



# SCOREwater

Smart City Observatories implement REsilient Water Management

## DELIVERABLE D4.5

# SUMMARIZE RELEVANT FINDINGS FROM EVALUATION PHASE, REGARDING TECHNOLOGIES FOR WATER MANAGEMENT

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## ABBREVIATIONS

Abbreviation	Definition
CKAN	Comprehensive Kerbal Archive Network
ICT	Information and Communications Technology
IoT	Internet of Things
SDG	Sustainable Development Goals
SME	Small and Medium-sized Enterprise
WWTP	Wastewater Treatment Plant
WBE	Wastewater-based epidemiology (WBE)





## PROJECT ABSTRACT

SCOREwater focuses on enhancing the resilience of cities against climate change and urbanization by enabling a water smart society that fulfils SDGs 3, 6, 11, 12 and 13 and secures future ecosystem services. We introduce digital services to improve management of wastewater, stormwater and flooding events. These services are provided by an adaptive digital platform, developed and verified by relevant stakeholders (communities, municipalities, businesses, and civil society) in iterative collaboration with developers, thus tailoring to stakeholders' needs. Existing technical platforms and services (e.g. FIWARE, CKAN) are extended to the water domain by integrating relevant standards, ontologies, and vocabularies, and provide an interoperable open-source platform for smart water management. Emerging digital technologies such as IoT, Artificial Intelligence, and Big Data is used to provide accurate real-time predictions and refined information.

We implement three large-scale, cross-cutting innovation demonstrators and enable transfer and upscale by providing harmonized data and services. We initiate a new domain “sewage sociology” mining biomarkers of community-wide lifestyle habits from sewage. We develop new water monitoring techniques and data-adaptive storm water treatment and apply to water resource protection and legal compliance for construction projects. We enhance resilience against flooding by sensing and hydrological modelling coupled to urban water engineering. We will identify best practices for developing and using the digital services, thus addressing water stakeholders beyond the project partners. The project will also develop technologies to increase public engagement in water management.

Moreover, SCOREwater will deliver an innovation ecosystem driven by the financial savings in both maintenance and operation of water systems that are offered using the SCOREwater digital services, providing new business opportunities for water and ICT SMEs.



## EXECUTIVE SUMMARY

This deliverable is part of subtask 4.1.2 *Iterative evaluations* and is the fourth and last in a series of evaluations through the project process. The purpose with the evaluations has been to understand barriers and enablers, share and bring forward experiences to improve the implementation of technologies and services and how to demonstrate the SCOREwater platform.

This last one summarizes findings from the evaluation phase as well as gives a summary of all the evaluations carried out within WP4 *Large scale demonstrations*. This deliverable completes the iterative evaluation carried out in subtask 4.1.2 *Iterative evaluations* and aim to provide valuable input to for example ongoing task 5.3 *Lessons learned from the case studies* and task 6.3 *End user uptake (incl. handbook and replication plan)*.

The evaluation was done through a web-based survey. It was sent out to all partners (50 people) known to be involved in SCOREwater at this time. All were given about two weeks to answer. In the end a total of 16 people responded.

The focus in the evaluation are key factors which may have hindered the process or can enable progress in phases to come. Further to understand what works and what doesn't. This last evaluation focused as well as others on lessons learned but also investigated whether identified barriers are new for this phase or if the same challenges have been following the project partners for longer.

It is structured into three themes and an 'other' to catch any insights that does not fit into the themes: Organization and planning, Technical aspects and Communication and stakeholder interaction. In each theme, results from previous evaluations are also summarized.

The results of the fourth evaluation show that across the three themes organizational challenges were the most prevalent, which differs from previous evaluations. Technical challenges were experienced by 38 % of respondents, compared to 31 % communications and stakeholder interaction. Regarding other types of identified barriers, the majority (88 %) hadn't identified any the last 6-8 months.

There were most positive experiences regarding the theme of organization and planning, 75 % answered they had positive experiences, for example project organization, the digital solutions during the pandemic and new contact and synergies formed thanks to this.

Lessons learned focused in this evaluation on potential usability of SCOREwater after the project ends. Many of the respondents see potential regarding the developed technology for example. Some state that the project structure enables development and progress and that the technology hopefully can be further used in the future and developed further. Also, the SCOREwater platform is highlighted by many of the respondent as good potential. It is seen to be very useful for making special datasets available to the public.

## 1. PURPOSE AND AIM WITH DELIVERABLE

This deliverable is part of subtask 4.1.2 *Iterative evaluations* and is the fourth and last in a series of evaluations through the project process. The purpose with the evaluations has been to understand barriers and enablers, share and bring forward experiences to improve the implementation of technologies and services and how to demonstrate the SCORE water platform.

This last one summarizes findings from the evaluation phase as well as gives a summary of all the evaluations carried out within WP4 *Large scale demonstrations*. This deliverable completes the iterative evaluation carried out in task 4.1.2 *Iterative evaluations* and aim to provide valuable input to for example ongoing task 5.3 *Lessons learned from the case studies* and task 6.3 *End user uptake (incl. handbook and replication plan)*. It will also contribute to analysing the outcomes of lessons learned from the demonstration cases - leading up to milestone 6 - Aggregated lessons learned.

The deliverable reports the results from the fourth evaluation carried out through a survey to all project partners and summarize their experiences, lessons, and input. It also summarizes the previous evaluations, completing task 4.1 *Providing common structures, baseline assessment and iterative evaluation*. It is deliverable type “report”.

## 2. THE SURVEY

The evaluation was done through a web-based survey, questions found in Annex I. The survey was made in the programme ‘Survey generator’. It was sent out to all partners (50 people) known to be involved in SCOREwater at this time. All were given about two weeks to answer. Two reminders were sent out. A total of 16 respondents participated by answering the questions in the evaluation. All individuals’ answers are anonymous and the figures in this evaluation present aggregated results. Among the respondents there were representatives from all three cases.

The focus in the evaluation are key factors which may have hindered the process or can enable progress in phases to come. Further to understand what works and what doesn’t. This last evaluation focused as well as others on lessons learned but also investigated whether identified barriers are new for this phase or if the same challenges have been following the project partners for longer.

It is structured into three themes and an ‘other’ to catch any insights that does not fit into the themes: Organization and planning, Technical aspects and Communication and stakeholder interaction.

The first evaluation, D4.2 (Matschke Ekholm, 2020a), was carried out in the Spring of 2020 (M12) and was partly a trial for the evaluation format which was being tested. At that time not many activities were fully carried out in the project yet. The second one, D4.3 (Matschke Ekholm, 2020b), was evaluating the implementation phase and the third, D4.4 (Matschke Ekholm, 2021), the testing phase.

The questionnaire has been slightly updated each survey. Changes were made mainly between D4.3 and D4.4 to better assist the respondents in fitting their responses into the themes.

## 3. ORGANIZATION AND PLANNING

This section is about the respondent’s experiences, (regarding barriers and/or enablers) in the project regarding organization and management among partners and stakeholders, WP- leaders, task leaders, the planning and coordination of the project and activities etc.

More than half of the respondents stated that they experienced barriers or other challenges with organization or planning during the fourth evaluation (figure 1). Half of the respondents had experienced these barriers previously in the project, i.e., before the summer of 2021 (figure 2). The result show that over time, more respondents have met barriers (figure 1).

More than half (56 %) of the respondents stated that they experienced barriers or other challenges with organization or planning during the fourth evaluation (figure 2). Half of the respondents had experienced these barriers previously in the project, i.e., before the summer of 2021 (figure 3). Over time, more respondents have met barriers (figure 2).

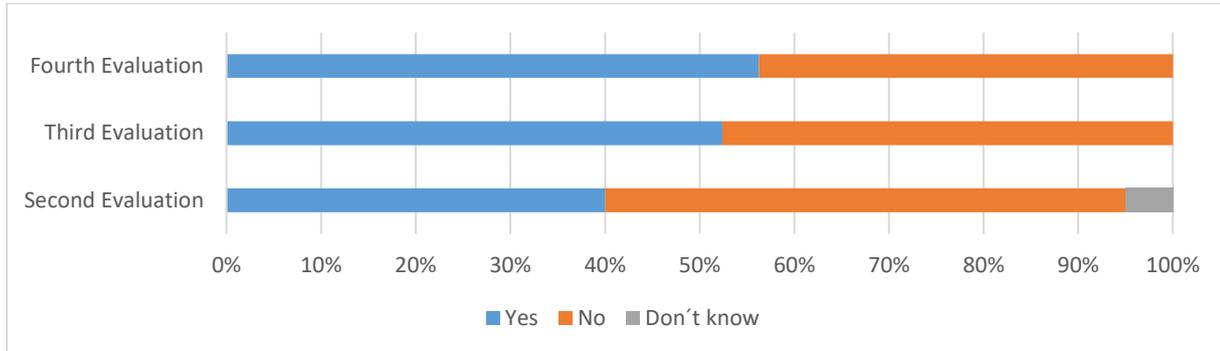


Figure 1: Did you experience any barriers or other challenges with organization or planning (past 6-8 months)?<sup>1</sup>

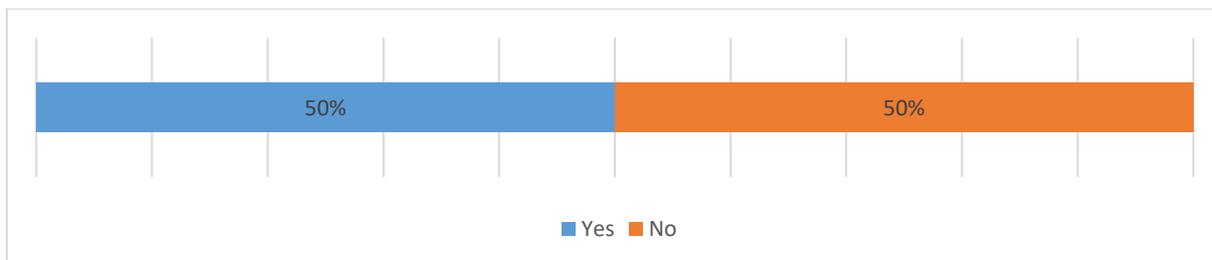


Figure 2: Have you experienced these barriers previous (before summer of 2021) in the project

One barrier experienced was difficulties in cooperation with partners and more specifically that a partner did not deliver as promised. This was managed by repeated personal reminders and by asking participants from the same partner to apply internal pressure to move the work along. Two respondents mentioned the covid-19 pandemic as a barrier, in part due to restrictions in some countries leading to an inability to hold meetings. This especially hampered progress with activities connected to citizen science. Other respondents mentioned access to data streams as a barrier. This barrier was managed by repeatedly asking for access. Due to delays, there was not enough data to draw conclusions, which led to communication difficulties regarding the projects. One respondent mentioned that not much new was communicated during the phase, as this will mostly be communicated in the next phase when there are concrete results. Others expressed that staff leaving the project slowed work down significantly. Another respondent mentioned limited commercial interest as a barrier, and that the problem was mitigated through explaining the value creation. Yet another respondent mentioned the amendments of submission deadlines which were due to synchronization with other tasks and deliverables as a barrier. Overall, respondents had ways to manage different barriers as can be seen above.

One respondent mentioned a lack of low-cost, low maintenance sensors for water measurements as a barrier, which was managed by focusing on solutions that supports criteria. This, however, must be seen as a technical issue and does not fit within the frame of the question posed.

<sup>1</sup> The question was not posed in the first evaluation. Also, it is worth mentioning that the question was posed slightly differently in the second evaluation, as the respondents were asked if they had experienced organizational and planning aspects as “challenging”, and not as “barriers” as in the third and fourth evaluation.

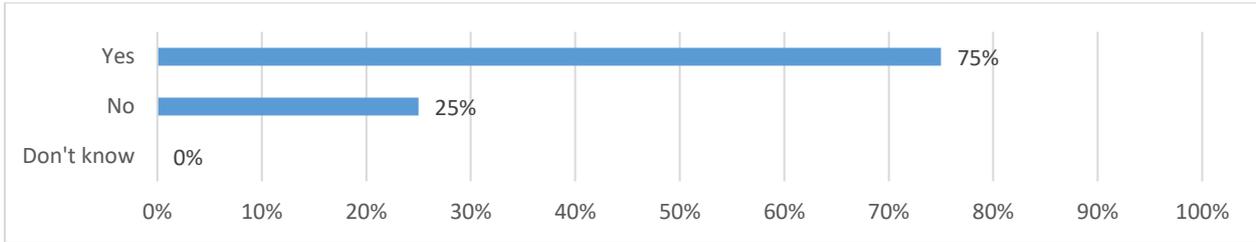


Figure 3: Did you have any positive experiences (e.g., surprises, outcomes, synergies) regarding organization or planning in the evaluation phase (past 6-8 months)?

Three quarters of the respondents stated that they had positive experiences regarding organisation and planning in the evaluation phase. The rest stated that they did not.

Some positives came out of the covid-19 pandemic. One respondent mentioned that virtual meetings turn out to be more efficient and productive than face-to-face meetings. Also, new opportunities came such as surveillance of virus quantities in sewage. One respondent stated that the organization and planning by the WP- and task-leaders was carried out with mostly good result and that regular meetings at several levels (task, WP, case, consortium, STC) was a success factor. There were also insights gained about different drivers for different types of organizations. Also, several respondents pointed out synergies formed between cases and partners. Further, learning by doing and discussing together on solutions are highlighted as positive experiences.

Another positive pointed out are the steps taken from some partners in making the data accessible through various activities enabling more data to be used through the platform. There were also some positive outcomes regarding results for instance when it came to the prototype of the flood alert service in Amersfoort. One respondents points out the good knowledge and scientific interest within and around the project.

The creation of new contacts was mentioned as a positive by several respondents. This was in the form of new contact surfaces for solution providers in different water sectors and contact with other projects through presentations and webinars.

### 3.1 IN PREVIOUS EVALUATIONS

The questions asked regarding organization and planning differ between the first, second and third evaluation. In the first evaluation respondents were asked how they perceived the understanding of user requirements. The respondent then thought that the planning and analysis to determine requirements of project actions, as well as the judgement of understanding of user requirements, were seen as fairly good to good.

In the second and third evaluation, the respondents were asked if they experienced organizational or planning aspects as challenging (hindering progress and/or development). In the second evaluation, eight out of the 20 respondents stated that challenges were faced. Among the challenges mentioned was the Covid-19 pandemic which caused many activities to a halt for a period which resulted in delays. The delays also effected other activities which in some cases were delayed as well. Moreover, respondents found that the large consortium, with many partners involved, was sometimes challenging. In the third evaluation more than half of the respondents experienced barriers or alike. However, many of the specified barriers did not relate to organization or planning. Four respondents listed budget constraints as an issue.

## 4. TECHNICAL ASPECTS

This section is about the respondent’s experiences, (regarding barriers and/or enablers) in the project during the last 6-8 months regarding, the technical work, activities, know how, problem related questions (e.g., IT-infrastructure, communication about IT, data collection/structure/analysis, machine learning, algorithms, platform design etc.)

Around four out of ten of the respondents (38 %) stated that they experienced barriers or other challenges with technical aspects in the evaluation phase. Around a third of the respondents specified that the barriers experienced had also been experienced previously.

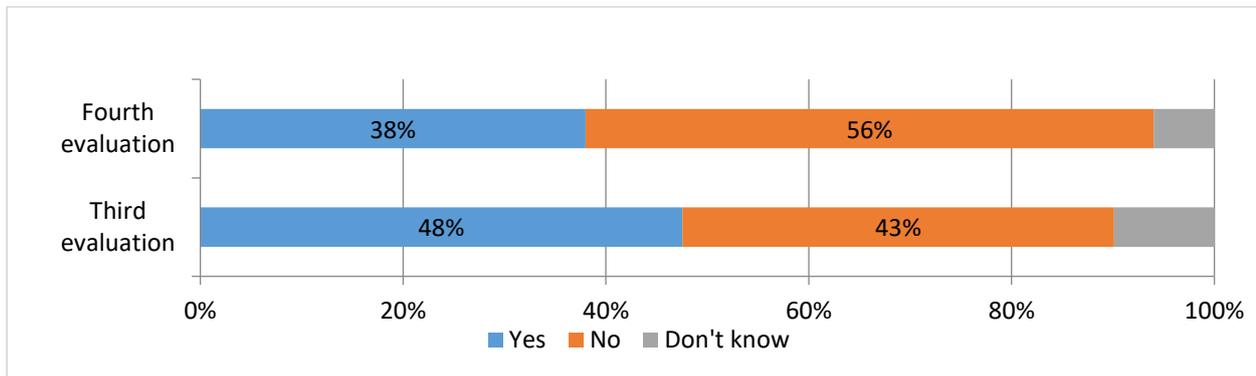


Figure 4: Did you experience any barriers or other challenges with technical aspects in the evaluation phase (past 6-8 months)? Examples: Unexpected technological requirements, installation of sensors, software implementation, access, technical skills, IT.<sup>2</sup>

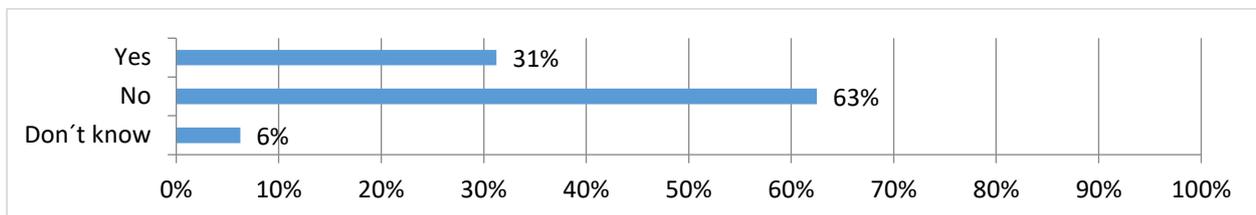


Figure 5: Have you experienced these barriers previously (before the summer of 2021) in the project?

Of the seven respondents who experienced technical barriers or other challenges during the evaluation phase, some mentioned low quality of the water parameters monitored in the Barcelona case. Multiple techniques had to be applied to improve the quality. Another barrier mentioned in the case of predicting effluent turbidity (Gothenburg), the results of the machine learning models were not as expected. To solve the problems identified, domain knowledge meetings are being held together with IVL and Swedish Hydro Solutions. Further, some flow data had limited quality. One respondent also mentioned difficulties in obtaining reliable measurements of the flow rate and velocity of wastewater. Another respondent mentioned that work was done to improve the quality by replacing some of the sensors.

<sup>2</sup> The question was formulated slightly differently in the first and second evaluation phase, compared to the third and fourth. The respondents were asked if they had or hadn't experienced: Additional technological requirements they didn't expect; Specific technology not available, or other technical problems; Complexity of the problems to be solved and lack of shared sense of urgency among key stakeholders.

Further, one respondent mentioned that pumping wastewater from sewers was especially challenging during low flow periods (e.g., nighttime). However, after improving the pump setup this problem, significantly improved. One of the selected sites for measurement was not available during construction which was managed by moving sensors. There were also issues regarding the long-term stability of sensor elements, which was however managed by focusing on long-term stable sensor types.

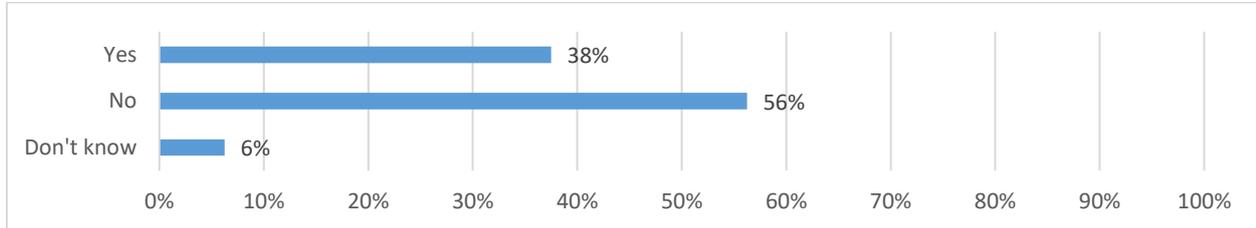


Figure 6: Did you have any positive experiences (e.g., surprises, outcomes, synergies) with technical aspects in the evaluation phase (past 6-8 months)?

Six of the respondents stated that they had positive technical experiences during the evaluation phase. In general, there were a lot of lessons learnt. One respondent simply stated that they learned a lot. More specifically, new knowledge was extracted from the data that was very useful in understanding the behavior of portable treatment plants, as well as knowledge on how to adequately balance technical requirements and on-site conditions. Another insight was that battery consumption and radio coverage down in water infrastructure worked very well. Among the positive experiences was also the collaboration with technology providers and partners to achieve a successful flow and speed result. There was also an interesting collaboration with IVL and Eurecat on the theme of water data, and how this data can be analyzed and used for improved water treatment.

#### 4.1. IN PREVIOUS EVALUATIONS

5 out of 6 respondents stated that they had experienced new technology, or new potentials offered by technology in the first evaluation. An example was different AI objectives being defined for each demonstration case, even if they were not all covered. When asked which technical aspects have been challenging, there was a shift in perception between the first and second evaluation. In the first evaluation the complexity of the problems to be solved were more pressing. In the second evaluation, project members mentioned experiencing “additional technological requirements you didn’t expect” and “specific technology not available or other technical problems”. The same question was not asked in the third evaluation, however, almost half of the respondents stated that they experienced technical challenges in the testing phase, with the recurring theme being the sensors; their liability, quality of data generated and on-site installation. In the second evaluation the respondents did see the consultation and involvements of certain partners as challenging, which was not the case in the first evaluation.

### 5. COMMUNICATION AND STAKEHOLDER INTERACTION

This section is about the respondent’s experiences, (regarding barriers and/or enablers) in the project over the past 6-8 months, concerning the communication and collaboration with other partners/stakeholders/end users in the project etc.

31% of the respondent's experienced barriers or other challenges when it came to communication and stakeholder interaction. This is lower than the previous evaluation which assessed the implementation phase. More than half of the respondents stated that the barriers were new and had not been experienced previously.

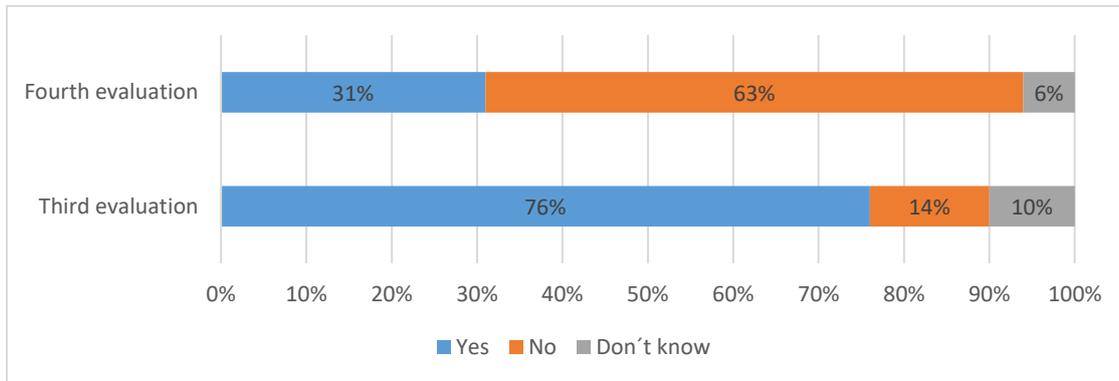


Figure 7: Did you experience any barriers or other challenges with communication and stakeholder interaction in the evaluation phase (past 6-8 months)?

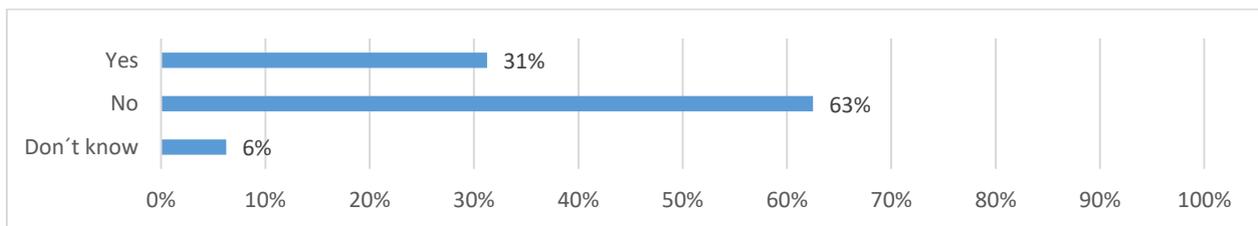


Figure 8: Have you experienced these barriers previous (before summer of 2021) in the project?

When elaborating on the experiences, most responses related to problems arising from the lack of physical meetings. These respondents stated that physical meeting would have been better and would have facilitated the generation of ideas in a more informal setting. Also, not meeting physically was said to have made it challenging to involve citizens. Digital meetings were also seen to slow down the process.

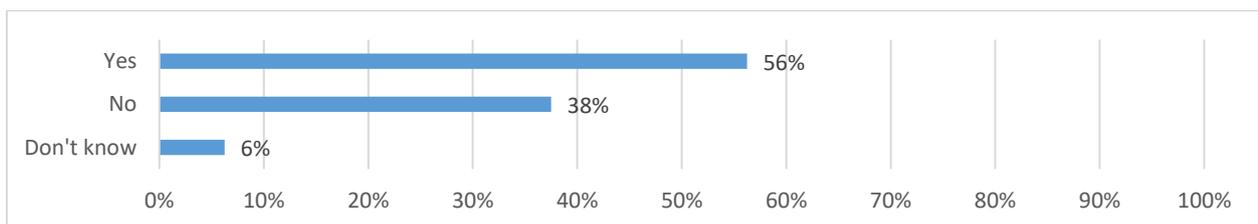


Figure 9: Did you have any positive experiences (e.g., surprises, outcomes, synergies) with communication and stakeholder interaction in the evaluation phase (past 6-8 months), e.g., in interacting with any of the stakeholder types?

When asked to elaborate on the positives regarding communication and stakeholder interaction, synergies were frequently mentioned. Specifically, one respondent mentioned that the wastewater sampling stations developed in some neighborhoods in Barcelona allowed collaboration with other sewage epidemiology projects to expand data on for example drugs and viruses. Also, different types of events led to positive outcomes were mentioned. Examples of this were cross-linking that arose from webinars, presentations and WP-cross work and a collaboration event with Synergy Group digital water 2020 which led to a larger audience being reached. Positive aspects also arose from digitalization due to the covid-19 pandemic. As all communication was moved online, it became easier to organize meetings with citizens from different countries.

## 5.1. INCLUSION OF STAKEHOLDERS

Half of the respondents stated that they included new stakeholders in the last 6-8 months and the rest either did not or did not know if they did.

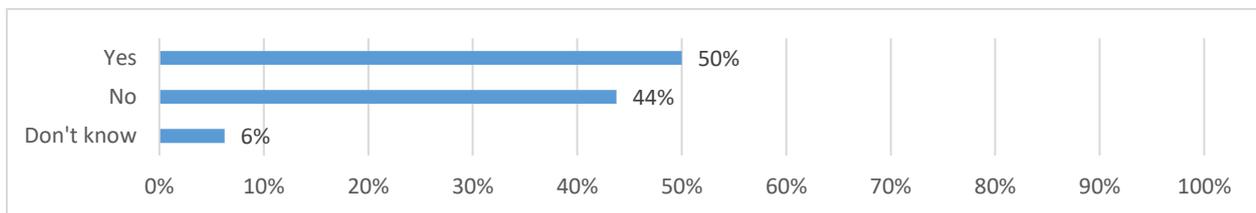


Figure 10: Have you involved new/different types of stakeholders in your work in the past 6-8 months?

Contact was made between the networks of public sanitation operators in Catalonia, Spain and Europe to share experiences of the project. This led to the dissemination of the project and its replicability to other cities. Other involvement of stakeholder came from the #WaterChallenge which led to more students being reached. Further, two respondents mentioned Wastewater-based epidemiology (WBE): that public water authorities become increasingly interested in WBE and that the discovery of new opportunities for applying WBE led to the involvement of new stakeholders. This, as well as the sketching of an exhibition on WBE science which involved contacting artists with environmental aspirations, was new to the respondent.

One respondent gained insights from stakeholder involvement on the actual contents of the data the respondent was working with, and another that domain knowledge was gained to refine the data-driven models.

One respondent describes a fruitful collaboration with a research agency that focuses on public health, amongst other things: “By working together, we gain access to their scientific knowledge (in this case: on how to effectively deal with greenery in the city). For them, we are an interesting party to collaborate with because we use their knowledge and give feedback on how to make it more accessible.”

## 5.2. PARTNERSHIP ARRANGEMENTS

Out of the respondents in the fourth evaluation, 63 % thought that the partnership arrangement with key stakeholders worked well (scored 4 or 5 on a scale from 1 = failed to 5 = constructive). Only six percent of respondents scored 2 or less. Overall, this points to a degree of satisfaction, with room for improvement. It is also a slight decrease in satisfaction compared to the third evaluation where 81% of the respondents scored a 4 or a 5.

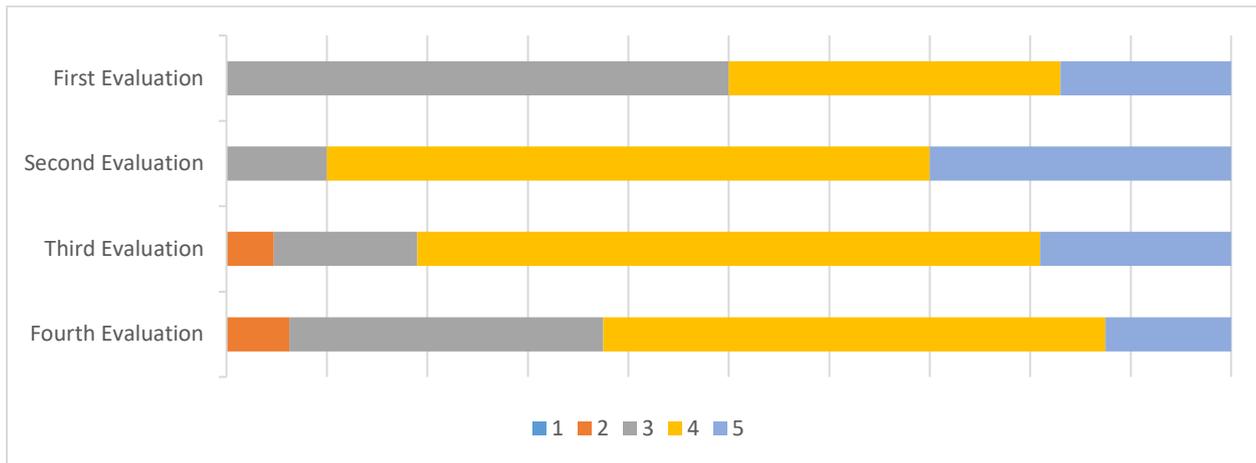


Figure 11: How do you perceive that the partnership arrangements work with relevant key stakeholders?

This can be compared to an even larger degree of satisfaction with the arrangements with partners, where 82 % scored 4 or 5 and 0 % scored 2 or less. The satisfaction being higher with partners can be due to differences in collaboration with stakeholders and partners. The collaboration with stakeholders is looser, and a well working collaboration requires partners to have something solid and of interest to offer.

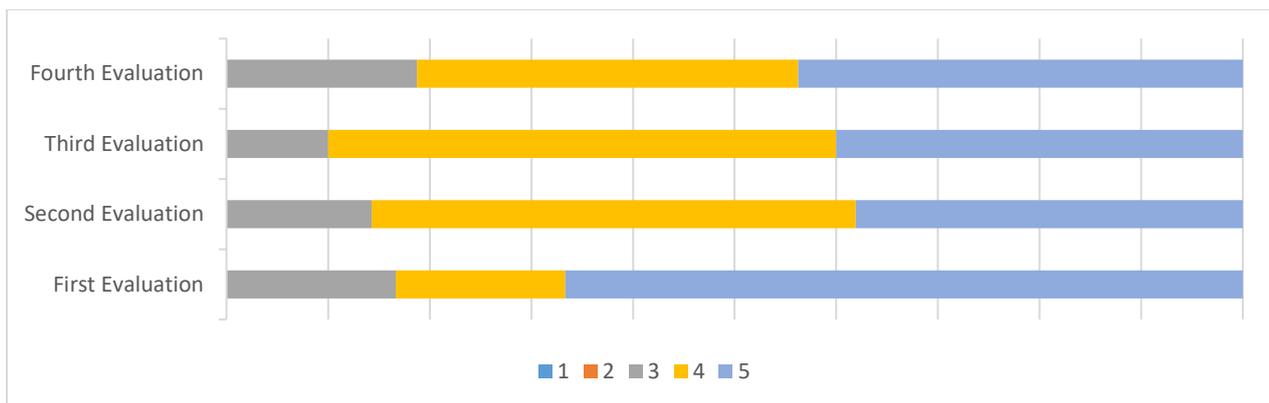


Figure 12: How do you perceive that the partnership arrangements work with relevant partners?

### 5.3. IN PREVIOUS EVALUATIONS

In the first and second evaluation, the respondents were asked about the consultation and involvement with intended users. During the second evaluation period the perception of the consultation and involvement of intended users was better and was no longer seen as a challenge. This could be due to the project still being in its early stages and that implementation was yet to take place. In the first evaluation, the response was more negative than when the same question was posed regarding key stakeholders or partners. The same question was not posed within the third evaluating period, however the respondents noted in general that the covid-19 pandemic was a barrier to stakeholder engagement especially regarding citizen involvement.

When it comes to stakeholder involvement the questions have changed. In the first two evaluations, the respondents were asked how consultation and involvement with stakeholders, partners and intended users had been. This question was not posed in the third and fourth evaluation, but respondents were asked more specifically about stakeholder interaction. This is most likely due to the characteristics of the different phases.

When asked how they perceived the partnership arrangements the respondents answered positively in general throughout all evaluation phases. The satisfaction with the arrangements with project partners was in general higher than with relevant key stakeholders. Satisfaction with the partnership arrangements were highest in the first evaluation period but remained high throughout. Regarding work with relevant key stakeholders, the lowest satisfaction was seen during the first evaluation period and the highest during the second.

When asked if stakeholder or end-users perspectives were included and/or if they were involved in the work, the answers varied but most respondents take stakeholders and end users perspectives into account during stakeholders meeting and they also present their work to get feedback. When asked the same question in the second evaluation period, most of the respondents answered that they have included perspectives and/or involved new stakeholders in their work. This was mainly due to the respondents needing more information about technical components and solutions, to increase their understanding of how the platform could and should be used as well as learn about the stakeholders' needs. One third of the respondents said they had included or considered including new stakeholders. When asked if new or different types of stakeholders were used during the third phase, almost half of the respondents had not included new stakeholders in the 12 months.

## 5.4. OTHER THEMES OF EVALUATION

In the first evaluation, the respondents identified standardization barriers with the FIWARE platform and new standards for exchanging information as well as with the IT infrastructure supplier. This caused problems for deployment of the SCOREwater platform. In the second evaluation, a little under half of the respondents answered that no other barriers were identified. Those identified were for example, legal barriers when installing sensors in the ground to measure soil moisture, technical barriers when accessing data as data owners must approve use, and ethical issues related to personal information when carrying out surveys. In the third evaluation, a little over half answered that no barriers were identified, and those that were consisted of standardization barriers, behavioural or legal barriers. This was seen to suggest no significant change all in all compared to the second evaluation.

### 5.4.1. IDENTIFIED BARRIERS AND SUGGESTIONS

Out of the respondents, 88% did not identify barriers or challenges other than those already mentioned. This is a significant improvement from the previous evaluation where the number of respondents was 57%.

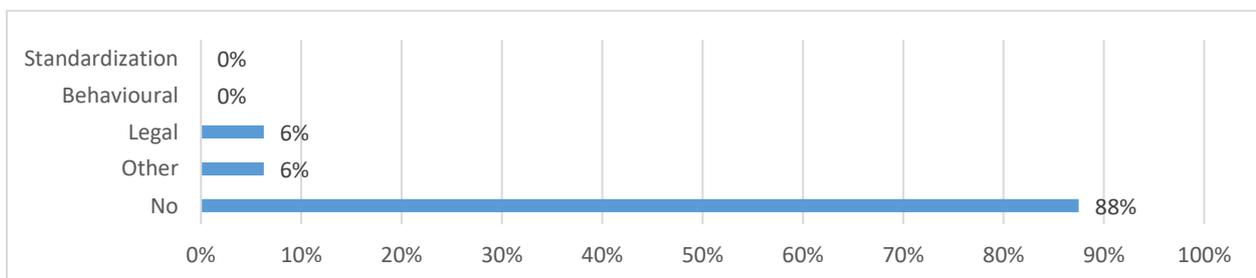


Figure 13: Have you identified any other barriers in your work so far (e.g., standardization, behavioural or legal barriers) that wasn't covered in previous questions?

In absolute terms one respondent has identified legal barriers, compared to a total of four respondents in the prior evaluation identifying legal, behavioral and standardization barriers. This respondent stated that, from a legal perspective, in the future all water infrastructure (not only drinking/raw water) will become more sensitive data which will make it more difficult to access and make public. One respondent identified that the epidemiology of wastewater required the absolute collaboration of health authorities to continue the advancement of the line of work.

## 5.4.2. IMPORTANT LESSONS

In this evaluation the lessons learned focused on potential usability of SCOREwater after the project ends.

When the respondents were asked how they assess the potential usability of the SCOREwater technology after the project has finished some stated that the project could be useful for an interested end-user and that it has a high potential and feasibility. The potential for the monitoring of water levels and turbidity and for the flood early warning system that has been developed is also mentioned and perceived as good. In the case of Barcelona, the usability is stated clear, “On the sociology and epidemiology of wastewater, the pandemic has shown its complete verification.”

Opinions differed regarding the potential more specifically. On the one hand, respondents stated that they are not sure about the business model, that some set-ups are expensive to replicate and that the scalability of most services is low. On the other hand, several respondents mention that the project structure allows for future development, that the reusability of the developed technology is high and that some of the work and results can hopefully be used in future product development. One respondent thinks that some of the project’s technologies can be exploited individually in further refinement.

The data platform was mentioned by several respondents. The platform could be kept alive after the project if it is formed so that the partners are happy to use it, which would make it possible to get others on board. The platform is seen to be very useful for making special datasets available to the public.

WBE stations are now in place in many countries and are mainly situated at the entrance of WWTPs. A challenge lies in deploying such surveillance networks inside the city, by means of stations like the ones demonstrated in SCOREwater. There is a hope that municipalities, with the results obtained in the case-study of Barcelona, incorporate intra-urban stations.

To improve user experience of the SCOREwater platform, some respondents touch upon the need of standards, especially mentioning data quality standards and data modelling for science. A consensus is required to standardize digital tools and exchange formats. Both the user and the visual interface are said to need improvement. Also, visualization and notification capabilities could be easier. It was further expressed that more data and more documents of the lessons learned are needed. To spreading the platform to more users, accessibility of the platform should be improved to allow more users to understand and make use of the platform as well as encouraging and disseminating the use of the platform and its data. Along these notes, another respondent mentioned input from people with experience in communication to improve the user experience.

What respondents point to as the most important lesson learned so far in the SCOREwater project varies. One respondent raises that they see a great interest from people of various professions and citizens, in improving city water management by making smart use of measured data and models. Other lessons arose from completing a project in real conditions, as it created an opportunity for new lessons compared to laboratory conditions. The innovations deployed for the demonstration cases are mentioned. One lesson that can be seen as related is that sewer data contains much more than just the measured water quantity and quality. Also, high quality measurements in water are difficult and require a good amount of maintenance. Other lesson learned were flexibility, communication and transparency, and that importance of planning. It is also important to have great partnership and having motivated people on board. One respondent puts this as follows:

*“It takes time to coordinate and work with several partners involved. But it also results in interesting synergies to work with, and get input, from several partners.”*

Another lesson learnt involved digital meetings, where it was found that they were both challenging when it comes to involving citizens and provided opportunities when it came to international collaboration as well as collaboration with citizens.

## 6. CONCLUSIONS

Four of these types of evaluations have been carried out within SCOREwater and the results vary over time. For each phase different challenges have arisen and managed. As the focus and the activities have shifted in the project so have the experiences.

In this last evaluation, more than half of the respondents stated that they experienced barriers or other challenges with organization or planning, which is slightly more than previously. Although regarding technical barriers, they have decreased, and most of them have not been identified before.

This could be a result of the sampling carried out in a time of a pandemic and planning and organizing some of the activities and implementation have been challenging in times.

The covid-19 pandemic is also mentioned and consistently seen as both an enabler and barrier throughout most of the evaluation themes. And even though we are at the end of the pandemic, effects still linger on and have caused some delays within the project as well as in connection to the project, for example organizing events are still challenging. In general, the results show a lot of lessons learnt when it came to the technical aspects. As SCOREwater is an innovation project this is not surprising.

31% of the respondent's experienced barriers or other challenges when it came to communication and stakeholder interaction. This is significantly lower than the previous evaluation which assessed the implementation phase.

Regarding issues on partnership agreements, the dissatisfaction has increased somewhat the last two evaluations. While the satisfaction is higher when it comes to arrangements with project partners. Half of the respondents also stated that they included new stakeholders in the last 6-8 months. The arrangements with new stakeholders tend to be more challenging than with the partners working close for a couple of years.

In the fourth evaluation 88 % of the respondent's state that they have not observed any "other barriers" which is a "major" difference compared to the third when a little over half answered that no "other" barriers were identified. Something that can be due to project progress and increased knowledge about the barriers that the project has been facing and could come to face.

## 7. REFERENCES

Matschke Ekholm, H., 2020a. Input to implementation phase regarding prototyping technologies for water management. SCOREwater deliverable 4.2. Horizon 2020 project, Grant agreement No 820751.

Matschke Ekholm, H., 2020b. Input to testing phase regarding implementing technologies for water management. SCOREwater deliverable 4.3. Horizon 2020 project, Grant agreement No 820751.

Matschke Ekholm, H., 2021. Input to revision phase regarding testing technologies for water management. SCOREwater deliverable 4.4. Horizon 2020 project, Grant agreement No 820751.



# ANNEX 1 - SURVEY QUESTIONNAIRE

First are some questions about who you are!(name and affiliation will not be shown in results report)

What is your name?

Which organization/company do you belong to?

Which WP are you mainly involved in?

Which demonstration case are you mainly involved in (if all 3 write “all”)?

*Organization and planning This section is about your experiences (regarding barriers and/or enablers) in the project the last 6-8 months, regarding organization and management among partners and stakeholders, WP- leaders, task leaders, the planning and coordination of the project and activities etc.*

Did you experience any barriers or other challenges with organization or planning in the evaluation phase (past 6-8 months)?

Yes

No

Don't know

Have you experienced these barriers previous (before summer of 2021) in the project?

Yes

No

Don't know

Please describe the barriers and how you managed them:

Did you have any positive experiences (e.g. surprises, outcomes, synergies)regarding organization or planning in the evaluation phase (past 6-8 months)?

Yes

No

Don't know

Please describe the experiences and any learning from them:

*Technical aspects This section is about your experiences (regarding barriers and/or enablers) in the project the last 6-8 months, regarding the technical work, activities, know how, problem related questions (e.g., IT-infrastructure, communication about IT, data collection/structure/analysis, machine learning, algorithms, platform design etc.)*

Did you experience any barriers or other challenges with technical aspects in the evaluation phase (past 6-8 months)? Examples: Unexpected technological requirements, installation of sensors, software implementation, access, technical skills, IT.

Yes

No

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Don't know

Have you experienced these barriers previous (before summer of 2021) in the project?

Yes

No

Don't know

Please describe the barriers and how you managed them:

Did you have any positive experiences (e.g. surprises, outcomes, synergies) with technical aspects in the evaluation phase (past 6-8 months)?

Yes

No

Don't know

Please describe the experiences and any learning from them:

*Communication and stakeholder interaction This section is about your experiences (regarding barriers and/or enablers) in the project the past 6-8 months, regarding the communication and collaboration with other partners/stakeholders/end users in the project etc.*

Did you experience any barriers or other challenges with communication and stakeholder interaction in the evaluation phase (past 6-8 months)?

Yes

No

Don't know

Please describe the barriers and how you managed them:

Have you experienced these barriers previous (before summer of 2021) in the project?

Yes

No

Don't know

Did you have any positive experiences (e.g. surprises, outcomes, synergies) with communication and stakeholder interaction in the evaluation phase (past 6-8 months), eg. in interacting with any of the stakeholder types?

Yes

No

Don't know

Please describe the experiences and any learning from them:





Have you involved new/different types of stakeholders in your work in the past 6-8 months?

Yes

No

Don't know

Please describe how and what you gained from that:

How do you perceive that the partnership arrangements work with each of the following?

Please rate on a scale from 1 to 5 where 1 is Failed or insufficient and 5 is Constructive/satisfying

1      2      3      4      5

Relevant key stakeholders

Partners

*Concluding questions*

Have you identified any other barriers in your work so far (e.g. standardisation, behavioural or legal barriers) that wasn't covered in previous questions?

Standardization

Behavioural

Legal

Other

No

If yes, please explain the issues/problems, how it affected you and how you managed it:

How do you assess the potential usability of the SCOREwater technology after project end?

Please describe what you think is needed to improve user experience of the SCOREwater platform:

What do you see as the most important lesson learned so far in the SCOREwater project?



## ANNEX 2 – STOCKTAKING

A final Annex of stocktaking was included in all Deliverables of SCOREwater produced after the first half-year of the project. It provides an easy follow-up of how the work leading up to the Deliverable has addressed and contributed to four important project aspects:

1. Strategic Objectives
2. Project KPI
3. Ethical aspects
4. Risk management

### STRATEGIC OBJECTIVES

Table 1 lists those strategic objectives of SCOREwater that are relevant for this Deliverable and gives a brief explanation on the specific contribution of this Deliverable.

Table 1. Stocktaking on Deliverable’s contribution to reaching the SCOREwater strategic objectives.

Project goal	Contribution by this Deliverable
<b>SO5. Identify and mitigate key barriers to implementation of smart, resilient water management</b>	<p>The deliverable could indirect help contribute to reach expected impact. It contributes to SO5 direct as this is one of the key deliverables identifying and reporting on key barriers.</p> <p>It is presenting lessons learned, highlighting experiences to reach improvements and development. It is contributing to SO5 to identify and mitigate barriers for implementation.</p>

### PROJECT KPI

Table 2 lists the project KPI:s that are relevant for this Deliverable and gives a brief explanation on the specific contribution of this Deliverable.

Table 2. Stocktaking on Deliverable’s contribution to SCOREwater project KPI’s.

Project KPI	Contribution by this deliverable
<b>10. Standardization barriers identified and mitigation options demonstrated</b>	<ul style="list-style-type: none"> <li>• No standardization barrier was identified in the evaluation. Most of the respondents (88 %) did not identify barriers or challenges other than those already mentioned. This is a significant improvement from the previous evaluation where the number of respondents was 57%.</li> <li>• One respondent experienced legal barriers.</li> </ul>
<b>11. Behavioural barriers identified and mitigation options demonstrated</b>	<ul style="list-style-type: none"> <li>• No behavioural barrier was identified in the evaluation. Most of the respondents (88 %) did not identify barriers or challenges other than those already mentioned.</li> </ul>
<b>12. Technological barriers identified and mitigation options demonstrated</b>	<ul style="list-style-type: none"> <li>• Around 40 % of the respondents stated that they experienced barriers or other challenges with technical aspects in the evaluation phase. Around a third of the respondents specified that the barriers experienced had also been experienced previously. See chapter 4.</li> </ul>

Project KPI	Contribution by this deliverable
13. Organizational barriers and enablers identified, and mitigation options demonstrated	<ul style="list-style-type: none"> <li>More than half of the respondents stated that they experienced barriers or other challenges with organization or planning during the fourth evaluation. Half of the respondents had experienced these barriers previously in the project, i.e., before the summer of 2021. See chapter 3.</li> </ul>

## ETHICAL ASPECTS

Table 3 lists the project’s Ethical aspects and gives a brief explanation on the specific treatment in the work leading up to this Deliverable. Ethical aspects are not relevant for all Deliverables. Table 3 indicates “N/A” for aspects that are irrelevant for this Deliverable.

Table 3. Stocktaking on Deliverable’s treatment of Ethical aspects.

Ethical aspect	Treatment in the work on this Deliverable
Justification of ethics data used in project	Not relevant
Procedures and criteria for identifying research participants	Not relevant
Informed consent procedures	Not relevant
Informed consent procedure in case of legal guardians	Not relevant
Filing of ethics committee’s opinions/approval	Not relevant
Technical and organizational measures taken to safeguard data subjects’ rights and freedoms	Not relevant
Implemented security measures to prevent unauthorized access to ethics data	No personal information has been handled
Describe anonymization techniques	The survey was sent out to all partners, but no information is given about who have responded and what they single individuals have answered.
Interaction with the SCOREwater Ethics Advisor	None, not relevant

## RISK MANAGEMENT

Table 4 lists the risks, from the project’s risk log, that have been identified as relevant for the work on this Deliverable and gives a brief explanation on the specific treatment in the work leading up to this Deliverable.



Table 4. Stocktaking on Deliverable's treatment of Risks.

Associated risk	Treatment in the work on this Deliverable
	No risk from the risk log identified





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