STARS 4 Water

Workshop report on capacity building for using the models, services and dashboards

Deliverable: D5.1

D5.1. Workshop report on capacity building for using the models, services and dashboards.

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CI	Classified, as referred to EU Decision 2015/444 and its implementing rules	

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Version	Date	Released by	Nature of Change
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0.3	17-08-2025	M. Blind	Addition of anticipated tutorials
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0.9	27-09-202	M. Blind	Final draft, incorporated comments of internal review
1.0			Approval final version

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Summary

The STARS4Water project aims to improve the understanding of climate change impacts on water resources availability and the vulnerabilities for ecosystems, society, and economic sectors at the river basin scale. The project adopts a stakeholder-driven approach to develop and deliver new data services and data-driven models to support decision-making for adaptive, resilient, and sustainable management of freshwater resources.

This report outlines the current capacity building intentions for using the models, services, dashboards and methodological approaches developed within the project. This capacity building effort is important as the project ambition is to ease the re-use of the products and methods. By facilitating upscaling and knowledge transfer, the impact of the project should far exceed the direct impact on the partners and river basin organisations involved in the project.

Key to successful capacity building is clarity on the learning objectives and intended audience. The capacity building materials must be self-explaining to ensure their long-term effectiveness beyond the project's end date.

In several workshops and bilateral meetings, the capacity building needs were re-defined as the need for video tutorials, complemented by additional, existing documentation and training material.

The video tutorials are organized along the underlying structure of the project: a shared perception category and shared science category with strong focus on co-creation with each three phases. With one exception tutorials are foreseen in each category-phase combination. In addition general or overarching tutorials are foreseen. These can be general tutorials, explaining for example the general purpose of a model, example tutorials in which a specific model is demonstrated, and 'how-to' tutorials, supporting adaptation of a mode for own needs.

Currently 39 video tutorials are envisaged. They will be part of the STARS4WaterAcademy, a section of the STARS4Water website. As these 39 tutorials are not very evenly distributed over the different categories and phases, and the categories and phases require some knowledge about the project, a different structuring of the Academy may need to be developed to allow the user to track a desired tutorial in a more direct way.

In the next stage, the tutorials will be developed. This is supported by instructions and templates.

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1 Introduction

The project STARS4Water aims to improve the understanding of climate change impacts on water resources availability and the vulnerabilities for ecosystems, society and economic sectors at river basin scale. Adopting a stakeholder driven approach, the project develops and delivers new data services and data-driven models for better supporting the decision making for adaptive, resilient and sustainable management of freshwater resources. Figure 1 visualises this approach, depicting a co-creation process. **Shared perception** refers to building a common understanding between stakeholders and researchers of what the challenges are, and, how they are observed. It starts with agreeing on data and observations, extends to understanding these and interpreting them consistently, and ends in aligning how information supports decisions. The aim is to reduce gaps in interpretation so that managers, policymakers, and scientists "see the same picture." **Shared science** refers to the development and use of models, services, and risk assessments. The figure emphasizes the co-creation of data services and modelling approaches, resulting in knowledge shared via products that are transparent, reusable, and relevant for decision-making. The aim is to ensure that scientific outputs are not isolated but directly inform practical water management choices.

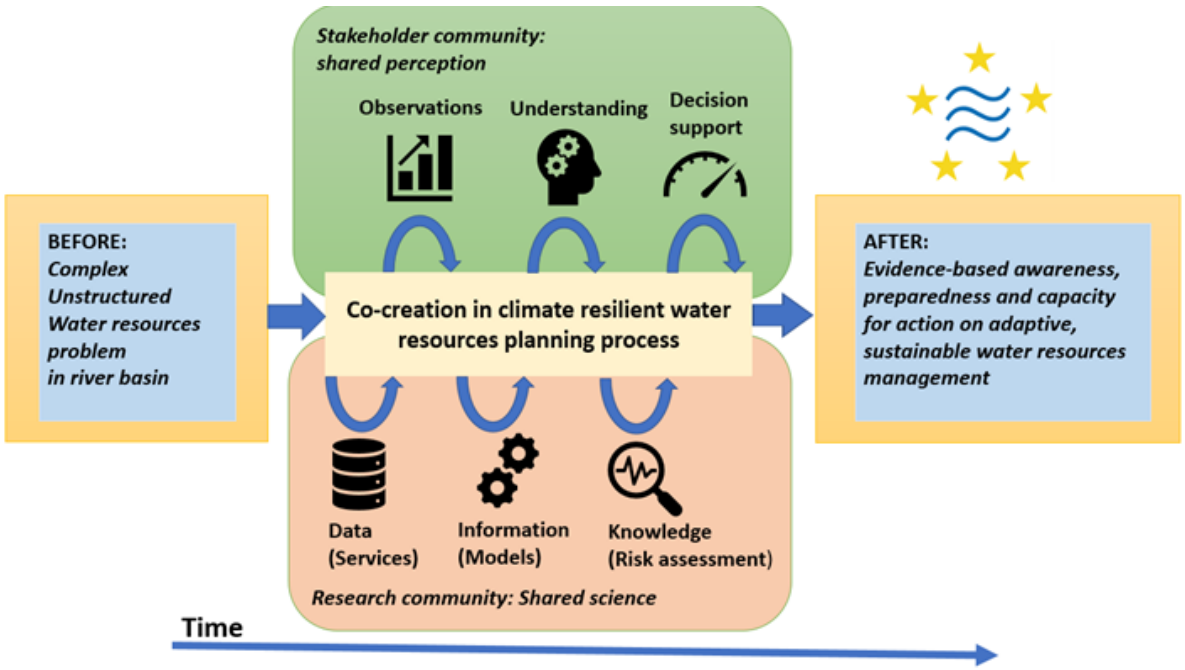

Figure 1: Basic underlying layout structure of the STARS4Water project, with strong focus on co-creation.

The co-creation process is applied in seven river basin hubs. Being stakeholder driven, many data, models and tools are developed for a specific river basin. The STARS4Water ambition is that innovative data services, models and tools developed within the project are (re-) used or exploited, not only by project partners, but also by others, supporting climate change informed water resources management. In other words, the project also works on upscaling and knowledge transfer to ensure that the project's outputs are useful for future work within other basins across Europe. To promote

sustainable uptake of results, it is important to assess the needs for capacity building. This report provides this clarification.

Chapter 2 elaborates on the approach adopted. Results are presented in Chapter 3 , followed by discussion and future steps in the final chapter.

2 Defining the capacity building needs

Originally, as reflected in the title of this deliverable, a single workshop was foreseen to identify the capacity building needs for future exploitation and enhanced uptake of the STARS4Water outputs. Effectively, a series of meetings and bilateral discussions were held to clarify these needs and map these to other activities in the project, most importantly the development of the STARS4Water Academy. An overview of these meetings is presented in Annex 1. The purpose of the STARS4Water Academy is to provide audience-tailored materials, mostly video tutorials, for different end-user groups. Capacity building needs identified in the meetings (Annex 1) should lead to capacity building materials accessible via the STARS4Water Academy entry webpage.

In the discussions, the following clarification and requirements emerged:

1. In the context of STARS4Water, capacity building is understood as demonstration and training of individuals about the innovative models, tools, data services, processes and methods delivered by the project. Although river Basins Authority's *institutional capacity* and the overall *cross-sectoral systemic capacity* are not a part of STARS4Water capacity building efforts, the co-creation approach adopted is a form of institutional and cross-sectoral capacity building.
2. Capacity building must target specific end-user groups like water managers, model/service/ dashboard users, developers, etc.
3. Capacity building is conveyed via the STARS4Water Academy. The capacity building needs determine the content of the Academy; thus, the Academy shall be largely populated based on the needs identified for uptake and exploitation.
4. Capacity building material must be self-explanatory. The aim is to ensure the long-term effectiveness of these materials beyond the project's end- date. After project completion, hands-on support and in-person training cannot be provided, thus a key requirement is that the material produced can be understood without additional support. Whenever possible, potential users shall be pointed towards additional resources such as deliverables of the project, models and source code, external training material, etc.
5. Capacity building needs will evolve after the delivery of this report, as project results continue to be produced.
6. As soon as models and tools are ready to be exploited by the project's River Basin Organisations (RBOs), the project aims to engage with RBOs to identify additional needs for tailored capacity building materials. This way the project ensures and validates that training material meet STARS4Water RBO's needs, encouraging these RBO to continue using tools and delivering material ready relevant to external uptake.

As a result, and in accordance with resources available, it was agreed that i) video tutorials were the best approach to fulfil the above criteria and ii) video tutorial should be produced for of at least all significant models and tools, data services, processes and methods, and risk assessment and policy aspects of the project.

Video tutorials should be organized along the project's core processes depicted in Figure 1. This is presented Table 1 alongside with potential examples. The structure may change to better reflect the overall guidance on the STARS4Water approach once this has been completed.

Category / phase	**Example models, services, dashboards and methodological approaches**
Overarching, general	• STARS4Water in a nutshell • The Academy: overall purpose.
1.1 Shared perception - Observations	• Methodological approach to assess stakeholder needs on data and tools. • Methodological approach towards collecting local data and metadata
1.2 Shared perception - Understanding	• Methodological approach towards the co-creation of dashboards • Methodological approach to develop story maps. • Methodological approach to develop scenarios
1.3 Shared perception - Decision support	• Story maps. • Dashboards.
2.1 Shared science - Data (services)	• Metadata Portal. • Impact Reporter. • Indicator development.
2.2 Shared science - Information (models)	• Various physical and data-driven models, ranging from physical to data-driven, basin scale to European scale.
2.3 Shared science - Knowledge (Risk assessment)	• Assessments of 'Safe Operating Space'. • Assessing the quantitative status of groundwater.

Table 1: Organisation of the video tutorials with examples.

For each model, services, dashboards and methodological approaches, etc, a (set of) explanatory video tutorial(s) is developed where each video tutorial is clear on its messages and audience, leading to a layered system. The layers, or types of video tutorials, are illustrated in Table 2.

Layer / type of video tutorial	Explanation
1: What / general	For each relevant tool/service/method, a general introduction will be provided on the tool/service/method, explaining e.g. what it is, when to use it and what the added value is. The target audience is primarily professionals such as water resources managers in river basin organisations or consultancies. Ideally the tutorials can be understood by the general public. There can be detailed explanation in this tutorial, but these are illustrated in layer 2
2: Examples	In this layer a real-life illustration of the tool/service/method is provided. E.g.: tool X applied in basin Y. Typically, the target audience will be more technical than the audience of layer 1, ranging from users of the results of models to model users.
3: How / edits	Depending on the tool, in this layer how a tool/service can be used 'as-is' and 'hands-on'. This targets model users /model developers. It may include some support on changing underlying data, parameters, etc., showing users how to interact, adopt or customize. This layer is only of added value if the tool/model is available for external use.

Table 2: Illustration of the layers or types of video tutorials.

Depending on the complexity of models, services, dashboards and methodological approaches at hand the layers may be combined if the target groups are homogeneous and the resulting tutorial remains concise.

In addition to the three layers links to other information will be provided, for example to deliverables, publications, (downloadable) models and source code, external trainings, etc.

Based on the tasks and activities, a preliminary list of potential video tutorials has been developed. The list was reviewed during the meetings, refined and validated. The preliminary list of video tutorials has been developed by the scientific partners based on the identified stakeholder needs for models, services, dashboards and methodological approaches in the cocreation process. It is anticipated that this list can extended based on stakeholders' requests.

3 Results

Table 3 presents the current intention on video tutorial development.

Table 4 presents the preliminary titles/content of the different video tutorials.

Tool category - phase	1: What / general	2: Examples	3: How / edits	Total	Group total
0 Uncategorized: general, overarching tutorials	3			3	3
1.1 Shared perception - Observations	2	2		4	9
1.2 Shared perception - Understanding					
1.3 Shared perception - Decision support	3	1	1	5	
2.1 Shared science - Data (services)	3	1	1	5	27
2.2 Shared science - Information (models)	6	8	5	19	
2.3 Shared science - Knowledge (risk assessment)	1	2		3	
Grand Total	**18**	**14**	**7**	**39**	**39**

Table 3: Statistics on intentions voiced by project partners on development of video tutorials for capacity building.

Overall, 39 video tutorials are currently intended to be produced (see Table 4). The distribution of these video tutorials varies across the categories/phases. This is not unsurprising, as most tools are in the 'shared science' category, providing the information to the stakeholder processes in the 'shared perception'- category. Within the 'shared science' category, most video tutorials deal with modelling tools. Currently no tutorial is listed "1.2 Shared perception – Understanding": The dashboards which can be used here, are included in 1.3 Shared perception - Decision support.

Table 4 shows that occasionally 'Layer 1: What/general' is not populated. One reason is that for some existing models such general information is readily available and will be made accessible as supplement information. In other cases, the general information will be in the introduction section of the example (-layer).

The current list of 39 video tutorials forms the basis of the STARS4Water Academy. As more methods and tools become available the Academy will be populated with additional video tutorials, accordingly. As a matter of fact, an additional 7 potential video tutorials have been identified, each of which will require further development and thoughts to conclude whether the video tutorial is of added value to the stakeholders.

Type /Category (see tab Design)	Tool/method name individual	Model	1: What / general	2: Examples	3: How / edits
Uncategorized	*Contribution of STARS4Water to policy*		*Present the key policy messages of STARS4Water (building on the findings of the policy briefs and the 'Co-creation in climate resilient water resources planning process' approach)*		
Uncategorized	*The STARS4Water Academy*		*Understand the purpose of the STARS4Water Academy*		
Uncategorized	*The STARS4Water project in a nutshell*		*Understand the objectives of the project, its set-up, and outputs. Highlight the 'Co-creation in climate resilient water resources planning process' approach*		
1.1 Shared perception - Observations	*Local data collection: Approach and lessons learned.*		*Learn about the approaches towards collecting local data, where to look, etc.*	*Provide practical guidance on collecting and organizing local environmental metadata to support river basin modelling and planning.*	
1.1 Shared perception - Observations	*Methodology to assess RBO Stakeholders' community needs for data and tools*		*Understand the process to elicit needs.*	*Learn how the process worked in a specific basin*	
1.3 Shared perception - Decision support	*Co-creation of dashboard for integrated risk assessments.*		*Methodology on how to co-create a dashboard*		
1.3 Shared perception - Decision support	*Development of scenario narratives and associated datasets*		*Learn about the co-creation approach to develop narrative, and what if scenario*		
1.3 Shared perception - Decision support	*Story maps*		*What are co-created story maps?*	*Understanding the story map of a basin*	*Story map with ArcGIS*
2.1 Shared science - Data (services)	*Impact Reporter (IR)*		*Explain what the Impact Reporter is, and how someone use the IR to find relevant information*		*Explain how someone can add an event to the IR*

Type /Category (see tab Design)	Tool/method name individual	Model	1: What / general	2: Examples	3: How / edits
			about events and their impacts (relevant queries, stats)		
2.1 Shared science - Data (services)	*Indicators for assessing climate risks and impacts on integrated water resources system*		*General overview of relevant indicators, the indicator approach*		
2.1 Shared science - Data (services)	*Metadata portal*		*Explain the purpose of the metadata portal and some overall up to date statistics*	*Explain how to navigate the portal*	
2.2 Shared science - Information (models)	*Co-creation of dashboard for integrated risk assessments.*		*Learn about what dashboards are and the general approach. Demonstrate using the generic dashboard.*	*Demonstrate the use of one of the tailor-made dashboards*	*Demonstrate the steps to take to develop a new generic and tailor-made dashboard*
2.2 Shared science - Information (models)	*EU level assessment*		*From local to global scale: The Role of Upscaling in Water Resources Management*		*How to create and apply a data-driven model to upscale SWE*
2.2 Shared science - Information (models)	*Improved models (multi-scale model integration)*		*Teaching the essentials of large scale and continental hydrological models*		*What decisions can be taken based on large scale simulations*
2.2 Shared science - Information (models)	*Improved models (process understanding)*	*Ribasim*	*Ribasim general introduction*	*Improvements to the RIBASIM Rhine model*	
2.2 Shared science - Information (models)	*Improved models (process understanding)*	*wflow*		*Improvements to the wflow model*	
2.2 Shared science - Information (models)	*Improved models (process understanding)*	*E-Flow*	*Provide an overview of the E-Flow concept*	*Provide an overview of the E-Flow tool with a worked example*	

Type /Category (see tab Design)	Tool/method name individual	Model	1: What / general	2: Examples	3: How / edits
2.2 Shared science - Information (models)	*Improved models (process understanding)*	*LISFLOOD*		*Improving Lisflood for a local use in the Drammen Basin. Approach and lessons learned*	
2.2 Shared science - Information (models)	*Improved models (process understanding)*	*WFLOW*			
2.2 Shared science - Information (models)	*New, data-driven models*	*ML Mapping model*		*Data-driven groundwater modelling (ML-mapping). Start on a higher level: What decisions can be taken based on this model?*	*How to create your own data-driven groundwater model (ML-mapping).*
2.2 Shared science - Information (models)	*New, data-driven models*	*ML Reservoir Model*		*Reservoir modelling. Start on a higher level: What decisions can be taken based on this model? Based on some examples.*	*How to adapt the model to fit your own data.*
2.2 Shared science - Information (models)	*Upscaling beyond 7 cases*		*Train the audience on the general ideas and approach to upscaling to other basins*	*Explain the results of the upscaling activities, training the audience to understand its value and limitations*	
2.3 Shared science - Knowledge (Risk assessment)	*Indicators for assessing climate risks and impacts on integrated water resources system*		*What is the SOS concept and how is it operationalised in S4W*		
2.3 Shared science - Knowledge (Risk assessment)	*Indicators for assessing climate risks and impacts on integrated water resources system*	*GWI*		*Groundwater Availability Index*	
2.3 Shared science - Knowledge (Risk assessment)	*Indicators for assessing climate risks and impacts on integrated water resources system*	*SOS*		*SOS Application over the Seine River (INRAE)*	

Table 4: Preliminary titles/content of video tutorial material to be developed.

4 Conclusions and follow-up

This report outlines the current capacity building intentions for using the models, services, dashboards and methodological approaches developed within the project. Based on several meetings 39 video tutorials be developed. We expect this number to increase when more results are delivered.

While the project is still in development stage, reflecting on capacity building is timely, but also challenging as developments are still ongoing. As a result, the work at hand is based on the insight of the science partners contributing to the project and developing tools, considering that tools have been defined in collaboration with stakeholders. We intend to engage with end-users of in a later stage to identify missing material or required improvements to existing tutorials.

The video tutorials will form part of the STARS4Water Academy which will be hosted on the STARS4Water YouTube channel and in a section of the STARS4Water website. On the Academy website, links to additional information will be provided, for example to deliverables, publications, (downloadable) models and source code, external trainings, etc.

The video tutorials are currently not evenly distributed over the different categories (see Table 3). While this structure is helpful at this stage of the project, we will consider adapting the structure to reflect the overall guidance to the STARS4Water approach and tools that will be developed during the remainder of the project.

Currently, the video tutorials are work in progress and will be uploaded to the STARS4Water Academy in a timeline fashion, prior to the end-date of the project. The development of the video tutorials will be supported by templates and instructions.

Annex 1: Meetings and workshops on capacity building.

Meeting	Relation to D5.1	Participants
STARS4Water WARSAW Meeting (22-24 April 2025)	Session on WP5, WP6: first discussions on tutorial material, decision on academy layout/approach	All project beneficiaries
WP 5 Workshop part 1 (deliverable 5.1) 16-6-025	Main subject of a WP5 accelerator meeting was clarifying the relationship with WP6 and enhancing collective understanding of both academy and tutorial development for anticipated training needs.	BOKU; UKCEH; Deltares; FZJ; GEOECOMAR; INRAE; NVE; RWS; SEVEN; SGGW; UCM; VanderSat.
WP5/D5.1 Workshop (part 2) Meeting 30-06-2025	Discuss WP5 work plan, following up on the meeting two weeks ago in which we discussed how to move forward with upscaling and uptake, focussing also on D5.1	BOKU; UKCEH; Deltares; FZJ; GEOECOMAR; INRAE; NVE; SEVEN; SGGW; UCM; VanderSat.
Bilateral meetings	Several bilateral meetings for in-depth discussions and clarifications	BOKU; UKCEH; Deltares; FZJ, GEOECOMAR; RWS; SEVEN; UCM.
D5.1 Workshop part 3, 02-09-2025	Completing video tutorial overview for D.5.1; Lessons learned from first scripting and video recording of tutorials.	BOKU; UKCEH; Deltares; GEOECOMAR; INRAE; NVE; SGGW; UCM.