



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 Local Action Plan for Thessaloniki, Greece

Contents

1.1	Specific Objectives and Results for the Regional Action Plan of Thessaloniki Province	2
1.1.1	Existing basis set by the Water Recourses Management Plan under current implementation for Water District EL-10 in Central Macedonia	2
1.1.2	Set of Objectives for the Regional Action Plan of Thessaloniki Province.....	4
1.2	Steps for the implementation of the Local Action Plan for the Region of Thessaloniki.	10
1.3	Methodological Framework	10
1.4	Administrative procedures.....	13
1.5	European network.....	13
1.6	Social acceptance	14
1.7	Public and private incentives	15
1.8	Investments.....	15
1.9	Legal framework.....	16
1.10	Conclusions	16

1.1 Specific Objectives and Results for the Regional Action Plan of Thessaloniki Province

1.1.1 Existing basis set by the Water Recourses Management Plan under current implementation for Water District EL-10 in Central Macedonia

As it is already referred to the relative SuWaNu document Regional state of play analyses (*DEL. 1.1*) the province of Thessaloniki is administratively included to the Region of Central Macedonia and regarding the water resources management it is part of the Water District coded EL-10.

On December 2017 it was publicized the 1st Revision of the Management Plan for the Water Basins of the Water District EL 10 of the Region of Central Macedonia. The Revised Management Plan was done according to the specifications of Directive 2000/60/EC (*WFD Reporting Guidance 2016*), and the Low 3199/2003 as amended and in force, and the Presidential Directive 51/2007. This plan has an implementation span from 2016 up to 2021 when it will be revised again.

The 1st management cycle for the W.D. EL-10 consisted of two types of measures: a) Basic Measures and b) Complementary Measures. The table below displays a synopsis of the foreseen measures of the 1st management cycle that ended on 31 / 12 / 2015.

Table 5: Measures Applied during 1st management cycle

A) BASIC MEASURES - Measure Type	Total number of measures
Measures for the promotion of sustainable and efficient water resources use (Article 4)	8
Measures for potable water (:Article 7)	5
Measures for controlling abstraction from surface and ground water	8
Measures for the artificial enhancement of groundwater bodies	2
Measures for the point discharge sources	8
Measures for the diffuses sources of water pollution / contamination	3
Measures to confront the negative effects on the condition of surface water bodies from hydro morphological lesions	2
Special measures for the priority (pollution) substances and other substances	1
Protective measures for pollution episodes due to accidents/extreme natural phenomena	1
TOTAL	39
B) COMPLEMENTARY MEASURES - Measure Type	Total number of measures
Administrative / Legislative measures	1
Financial or tax measures	1
Environmental agreements after negotiation	3
Pollutant emissions checks	3
Reconstruction and restoration of wetland areas	2
Water abstraction control	4
Infrastructure construction	8
Educational measures	4
Research, development and demonstration projects	3
Other measures	8
TOTAL	37

The majority of the above measures display an administrative and investigative character aiming to awareness enhancement on critical water resources management issues for the WD EL-10 area. Positive results from the applied measures, related to the improvement of the condition of the surface & ground water bodies are considered to be very limited.

The empirical basis for the elaboration of the 1st Revision of the Management Plan for the Water Basin EL-10 that led to the measures that will or are under implementation on the 2nd management cycle (2016 -2021), is consisted of the following frame of remarks deriving from the past:

- The planning of the programs measures should be based on the available financial instruments and the capacities of the involved bodies. This will avoid the phenomenon of non-implementation of measures due to lack of resources observed during the 1st Management Cycle.
- The recent economic collapse of the country and the strict economic measures that the country is obliged to follow to its recover should also be taken under consideration on the calculations of the real available funds for works related to water resources management.
- The measures adopted for the 2nd management cycle should be particularly targeted at strategically important pressures and objectives in order to increase their effectiveness.
- Utilizing the experience gained from the implementation of the measures of the 1st management cycle so that the selection and prioritization of the measures of the new 2nd management cycle to ensure better efficiency.

The adopted framework for the implementation of the 2nd management cycle for the WD EL-10 is as follows:

- 1) **Programs for monitoring / assessment of the quantitative and qualitative situation of surface and groundwater systems.** There have been identified water systems for which little is known about their ecological and / or chemical characteristics. Therefore, it is necessary to give priority to the measures related to the verification of the status of these systems. In particular, it is noted that very often the analyses of the endings are based on theoretical estimates, while there is a lack of real data on consumption and losses for the various uses of water. Therefore, while maintaining the previous direction, priority should be given to the relevant measures concerning actual consumption measurements of the various water uses.
- 2) **Ensuring potable water resources in sufficient quantity and satisfactory quality in accordance with the requirements of the relevant legislation.** The relevant measures are a priority for the current Management Plan.
- 3) **Water for agriculture.** Agriculture is a very important activity for the local and national economy. Measures related to the modernization of irrigation infrastructure, the adoption of modern irrigation methods and the adoption of good agricultural practices for increasing the benefits of irrigation water and minimizing the impact of agriculture on diffuse and spot pollution and are a top priority for the Plan.
- 4) **Protected areas.** The Water District EL-10 includes several particularly important protected areas. The relevant measures are a priority for the Management Plan.
- 5) **Strengthening environmental inspections and controls.** The implementation of the Program Measures requires the implementation of broader and denser controls on water abstraction and pollution from point-to-point waste sources. The relevant measures are a priority for the current Management Plan.
- 6) **Other Complementary measures.** According to the list of measures to be implemented the ones of the category “other measures” are consider to add synergies to the measures thus adding positive impacts for the Management Plan.

Taking under consideration the above as well as the ongoing implementation documents for the WFD published by the E.E. the measures for the 2nd management cycle are synoptically given to table 4 below.

Table 6: Measures for implementation on the 2nd management cycle for the WD EL-10 (2016-2021)

A) BASIC MEASURES - Measure Type	Total number of measures
Measures for the recovery of the cost of water services (Article 9)	4
Measures for the promotion of sustainable and efficient water resources use (Article 4)	8
Measures for potable water (:Article 7)	4
Measures for controlling abstraction from surface and ground water and for water storage	2
Measures for the artificial enhancement of groundwater bodies	2
Measures for the point discharge sources	4
Measures for the diffused sources of water pollution / contamination	4
Measures to confront the negative effects on the condition of surface water bodies from hydro morphological lesions	5
Special measures for the priority (pollution) substances and other substances	2
TOTAL	35
B) COMPLEMENTARY MEASURES - Measure Type	Total number of measures
Administrative / Legislative measures	2
Measures of effectiveness and reuse	1
Pollutant emissions checks	5
Reconstruction and restoration of wetland areas	1
Water abstraction control	1
Educational measures	2
Research, development and demonstration projects	4
Other measures	2
TOTAL	18

1.1.2 Set of Objectives for the Regional Action Plan of Thessaloniki Province

The present RAP that is elaborated under the Action 2.6 of the SuWaNu project is for setting a medium to long term inclusive vision for the Thessaloniki province on reclaimed water reuse to irrigation, which must be anchored to the relative basis already set by the implemented Management Plant for the WD EL-10 and is in consistency both with the national development strategy for reuse of reclaimed waters and the main aim set by the SuWaNu consortium.

The diagnostics upon this vision must be set derived from the previous actions of the SuWaNu Europe (actions: 1.1, 2.1, 2.2, and action 2.3) from which we have taken stock of the main economic and social challenges and opportunities, and we have examined the environmental challenges and opportunities that are closely related to the potential of use of reclaimed water for crops irrigation at Thessaloniki area.

The vision adopted for the Regional Action Plan for Thessaloniki province is as follows:

First level:

To nudge the increase of use of reclaimed water in agriculture, throughout the Thessaloniki region, resulting in a more resilient agricultural sector coping with water scarcity and climate change effects.

The process of elaborating the strategy itself needs strong and political commitment that must be adopted by all levels, a network of champions across the local government complex to drive the change process at the technical level, through consultations with the key different stakeholders and a really wide sharing of information to ensure a transparent decision process.

Core elements of the strategy to elaborate the vision set are:

Institutional set up of champions: The aimed change in process that involves cross-sectoral collaboration requires a critical mass of people with the ability to understand the vision, communicate with the various local stakeholders and technical expertise in order to design, appraise, apply and adjust the policy solutions. To this end the Regional Working Group of Thessaloniki set up during Task 2.5 of the SuWaNu is going to play that role alongside the consortium local partners (ANETH S.A. & AUTH)

Information dissemination and transparency: All the information generated in the policy making process of the RAP should be widely available and the process must be done transparently, allowing all regional key stakeholders a voice and ensuring that disagreements are noted in public fora. To this end the responsible consortium partner (ANETH S.A.) will organise specific meetings with the RWG in the proper manner due to conditions imposed by the Covid 19 epidemic and will attend the dissemination of all material created by the SuWaNu project to the RWG members.

The Specific objectives of the Thessaloniki Regional Action Plan are based on the assessments done during the tasks done so far of Work package 2 of the SuWaNu project and in particular the SWOT and PEST analyses (D.2.1) as well as the basic conclusions for the Thessaloniki area of the AKIS analysis (D.2.2).

Social perception - barriers pinpointed form Deliverable 2.1

In Thessaloniki area the public acceptance correlated to food security, for the use of the reclaimed water to irrigate crops is considered to be the most relevant issue on policy strategy in order to advocate the practice. Equal to that is the gravity of an emerging disagreement among various social groups on the final use options for the reclaimed water e.g. wetlands water flow support or coastal zone aquifers artificial recharge, versus additional irrigations supplies.

Reclaimed water costs – barriers pinpointed from Deliverable 2.1

The main identified barriers for further advancements in reclaimed water re-use to irrigation have to do with the increased / elevated costs of treatment and quality monitoring systems and the uncertainty of profitability of the current intensive forms of agriculture to the Thessaloniki plains. Another cost related barrier has to do with the geographical disperse of a significant number of small size decentralised WWTPs that dictates investment of large sums of funds to build the needed infrastructure for the delivery networks to the fields.

Regulation framework – barriers pinpointed from Deliverable 2.1

The main barriers for expanding the use of re-claimed water to irrigate crops in Thessaloniki area from the Legislative / administrative source of origin is the increased level of uncertainty posed by the ongoing trend of the EU to adopt severe / stricter regulations regarding the quality of the reclaimed water and from the cumbersome regional administrative system in which the decentralized authority (central government representative) plans the water resources management and the regional (elected) government is obliged to implement the planning.

Barriers pinpointed by the Deliverable 2.2 (AKIS analysis) regarding the Key players at Thessaloniki.

The most important barrier has to do with the relative low linkage among the key players that result in limited communication and cooperation. Therefore the objective of increasing the level and the effectiveness of the communication channels among key players at Thessaloniki area emerges as a primary objective.

Considering the above mentioned core conclusions for Thessaloniki area, of the performed tasks of the project SuWaNu the specific objectives of the Regional Action Plan are identified as follows:

Second level:

1. **Increase the administrative capacities and the procedures to further advance the implementation of reclaimed water for irrigation in agriculture, towards an integrated water resources management.**
2. **Exploit the opportunities offered by the relative European & word-wide networks to disseminate existing results and adopt best practices for local use regarding reclaimed water.**
3. **A public outreach to further advance the public acceptance of reused water to crops irrigation.**
4. **Stimulate public and private stakeholders to invest in research and technology to improve and expand the use of reclaimed water in agriculture.**
5. **Public & private financial policy provides incentives for the use of reclaimed water for irrigation.**
6. **The exploitation of the evolving European and national legal framework that steadily encourages the use of reclaimed water in agriculture.**

Third level:

Analyses of the Specific Objectives and linkage with the corresponding results that lead to their achievement.

S.O. 1: Increase the administrative capacities and the procedures to further advance the implementation of reclaimed water for irrigation in agriculture, towards an integrated water resources management.

The increase in capacities at all levels of administration of water resources management in pursuance of the main goal of the R.A.P. for Thessaloniki to increase the use of reclaimed water for crop irrigation requires actions for supporting the skills development and professionalization of wastewater management and services delivery. Local academia has to play an important role by providing training and education. The recent technological advances in waste water reclamation, as well as the main target set by the SuWaNu project, is to **make the shift** on the primary objective of wastewater management from “**treat and safely dispose**” to “**reuse, recycle, and recover resources**” towards a more integrated management scheme that leads to better safety standards (quantitative and qualitative) for agriculture and the environment.

Overcoming the practical difficulties of implementing reclaimed water quality regulations can be particularly challenging. In order to realize the goals of irrigation water quality improvement and water resources protection, individuals and organizations responsible for various aspects of wastewater management need to comply and act in the collective interest. Benefits are only realized once everyone abides by the rules to protect water resources from pollution.

S.O. 2: Exploit the opportunities offered by the relative European & world-wide networks to disseminate existing results and adopt best practices for local use regarding reclaimed water.

Data and information on wastewater generation, treatment, reclamation, and reuse to irrigation is essential for local / regional policy-makers, researchers, practitioners, and public institutions in order to actively participate to the development of local action plans aimed at environmental protection and the safe and productive use of the reclaimed water. Knowledge concerning the volumes and the spatial distribution of their availability, perhaps even more importantly, the constituents of wastewater are necessary tools for protecting human and environmental health and safety. The appropriate and affordable technologies, both new and well established, need to be transferred to the key-players in a homogenous and compiled manner in order to establish a capable basis of knowledge based decision making in all administrative layers that will result in increased reuse of reclaimed water. To this end, the relative Fact Sheets produced on task 3.1 of the SuWaNu project will be a valuable asset, alongside the continuous sessions of the RWG that was established from the task 2.5.

S.O. 3: A public outreach to further advance the public acceptance of reused water to crops irrigation

The recent literature indicates that a technically well designed reclaimed water reuse project that appears financially realizable and incorporates state of the art safety measures and capable water reuse schemes can simply fail if its planners do not adequately account for the dynamics of the local society acceptance. From the initial works of the Regional Working Group of Thessaloniki and in particular from the representative of the consumers association the feedback was that although there is a positive trend for acceptance of the reuse methodologies (already introduced and novelties), mainly based on environment protection notions, there is also a strong public resistance due to health safety related to food production chains that use agriculture products irrigated with reclaimed water. The raising of broad public awareness and education should be the main tools to overcome social, cultural, and consumer barriers. To this end, the Thessaloniki RAP must exploit the dynamics set by the open participatory workshop of task 2.5, the ongoing works of the RWG and to further involve the key players identified by task

2.2 (AKIS analyses). To this effort, the relative toolkit of Fact Sheets of task 3.1 oriented to social associations and consumers will be utilised.

S.O. 4: Stimulate public and private stakeholders to invest in research and technology to improve and expand the use of reclaimed water in agriculture.

Reclaimed water reuse becomes more economically feasible if the point of reuse is done close to the point of production. Treating waste water to a water quality standard acceptable by agriculture as the end user imposes a fit-for-purpose treatment, increases the potential for cost recovery, and also the dynamics of circular economy for the region. Also, the region's waste water vast potential as an alternative source of resources such as nutrients remains underexploited. For example, urine collection and use will become an increasingly important component of ecological wastewater management, as it contains 88% of the nitrogen and 66% of the phosphorus found in human waste - essential components for plant growth. With extractable mineral phosphorus resources predicted to become scarce or even exhausted over the next decades, its recovery from wastewater offers a realistic and viable alternative. The Thessaloniki area possesses all the necessary ingredients for participating in research, development, and testing of new technology solutions regarding waste water reclamation and reuse to agriculture. It has at least two large centralized municipal WWTP's, and at least 7 small decentralized WWTP's, it has 11 Local Land Reclamation Agencies that operate irrigation networks as well as a university and research institutes that could collaborate to implement research on contaminants, pollution loads, ecological functions, system interaction and human behaviour regarding reclaimed water use to irrigation.

S.O. 5: Public & private financial policy provides incentives for the use of reclaimed water for irrigation.

The total scheme of waste water management and sanitation is considered to be expensive and capital intensive action. This characteristic is predominant to large centralized systems, which require huge up front capital expenditure for their establishment and display increased operational costs. As it was presented by the representatives of the Thessaloniki Water Supply and Sewerage Company SA (EYATH S.A.), which operates two large centralized systems, these systems rarely generate significant revenue and are therefore the managers experience funds scarcity for investment on novel methods and technologies. Therefore the RAP should contain actions that will coordinate investments and financing in order to improve the overall performance of wastewater management systems on reclaimed water reuse.

The decentralized WWTP's at Thessaloniki region are common in smaller communities, treating lower volumes of wastewater, applying low cost technologies and display a wide geographically disperse. Another typical characteristic of these units at Thessaloniki area is the lack of sufficient coverage of their operational – maintenance costs leading to often system failures. In order to incentivise their upgrade towards the SuWaNu main goal the RAP must contain measures aiming at human capacity upgrade and cost effective at a case by case level investment on new technologies that will generate additional income to the primary sector.

Wastewater use can add a new revenue stream to wastewater treatment, particularly under conditions of recurring or chronic water scarcity. Within the broader context of water resources

management, multi-purpose water infrastructure may offer additional advantages for enhanced wastewater treatment, but this is often more difficult to finance than single-purpose projects. The recovery of nutrients (mainly phosphorus and nitrogen) can add significant new value streams to improve the proposition of cost recovery. Apart from tangible economic benefits, improved nitrogen recovery would also reduce the nitrogen loading to the atmosphere leading to a more pro-environmental operation of the WWTP systems.

The figure below shows the simplistic model for cost recovery followed by the majority of the Municipal owned and operated WWTPs at Thessaloniki area through discharge- sewer fees and the chains process point in which additional cost revenues could be envisaged and must be regulated.

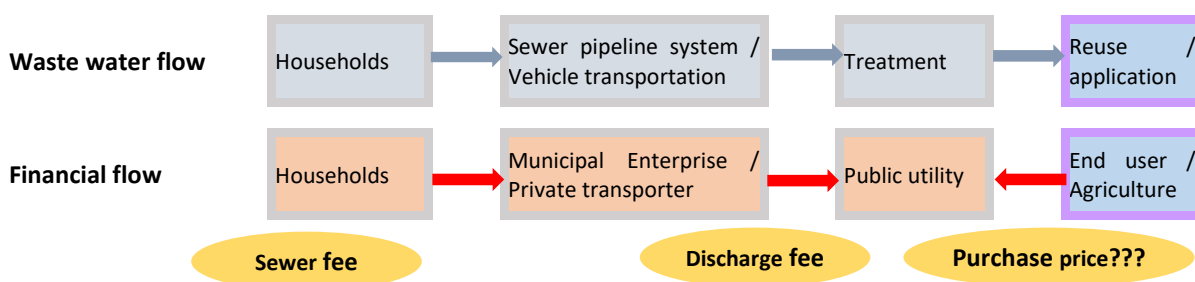


Figure 8: Financial flow model for settlement waste water management [1]

Source: Modified from Strandle et al (2014)

S.O. 6: The exploitation of the evolving European and national legal framework that steadily encourages the use of reclaimed water in agriculture.

One of the main reasons why wastewater has been largely neglected as an alternative source for irrigation offering quantities stability and controllable quality characteristics at the specific points that it is available (close to WWTP sites) is that so far the legislation focus was on the insurances for the environment impacts from the discharge of the effluent of the WWTP's. As it is displayed to the relative section of the Deliverable 1.1 State of Play in Thessaloniki province the main legislative quests for the recent decades were the compliance with the National – European regarding the treatment status of the wastewater of urban origin.

Recently the harmonization of the national legislation for compliance with the EU DIRECTIVE 2000/60/EC and the consequent implementer guidelines regarding water reuse. The J.M.D 145116/2011 "Determination of measures, conditions and procedures for the re-use of treated waste water and other provisions" as it was amended by the L.M.D. 191005/2013 is in force at national level and provides the frame under the irrigation of crops with reclaimed water is allowed to be done, (more details can be seen at the Deliverable 1.1: State of Play).

The 1st Revision of the Management Plan for the Water Basins of the Water District EL 10 of the Region of Central Macedonia foresees a number of measures aimed to implement the latest legislation concerning the water resources management and within this frame the reuse of water as it is set by the J.M.D 135275/2017: "Approval of general rules for costing and pricing of

water services. Methods and procedures for recovering the cost of water services in its various uses”.

Also another legislative initiative that is undergoing preparation and has to do with the reclaimed water use is the one under title: “Compilation of a technical specifications manual for the implementation of the reclaimed water reuse methods dictated in JMD 145116 / 2.3.2011 (Government Gazette 354B), as in force, where the description of the potential reuse methods will be determined, the conditions for application of each method will be described, the minimum requirements the overall practice of correct and acceptable execution, the procedures provided for the relevant licensing, as well as the specific responsibilities of the involved administrative carriers”.

The latest legislation developments coming from the European Parliament is the REGULATION (EU) 2020/741 of the European Parliament & of the Council of 25 May 2020 “on minimum requirements for the water reuse”.

The legal provisions of the new European Directive regarding the quality characteristics of the recovered water and the required controls for its use in irrigation are strict at the same level as the J. M. D. 145116 / 2.3.2011 in some points, while it is looser in the majority of the examined topics. Our perception is that there will be required no new national legislation for compliance with the Regulation 2020/741, but there is a possibility to have the release of a new guidance document with instructions for the implementation of the J.M.D 145116 in compliance to the latest REGULATION or an minor amendment of the J.M.D.

Moreover the Risk Assessment procedures as described in Annex II of the Regulation (EU) 2020/741, are also foreseen, as contents of the necessary studies for getting reuse permits as stated at article 9 of the L.M.D. 145116.

The R.A.P intends to include actions that will be synergistic with the relevant legislation under implementation now and to the immediate future and will be adopted to the particular circumstances of the region. We must take under consideration the location of the existing large centralized WTP systems, the large area sum of the environmental protected areas of Thessaloniki, and the stark economic inequalities among the different potential rural areas which the strategy must cover.

1.2 Steps for the implementation of the Local Action Plan for the Region of Thessaloniki.

The RAP bases their specific actions on the SO and results set by the GAP. The SO and elaborated strategy of the GAP, form the basis for the specific steps/actions to the realisation of the GAP strategy.

Fourth level:

1.3 Methodological Framework

For the Thessaloniki RAP development a collaboration network has been established were the two local partners of the SuWaNu consortium (p.p. 7: ANETH S.A. & p.p.: 8 AUTH) initiated a series of targeted consultation meetings with the members of the RWG and also with the organisations which are key-players on water resources management of the region (EYATH S.A. Municipal water supply and sewerage services, the Directorate General for Environment & Water Resources, the Directorate of Planning & Environment, the Soil and Water Resources Institute, the Association of Agricultural Cooperatives of Thessaloniki - Langada and the Center for the Protection of Consumers in Thessaloniki).

This broad scheme managed to perform the needed consultations and exchange of opinions in a more than adequate manner overcoming the barrier set by the austere isolation measures posed to combat the C-19 epidemic. This was done by extensive exchange of data and information via e-mail and phone provided by ANETH S.A., the responsible partner for the task and the careful monitoring of the continuous revision of the specific circulating word documents. Also when the circumstances allowed it a series of consequent one to one sessions were done to confirm and finalize the position of each key-player on the issues that the RAP contained.

The task leader character as an Development Agency formed & owned by Local Authorities that concentrates a critical amount of trust as well as the specific professional profiles of the individuals involved with many of those people having a common timeshared professional experience working together on water management projects under different positions helped to create the needed commitment to elaborate a bottom up based Regional Action Plan aimed to increase the use of reclaimed water to irrigation.

More specific the task leader developed a first draft of the anticipated regional results and actions that were in coherence with the direction given by the General Action Plan (more details at the task 2.3 Deliverable) The conceptual framework displayed on the previously mentioned 3 levels was easily agreed and accepted by the involved key-players as they have been heavily involved to the formulation of the main driving conclusions through their participation to all the previous tasks performed in Thessaloniki (task 2.4 formulation and sessions of the RWG, task 2.5 participatory workshop). Also, the responsible local partner for the elaboration of the R.A.P. maintained a continuous flow of data and information that were available on time from the materialized actions of the SuWaNu Europe project actions 1.3 & 1.4 on light house applications of reclaimed water use, actions 2.1, 2.2 and 2.3 in order to comprehend and co-shape the conclusions of the SWOT – PEST & AKIS analyses outcomes for the region.

Finally, they were informed on the draft deliverables of the Work Package 3 & 4 that can and will be used as tools to further promote the use of reclaimed water to crop irrigation at the grater Thessaloniki area. The figure below displays the matrix of the key players that were involved in the formulation of the Thessaloniki Regional Action Plan.

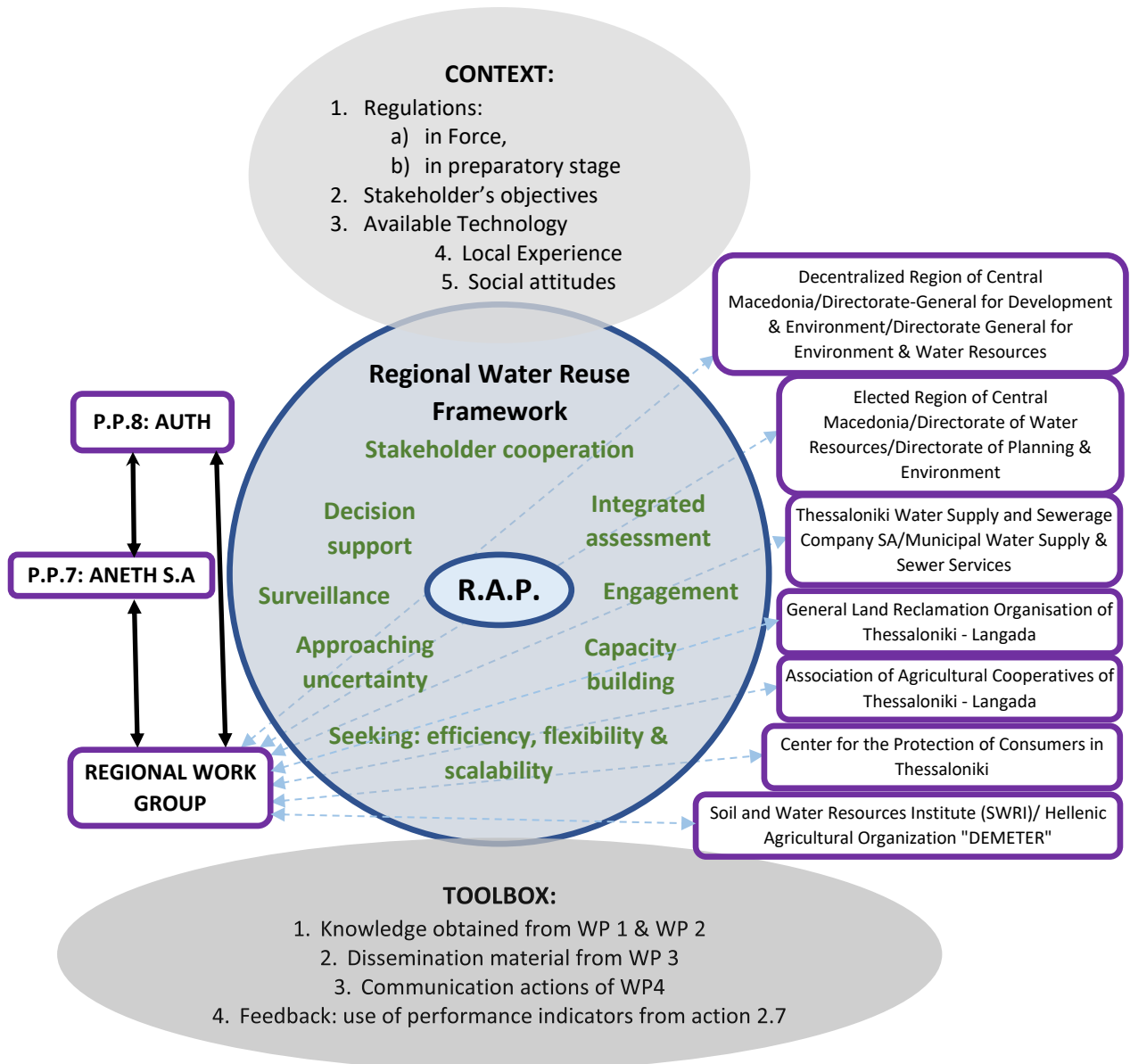


Figure 9: Development methodology of the Regional Action Plan

Desired Result 1: *The elaboration of a realistic Regional Action Plan for reclaimed water use that will incorporate knowledge transfer, capacity build up, synergy with the past/current implemented management plans and will be widely accepted due to the transparent and participatory procedures followed for its elaboration.*

Action 1: Delivery of the Regional Action Plan of Thessaloniki area.

The Thessaloniki R.A.P. will be adapted to the areas specific contests focusing on adding reclaimed water to the available irrigation resources for the area and upscaling the nutrients recovery for agriculture use thus promoting environment protection, resilience on water resources and circular economy.

The RAP intends to greatly influence the future Management Plans of the Water District EL-10 by increasing the trends for integration of the waste water reuse at a Watershed Management

scale. The elaboration method of this plan that involves all regional Key-players on water resources serves the purpose of its acceptance and ensures its positive effects.

Fourth level:

1.4 Administrative procedures

Desired Result 2: Increase the administrative capacities and the procedures to further advance the implementation of reclaimed water for irrigation in agriculture, towards an integrated water resources management.

Action 2.1: Develop a Regional Policy Statement to support and encourage consideration of the reclaimed water re-use to the regional Watershed –Scale Planning context.

The SuWaNu local partners and the Regional Working Group members will develop a common policy statement that will support and encourage the responsible regional water resources managers to engage in planning efforts at watershed scales that will fully evaluate approaches such as reclaimed water re-use. The statement will be prepared and agreed on a RWG meeting and will be disseminated through the regional water management authorities: Decentralized Region of Central Macedonia / Directorate General for Environment & Water Resources / Elected Region of Central Macedonia / Directorate of Water Resources / Directorate of Planning & Environment. The action has a clearly administrative character and bears non-economic costs.

Action 2.2: Incorporate water reuse and capture concepts into integrated planning efforts at the subsequent revision of the Management Plan of the Water District EL-10.

Embedding the trend of water reuse as a water management tool, is most successful when viewed as part of the entire water system at the existing Regional Watershed Scale. The successful “lighthouse” cases that were identified through the SuWaNu action 1.4 can share many attributes that can be hallmark traits of effective and integrated water resources management. The action aims to explicitly recognize the importance of reclaimed waste water reuse in the follow up design of the integrated water management plan and policies for the Water District EL-10. It will be done by the suitable compilation of the outcomes of the action 1.4 and their use as knowledge base by the local responsible administrations for the formulation of the fore coming 2nd revision of the Management Plan of the Water District EL-10 for the period 2021 – 2026. The costs for the 2nd revision are foreseen and secured to the public expenses programme for this period.

Fourth level:

1.5 European network

Desired Result 3: Exploit the opportunities offered by the relative European & word-wide networks to disseminate existing results and adopt best practices for local use regarding reclaimed water.

Action 3.1: Provide reliable performance information to support water re-use by enhancing technology demonstration and validation.

The RWG and the SuWaNu local project partners will actively and closely collaborate in order to deliver the reuse oriented information that is collected / generated by the project to those considering and implementing water re-use systems. To this end all the relative outcomes of the Work Packages 1 & 3, will be translated and handed out to the Decentralized Region of Central Macedonia / Directorate General for Environment & Water Resources and to the Elected Region of Central Macedonia /Directorate of Water Resources / Directorate of Planning & Environment. This data set will be used to shape the facts that the water managers take into account for designing future management plans, measures and works for water resources.

Action 3.2: Identify regional candidates for water reuse system implementation and provide feasibility case examples.

ANETH S.A. will proceed to the elaboration of a preliminary feasibility investigation study for identifying regional decentralized WWTP's that are under construction or on operation start and underpin the win – win characteristics by the adoption of re-use methodologies regarding both economic and environmental benefits. As already mentioned to the deliverable D1.1: State of Play, at the wider area of Thessaloniki, there are several sewage treatment plants under study / construction stage in order to cover groups of dispersed settlements. The study will delineate the optimum irrigation radius from the point of water resources availability, and indicate the suitable type of crops in correlation with the local characteristics. Also the study will prioritise the interventions according to the degree of environmental sensitivity of each specific case.

Fourth level:

1.6 Social acceptance

Desired Result 4: A public outreach to further advance the public acceptance of reused water to crops irrigation.

Action 4: Compile and provide info-data from the info packages of the Work Package 3 concerning vocational training of farmers on issues of water use efficiency and re-use of water and the protection of surface and ground water systems.

ANETH S.A. will adequately translate and compile the relative material in order to be used as training material by the Vocational Centers of the region that are potential contractors for the implementation of vocational training programs for farmers. Training programs for farmers are

planned and executed on each programming period with the nominated funds from the EU rural development funds. These programs in Greece are done by specialized Vocational Training Centers (V.T.C.) that are either public either private and are all functioning under a common regulated frame. The task leader for Thessaloniki area will collaborate with the VTC's that are active at Thessaloniki area and provide them the info data set for farmers training covering the thematics of reclaimed water reuse in irrigation. The training programs are commonly offered with special topics that will serve the objectives of each programming period and since the optimization of resources use to agriculture is a permanent goal for E.U. produced info data set is foreseen to be used well into the next programming period.

Fourth level:

1.7 Public and private incentives

Desired Result 5: Stimulate public and private stakeholders to invest in research and technology to improve and expand the use of reclaimed water in agriculture.

Action 5: Enhancement of private – public incentives on reclaimed water re-use in agriculture.

ANETH SA will prepare and draft / formulate a specific measure for the next period of implementation of the CLLD program (2020 -2024) in its area of responsibility, which will provide the terms and conditions for financing of public-private partnerships for the implementation of projects oriented to the reuse of water in the irrigation of crops. ANETH will prepare a Technical Data Sheet that will contain all the legal and technical specifications that potential investors' schemes must meet in order to be eligible to apply for funds from the CLLD program.

Fourth level:

1.8 Investments

Desired Result 6: Public & private financial policy provides incentives for the use of reclaimed water for irrigation.

Action 6.1: Compile available financial resources concerning the non-traditional funding mechanisms.

The P.P & ANETH S.A. will identify and compile information the potential use of non – traditional reclaimed water reuse project funding and financing approaches, including public – private partnerships and will elaborate 2 specific workshops with respective Municipal Development Directorates and the managers of Municipal Water Supply and Sewerage Services in order to

inform them about the financing options for such project that will be current to the immediate future.

Fourth level:**1.9 Legal framework**

Desired Result7: The exploitation of the evolving European and national legal framework that steadily encourages the use of reclaimed water in agriculture.

Action 7: Incorporation of the SuWaNu outcomes from Work Package 3 and Work Package 4 to the development of the Preparation of the Regional Manual for the technical specifications for the application of re-use methods.

The RWG members and the local task 2.6 leader will collaborate with the Directorate General for Environment & Water Resources of the Decentralized Region of Central Macedonia in order to incorporate the relative info packages of the SuWaNu project, containing data on methods and technologies to the compilation of the Manual of technical Specifications for the implementation of the reuse methods provided by the JMD 145116 / 2.3.2011 (G. G. 354B), as in force, where the description of the potential reuse methods will be determined, which consists of the application of each method and application, the minimum requirements the overall practice of correct and acceptable execution, the procedures provided for the relevant licensing as well as the specialization of the responsibilities of the bodies involved.

1.10 Conclusions

Water scarcity is particularly important in semi-arid regions such as the north Mediterranean area [2], [3], and especially for the Thessaloniki region with its established agriculture pattern (rice pads, cotton fields, corn fields and vegetables) were the irrigation water demand often approaches or exceeds, water availability. The availability of water resources is also intrinsically linked to water quality, as the pollution of water sources may prohibit different type of uses. If current trends persist, water quality will continue to degrade over the coming decades, particularly in resource-poor countries in dry areas, further endangering human health and ecosystems, contributing to water scarcity and constraining sustainable economic development. [4]

Taking into account the transnational character of the Thessaloniki surface water bodies which are the main suppliers of irrigation water, the foreseen increase in water holdups to upstream countries for their own development needs (agriculture, energy), and the uncertainty imposed by climate changes, makes it evident that we ought to carefully examine and prepare for the scenario of limited fresh water supply for the imminent future.

In Europe, the implementation of the Urban Waste Water Treatment Directive (91-271-EEC) has already contributed to obtain treated wastewaters of quite high quality that could be reused for certain applications or improved by polishing steps for uses with higher quality requirements (European Commission, 2001).

The ability to reuse water, regardless of whether the intent is to augment water supplies or manage nutrients in treated effluent (also a factor leading to water reuse), has positive benefits that are also the key motivators for implementing reuse programs. [5] These benefits include improved agricultural production; reduced energy consumption associated with production, treatment, and distribution of water; and significant environmental benefits, such as reduced nutrient loads to receiving waters due to reuse of the treated wastewater.

Even though reclaimed water reuse in Thessaloniki started since 1995 and displayed early “infant” deficiencies related to salinity, [6] its potential has not yet been exploited adequately, and the proportion of water reuse in total wastewater generation is still small. The notion of Circular Economy that gains a more and more steady pace recently sees many regions beginning to use their financial and regulatory capacity to kick-start a circular economy that could create significant synergies for the wide adoption of water reuse.

Conventional urban wastewater treatment usually ends with secondary treatment which cannot efficiently remove all the different compounds found in sewage and therefore treated effluents are one of the main sources of persistent micro pollutants in the environment; [7], [8] For water reuse, tertiary treatment is needed to provide additional removal of contaminants such as microbial pathogens, particulates, or nutrients, and advanced treatment processes are employed when wastewater is to be reclaimed for reuse, depending on the type of use and quality requirements. Overall, reusing water requires physical and chemical treatment processes, pipelines, waste disposal mechanisms, and other systems. [9]

Also significant environmental concerns over negative impacts from increasing nutrient discharges to coastal waters of Thermaikos Gulf tend to result in mandatory reductions in the number of sea discharges to the imminent future.

The circular economy offers a new way of looking at the relationships between markets, customers and natural resources, promoting sustainable and resource-efficient policies and practices. A business model that enables the economy to grow, while minimising the amount of virgin resources that are extracted. A transition to a circular economy will encourage a more-efficient use of water, combined with robust incentives for innovation, can enhance an economy's ability to handle the demands of the growing imbalance between water supply and demand. [10]

In Thessaloniki the current over abstraction of water from surface and ground water bodies is a significant pressure, for supporting the needs of the sizable agriculture sector as well as the needs of the second largest city of the country.

The E.U trend for introducing more advanced environmental regulations that require effluent quality delivered by advanced wastewater systems that remove emerging contaminants such as organic micro pollutants and other numerous controlled substances would make direct water reuse more profitable in comparison to discharging the effluent to a receiving water body.

Water reuse offers the potential to transform the linear human water cycle (abstract, treat, distribute, consume, collect, treat and dispose) into a circular flow by closing the loop, but also

potentially decoupling municipal water consumption from the depletion and pollution of water reserves. [11]

The proposed RAP is aims to contribute to a circular economy approach and offer a strategy to improve water supply by managing wastewater better. The plan was elaborated at a bottom-up approach, utilising multistakeholder e-consultation, dealing with the distancing affects posed by the COVID-19 epidemic.

The Plans proposed measures are designed to act synergistic with the measures under implementation of the Management Plan for the Water District EL-10 in which the Thessaloniki region belongs.

Also the measures have a strong realist approach in what concerns their estimated cost in human effort, taking into consideration the overwhelming negative effects of the economic crisis that rocked the country for the past 10 years.