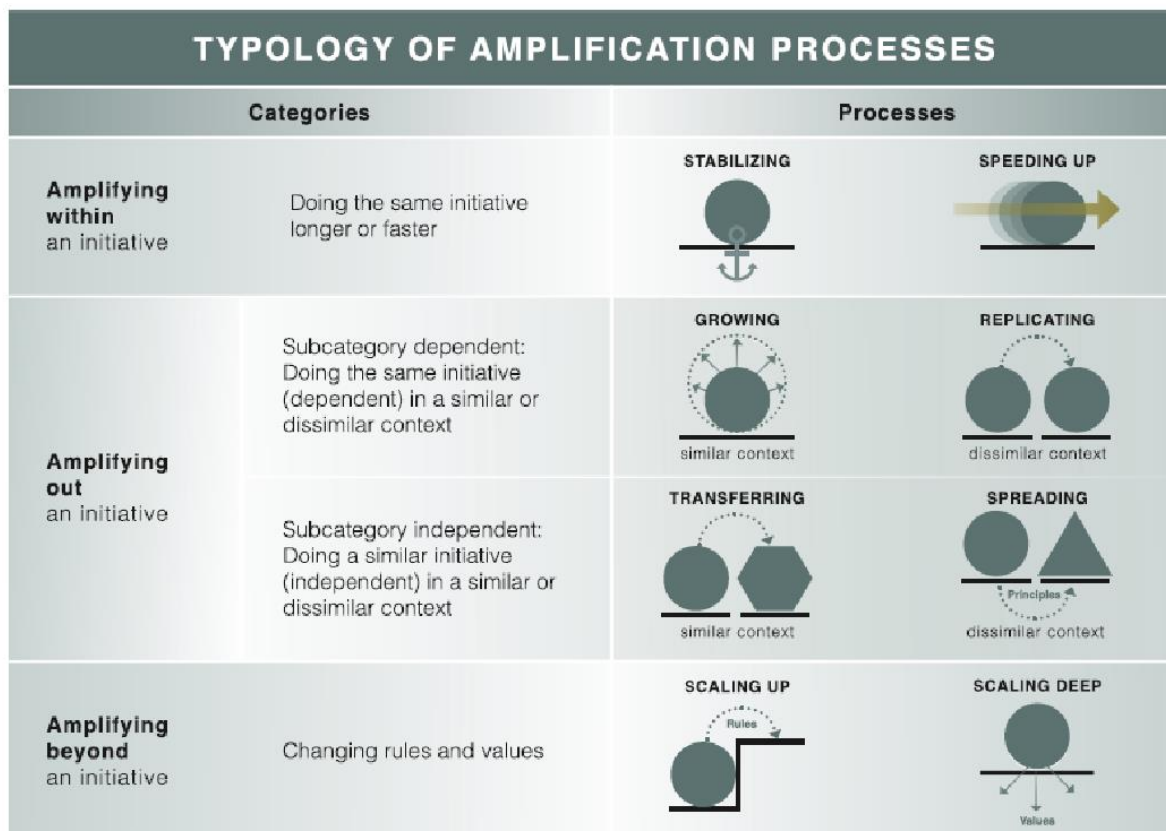


Figure 1: Eight amplification processes grouped into three categories. There is no vertical correspondence between the eight illustrations intended (Lam et al., 2020)

The Reconnect project (2018) laid out an scaling strategy (Kuhlicke et al., 2021, Figure 2), based on three pillars: (i) co-creating and replicating (NBS) solution and demonstrating its co-benefits; (ii) enhancing the capacities of interested stakeholder; and (iii) supporting policies' changes for a more effective uptake of NBS across Europe and beyond. Answers of 220 stakeholders to the standardized survey about scaling underlined: (i) societal and economic co-benefits beyond DRR are important when deciding for a solution. The way (ii) how people perceive barriers is changing during the process of realizing the solutions, therefore is important to get support on the challenges since the very beginning. To underpin (iii) the social innovation potential of a solution is of great reliance, mainly the participatory processes and co-creating of the solution (scaling deep). Scaling activities (iv) should be built around interactive formats (such as, personal conversation with colleagues, workshops and seminars, on-site field trips, partnering with other organization). In order to achieve a high impact, four different kinds of scaling were suggested, including activities aiming at:

- Changing the cultural roots of how hydro-meteorological risks are perceived and managed (scaling deep);
- Making a great number of stakeholders and people aware of the key outputs of RECONNECT and building up capacities relevant for realising NBS (scaling out);
- Changing existing laws and regulations so they more effectively enforce the uptake of NBS (scaling up);
- Analysing drivers and barriers to the uptake and implementation of NBS (scaling down), and being aware of the respective context and capacities of those actors initiating and supporting scaling activities as well as the context and capacities of stakeholders, communities and organisations which are the target of scaling activities.
- As an implication, scaling became an activity that cut across almost all activities pursued in the project, referred to as cross-cutting scaling.

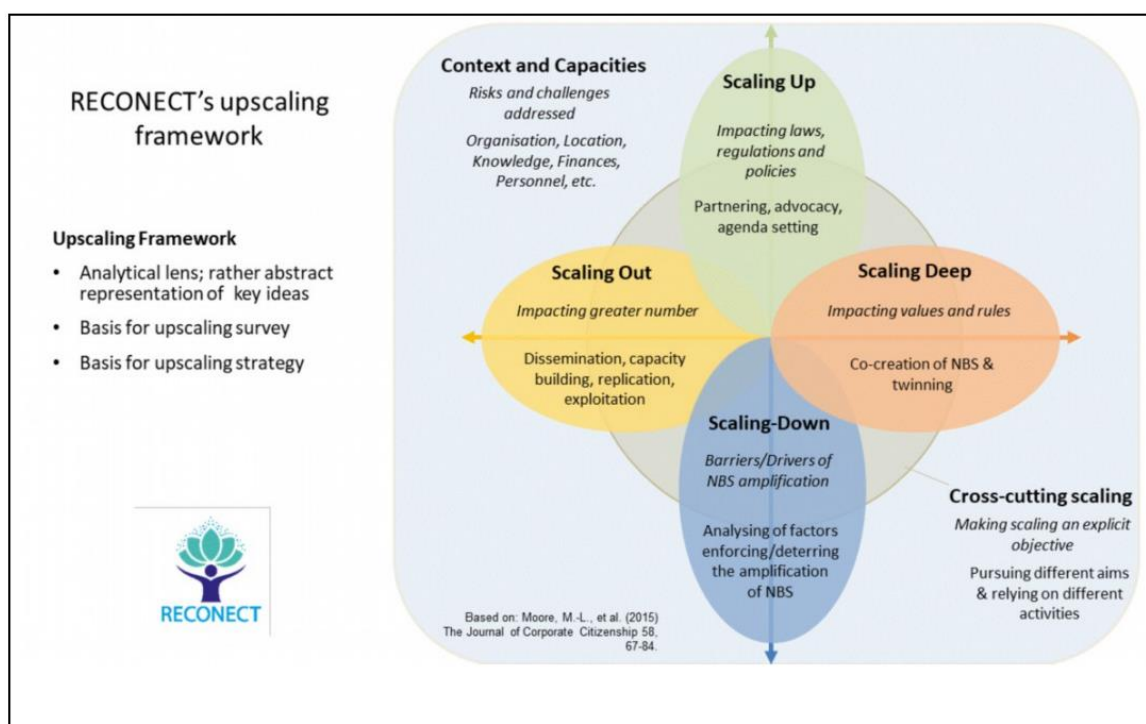


Figure 2: Reconnect scaling strategy (Kuhlicke et al., 2021)

3.1.3. Describing the process of transfer and scaling

Different verbs are used when describing the processes of transfer of scaling. We reviewed the four English dictionaries (Oxford, Cambridge, Meriam, and Collins dictionaries) to describe the meaning. We do this to increase understanding of the original terms for non-native speakers.

Process of creating a solution is usually described by using following verbs: **Invent**- design or create what did not exist before. To produce for first time based on ingenious thinking or experiment. **Develop** - grow or cause to grow and become more mature or advanced or elaborate. To grow or change to larger or stronger form, to cause to grow gradually. **Innovate** - make change in something established by using new methods, ideas. Introduce changes and ideas. Make changes in a new way. **Transform** – change the nature, function, or condition of; convert, modify.

Process of “moving” a solution are usually to **transfer** - moving (of the solution) from one place / settings, etc. to other place/settings, etc. The type of transfer we distinguish depends on the way in which the solution is changed. **Replicate** – make exact copy, reproduce or repeat, or duplicate something. In this case we do not consider changing the solution. **Adapt** – adjust to different use or to meet different conditions in the place we move the solution to. **Customize**- make or change something according to the buyer's or user's needs.

Process of spatial use / increase of solution lead to differing spatial distribution in comparison with the initial stage (before transfer). **Multiply** - increase in number of occurrences of a solution. **Spread** – open out (something) to extend its surface area, width, or length. **Expand** - become or make it larger or more extensive. **Scale** – change in the extent of a solution (application).

Processes in accepting the solution: There, where solutions are transferred to, those processes are taking place. We have found three verbs describing this process. **Uptake** – action of taking up or making use of something that is available. **Adoption** - action or fact of choosing to take up or follow something. Act of taking something as your own. **Mainstream**–making the solution to be shared by the most people and regarded as normal and conventional. **Enable** - to make someone able to do something, or to make something possible.

Processes of keeping the solution in place: **Maintain** - cause or enable (a condition or situation) to continue. **Sustain** – strengthen or support. **Empower** - to encourage and support the ability to do something; to give someone official authority or the freedom to do something.



4. The HuT Scaling Framework

4.1. Role of transfer in The HuT project

The DRR solutions in The HuT are co-developed exploiting nexus within the following three domains of expertise: human-centred DRR, governance and policy, science and technology. An “optimal” assortment of tools and solutions will be identified in each demonstrator considering the unique requirement of the demonstrator sites and supporting broader-scale uptake and usability. Proposed DRR solutions might be ex-novo actions or improvements of already existing tools or processes, or an “import” of solutions/knowledge, already developed in other contexts. In this context The HuT views all the demonstrators as front-runners and followers at the same time - depending on the activities considered. The intra – inter demonstrators transfer is envisaged, and specific activities support The HuT - solutions spreading beyond the project consortium (WP5, WP6 and legacy).

The HuT proposal has defined 25 activities related to transfer. Those have been transferred to 20 tasks in the working packages. Together five major transfer routes were defined in the proposal stage.

1. Development. New activity to be developed during the project (D)
2. Transfer of best practice and Development. Existing activity needing important customization (TD)
3. Transfer of best practice to/from Demonstrator. Existing activity not needing important customization (t/f)
4. Demonstrator receiving process/tool from Transfer of best practice. Activity imported not needing important customization (to)
5. Demonstrator giving process/tool from Transfer of best practice. Activity exported not needing important customization (fr)

4.1.1. The HuT tasks in relation to scaling

We have compared 20 The HuT tasks from the Grant Agreement under existing scaling framework of Lam et al. (2020) and other related research.

The results of the comparison can be viewed in Table 2. The main activity and the envisaged ambition for transfer to other demonstrators was indicated. In case, that the knowledge is not available within the demonstrator, the demonstrators are first expected to learn from the “front-runners” and then apply the task. The transfer routes 2 to 5 are processes related to Amplifying out, and transfer route 1 can be understood as amplifying within. Table 2 shows the commitment of the 10 demonstrators to take part in the different transfer routes.



Table 2: HuT Task related to scaling (after Lam et al., 2020)

		AMPLIFYING WITHIN			AMPLIFYING OUT				AMPLIFYING BEYOND		
X - main activity , (x) - ambition for transfer to other demonstrators as explained in grant agreement. Yellow colour means that task is related to all scaling categories.											
TASK DESCRIPTION	DEMS involved	STABILIZING	SPEEDING UP	GROWING	REPLICATING	TRANSFERRING	SPREADING	SCALING UP	SCALING DEEP	SCALING DOWN	
				same initiative same context	same initiative different context	similar initiative similar context	similar initiative different context				
		Lam et al. (2020)				Lam et al., 2020; Moore et al., 2015; RECONNECT 2018					Lam et al., 2020; Moore et al., 2015; RECONNECT 2018
T1.1	Fast-track implementation of DDR actions	ALL			x	x	X	x			
T1.2	Local DRR nexus Forums	ALL						x	x	x	
T1.3	Local data portals	DEM2, DEM3, DEM6						x	x		
T1.4	The Hut for Me and You	ALL							x		
T1.5	End-to-end evaluation of existing warning systems	DEM3, DEM6					x	x			
T2.2	Operational warning systems	DEM2, DEM3, DEM6, DEM9, DEM10			(x)	(x)	(x)	(x)	x	x	
T2.3	Public engagement	DEM1, DEM3, DEM6, DEM9, DEM10			(x)	(x)	(x)	(x)	x		
T2.4	Cultural changes	DEM1, DEM3, DEM6			(x)	(x)	(x)	(x)	x		
T3.1	Enablers and barriers to multi-hazard/systemic risk reduction	DEM1, DEM8, DEM10, DEM5			(x)	(x)	(x)	(x)	x	x	
T3.2	Robust decision support tools for multi/systemic risk policy making	DEM5, DEM10, DEM3			(x)	(x)	(x)	(x)	x	x	
T3.3	Insurance and risk financing instruments for DRR and local resilience	DEM3, DEM8			(x)	(x)	(x)	(x)		x	
T4.2	Innovative Nexus Monitoring	DEM2, DEM3, DEM9, DEM10	x	x	x	x	X	x			
T4.3	Innovative Nexus Modelling	DEM1, DEM2, DEM4, DEM6, DEM7, DEM8, DEM9	x	x	x	x	X	x			
T5.2	International DRR nexus Forum	All			x	x	X	x	x	x	
T5.3	Replication Roadmap -> Scaling roadmap										
T5.4	Capitalising outcomes for policy-making	All						x			
T6.1	CDE	All					X	x	x	x	

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T6.2	Outreach and engagement	All					X	x		x	
T6.3	Networking	All	x	x	x	x	X	x			
T6.4	Consolidation of exploitation strategy										

4.2. Summary and glossary of the terms

The following framework describing the processes of scaling will be used in The HuT project (Figure 3). This framework comprises both transfer and scaling in one approach. The glossary below explains the terms, we will use during the project. After providing the definition, there is an example from the project related to the process.

1. **Amplifying within** - extending impact within the demonstrator, where the solution / innovation originated. It has two subprocesses:

1.1 Stabilizing – process of strengthening the structures, linkages, connection which support the existence / sustaining of a solution / innovation.

1.2 Speeding up – process of accelerating impact of the solution / innovation in the demonstrator.

Some examples from the sets of amplifying are for example (i) Viz 24 in DEM7 (Tisza River Basin), (ii) IoT monitoring in Dorset County in DEM9 or (iii) in Val d’Aran in DEM2.

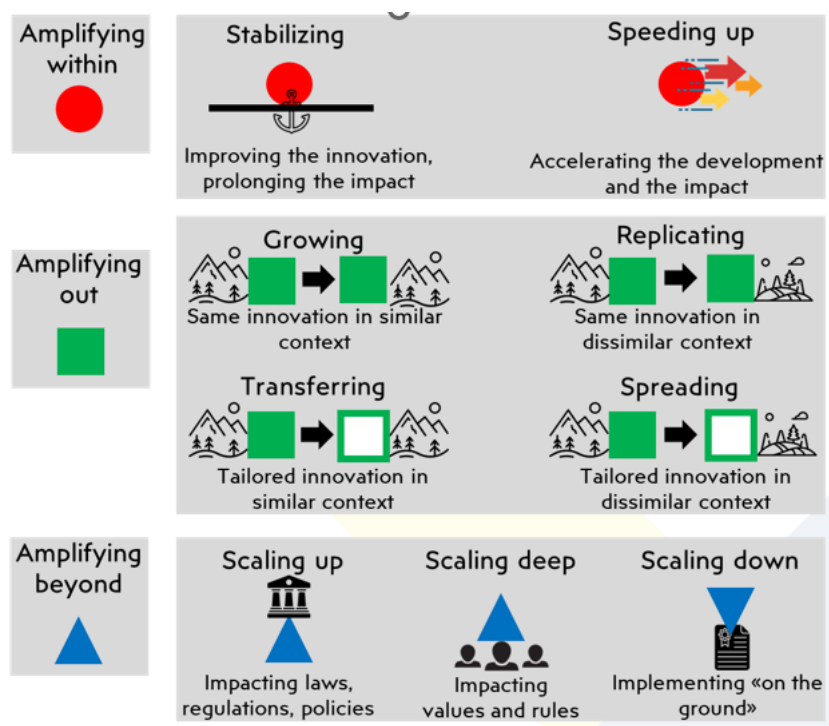


Figure 3: The HuT Amplifying framework (modified after Lam et al., 2020)

2. **Amplifying out** – increasing impact range of the solution / innovation outside of its original context.

2.1 Growing – process of doing the same solution / innovation in a similar context.

2.2 Replicating – process of doing the same solution / innovation in dissimilar context.

2.3 Transferring – process of doing similar (independent of original) solution / innovation in context similar to the context of the original solution / innovation. Please refer to this category solely: Amplifying out/Transferring, to avoid confusion with verbs “transfer”, “transferring”.

2.4 Spreading - process of doing similar (independent on original) solution / innovation in context dissimilar to the context of the original solution / innovation.

This group of processes includes most of the transfer routes defined originally in HuT. Some examples from the sets of amplifying innovations:

(iv) Monitoring system under development in DEM3 (Monti Lattari) represents, currently, a good example of knowledge transfer from more skilled Partners (spreading); after, same approach is hopefully be transferred in similar context (growing)

(v) Several attempts to capitalize serious gaming developed in other contexts and other main issues have been carried out in DEM5 (replicating, spreading)

3. **Amplifying beyond** – processes changing the system components and linkages, which influences (enable or hinder) the solution´s / innovation´s impact.

3.1 Scaling up – process of increasing impact via reaching higher institutional levels and embedding the solution / innovation into operational schemes or policies.

3.2 Scaling deep – processes of changing the values, perceptions and habits influencing the solution / innovation´s impact.

3.3. Scaling down - process of ensuring that changes in laws, policies or norms, have the necessary means to implement the envisaged good practices on the ground (Rodriguez et al., 2020; RECONNECT framework)

The Amplifying beyond is related to The HuT Nexus and tasks in different working packages: (vi) scaling up for WP3, (vii) scaling deep for WP2, (viii) scaling down for WP4. An example are (ix) the modelling efforts (WP4) for the improvement of predictive models used in EWS which scale down the innovations (for example, setting standards/thresholds)

Each process consists of activities appearing in a chronological sequence. The activities may have different target groups (actors). The activities alone, or the synergy effect of the activities, and their order can be essential for the resulting degree of impact / leading to output. Processes of different amplifying pathways can overlap, with activities in “amplifying within” and “amplifying out” being more similar than “amplifying beyond”.

4.3. Amplifying process

A process is a series of actions that you take to achieve a result (Cambridge Dictionary, 2023). All kinds of amplifying processes identified in The HuT (Section 3.1.1) consist of specific set of actions leading to desired outcomes. Those outcomes are dependent on multiple stakeholders (individuals and institutions), influenced with various factors (incl. connected or parallel processes, various directly or indirectly connected actors), which are subject to change.

Therefore, strategic thinking and collaborative, co-creative planning of amplifying strategy (process design) is crucial to success (Kuhlicke et al., 2021). Once the process design is created, it should



be followed step-by-step, while sustaining attention on affecting factors (monitoring), evaluating of the progress against pre-set indicators, and / or adjusting whenever is necessary (Kuhlicke et al., 2021, Barnett and Gregorowski, 2013). Experience in participatory processes showed that some parts of a strategy or a process design could become obsolete in time. The reasons could be (i) circumstances changed, (ii) factors inadequately considered in the planning process, or (iii) recently occurred phenomenon, etc., and it is useful to adjust and adapt the process. In fact, those are conclusions driven for many different areas in knowledge transfer (social learning, adaptive learning), organizational change management, theory of change.

The ecosystem stewardship management principle, which is inevitable pre-condition to successful climate adaptation at 1.5°C target (IPCC, 2023) bring another point to consider. The stewardship management principle (Chapin et al. 2009) is based in Howling's socio-ecological adaptive system theory. The principle teaches us that it is the functional relation between system components, which determines the effect of an intervention on a complex adaptive socio-ecological system. After an intervention (i.e., disturbance) to adaptive socio-ecological system, a system, though re-organized (with some components lost, some appearing newly), might sustain its structure, fundamental function, identity, and feedback. This process is adaptation due to system's resilience. On other hand, intervention can lead to transformation, during which fundamentally new systems (with different functions, feedbacks, identity, and structure) would be created. Those considerations have implications for the amplifying process. The functional relations between actors, institutions, enablers, barriers, might be assessed related to envisaged outcome of amplifying process, and monitor thereafter to track their development with different activities.

However, the initial plan (amplifying strategy / amplifying process design) can provide the foundation leading to outcome and the foundation for the necessary adjustments that must be made as the amplification proceeds. The aim should balance between desired outcomes and practical realities of the process (Kuhlicke et al., 2021).

4.3.1. Steps of amplifying process

Amplifying is a co-creative process between the solution owner and the actors or stakeholders receiving/adopting/co-developing the solution (approach). This process has some desired long-term outcome, which is defined by the change the amplifying solution is making in disaster risk reduction or disaster preparedness. The process would consist of different activities implemented parallel to each other or in a chronological sequence. The activities alone, or the synergy effect of the activities, and their order can be essential for the resulting degree of impact success. We presume that activities in different amplifying pathways would be actually similar and might be overlapping.

For planning the amplifying process, we combined the multi-criteria decision-making matrix for co-creating innovation (Kuhlicke et al., 2021), the theory of change guidelines (United Nation Development Group, 2017; Barnet and Grotowski, 2013), and participatory process and facilitation guidelines (Bokal and Vagoova, 2020; Akhmouch and Clavreul, 2016; Künkel et al., 2011, Smit et al, 2011), and combined them with different project and process management tools. The steps of the process are summarized in Figure 4. Amplifying process is a stepwise process, which is planned in eight simple steps: (i) define, (ii) analyse, (iii) decide, (iv) consider, (v) co-design, (vi) realize, (vii) evaluate, (viii) adjust. The steps connect together activities that need to happen to achieve the goals of the whole process.

Define: To be able to amplify the solution, it is beneficial to define the DRR solution – its main attributes, current context (e.g., stakeholder environment, institutional settings it is applied in), and look backward and analyze the main steps, processes and milestones which led to development and successful use of the solutions. Listing the enablers (driving forces) and how



they were exploited, and listing of barriers (restraining forces) and lessons learned while overcoming them are also beneficial. It is important to distinguish which amplifying process is envisaged right at the beginning and decide if one or more amplifying processes would be developed for the same solution. We should clearly state what is the main long-term outcome (overarching goal of the process), and if it can be reached within the duration of The HuT project. Each amplifying process within The HuT project have specific outputs (tangible result of the activities), which contribute to or represent intermediate outcomes. For example, documented increase in awareness, or increased access to scientific evidence are short-term outcomes, while increased usage of scientific evidence, adoption of innovation principles, or behavioural change (e.g., by adjusting day-to-day operation routines) are medium-term outcomes (Barnet and Grotowski, 2013). Ultimate outcomes are outcomes which influence the systemic settings, (i.e., policy change, cultural change), which might be needed in some type of amplifying processes (amplifying beyond). Those could be, but must not be identical with overall outcome in context of DRR innovation. In fact, it depends on the experts defining the process, and it is recommended to keep the process outcomes tangible (e.g., adjusting day-to-day operation routines/behaviour by using the solution) rather than too general (e.g., increase risk preparedness by implementing solution; Barnet and Grotowski, 2013). Furthermore, by considering the amplifying process outcome, it is important to consider its feasibility within The HuT project (its plan, deliverables), mandates of institution to lead or support the process, and values / ethic principles /sustainable adaptation principles (which the outcome is contributing to).

Analyse: After having set the aims of the amplifying process – the intermediate and final outcome, and analysis follows. It is important to decide on the steps towards the outcome. The steps can relate to one main outcome and cover multiple intermediate outcomes (could be called milestones in the project management language). There are multiple ways how to define those steps. Theory of change suggest “backward planning”. This method is based on defining the last step which need to be reached before the outcome. Once defined, a step before is described, and the process continues until we come to the current situation. For each steps conditions, or so-called connected requirements should be analyzed. Other well-known method is “problem and solution tree”. This method is based on brainstorming on problems challenges related to the envisaged outcome. The relationship between the problems should be visualized. They are sometimes visualized as the roots of a tree. Afterwards, the problem tree is replaced by solution tree – following the same structure. The solutions are branches of a tree. Concrete action to solutions is define as the trunk of a tree. They connect problems (roots) with solutions (branches), and in this manner – the outcomes (fruit) can appear.

In this stage of amplifying process, the analysis of barriers & enablers of the process is suitable. This might be done via the analysis of Forcing fields (enabling and hindering conditions per action), or using SWOT analysis (strength and weakness in solution /action /process itself; and opportunities and threads in outside environment), PEST analysis (political, economic, social, and technological factors), or other strategic thinking methods. Those factors should be revisited in later stage, during of amplifying process.

Furthermore, it is recommended to map the key stakeholders related to the process. Identification of actors can follow by basic direct mapping, or by snowball (“people recommend people”). Most importantly, it is necessary to understand the personal and institutional needs, barriers, mandates, priorities, power to decide, power to influence, interest. Recommended is to map functional relationship between organizations, and a function of the representative within the organization. In institutions and cultures where hierarchy is important, attention should be given to who and how to approach the stakeholders. Each group of stakeholders should be managed differently – in regard of participation methods, intensity and manner of interaction, and communication. Methods such as “Circle of competence” or “Circles of control-influence-concern”



could help a team preparing the amplifying process to understand where there is a need to enlarge the core team, e.g., by including some stakeholders.

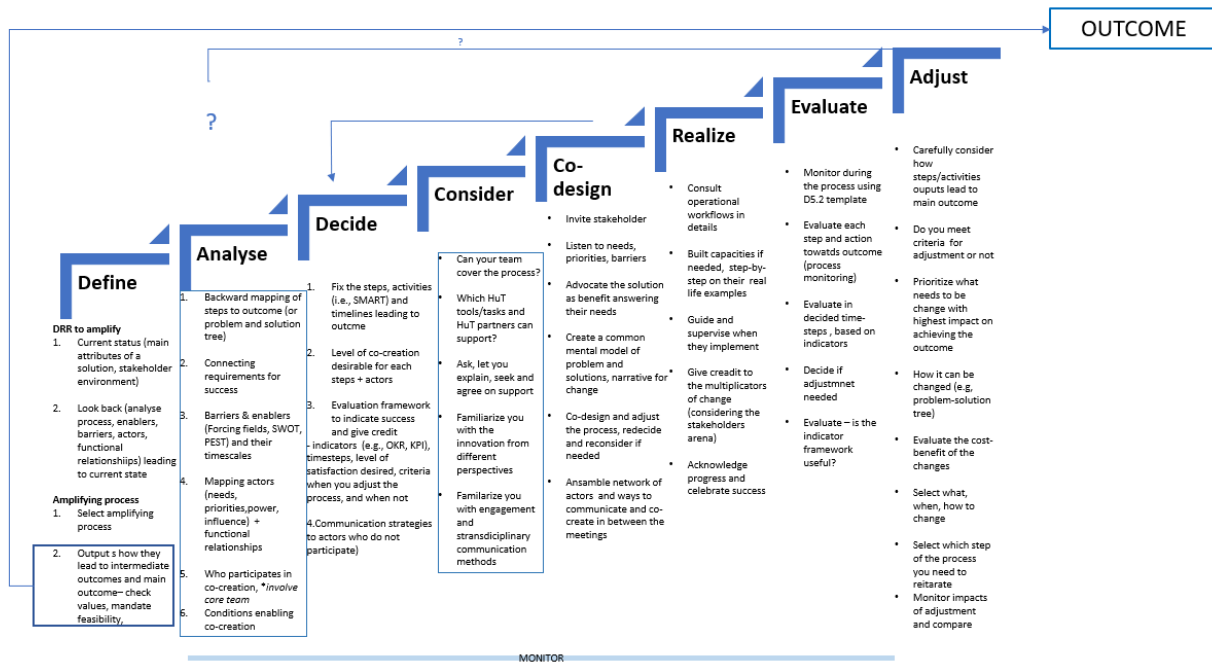


Figure 4: Steps of amplifying process (after Kuhlicke et al., 2021, modified)

Decide: The steps and activities should be planned (e.g., SMART) timely and prioritized. The steps are recommended to be fixed and rigorously followed (Kuhlicke et al., 2021) unless the evaluation phase show needs to modify the plan. Here we decide on the level of co-creation desirable for each step and stakeholder group. The golden rule of participation is engaging stakeholders as soon as possible. However, the different participative methods, and communication methods could be applied during the process. The communication strategies towards stakeholders which would not be involved and might be only informed should be set up too.

We highly recommend setting up ways to monitor and evaluate the success will be done and execute it during the process thereafter. In The HuT we use a standardized approach, which is described under step Monitoring and evaluation on the following page. However, we suggest each partner leading an amplifying process to set indicators of success towards the intermediate and main outcome. Those could be both qualitative and quantitative and should be set in a way they are observable and measurable. Suitable methods are “Key performance indicators” or “Objectives and key results”. Target, representing the ambition of the process towards outcome, should be set for each indicator. Targets could be numerical values (e.g., “20”), or showing a progress (e.g., increase by 20 % compared to previous evaluation). We recommend looking at evolution of / impacts influencing key functions, rather than “counting number of outputs”. Furthermore, we recommend setting basic threshold for the indicator, by which, when achieved you know, the amplification will happen. The threshold must not be necessarily equal to the indicator’s target. Finally, we recommend considering basic criteria, which you will use to decide if a plan should be modify after an evaluation. Having these criteria before evaluation is useful to keep the original idea how to achieve the outcome in mind. If the co-creation process start to diverge from the original path, those criteria help to replan in line with original road to outcome. Thus, the criteria

keep us focused on the original destination, and motivate us to use shortcuts or “elevators” in situation, where it might be tempting walking around in loops or turn to completely different direction.

Consider: Here, the consideration of own resources, possible support of or synergies with other The HuT tools and resources follows. It is important to be familiar with the innovation from different perspectives, what should be easier to do as you already know the needs, enablers and barriers in each institution (step analyze). To familiarize yourself with stakeholder engagement, participatory methods and the basics of transdisciplinary communication, and to follow them in the next steps proved as efficient.

Co-design is done with wider range of stakeholders you have considered to be key for the process. It is important to include stakeholders as soon as possible in the process and to be clear about the role, the expectation upon them, time involvement, and to clearly articulate benefits. Collecting and reflecting the needs, barriers and priorities of the stakeholders, creating a common mental model of the problem and solution and narrative of change, together with advocating the solution from perspective how it could answer the broader needs, are very powerful to start with. They support the ultimate aim – to create a ownership by (some of) the stakeholders and step-by-step empower the stakeholders to become the (co-) owner of the amplifying process. Facilitating the process is important, and the level of engagement and support should be balanced to a comfortable extent, in a way that it does not pose a burden on stakeholders in a short and long-term. Hereby it is important to consider, how the stakeholders are managed in between the meetings, and monitor their behaviors towards the process, and interactions among them. The owners of the process might need be ready to co-design and adjust the steps previously defined, but a careful consideration should be given to steps which are diverting the focus and attention from the process outcome.

Realize: It is important to recognize that institutional barriers may sooner or later hinder the process despite stakeholder personal interests or real needs are high. Therefore, managing the key functional relationship (and people) influencing the operational workflows from the very beginning is needed. By doing so, the motivation and momentum of stakeholder’s representatives, which are directly involved in the operational work later could be maintained and grown by continuous overtake of responsibilities. This part of the process should not be underestimated. Stakeholders should be supported in the modification of their operational workflows by a stepwise, empowering (showing their roles, opportunities, scoping on what they can do already now), ideally supervised, and appropriate (avoiding too high expectations) suggestions. Having the process co-design by expert on organizational change management and having dedicated sufficient time for continuous engagement is very useful. Building the capacity requires a similar approach, being practically oriented and directly applicable (under supervision) in the operational workflow. Credit should be given to the multipliers of change -to both who influence the process by decision, and those who implement. Progress should be acknowledged, and success celebrated, and celebration should be included also by achieving the small steps in the slow running processes, which contribution towards the outcome is not obvious.

Evaluate: In The HuT we use a standardized approach, which is offered in set of templates in deliverable D5.2. The templates serve two purposes – monitoring and evaluation, and it is based in models used in organizational change management. Talking about monitoring we mean the regular “journaling” on activities which happened during the amplifying process. We refer to this activity as process-based monitoring. This approach helps us to create databases for process analysis, and back-identify the factors, functional relationships, events contributing to success or failure of a process. The progress-based evaluation is based on indicators (such as “key performance indicators”, or “objectives and key results”) for the process, which each demonstrator can set for their respective amplifying processes. We recommend linking them to HuT project



KPIs linked to their activities (if applicable). The template provided in D5.2 navigates only the reporting frequency, and how to report on the achieving the indicators. After the evaluation, eventual changes should be considered. Here the critical value of indicators and the criteria for modification, we recommend to define in step “decide” are supporting the decision.

Adjust: It is important to consider that amplifying is an open process which in most cases will require the need to change and adapt the original plan (Kuhlicke et al., 2021). However, it is important to carefully consider how the steps, outputs and intermediate outcomes lead alone or by their synergic effect to main outcome. Otherwise, the adjustment and re-planning in changing conditions might lead to losing the process focus (Barnet and Grotowski, 2013). Therefore, we suggested drafting criteria for adjustment, in the phase Decide. Those criteria can help and support decision making in challenging times. Further support is provided by the process monitoring, in which we can see the continuous progress and analyze in detail, what exactly need to be adjusted. We suggest careful prioritizing of the key points (subprocess, interaction, functional relationship among actors, event sequence, etc.) which need to be changed, and assess the impact of this change towards outcomes (intermediate, and overall). Afterwards a way to change the key point (e.g., by using problem-solution tree methodology) can be done, and cost-benefit of those solution assessed. Finally, the step of the process in which reiteration or change should appear should be identified. The results of the adjustment should be carefully monitored and compared with the original process, to assess its efficiency and effectiveness.

The steps outlined can vary in order and could be iterative. It is important to identify the concrete steps with a timeline of the project activities when these are going to happen. It is also important to identify, and – as early as possible – reach out to the actors who need to be involved in each step (Kuhlicke et al., 2021).



5. Conclusions

5.1. The HuT amplifying in practice

The HuT amplifying framework is established based on the existing state of the art. The framework comprises all transfer routes defined in proposal stage and all tasks of the project applied by demonstrators, as shown in (Table 2). This document defines the vocabulary and describes the “amplifying” framework we are going to use in The HuT project to observe the DRR solution transfer and scaling, which will happen during implementation of the project activities. Amplifying within, amplifying out and amplifying beyond are three processes the demonstrators are tackling in the project. Those activities are developed within project task by project partners, and include stakeholder within and outside project consortium. The same innovation can be (often) in different stages related to different amplifying sub/processes. For example, it could require “amplifying out” during its development, but once developed representing an example of “amplifying beyond”

Amplifying (transfer and scaling in The HuT proposal) is a process which requires systematic planning in how pilot-tested innovations can be implemented in different conditions as they were originally created for. Typically, innovations included in The HuT project were tested within special organizational, financial, and human resources, which might be not fully available when amplification takes place. Managers responsible for leading the process would possibly face challenges and find solutions to them. This is a valuable learning process which is happening in the The HuT project and will be observed making use of the deliverable D5.2 Template for documenting DRR solution and transfer process. That information will serve the demonstrators, to observe and evaluate their own transfer and scaling progress, to enrich the social learning from demonstrator to demonstrator in Demonstrator Management Board. They will contribute to document the valuable contribution of project activities and tasks to the amplification process. Finally, the results of those processes will drive best practice and lessons learned for deliverable D5.5 Replication Roadmap, and deliverable D5.6 Policy brief on Scaling up (Amplifying) DRR solutions.



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