SUWANU
EUROPE

Development of Regional Action Plans for the fast implementation of water reuse to the 8 pilot Regions of the SUWANU EUROPE project:

Steps for the implementation of the Regional Action Plan for Flanders, Belgium

Contents

1.1 Context and aim of the Flemish Regional Action Plan

This Flemish Regional Action Plan (RAP) was coordinated and written by het Proefstation voor de Groenteteelt (PSKW) as partner organization in the SuWaNu Europe project. PSKW is one of the horticulture research centers in Flanders currently involved in various projects on this specific thematic. The elaboration of the RAP involved a variety of stakeholders – among others the Flemish Environmental Agency (VMM) responsible for the implementation of the EU regulation regarding reclaimed water for agricultural irrigation. Although many stakeholders gave their input for this RAP, it might not be seen as a plan that will be enforced by the regional authorities but rather as an advisory document.

1.2 Method for the elaboration of the Flemish Regional Action Plan

The development of the Regional action plan (RAP) for Flanders was elaborated in close collaboration with the Regional Working Group (RWG). During the past 18 project months, the RWG met four times to interact on the specific actions of the SuWaNu Europe project. The preparation of the RAP was the common thread running through these sessions. Table 4 provides an overview of the meetings of the Flemish RWG and the topics of the RWG meetings.

Table 4: Overview of the RWG of the Belgian target area

RWG	Date	Scope of the RWG
1	6th of May 2019	▪ *General introduction of the SuWaNu Europe project* ▪ *Expectations of the SuWaNu Europe consortium and RWG members*
2	26th of September 2019	▪ *SWOT & PEST analysis Belgian pilot area* ▪ *Interactive sessions: first steps towards a RAP... identifying the needs for knowledge exchange to support water reuse*
3	20th of February 2020	▪ *Presentation and in-depth discussion on "demand for reclaimed water in agriculture" and "quality needs for reclaimed water", 2 of the identified themes (RWG2)*
4	24th of June 2020	▪ *Online workshops and presentations on the "suitability analysis of reclaimed water for irrigation purposes" and "migration of micropollutants through our growing systems"* ▪ *Interactive discussion to identify actions to be implemented in the RAP*

During the second RWG meeting, the participants were asked to list their needs and obstacles to support uptake of water reuse in Flanders. The discussion revealed that further insights are needed in a series of topics as the primary steps in the RAP. The following topics were identified:

1. Identification of the need for water reuse for irrigation purposes in the provinces of Antwerp and Limburg
2. What are the quality requirements from the perspective of the plants, growing systems, irrigation methods, soils, human health…?
3. What are the possibilities related to distribution of the reclaimed water?
4. Will use of the reclaimed water lead to competition with for example nature?
5. How should the framework have to look like? Who will have access to the reclaimed water?

Topics 1 to 2 were presented and discussed in more detail during the third and fourth RWG.

Besides the meetings (Fig. 2), RWG members were contacted whenever their input was relevant for the interim elaboration of the different tasks and preparation of the RAP. All members received the draft of the RAP and were offered the possibility to comment on the document.

Figure 2: Impression of the workshop during the 1st RWG

1.3 Flemish Regional Action Plan

1.4 Legal framework

Result 1.1: National legislation complies with the European legislation regarding wastewater treatment and reuse of reclaimed water

At the Flemish level, the use of treated wastewater for irrigation purposes is, nowadays, regulated under the national "Raw Material Statement" (Grondstofverklaring). The Raw Material Statement includes a risk assessment for the implementation of treated wastewater under specific conditions. Therefore, a risk assessment is performed taking into account the water quality of the treated waste water, the intended use, the duration of the use. This risk assessment is, however, limited. As no reclamation facilities exist yet in Flanders, this regulation only relates to the use of treated wastewater.

The current 'Raw Material Statement' does not fully respect the conditions prescribed by the new EU-legislation. F.e. the minimal quality criteria are not enforced. Therefore, a new legal framework will be developed that ensures a full implementation of the new EU-legislation and is broad enough to capture all water reuse activities where a need for regulation has been detected.

Step 1.1.1 Developing national legal and administrative framework to implement the EU-legislation

The new European legislation strives to implement reclaimed water in a safe way for humans, animals and the environment. This implies that the European legislation needs to be integrated into national and regional legislations related to food security & public health, environment and agriculture etc. The relevant legislations will have to be identified and evaluated, as they may pose additional restrictions to the use of reclaimed water.

Step 1.1.2 Involve stakeholders in legislation discussion Flemish level

Stakeholders will also be involved in the development of the new adapted framework for reclaimed water for agriculture.

Step 1.1.3 Evaluation of an eventual 'opt out' option

Belgium will have to implement the new European legislation regarding water reuse by the 26th of June 2023 unless Belgium considers that there is no need for reclaimed water to fulfill the irrigation needs for the agricultural sector. At the moment of the finalisation of this deliverable (June 2020), the Flemish Environmental Agency (Vlaamse Milieumaatschappij, VMM) is coordinating the investigation of both options for the Flemish region. In case this study reveals there is no or only limited need for the use of reclaimed water, Belgium can opt out. Every six years, this study will have to be reviewed.

Increased insights in reclaimed water needs for irrigation purposes are crucial in order to develop the national translation of the European law on water reuse. Actions supporting deeper insights in the potential of water reuse for the provinces of Antwerp and Limburg are included in Section 3.1.3.

Result 1.2: The legislation allows the use of reclaimed water throughout the year for agricultural irrigation

Year-round use of reclaimed water might be of interest to ensure the economic feasibility of water reclamation (cfr. Section 3.1.6). Currently, reclaimed water can be applied year-round in case the water quality criteria posed in the European legislation are met. Nevertheless, sectoral regulation can pose restrictions.

Step 1.2.1 Evaluation of the European legislation on reclaimed water in the frame of the Flemish manure decree

As reclaimed water contains nitrogen and phosphorus its use has to comply with the regulations posed in the Manure Decree. Reclaimed water is classified as "other fertiliser" and will have to be applied according to the regulations linked to fertilisers classified in this category. Use of "other fertilisers" is not allowed in outdoor crops from 1st of November till 15th January. The year round use of other fertilisers is allowed for greenhouse crops. As the application of nutrients through reclaimed water appears to be limited, it might be relevant to simplify the legislative requirements for reclaimed water under the manure decree as to lower the administrative threshold for farmers. The latter needs investigation and discussion with the stakeholders.

The Flemish Land Agency (Vlaamse Landmaatschappij, VLM) is responsible for the development of the Manure Decree and its implementation.

Step 1.2.2 Evaluation of the European legislation on reclaimed water in the frame of the national implementation of the Water Framework Directive (Stroomgebiedbeheerplannen)

Part of the "Stroomgebiedbeheerplannen" strives to achieve good qualitative and quantitative status of the Flemish waters. The current Stroomgebiedbeheerplannen focus on the period 2016-2022. New plans (2022-2027) have to be developed taking into account the impact of water reuse on both water quality as water quantity conditions of the Flemish waters.

Result 1.3: European and national organizations have strict regulations regarding reclaimed water quality standards

Currently, the legislations and guidelines for the quality of reclaimed water intended for agriculture put a lot of emphasis on human microbial safety. Norms and monitoring mentioned in the European legislation relate to parameters such as pathogens and microorganisms, chemical-physical parameters, BOD (biological oxygen demand) and COD chemical oxygen demand) (Alcalde-Sanz and Gawlik, 2017). Nevertheless, several other contaminants are detected in reclaimed water, such as undesirable ions (sodium), heavy metals and micropollutants. These contaminants are not often described in the guidelines, but can be taken in via vegetable consumption causing potential hazard for human health or plant development issues. Although human health is a major concern, the impact of these contaminants on plant development and ecological interactions must not be overlooked.

Step 1.3.1 Research initiatives to gain insights in long-term effects of the use of reclaimed water under Flemish agricultural conditions

In order to write up-to-date guidelines and to encourage the use of reclaimed water on Flemish agricultural fields and greenhouses, it is important to enrol long-term experiments for the different agriculture practices to comprehend the effects of sodium and micropollutants behaviour in plants and on various substrates.

Particular attention to sodium concentrations in water should be considered for most cropping systems. Similar to plant species, most crops require low sodium concentrations as they are not adapted to high sodium or salinity environments. Sodium ions, heavy metals, multiple micropollutants and derivate might negatively affect soil structure, microbial activity and soil-plant interactions. As their impacts are multidirectional, all these different chemical compounds and micro-organisms have to be taken into consideration, in case reclaimed water source is declared for agricultural purposes.

Recently, multiple studies confirm the uptake of micropollutants and assume that uptake depends largely on three factors: 1) transpiration rate of the crop, 2) specific chemical and physical properties of the micropollutants or undesirable ions, and 3) chemical and physical conditions of bulk soil-rhizosphere environment. When one of these factors differs, the bioavailability of these compounds is altered and a different uptake pattern will be followed. Due to this variation and sparse knowledge about the complex interactions, it is difficult to predict the migration of micropollutants, bioavailability and uptake by plants.

Various research initiatives can be undertaken to investigate the missing information for the implementation of reclaimed water in Flemish agriculture:

- Opportunities are launched by National programs, both research and demonstration projects.
- Opportunities are launched by European research programs, such as H2020, Life, EIP, etc.

Box 1: The uptake of undesirable compounds in plants

Plant growth is determined by metabolic processes and transpiration rate. Similar to specific growth requirements, the total water demand for optimal growth differs among plant species. Water, nutrients and micropollutants uptake are tightly regulated by cellular

processes. One major characteristic which can affect the uptake of micropollutants is the pH of the rhizosphere and this external intermediate zone is controlled by the plant. Plants alter the pH by excreting ions, sugars, proteins into the rhizosphere. Through these changes, physio-chemical properties of micropollutants can switch and these compounds can become bioavailable and taken up together with nutrients via the symplastic or apoplastic route. Significant differences were detected in the uptake of micropollutants among species but also between cultivars (as demonstrated in carrot cultivars). It is suggested that lipid content of leaves and roots play an important role in the uptake of micropollutants. Knowledge about the bioavailability of micropollutants controlled by plants together with the uptake regulation is not yet fully understood.

Several researchers suggest that the transpiration rate is a good estimator for micropollutant uptake. Nevertheless, some questions remain about the maximum concentration able to be taken in and how these compounds are translocated within the different plant tissues - particular into the edible parts. More information is necessary about their role in metabolic processes for growth and development.

Box 2: Uptake and accumulation of compounds in soil and substrate

Various soil properties affect the migration, accumulation (sorption) and leaching of sodium and (micro) pollutants and inherently play a vital role in plant uptake. Soil type, organic matter, cation exchange capacity (CEC) and pH determine the bioavailability of micropollutants and sodium ions. Clay and loam will accumulate these compounds whereas in sandy soils these compounds will often percolate or leach. Additionally, the chemical-physical properties of (micro) pollutants, such as ionizable compounds and lipophilic characteristics, play an important role for their accumulation in soils or uptake within different plant tissues. Importantly, agronomical practices such as, tillage and soil mulching, can alter soil characteristics and simultaneously affect the bioavailability of the micropollutants. Furthermore, it is occasionally observed that sodium ions and various micropollutants can induce unequal/dispatched water distribution in soils, so called 'hydrophobicity effect'. These compounds enforce the water repellence and result in a reduced soil hydraulic conductivity. As the long-term effects of these interactions are yet unknown, it is important to elucidate these effects before reclaimed water is frequently applied on agricultural field.

Although a large body of literature is available about the use of reclaimed water for irrigation, most studies investigated conventional cultivation practiced in Southern European countries. Importantly, the majority of Flemish greenhouse horticulture differs from these Southern European practises. Whereas, conventional cultivation does have organic soil types (sand/loam/peat) and do not use recirculation, the closed hydroculture growing systems performed in Flemish regions use inert substrate (stone wool) follow a zero-waste strategy, and try to re-use 100% of water and nutrients applied. Insufficient knowledge is available about the accumulation and thresh-hold concentrations of various unwanted ions and compounds in inert substrates, originating from reclaimed water, which confines good support for guidelines.

In countries were already reclaimed water irrigation of soil-bound crops are common practices, multiple studies are performed to investigate the effects of the use of reclaimed water for irrigation of various crops. Even when the agricultural practices and crops are similar among experimental setting, soils and climate of arable land differ in many respects and therefor it is difficult to compare one on one outcomes. This does not imply that the results cannot been viewed for the Belgian agricultural practices, as open field practices are almost similar between all countries. Even more so, the results from previous studies can be taken into

account to make good predictions for the Belgian settings, but profound conclusions cannot be deducted. Due to this is recommendable to conduct experiments to test the use of reclaimed water, for a specific crop, soil type, climate, and irrigation period and technique in Belgian. A more general note, many efforts are already put forward however as every setting is unique and a large number of repeats are still missing to compare outcomes and confirm the effect of particular chemical compounds, present in reclaimed water. Importantly often only the crop and agricultural setting is tested only once, but is very desirable to generate more results about this topic to fill in the complete image for the sustainable use of reclaimed.

Step 1.3.2 Defining indicative water quality guidelines meeting human health, environmental and agricultural needs

In order to put forward informative guidelines for the long-term use of reclaimed water and good common agricultural practices, insights gained from research, mentioned in section 1.3.1., should be used to substantiate. Indicative thresh-hold values for different heavy metals, undesirable ions (sodium) and micropollutants would complement the existing criteria for direct human health issues. These water quality guidelines should be evaluated with the different actors involved and should be incorporated in the sectors' "Standard for good Agricultural Practices", such as "Global Gap" but also the standards set at the national level, such as "Vegaplan".

Step 1.3.3 Developing and implementing proper and practical feasible risk management systems

The new European regulation includes the implementation of water risk management systems. Risk assessment systems should not only address the effects on human and animal health and the environment but also the possible risks posed to the crops grown under Flemish climate conditions and adapted to the growing systems (soil bound/soilless with(out) recirculation). These risks management systems will need regular evaluation and adaptation according to the latest insights.

1.5 Investments

Currently, only very limited investments exist in reclamation facilities or distribution networks to use reclaimed water for agricultural irrigation in Flanders.

No fully-operational reclamation facilities exist in Flanders to reuse water originating from wastewater treatment plants. Although there is growing interest from different actors to experiment on a small-scale and with pilot treatment, it is too early to speak about concrete investment plans or locations for reclamation facilities.

Hand in hand goes the process for the investments in distribution networks. Experiences of farmers in the last years made apparent that road transport of water is only cost-efficient in a very limited radius (range of a few kilometers). The stakeholders' discussion with the regional working group also stated that road transport is not a sustainable option from a mobility and emission point of view, and therefore distribution networks should be favored where feasible. Contrary to some southern European countries, farmers in Flanders do not have the tradition to cooperate regarding the supply of water to their fields. Water shortages used to be rare and

occasionally. This is the reason very few irrigation canals or irrigation cooperatives have seen the light in Flanders. Two distribution networks and their famers' cooperatives, the CIRO-network[1] and Inero-network[2], can be used as example for future initiatives in the region. The lack of investments in reclamation facilities and distribution networks can be explained by the lack of insights in the costs and benefits linked to these investments. By consequence it is not yet feasible to elaborate case-specific business plans. Following reasons limit these investments:

- Clear water quality recommendations for the agricultural users to which the reclaimed water must comply (depending on the application use and period), aside from the legislative quality criteria defined in the EU regulation.
- The amount of treated wastewater available to be reclaimed for agricultural end-uses
- The demand of the agricultural sector for reclaimed water compared to other water source
- Unclear which actor is willing to invest in these infrastructures and how this investment can be returned (business plan)

Result 2.1: Investments in reclamation facilities and distribution networks

Step 2.1.1: Defining indicative water quality guidelines for reclaimed water intended for agricultural purposes

In general, good water quality for agricultural practices are based on EC-values, pathogens and chemical and biological activity. Although the EC-values are important when horticulture is performed, they are indicative but not conclusive and often not giving all the required important information. As efforts can put in the latter, it is recommendable to include also the actions mentioned under step 1.3

Step 2.1.2: Quantification of the demand of the agricultural sector for reclaimed

Adequate infrastructures and reclamation facilities can only be foreseen based on specific water demand from the agricultural sector – and by extension other sectors. Therefore, the regional quantification of the water demand per agricultural system (with their specific water quality criteria) is essential.

[1] VLML. (2017). Ruilverkaveling MOLENBEERSEL.
[2] https://f2agri.vito.be/nl,

Box 3: Quantification of water needs at field level

Water needs can be estimated per type of crop, soil/soilless and other site-specific parameters. These vary considerably based on the weather conditions. PSKW calculated the water shortages at field level - in case optimal crop growth was aimed - based on historical climate scenarios (and previously mentioned field-specific parameters). Mapping of water needs for the year 2018 resulted in Figure 3.

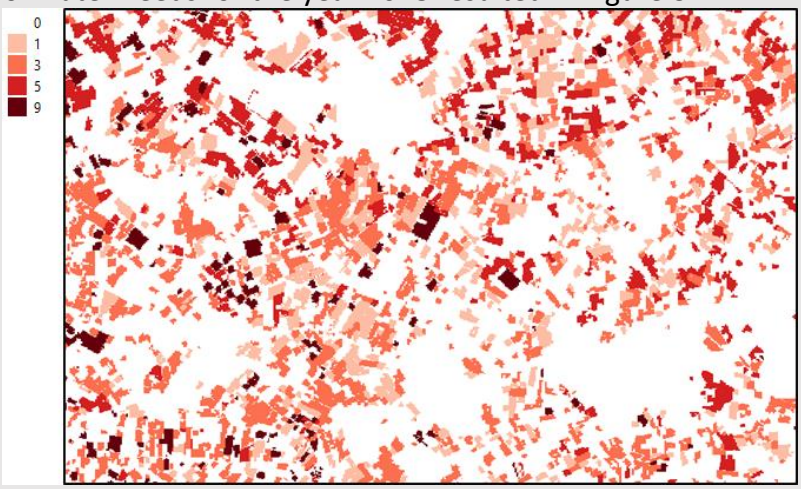

Fig 3: Estimation of water needs at field level for a region in the province of Antwerp based on weather data of 2018. Normalization of the results between 0 (no water shortage) and 9 (> 200 l/m²/year m³)

Although maps give valuable insights in the agricultural water demand per region, it only partly indicates the interest for reclaimed water as water source. Further steps should be taken to quantify the interest in reclaimed water compared to other available sources (surface water, groundwater, more buffering of rainwater, tap water…).

Step 2.1.3: Insights in the amount of treated wastewater available to be reclaimed for agricultural end-uses

During the summer, the inflows of treated wastewater represents the major share of the total river flow in some watercourses. In these cases, the discharges from wastewater treatment plants are essential to guarantee the ecological life in those watercourses. To prevent some rivers to dry out in case water would be reclaimed for agriculture, the Flemish Environmental Agency plans to determine “minimum ecological flows” per watercourse. In case a watercourse essentially relies on treated wastewater and is ecologically important, limitations would prevail on the volume of water reclaimed water allowed for agricultural irrigation.

Step 2.1.4: Identification of suitable locations for the use of reclaimed water for agricultural irrigation

The identification of suitable locations for the implementation of reclamation facilities and distribution networks depends on various factors, namely:

- water treatment requirements in order to comply to specific laws and guidelines (step 2.1.1),
- the quantity of reclaimed water demand for agriculture (step 2.1.2)
- the available water to be reclaimed (step 2.1.3),

- the presence of water-demanding fields in the neighborhood of wastewater treatment plants (as an indicator of the distribution/transport costs)

The mentioned parameters are site-specific, and should therefore be evaluated spatially.

Box 4: Methodology to evaluate the suitability for reclaimed water for agricultural irrigation

PSKW performed a first version of a geospatial suitability analysis based on the methodology of Manashi et al. 2019. Multi-Criteria Decision Analysis (MCDA) was used as method to evaluate the suitability of a location for irrigation with reclaimed water in Flanders. This method consists to integrate various information of various evaluation criteria into a final suitability map. The first version considered following criteria

Crop category cultivated (as a proxy for the "treatment needs")

Volume of water shortage (as a proxy of the "demand for reclaimed water")

Distance of the field from a wastewater treatment plant (as a proxy for the "distribution cost")

Action areas for groundwater (as a proxy for vulnerability of (groundwater)water resources)

Each of the criteria was assessed and normalized to a score from 0 (not suitable) to 9 (very suitable). Afterwards, they were integrated into a final suitability score given assigned weights.

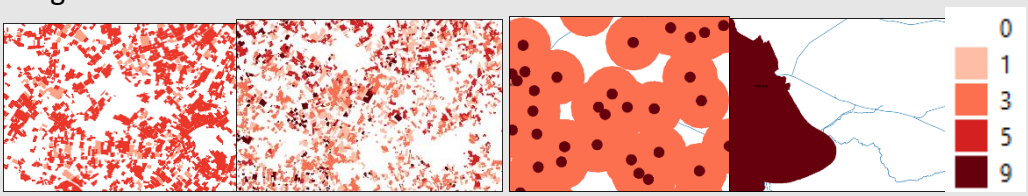

Figure 4: *The four evaluation criteria for a specific region scored from 0 (not suitable) to 9 (very suitable) are used as input for the final suitability map.*

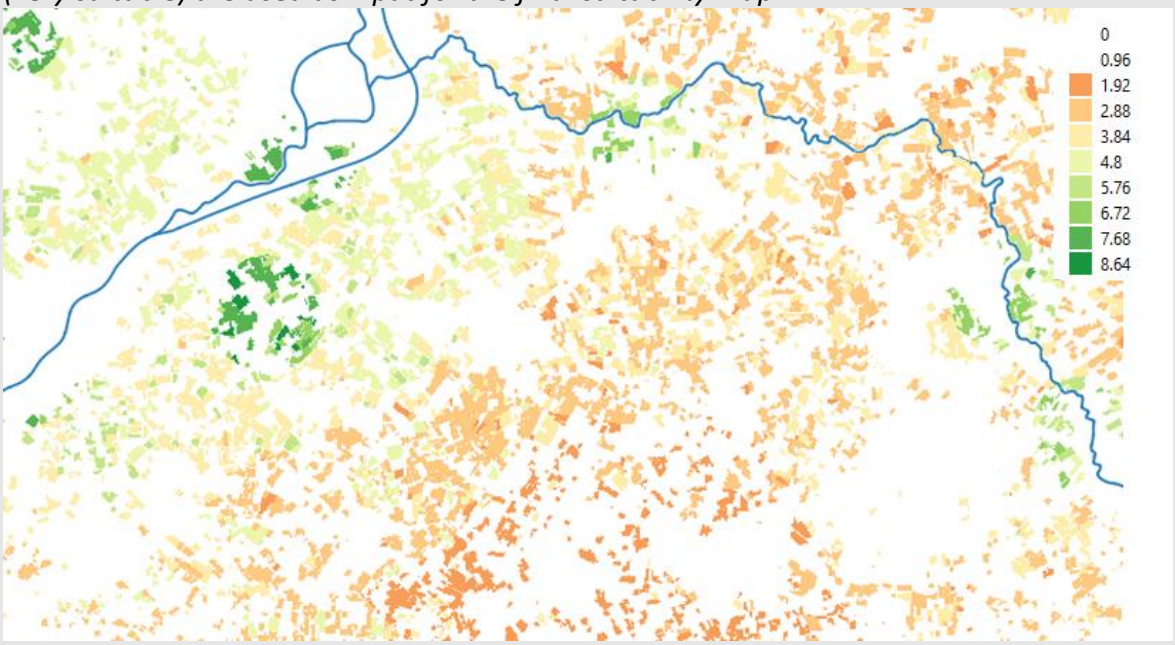

Figure 5: First version of the suitability analysis for a region in the province of Antwerp (0 =not suitable, 9 = very suitable)

The analysis was performed for the Province of Antwerp, and can be extended to different provinces. This preliminary analysis was presented and discussed during the 4th regional working group with the stakeholders.

To further elaborate the suitability analysis, future additions could be made with information regarding:

- Availability of reclaimed water (based on the minimum discharges in rivers)
- Demand for reclaimed water compared to other water resources
- Better estimation of the treatment needs per crop category

Those integrations can be added, once progress has been achieved in respectively step 2.1.1, 2.1.2 and 2.1.3.

Step 2.1.6: Elaboration of cost-benefit analysis and business plans

Once the previous steps performed, potentially interesting locations might be identified to invest in reclamation facilities and distribution networks. In those locations, it will be crucial to develop site-specific business plans in order to evaluate the economic feasibility to invest in reclamation facilities and distribution networks. According to the demand and type of agricultural cropping systems (more horticulture or soil bound crops,…) -eventually other users - costs of treatment technologies and operations can be evaluated for reclamation facilities. Business plans for distribution networks will be developed based on the, among others, the amount and type of users, the distances from the reclamation facility to the users, and road crossing.

Other important aspects that will be defined while setting up the business plan are:

- **The investor**

  It is crucial to define the organization or actors who will invest in the infrastructures and will take care of the maintenance and operation.

  Regarding reclamation facilities, it is not evident the wastewater treatment provider – Aquafin - sees interest in financing and running the treatment operations. In this case, other actors – private companies, farmers or the state – might be interested. This will strongly depend on the scale and application use of the reclamation facility.

  The business model for the development of the distribution (network) will strongly differ depending on the investing actor(s).

- **The payment method**

  This refers to the method to collect the revenue stream. Some cases work with a fixed/variable fee to users which account for the treatment and distribution costs.

- **Cooperation of users**

  In case the reclamation facility and distribution network deliver a service to multiple users, a cooperation agreement would be relevant on aspects such as payment, water management communication.

- **Constitutional framework**

  This relates to the role of the state in supporting initiatives of reusing water for agriculture. As apparent from the database of initiatives, many cases in Southern Europe get essential state support in the form of investments, grants or subsidies.

Depending on the political vision in Flanders for the reuse of water for agriculture, this support might play an essential role in the development of reclamation infrastructures and distribution networks.

- **Sludge treatment and disposal**

When cleaning your water, most of the microbial and chemical waste accumulates in the sludge. Since these undesirable and toxic chemicals are persistent within the sludge, vigorous cleaning of the waste stream is required before disposal on land or nature. As the costs for the treatment of the waste stream can be considerable, those need to be accounted in the business plan.

1.6 European network

Result 3.1: Flanders promote international exchange and dialogue to expand the use of reclaimed water

Step 3.1.1 Participation of Flemish RWG members in international (thematic) networks related to water reclamation

The use of reclaimed water for irrigation purposes is still very new for the Flemish agricultural region. As described above, policy, infrastructure and practical experiences are very scarce are lacking. The region, therefore would benefit from a close interaction with other Member States more experienced in the implementation of reclaimed water. From this perspective, the participation of PSKW in the SuWaNu Europe thematic network is an important step forward; The thematic network (TN) allows to exchange relevant and in –depth information and experiences with the other European Member States involved in the project. The development of the SuWaNu Europe initiatives database proved being a good exercise to get a broader view on the different aspects involved in the implementation of reclaimed water.

PSKW also participated in events of the Water Reuse and EUVRIN, again excellent opportunities to exchange relevant information related to reclaimed water.

It is strongly advised to all partners involved in the RWG to be actively participating in these European networks to exchange knowledge on water reclamation.

Step 3.1.2 Participation of Flemish RWG members in international networks related to "water and nutrient management" at large

It is recommendable to participate in European networks addressing "water and nutrient management" at large. In the past, PSKW was involved in the thematic network FERTINNOWA focusing on a broad range of technological aspects related to irrigation and fertigation practices applied all over Europe. The exchanged knowledge showed being very relevant for the practical implementation of reclaimed water in the Flemish horticultural sector. The thematic network supported PSKW finding adequate technologies to apply, for example, selective sodium removal supporting the use of reclaimed water in soilless greenhouse crops applying recirculation. But also, further insights in growing vegetables with higher sodium levels, both in outdoor as indoor crops.

A close linkage to the "EURAKNOS" thematic network might be very relevant as this thematic network aims providing the overview of the existing European H2020 initiatives. It should be strongly recommended to maintain and strengthen the linkage to these international networks. This can be achieved by actively contributing to these and new initiatives, especially for those topics identified as remaining knowledge gaps (cfr. Section 6.1). PSKW is active member of the EURAKNOS consortium.

Result 3.2: All actors involved in reclaimed water implementation have a specific network to share and exchange results and practices

Step 3.2.1 Active participation in operational groups focusing on reclaimed water for agricultural irrigation

At the Flemish level, authorities promote the organisation of Operational Groups (EIP). These initiatives focus on the collaboration of actors with various background (farmers, advisors, technology suppliers, authorities, researchers, …) on specific topics. Nowadays, there is a strong focus on circularity and water issues in Flanders. It is strongly advisable to organise operational groups and to use the European framework of the EIP Agri to get in contact with other initiatives and exchange information. Furthermore, one should make use of opportunities offered by initiatives such as the EURAKNOS and SuWaNu Europe to connect and contact European initiatives.

Step 3.2.2 Identification of related initiatives at the national and international level

Initiatives, such as the before mentioned thematic network EURAKNOS might already provide an overview of related European initiatives. The follow-up initiative "EUREKA " is building a database collecting the project outcomes of a broad range of European initiatives and providing a way to get in contact with the experts involved.

At national level, it is recommended to provide an overview of the initiatives ongoing in the field of reclaimed water. The SuWaNu Europe database developed in task 1.2 was already a first approach collecting the initiatives at Flemish level. This initiative should be maintained even after the SuWaNu Europe project ends.

1.7 Social acceptance

Result 4.1: The general public is aware of the status of water availability in Flanders

Step 4.1.1 Carry out information campaign on the status of water availability in Flanders

During the past four years, the general public in Flanders has been confronted with successive periods of drought. The authorities and media did great effort to inform the broader public about the rather low water availability per capita. However, further initiatives are recommendable to support the decrease of the fresh water use per capita and increase the awareness of the wider public for alternative water sources. The Flemish government is investing in initiatives supporting behavior changes and these initiatives should be maintained.

The Flemish Environmental Agency formulates tips regarding water use to the general public, and gives with regular updates about the latest actual status of drought in Flanders.

Figure 6: Example of one of the Flemish infographics showing the general public how to decrease the water use per capita (2016 - VMM) - focus on tap water.

Results 4.2: The general public is aware of the benefits regarding the use of reclaimed water in agriculture

Step 4.2.1 Set up a communication strategy to inform the broader public about the use of reclaimed water and overcome the disgust of the general public

The VMM foresees a communication strategy to overcome the general public's disgust for the use of reclaimed water. Currently, there is no information about the public opinion in Flanders regarding the use of this water source for agriculture. Inspiration for the communication strategy can be obtained from other countries/regions already implementing reclaimed water for many years, such as Israel, California, Cyprus, …. . In Flanders, the communication experience of IWVA might be of interest since one source of their drinking water production originates from a wastewater treatment plant. Awareness raising actions, consultation and collaboration

activities for the development of the various wastewater reuse schemes might be appropriate. Transparency on exposure risks to the public and how these will be addressed.

Box 5: Book for children to raise awareness on water reuse

Inspiration can be found in the SuWaNu Europe Deliverable 1.4 Lessons learnt from Israel and Cyprus success stories and in Deliverable 1.2 The initiative database. It should be considered including the different population groups, including (small) children. One of the inspiring examples in Cyprus informing children on water issues. "The secret handbook of the blue circle" was inspired on the scientific work carried out by the research group of Nireas International Water Research Centre at the University of Cyprus. The group worked together with one of the greatest Greek children's storytellers informing the children about water quality and quantity issues

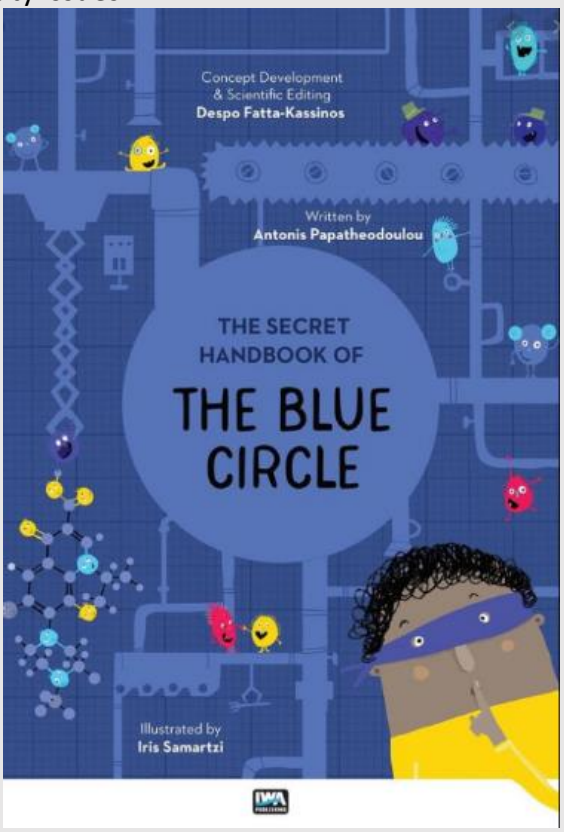

Figure 7: The Secret Handbook of the Blue circle (Papatheodoulou, A., & Fatta-Kassinos, D. (2019).

Step 4.2.2 Disseminate and demonstrate the stories of successful water reclamation projects for irrigation

Further initiatives should be taken demonstrating and disseminating the outcomes of "lighthouse projects" using reclaimed water for agricultural irrigation identified in the SuWaNu Europe project. The general public and agricultural sector should be able to visit initiatives and hear about their experiences. Few ongoing demonstration projects are currently taking place in Flanders, but might be initiated in the coming years under various funding opportunities.

Result 4.3: The general public trusts the public authorities managing the water reclamation process for agriculture

Step 4.3.1 Create a participatory Committee with representatives of all key actors involved in the use of reclaimed water on agriculture

In the past years, a broad group of stakeholders has been involved in the discussions regarding implementation of reclaimed water. Also, in the upcoming years, this diverse group should be actively involved in the further elaboration of the water reuse policy.

Step 4.3.2 Conduct water quality and safety studies on the use of reclaimed water for irrigation with socially known and respected academic and research institutions

The research and demonstration initiatives should as well pay attention on water quality and plant/human/environment safety issues.

1.8 Conclusion

The Regional Action Plan (RAP) for Flanders stipulates actions for the use of reclaimed water for agricultural irrigation in the region. The RAP is structured in a set of objectives regarding (1) the legal framework, (2) investments, (3) European network and (4) social acceptance.

The Flemish regional action plan elaborates actions regarding following objectives:

- The legal framework:
    - National legislation complies with the European legislation regarding wastewater treatment and reuse of reclaimed water
    - The legislation allows the use of reclaimed water throughout the year for agricultural irrigation
    - European and national organizations have strict regulations regarding reclaimed water quality standards
- Investments:
    - Investments in reclamation facilities and distribution networks
- European network:
    - Flanders promote international exchange and dialogue to expand the use of reclaimed water
    - All actors involved in reclaimed water implementation have a specific network to share and exchange results and practices
- Social acceptance:
    - The general public is aware of the status of water availability in Flanders
    - The general public is aware of the benefits regarding the use of reclaimed water in agriculture
    - The general public trusts the public authorities managing the water reclamation process for agriculture

Although the microbiological safety is already well covered in the European regulation, the RAP stipulates the importance of gaining insights in long-term effects of the use of reclaimed water

under Flemish agricultural conditions – specifically regarding undesirable ions (sodium), heavy metals and micropollutants. This will enable to define indicative water quality guidelines for these parameters.

Based on stakeholder discussions with the regional working group, permanent solutions for the application of reclaimed water for agriculture should be sought (e.g. infrastructures). Therefore, there is the need to assess whether the implementation of reclamation facilities and distributions networks is economically interesting. The RAP defines the utility of developing business plans for these infrastructures in specific locations. In order develop adequate business plans, actions to get insights in following knowledge gaps should be taken:

- Availability of reclaimed water (based on the minimum discharges in rivers)
- Demand for reclaimed water compared to other water resources
- Better estimation of the treatment needs per crop category

Furthermore, the RAP stresses out the importance for Flanders to gain knowledge regarding water reuse with other European countries. Lastly, the public acceptance of this practice should not be lost of sight and integrated timely in case large-scale implementations would take place in Flanders.