WIZ – THE WEB PORTAL

SPECIFICATIONS

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Introduction

The project aims at designing a web portal that will provide local authorities, enterprises and citizens a general vision on the local water distribution and on the current and future water availability, taking into consideration the environmental impacts due to climate change.

Thus, the main objective is to provide a decision-making tool to local authorities involved in territorial planning in order to improve water management based on a detailed knowledge of the territory.

The system needs also to favour public participation in water management, directly involving citizens and enterprises in the water resource management.

Ultimately, the platform needs to grant data exchange and foster collaboration with other European projects.

System users

Users who will interact with the system are the following:

- Non-logged in user
- logged in user
    - Planner
    - Water Resource Utility
        - Technical Office
        - Administrative Office
    - Water Resource Authority
    - Citizen
    - System Manager
    - IT Developer
- System Administrator
- Server W*S

Figure 1 shows a chart summarising the actors of the system

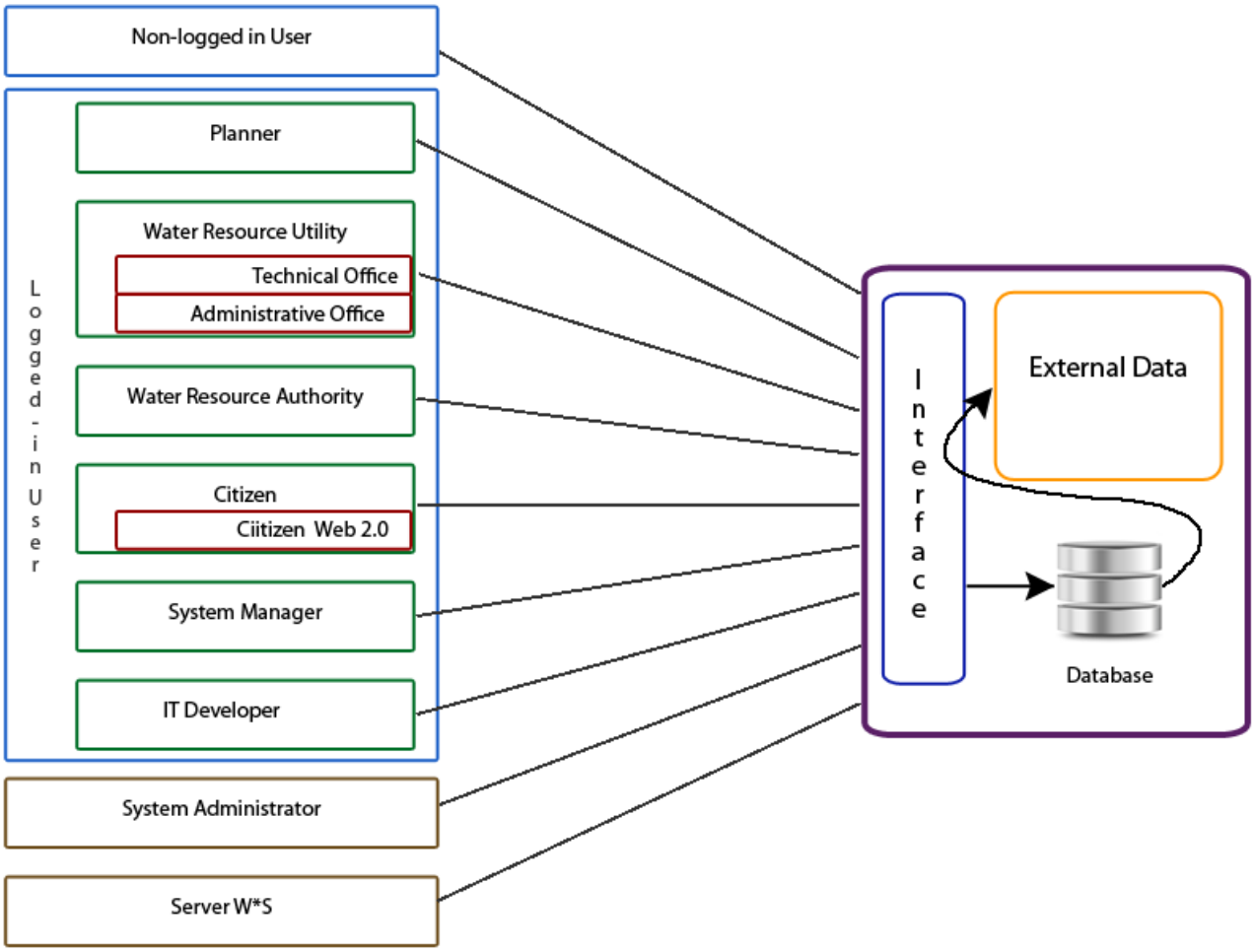

Figure 1: Actors of the system

Some users will directly access the server that hosts the system, while others will interact with the system itself. The latter ones undergo an authentication phase to allow the system to recognize and classify the user based on the category he belongs to. For each user category, the system will only grant access to the functionalities associated to that given category.

Users who have not registered yet or who have not signed in yet, will be classified as *non-logged in users.* From the system point of view, this category is like any other category, thus the same rules specified above apply.

Non- logged in user

A *non- logged in user* is simply a user who has not signed in or, in general, a user who is not yet registered with the system.

For this category of users, the functionalities list is the following:

- Login: allows the system to identify the user by means of his user id and password
- Registration: allows a user who is not registered yet, to register to the system and log in
- Password retrieval: through this functionality the user can request a new password from the system
- consultation of geographical map: allows a user to access a section containing geographical information; in particular a user can:
    - have knowledge of the water sources and the characteristics of the facilities, as well as the areas served by these sources
    - have knowledge of the location and the characteristics of the facilities
    - have knowledge, in the different areas, of the availability of the water resource in terms of water distribution capacity
    - have knowledge of the cost, both in venal as well as in terms of issued CO_2, of the transport, water purification and distribution supplied to the different areas
    - have knowledge of the characteristics of the supply network and of the issued service
    - have knowledge of the measured and perceived water quality parameters

The use cases chart of Figure 2 summarises the list of functionalities, which can be accessed by this kind of user.

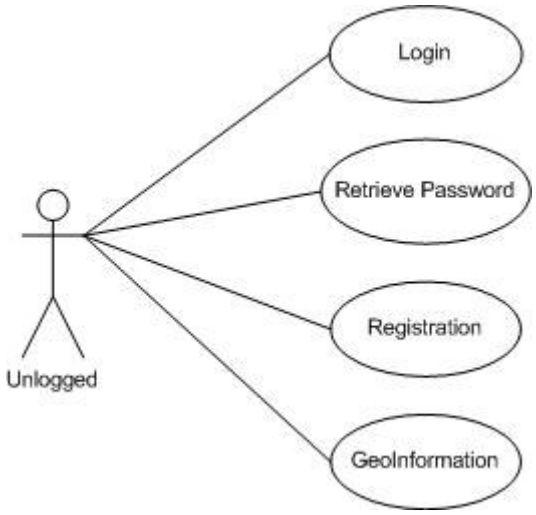

Figure 2: Use cases chart- non-logged in user

Logged in user

A *logged in user* is a user who has followed the log in procedure upon registration and has hence been authenticated by the system. A *logged in user* can access specific functionalities based on his role. As you can read in the list of the paragraph 'System users" his role can be that of:

- Planner
- Water Resource Utility
- Water Resource Authority
- Citizen
- System Manager

There are functionalities however, which do not closely relate to a role and are hence common to all logged in users.

A *logged in user* can visualise his own profile and eventually modify it: a profile contains information provided during the registration phase.

A *logged in user* can also manage the notifications, which are automatically generated by the system to notify the user about certain events, and can choose which notifications should be sent also to his email address specified in his profile.

Once he is finished, he can logout to terminate the session.

The chart showing the details with the various functionalities is provided in Figure 3.

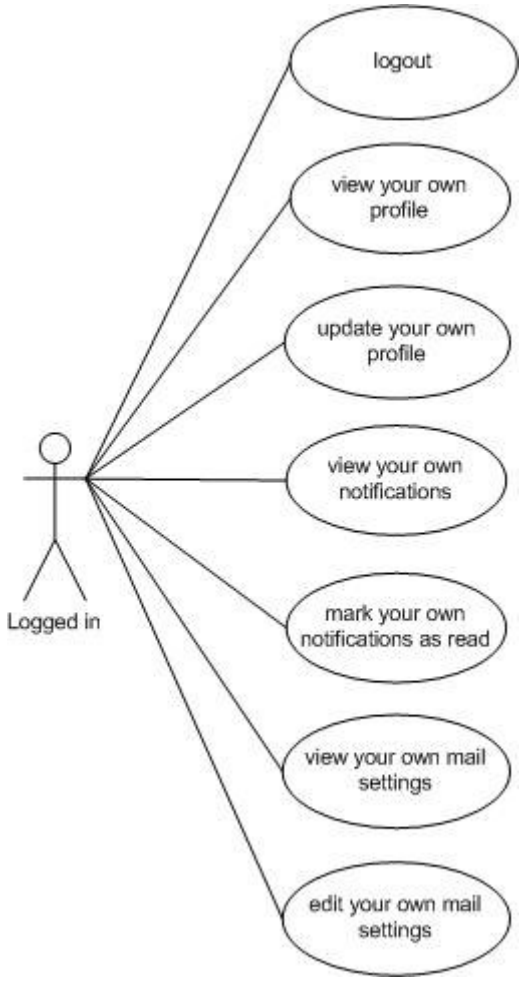

Figure 3: use cases chart – logged in user

Planner

The planner is represented by the local entity in charge of town planning: he accesses the system to request the Water Resource Utility's advice on the water resource availability and accessibility.

The request is made of some alphanumeric information with associated geographical data indicating the areas of the subject request. The system foresees two types of requests:

- Preliminary phase request: the level of detail is represented by **UTOE**[1]. In this case the water resource utility's action is not required and the system will provide a real-time response indicating the availability of the water resource and possibly future estimations
- Executive phase request: the level of detail is represented by the single allotments. In this case the water resource utility's action is required, thus the system can not provide a real-time response.

The system provides a geographical map on which to draw the various areas matching the request. As an alternative, this information can be imported from a file provided by the user. Subsequently, the user has to reply to a few simple questions on the foreseen use, i.e. the intended land use together with a serious of parameters which go along, and the system will automatically and in real-time calculate the amount of water resource necessary to satisfy the user's needs. At the same time, the user will be informed about the real water resource availability in that area; if available, the trend of the resource availability will be shown during a period of time (forecasted by the Water Resource Authority).

The user can not only view all requests he has done himself, but also all those created by other planners belonging to the same city-state. Especially in those cases where the system does not provide a real-time response, the user can monitor the evolution of the requests by following a procedure by which the user gets a formal response from the water resource utility.

The water resource request goes through different states:

- **Saved:** indicates a request, which is visible only to the user who created it; a request in this state can always be modified, any moment.
- **Submitted:** indicates a request officially forwarded to the water resource utility; a request in this state can not be modified by the user.

[1] **U**nità **T**erritoriali **O**rganiche **E**lementari (translation: 'primary harmonic territorial units', i.e. smallest territorial portions that can systemically tackle urban and territorial issues.)

- **Approved/Rejected:** indicates a request, which has been officially approved/rejected by the water resource utility; a request in this state can not be modified by the user.

The user can hence modify or cancel his water requests only when the modification is compliant to the state of the request. It is not possible to modify or cancel water requests submitted by other users.

The system provides also a functionality that allows to spawn a paper version of the water resource requests.

The planner can also look up the geographical map in order to:

- Have knowledge of the water sources and the characteristics of the facilities, as well as the areas supplied by these sources
- Have knowledge of the location and the characteristics of the facilities
- Have knowledge, in the different areas, of the availability of the water resource in terms of water distribution capacity
- Have knowledge of the cost, both in venal as well as in terms of issued CO_2 , of the transport, water purification and distribution supplied to the different areas
- Have knowledge of the characteristics of the distribution network and of the supplied service

Figure 4 shows the functionalities provided for this type of users.

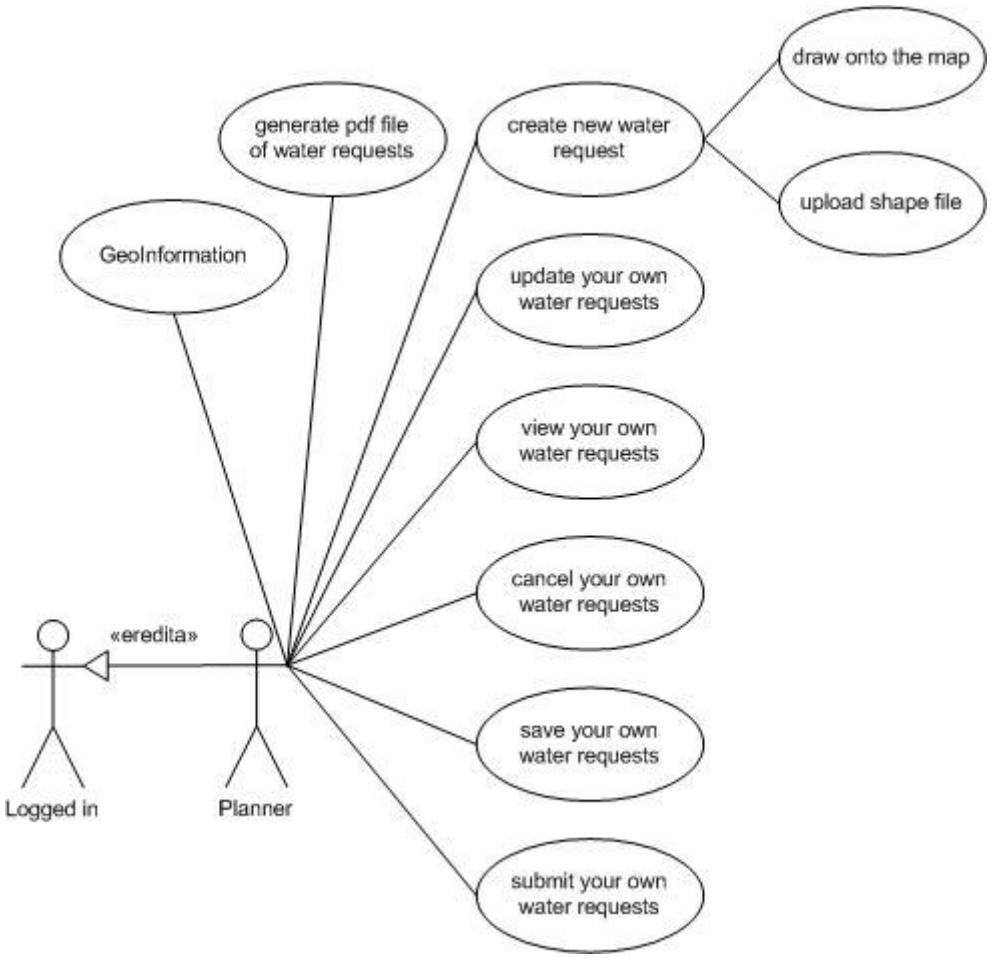

Figure 4: Use cases chart – Planner user

Water Resource Utility

The *water resource utility* is the entity, which manages the water resource and is hence the recipient of all water resource requests submitted by the *planner* user: it has to give advice on the feasibility of the requests. This task requires different competences and know-how; for this reason the *water resource utility* is organised in two sub-categories:

- Technical office
- Administrative office

The differences between these two users and their functionalities will be highlighted in the subsequent paragraphs.

Technical Office

The user *technical office* is in charge of assessing the water resource requests from a technical point of view. Within the water resource utility, a user who belongs to this category, is the first to view the incoming requests from the planner (those who have been submitted) and to provide a technical feasibility advice. The user can not only view all submitted requests and eventually create a paper version, he can additionally approve a request, i.e. give a positive advice, or reject a request and sent it back to the planner who has created it in order to be modified.

In order to express a technical advice, the *technical office* user needs to model the request for an external simulation software called EPANET; the system will hence provide functionalities whereby data inserted by the planner can be exported in a format compliant to the simulation software EPANET.

This type of user is also responsible for some additional data, which is necessary to guarantee the correct functioning of the system. Thanks to this data, the system can automatically calculate the amount of necessary water resource meanwhile the water resource request is being created by the planner. This data can refer to:

- The categories
- The formula for reckoning the population equivalent
- The formula for reckoning the water demand starting from the population equivalent

Figure 5 sums up what has been stated so far.

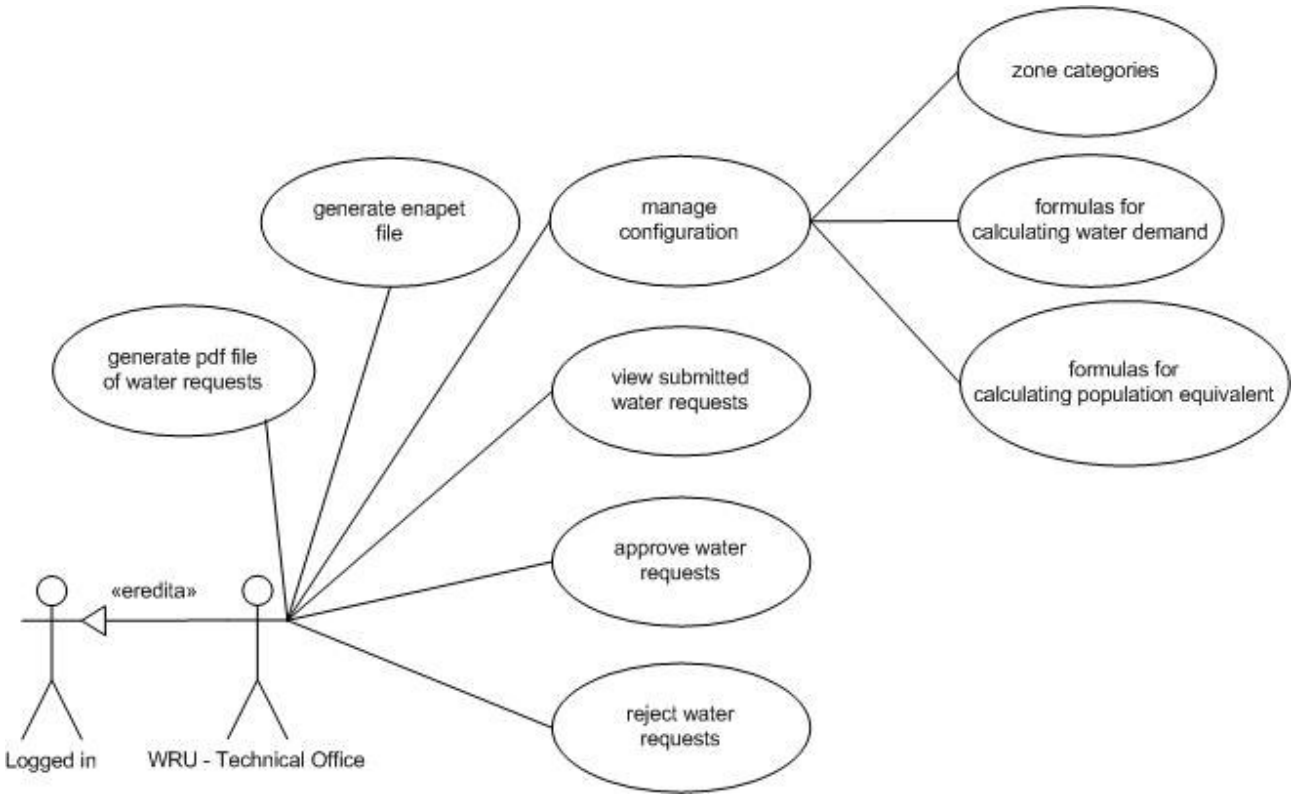

Figure 5: Use cases chart – Water Resource Utility User: Technical Office

Administrative Office

When a water resource request gets a favourable feasibility advice from the *technical office user*, it is sent to the administrative office which is called to express its opinion on the chance to confirm the request or not. The administrative office then officially communicates to the *planner user* its commitment to satisfy the water demand requested during the water resource request phase.

The *administrative office* user does not receive all water requests sent by the *planner* user; it only receives those who have been granted a positive technical advice and, which have been substantially approved by the *technical office*. Based on internal rules within the water resource utility, the user will decide which requests among those received to confirm and which to reject. The user has even more freedom as he can also decide to postpone the decision by providing the *planner* user a general interest in satisfying his request in the future.

In case the user approves the request, he also has to monitor the construction work execution as indicated in the water resource request created by the *planner* user and in particular take note of the start and end of the construction works. These two dates are

not only accounted for the record but are important for the water resource utility, which keeps track of the water quantity request, which has indeed been spent finally.

There is always the basic functionality that allows to print a paper version of the water resource request; Figure 6 shows a chart with the functionalities.

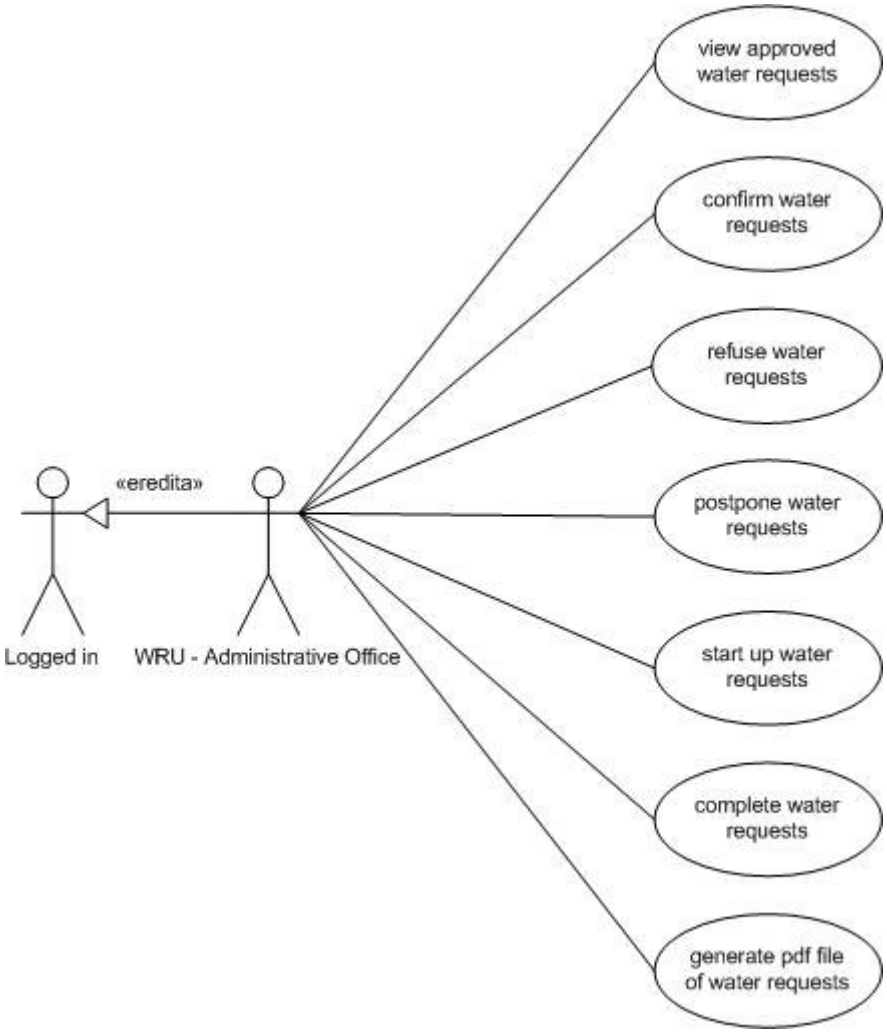

Figure 6: Use cases chart – Water Resource Utility User: Administrative Office

Water Resource Authority

The *water resource authority* is in charge of administering the water resource as a whole through an appropriate planning process. This kind of user is not foreseen to have a real interaction with the system. The scope is to allow this kind of user to examine the water resource requests sent by the planners in order to have an idea on the intended use of the resource and to schedule if necessary an upgrade of the resource. The system will also periodically send comprehensive reports on the amount of water resource requested by the planners.

Figure 7 sums up the functionalities for this kind of users.

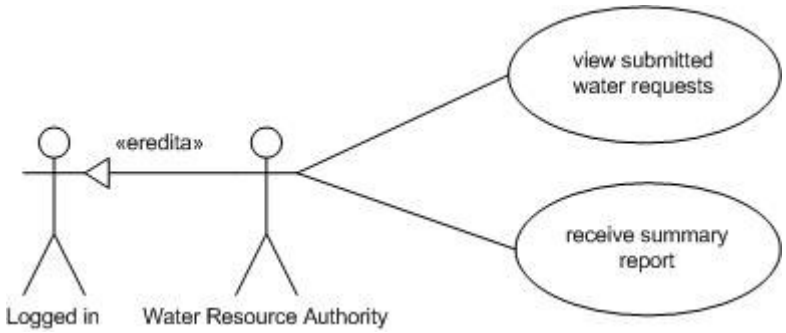

Figure 7: Use cases chart – Water Resource Authority User

Citizen

This category of users is formed by citizens who seek the advice of the system to obtain general information on the water resource availability and the distribution network. The information is the same as the one available to a *non-logged in user* and it allows to:

- Have knowledge of the water sources and the characteristics of the facilities, as well as the areas served by these sources
- Have knowledge of the location and the characteristics of the facilities
- Have knowledge, in the different areas, of the availability of the water resource in terms of water distribution capacity
- Have knowledge of the cost, both in venal as well as in terms of issued CO_2 , of the transport, water purification and distribution supplied to the different areas
- Have knowledge of the characteristics of the distribution network and of the supplied service
- Have knowledge of the measured and perceived water quality parameters

The citizen can not only consult the map but also interact with the system providing information on the perceived water quality and on possible water losses or general ruptures.

Figure 8 details these functionalities.

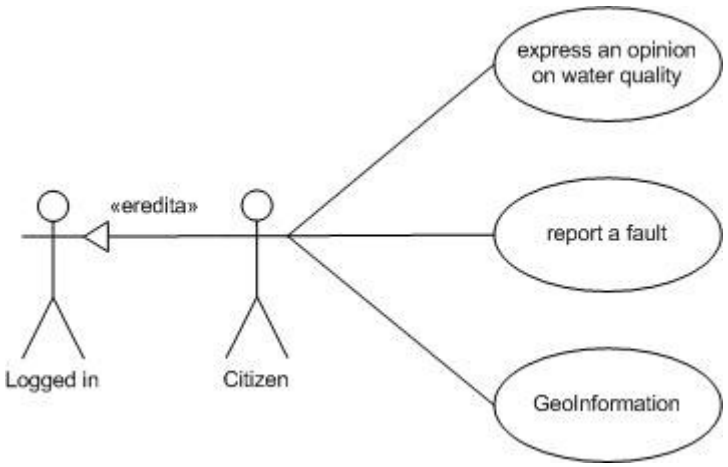

Figure 8: Use cases chart – Citizen user

System Manager

The *system manager* manages the marginal functionalities, which are however necessary to guarantee a correct operation of the system. In particular, the *system manager* can approve or block the account of a specific user, can reset passwords or modify some information of a user's profile.

It is also possible to modify or restore the general configuration of the system on top of the default values, that is all those properties that indicate the system in which format data are to be shown to a user, which external services should be uploaded and in which way, how to manage the sending of emails, in which path to store the files that are eventually generated automatically or uploaded by a user.

To speed up the tasks of the *technical office* user, the *system manager* can also insert (but more in general modify) the configuration data relating to the automatic calculation of the water demand.

In Figure 9 the functionalities of this category of user are shown.

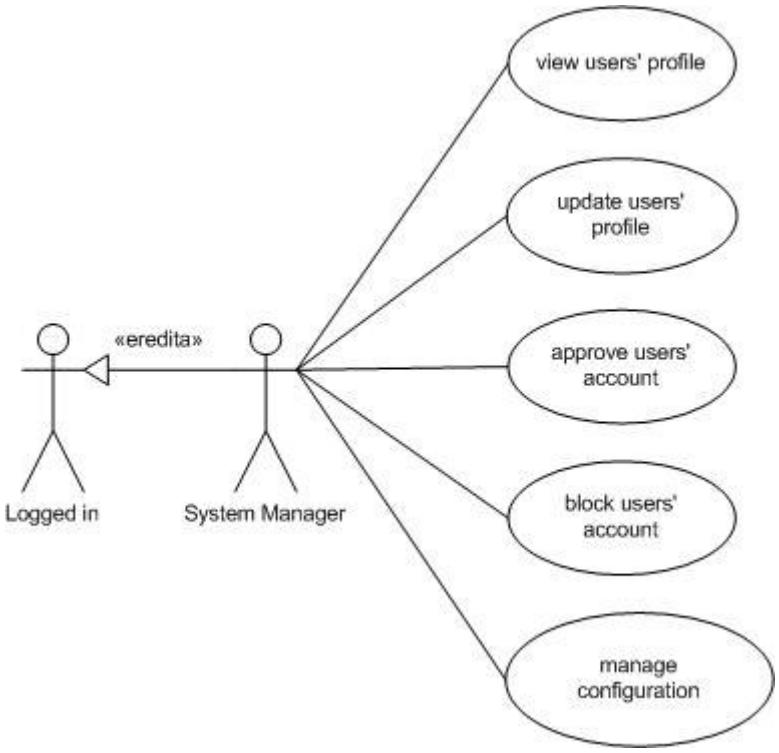

Figure 9: Uses cases chart – System Manager User

IT Developer

The *IT developer*'s role is to improve the system and add functionalities. This is the reason why a plug in mechanism has been foreseen, this way a user can enhance the functionalities of the system.

The user can look up the handbook to understand how to create and upload a plugin and subsequently create a personal plugin. Each plugin can be enabled or disabled anytime.

Figure 10 shows what has been stated so far.

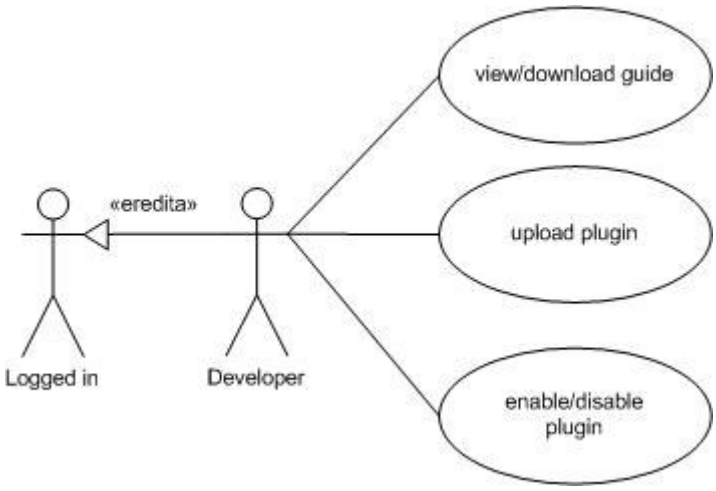

Figure 10: Use cases chart – IT Developer User

System Administrator

The *system administrator* directly accesses the server that hosts the system to perform the installation.

The system itself but also the libraries and/or necessary external software to guarantee a correct system operation are all part of the installation environment. The *system administrator* needs also to set up a database for information storage purposes, which is populated with the initial data.

Then, the *system administrator* has to monitor the correct functioning of the server that hosts the system as well as the system as a whole. He has to make periodical backups for data restoration following any malfunctioning but also generate periodical statistics on the use of the system; Figure 11 shows this use case.

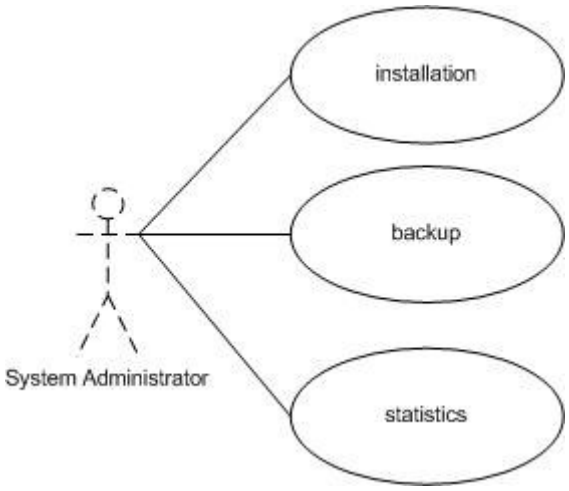

Figure 11: use cases chart – System Administrator User

*Server W*S*

This typology is not represented by real users, but by web services that access the system to gain geographical information. The system will thus allow sharing of both data structure and metadata of all those information, which:

a) do not breach the privacy of the other users

b) are classified as "insensitive"

c) are useful to a third user in order to complement his knowledge

Figure 12 shows this interaction.

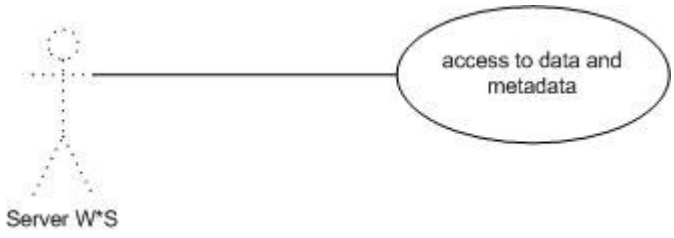

Figure 12: Use cases chart - Server W*S User

Requirements Analysis

Functional Requirements

The functionalities described in the different use cases represent the functional requirements of the system. In this paragraph these functionalities will be treated separately in order to detail their associated operations, also through the use of scenarios highlighting the interactions between the system and the other actors involved.

Registration

A user registers on the system by creating an account, this implies inserting a serious of information which altogether represent a user's profile. The following information is requested during the registration process:

- First Name
- Last Name
- Municipality the user lives in
- Organisation
- Title
- Email address
- Username
- Password
- Role

A user who registers to the system can choose his own role, but for security reason, the choice lies between *Citizen* and *Planner*.

The *system manager* is anyway responsible for approving the registrations; a user whose account has not been approved, will access the system with the *citizen* role.

The inserted data needs to be validated by the system, this may result in the creation of an account, whereby a confirmation email is sent to the user.

The described scenario is sketched in Figure 13.

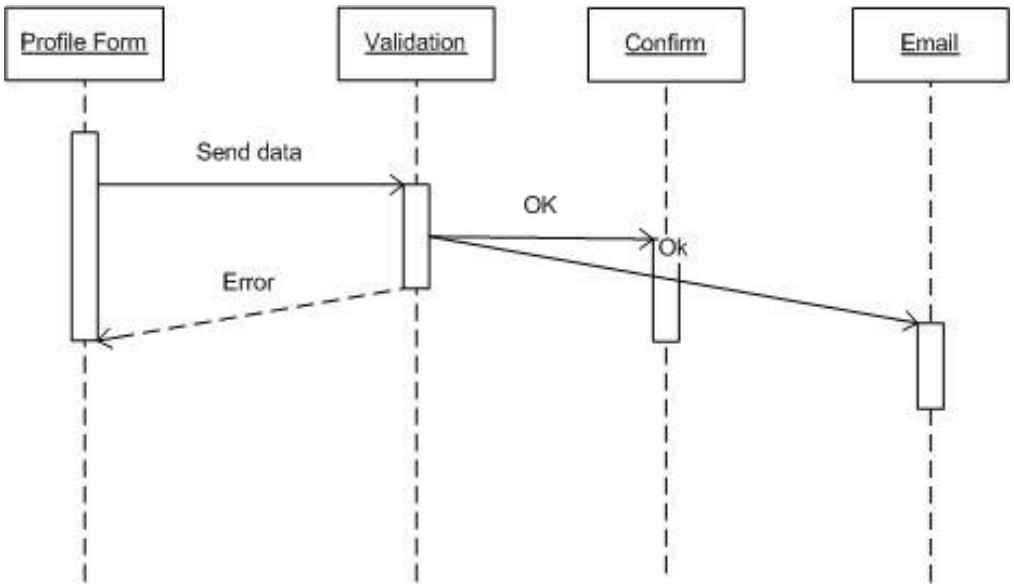

Figure 13: Scenario - Registration

Login

The log in procedure allows an already registered user to authenticate himself with the system. The authentication occurs through username and password.

The information requested while logging in are:

- Username
- Password

The login procedure will successfully occur giving access to the user only if the following conditions apply:

- A user with the provided username does exist
- The password matches the once, which has been stored
- The user's account has not been blocked

Access with the user's role only occurs if the account has been approved by the *system manager*; otherwise it occurs through the *citizen* role.

Figure 14: Flow Chart – shows the login procedure while Figure 15 shows the scenario.

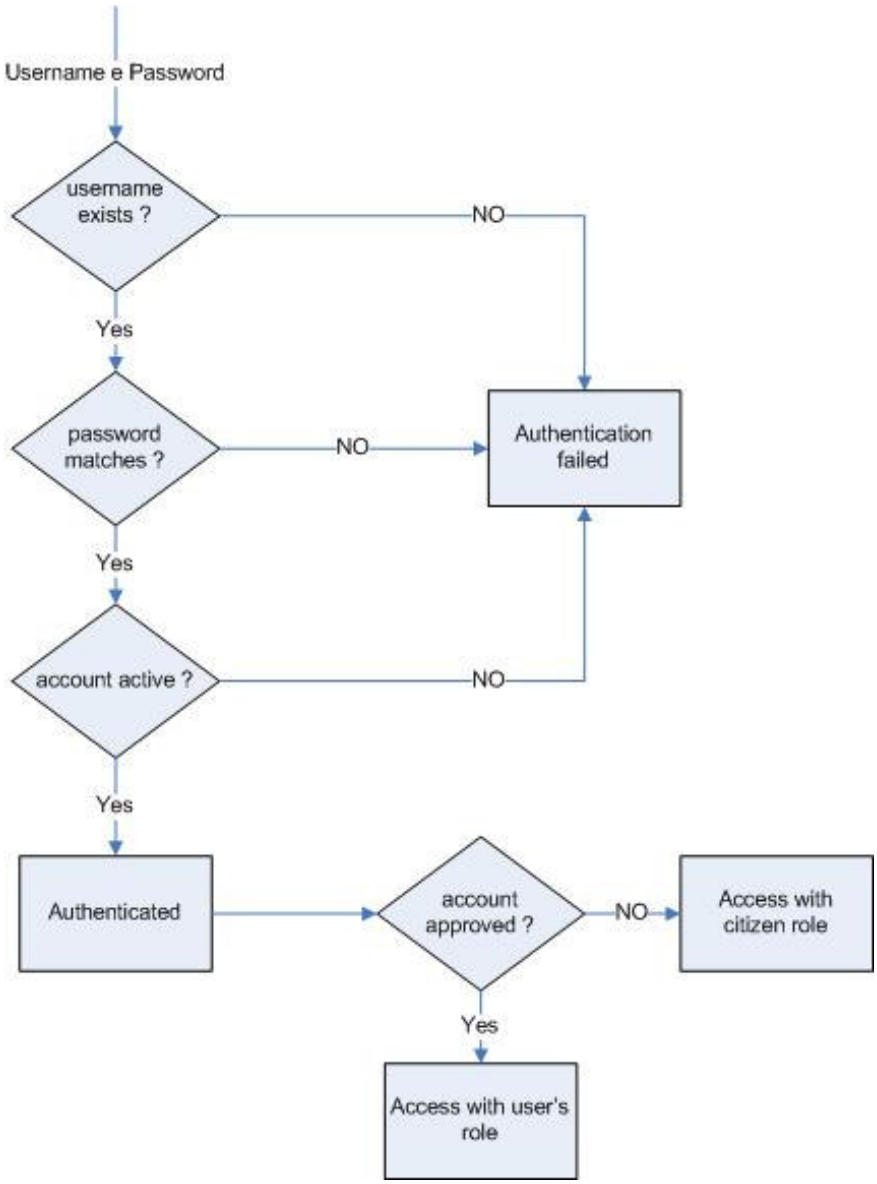

Figure 14: Flow Chart – login procedure

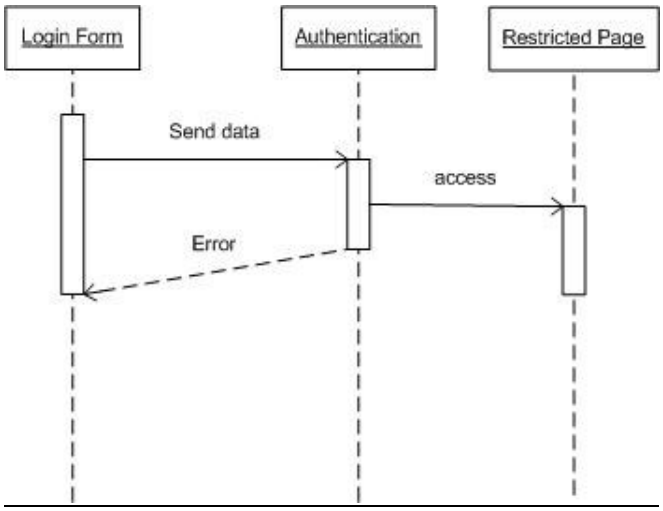

Figure 15: Scenario - Login

Password Recovery

This functionality allows registered users to recover their password in case of loss. The system will ask users to provide their username and if the username is found, the system will send a new password to the email address specified during registration. The scenario is provided in Figure 16.

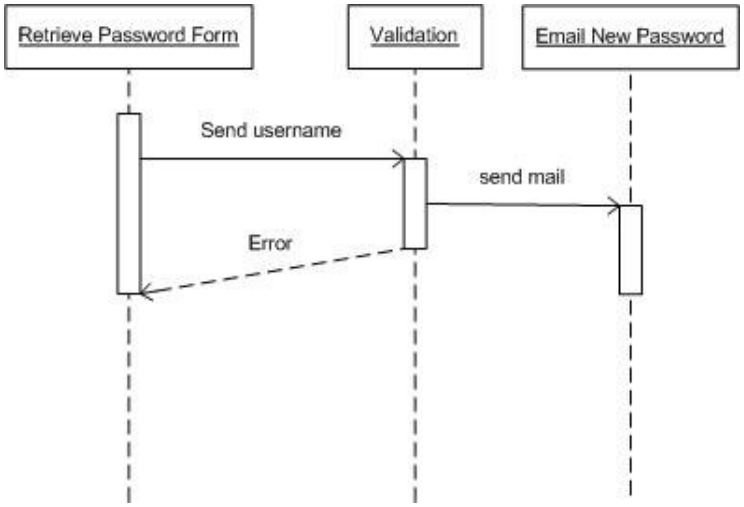

Figure 16: Scenario – Password Recovery

GeoInfo

This functionality allows users to view information in order to gain detailed knowledge on the water resource. Data is shown on a map and is hence geo-referenced giving knowledge on the :

- Location of all water sources, subdivided into:
  - rivers
  - lakes
  - wells
  - springs
- Topology of the distribution network
- Location of the facilities, subdivided into:
  - pumping station
  - water purification systems
  - accumulations
  - adductions

Besides consulting the map and viewing this data, users can launch simple queries; by clicking on a point of the map of their choice a user can have knowledge of:

- which are the water sources and in which percentages
- the availability of the water resource
- the cost of both in venal as well as in terms of issued CO_2 , of the transport, water purification and water distribution
- the parameters of the measured and perceived water quality

By selecting the type of information a user is interested in, the system will respond by showing the requested data without the support of the map since this is not a geo-referenced information anymore.

Figure 17 describes this interaction.

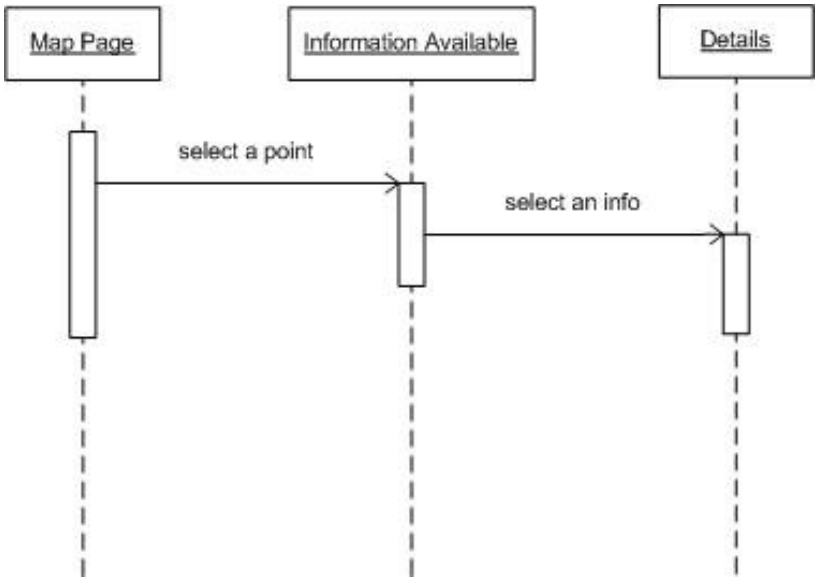

Figure 17: Scenario - GeoInfo

Log out

The log out function closes a working session; once logged out, the user is not authenticated anymore. He can still access the public section but not use the options made available to him by the system based on his role, as he would then need to log in again.

Profile

The profile is the result of all the information provided by the user during the registration. The user can view as well as modify his profile. The related scenario is similar to the registration scenario and is shown in Figure 18.

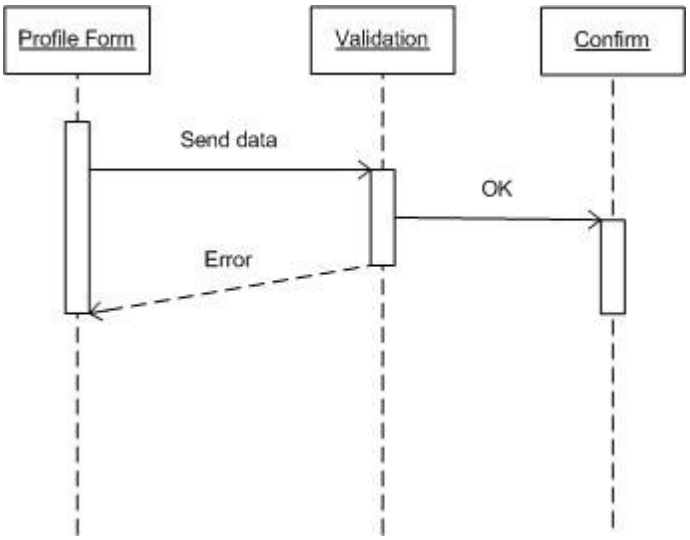

Figure 18: Scenario – Profile Visualisation/Update

Notifications

Notifications are messages, which are automatically generated by the system as soon as certain events occur. These notifications are defined by an entity and an event; when an event X occurs relating to an entity Y, the notification that is triggered keeps track of both the event (X) and also the entity (Y). Notifications are targeted to a specific user, or to all users who have a certain role; Figure 19 sketches what has been stated so far.

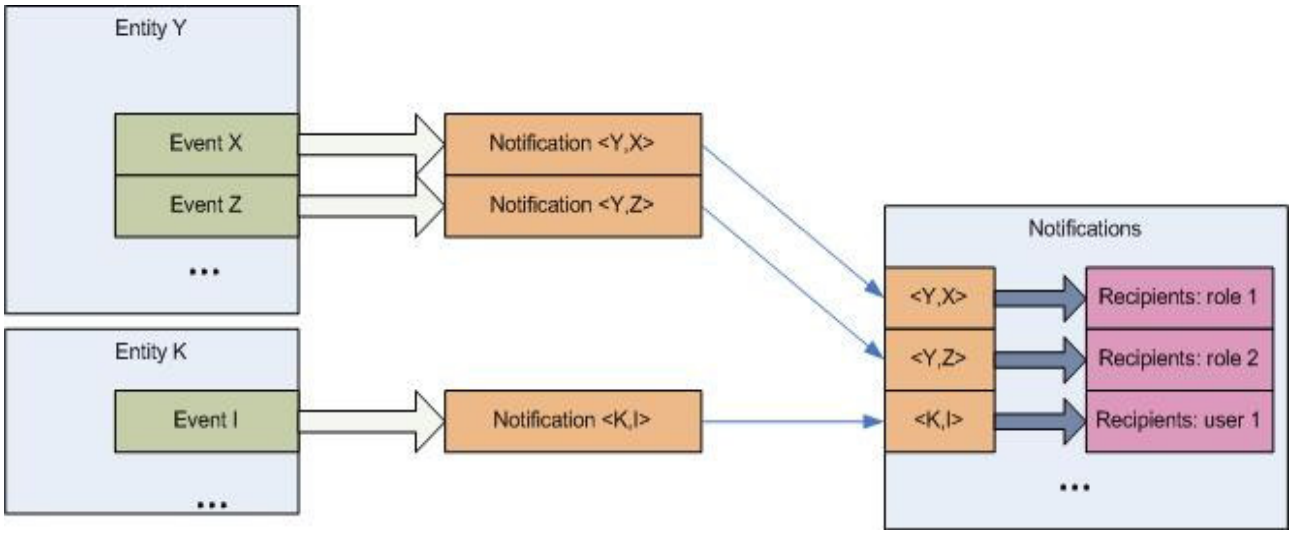

Figure 19: Organisation of the notifications

Each user can consult the notifications he is concerned with by visualising:

- Date and time of the notification
- The description
- The connection to the entity that triggered it
- The flag indicating if the notification has already been read or visualized and treated by another user

By default, the notification generates also an automatic system email to all users addressed by the notification.

It is not possible, of course, to modify the content of the notification; however a user can mark a notification as 'read' (if he is the recipient) or mark it as 'treated' (if the recipient is a group of users with the same role the user belongs to) meaning that the user is taking care of it.

Email settings

A user can change the default behaviour of the system, which sends an email each time a notification is triggered.

The system is very flexible, thus the user can:

- Disable all emails
- Disable only those emails relating to a specific entity
- Given a certain entity, disable only those emails relating to a specific event

Figure 20 shows the flow chart.

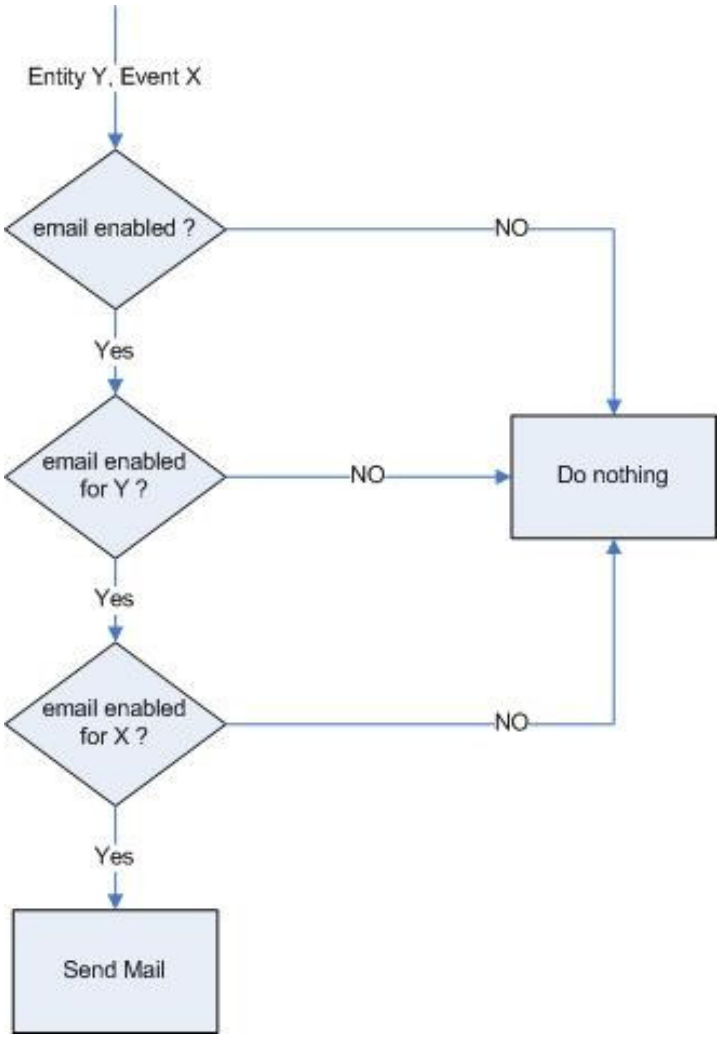

Figure 20: Flow chart – automatic email sending procedure

Upon expressing the preference to disable the automatic email sending procedure, the system still keeps triggering notifications, which can be viewed by the user; they are simply not sent by email anymore.

Water Resource Request

Water resource requests represent a fundamental entity of the system. By means of these requests a *planner* user can file a request to the *water resource utility* to learn how much water is available and how it can be accessed.

The system recognises two types of requests:

- Preliminary phase requests: the geographical areas represent **UTOE**. In this case the water resource utility's action is not required and the system will provide a real-time response indicating the current and future availability of the water resource
- Executive phase requests: the geographical areas represent the single allotments. In this case the water resource utility's action is required, thus the system can not provide a real-time response.

In both cases, the user must also specify the intended use for each area; in the preliminary phase request one or more intended uses can be indicated for the same area, while in the executive phase request each area can be associated to a sole intended use. The chart in Figure 21 clarifies this difference.

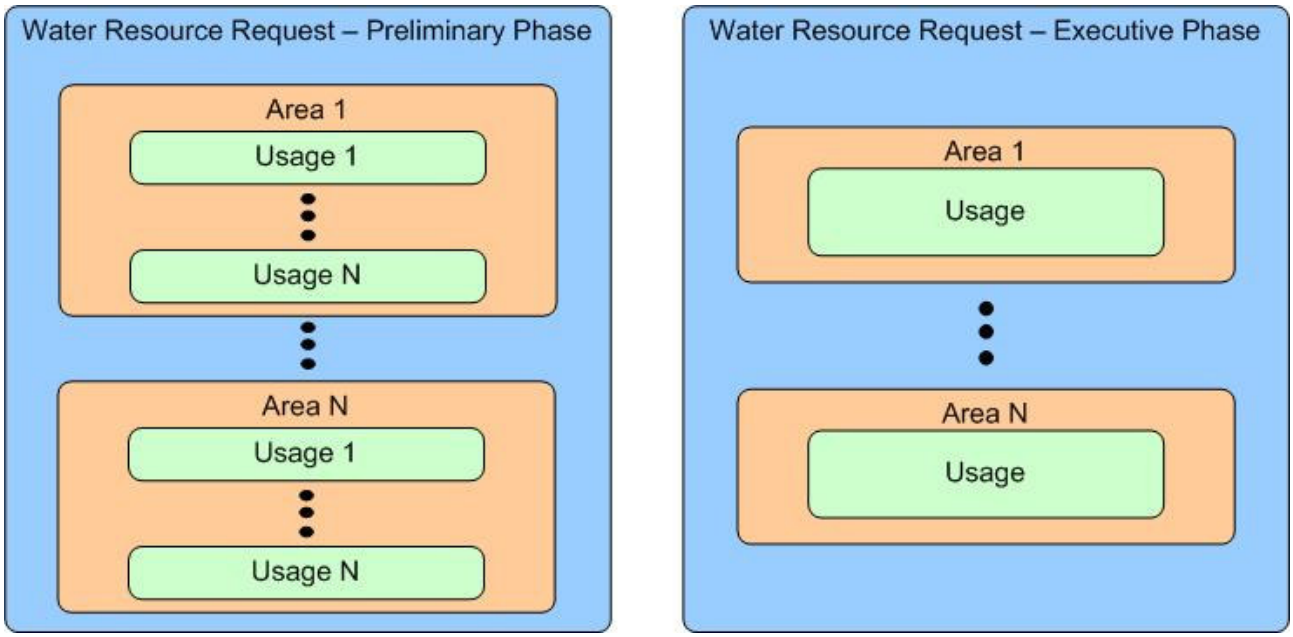

Figure 21: Typologies of a Water Resource Request

Water resource requests go through different states; the evolution from one state to the other depends on the typology of the request itself. The chart showing the states in Figure 22 indicates the course of a preliminary phase request.

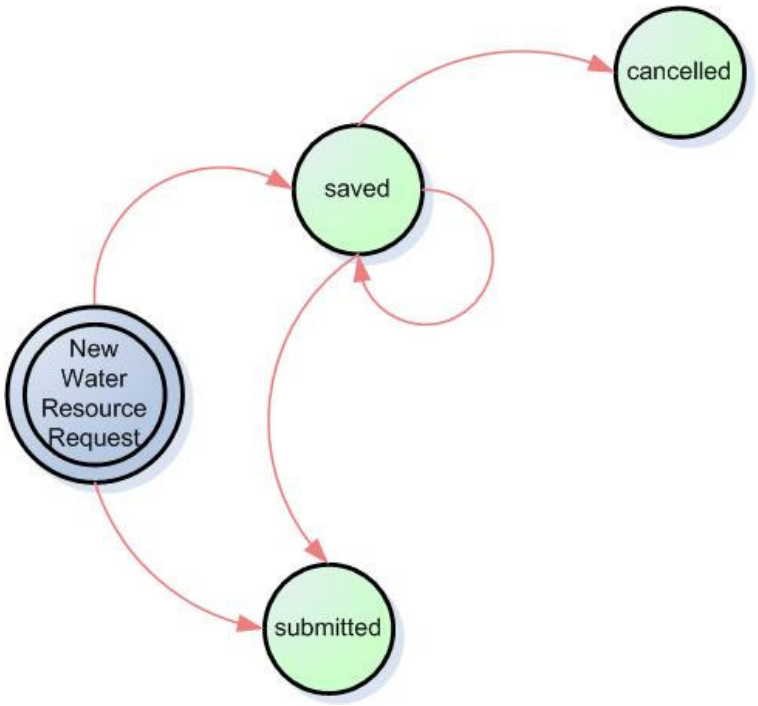

Figure 22: Chart with the states of a water resource request in the preliminary phase request

The diagram shows that a preliminary phase request can be in one of the following states:

- Saved: it is visible only for the user who created it, who can permanently modify and save it
- Cancelled: the request is not valid anymore. It remains visible only for the record of the user who created it but it can not be modified anymore, least of all it can be submitted
- Submitted: the request is sent to the system. From this moment on it can be viewed by the *water resource utility* and it can not be modified by the user who created it anymore.

In Figure 23, on the other hand, the evolution of an executive phase request is shown.

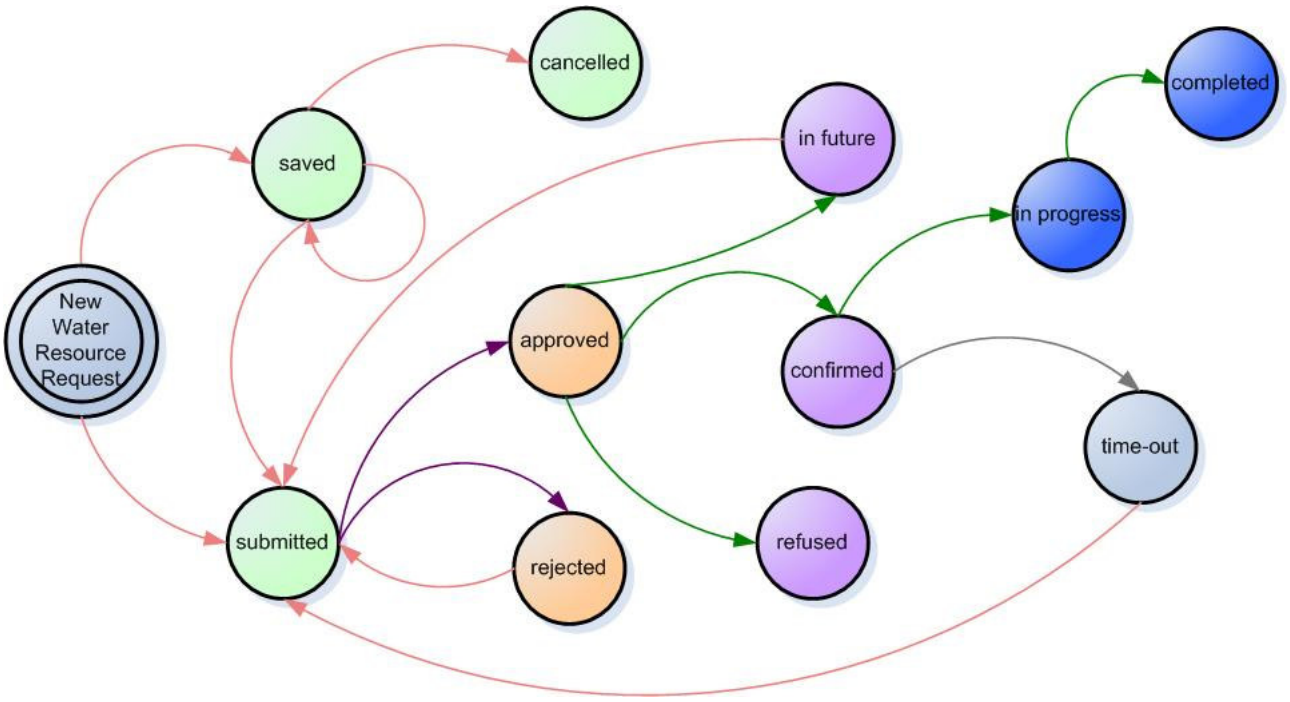

Figure 23: Chart with the states of a water resource request in the executive phase request

In this case the figure is more complex, especially because other actors are also involved, the states are the following:

- Saved: it is visible only for the user who created it, who can permanently modify and save it
- Cancelled: the request is not valid anymore. It remains visible only for the record of the user who created it but it can not be modified anymore, least of all it can be submitted
- Submitted: the request is sent to the system. From this moment on it can be viewed by the *water resource utility* and it can not be modified by the user who created it anymore.
- Approved: indicates that the water resource utility – technical office, has expressed a positive advice on the possibility of satisfying the request
- Rejected: indicates that the water resource utility – technical office, has expressed a negative advice on the possibility of satisfying the request; in this case the request can be modified by the planner who created it and subsequently submitted again

- Confirmed: indicates that the water resource utility – administrative office, has officially communicated to the planner its willingness to satisfy his request
- Refused: indicates that the water resource utility – administrative office, has no intention to satisfy the request filed by the planner
- In future: indicates the willingness of the water resource utility – administrative office, to satisfy the request in the future
- Time-out: a confirmed request requires action; the planner needs to kick off the construction works within a maximum limit of time established by the water resource utility – technical office. If this doesn't occur, the system will automatically mark the request as expired (time-out). An expired request can be resubmitted by the planner by restarting the procedure
- In progress: indicates that construction works relating to the subject request have begun
- Completed: indicates that the construction works are finished. This state terminates the procedure and indicates that the requested resource has been supplied indeed.

Creation

The creation of a water resource request requires first of all some alphanumeric data (but not geographical ones) such as:

- Unique identifier
- Date and time e of the request
- Typology
- State
- Name
- Description
- Notes
- Associated water demand

Clearly, also geographical information relating to the areas subject of the request are needed; these areas can be directly drawn on the map or acquired through a file. The system supports shape format files uploads. In this case the .shp file is required to upload the areas with the projection from the file.

The system will also request information on the intended use of the single areas, regardless of the fact whether the areas are uploaded from a shape or drawn on the map.

To facilitate the task to a user, the intended use of an area requires:

- A category (hotel, restaurant, etc.)
- A value to be assigned to a parameter, which depends on the chosen category

This information will be used by the system to automatically calculate the water demand associated to every single area and, as a consequence, the total water demand associated to the request.

The system will also provide the current and future water resource availability from one area to the other.

Visualisation

A generic user will visualise a filtered list of water resource requests based on his role.

Figure 24 shows which are the states a preliminary phase water resource request needs to be in order to be seen by the various users categories:

- Planner user: sees requests in all states, provided he is the one who created them (orange box)
- Water resource authority user: sees requests, which have been submitted (yellow box)
- Water resource utility user – technical office: sees requests, which have been submitted (blue box)

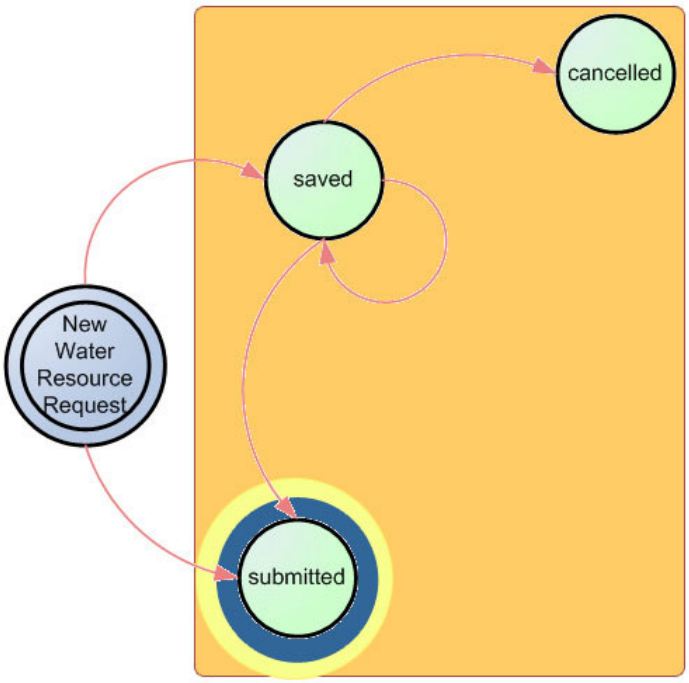

Figure 24: Visibility of the preliminary phase water resource requests states based on the user's role

Figure 25, on the other hand, is related to an executive phase water request:

- Planner user: sees requests in all states, provided he is the one who created them (orange panel)
- Water resource utility user – technical office: sees requests, which have been submitted and beyond this state (green panel). Hence, neither saved nor cancelled requests can be seen by this user.
- Water resource utility user – administrative office: sees requests, which have been submitted and beyond this state (yellow panel). Hence, neither saved, cancelled, submitted nor rejected requests can be seen by this user.

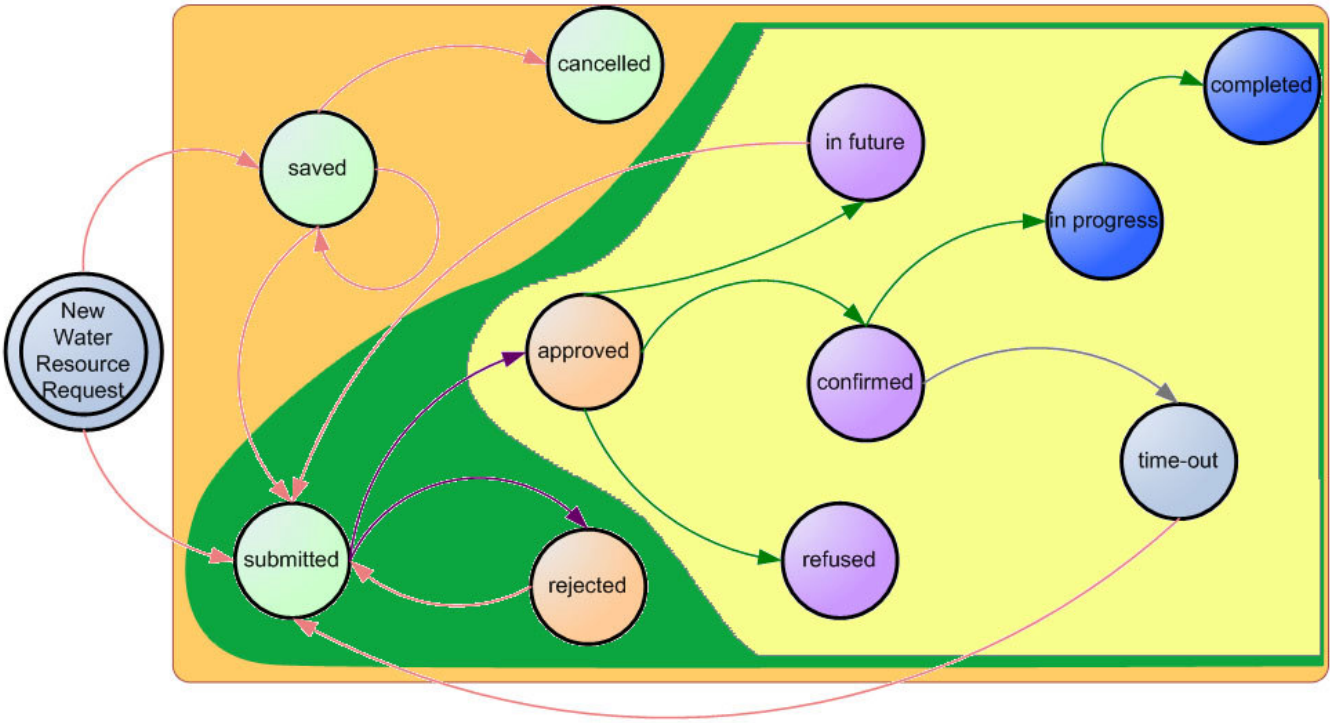

Figure 25: Visibility of the executive phase water resource requests states based on the user's role

For each request a summary of available information will be reported, such as:

- Name
- Identifier
- Typology
- State
- Description
- Note
- Associated water demand

The user can choose between viewing a list or a gallery with the information and filter the requests based on their states.

By selecting a particular request, in-depth information on areas and intended land use of these areas can be accessed. A user can also access additional information produced by the system on an area-by-area basis, such as:

- Service area (SA) concerned and relating city-state
- height
- the surface of the area
- detailed information on the calculation done to reckon the water need

Geographical information for the request in general or for a single area can be exported in a shape format file.

Modification

Only requests, which are in the saved status can be modified; a user can only modify his own requests.

It is very similar to the creation phase; it is possible to add, eliminate or change the intended land use of the areas. These operations will modify the total water demand of the request.

Certainly, it is possible to modify also non-geographical information, but nor it is possible to modify the typology of the request neither its state.

Change of state

Whenever there is a change of state, a notification is sent via email; the recipient of the notification and of the email always changes based on the starting and target point. Moreover, not all user categories can change the state of a water resource request from a hypothetical state X to another state Y: each user can enable only some states, based on his role. The states of a preliminary phase request are all enabled by a planner user; the notification is triggered only when the request reaches the *submitted* state and recipients are the *water resource authority* and the *water resource utility – technical office*; the chart is displayed in Figure 26.

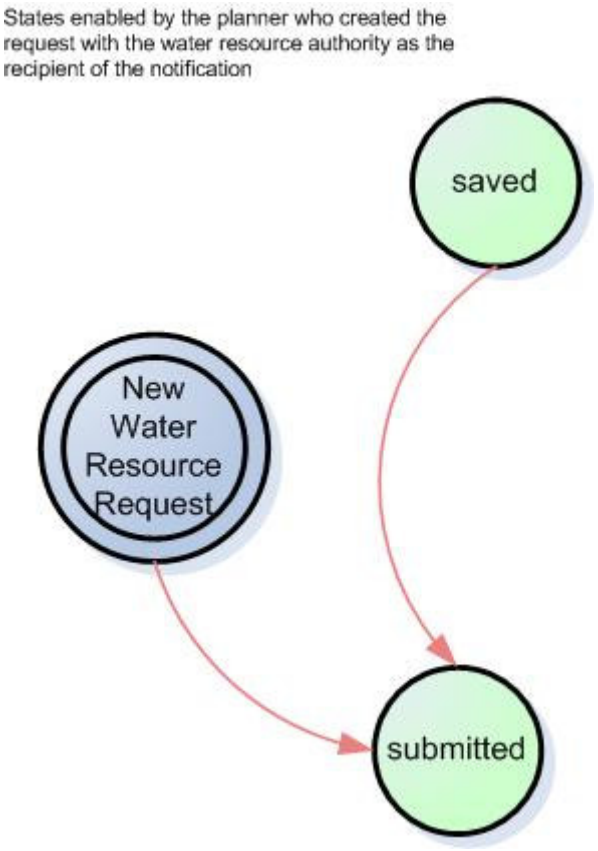

Figure 26: Change of states of a preliminary phase water request: the transition from one state to the other is always enabled by a planner user and ends with a notification to the water resource authority

As opposed to the preliminary phase, the executive phase water request is a little bit more complicated and involves different actors; charts in Figure 27 and subsequent ones relating to an executive phase request show that:

- an operation that starts with a 'new request' and is then 'saved' is carried out by the planner; no notification and/or email is foreseen
- an operation that is 'saved' and then 'saved' again is carried out by a planner; no notification and/or email is foreseen
- an operation that changes the status from 'saved' to 'cancelled' is carried out by a planner; no notification and/or email is foreseen

- an operation that starts with a 'new request' and is then 'submitted' or is in the 'saved' status and then 'submitted' is carried out by a planner; the notification and/or email triggered is addressed to the water resource utility – technical office
- an operation that changes the status from 'submitted' to 'approved' is carried out by the water resource utility – technical office; the notification and/or email triggered is addressed to the water resource utility – administrative office
- an operation that changes the status from 'submitted' to 'rejected' is carried out by the water resource utility – technical office; the notification and/or email triggered is addressed to the planner who is the owner of the request
- an operation that changes the status from 'rejected' to 'submitted' is carried out by the planner who is the owner of the request; the notification and/or email triggered is addressed to the water resource utility – technical office
- an operation that changes the status from 'approved' to 'confirmed' or from 'approved' to 'refused' or from 'approved' to 'in future' is carried out by the water resource utility – administrative office; the notification and/or email triggered is addressed to the planner who is the owner of the request
- an operation that changes the status from 'in future' to 'submitted' is carried out by the planner who is the owner of the request; the notification and/or email triggered is addressed to the water resource utility – technical office
- an operation that changes the status from 'confirmed' to 'time-out' is automatically executed by the system; the notification and/or email triggered is addressed to the planner who is the owner of the request
- an operation that changes the status from 'time-out' to 'submitted' is carried out by the planner who is the owner of the request; the notification and/or email triggered is addressed to the water resource utility – technical office
- an operation that changes the status from 'confirmed' to 'in progress' is carried out by the water resource utility – administrative office; the notification and/or email triggered is addressed to the planner who is the owner of the request
- an operation that changes the status from 'in progress' to 'completed' is carried out by the water resource utility – administrative office; the notification and/or email triggered is addressed to the planner who is the owner of the request

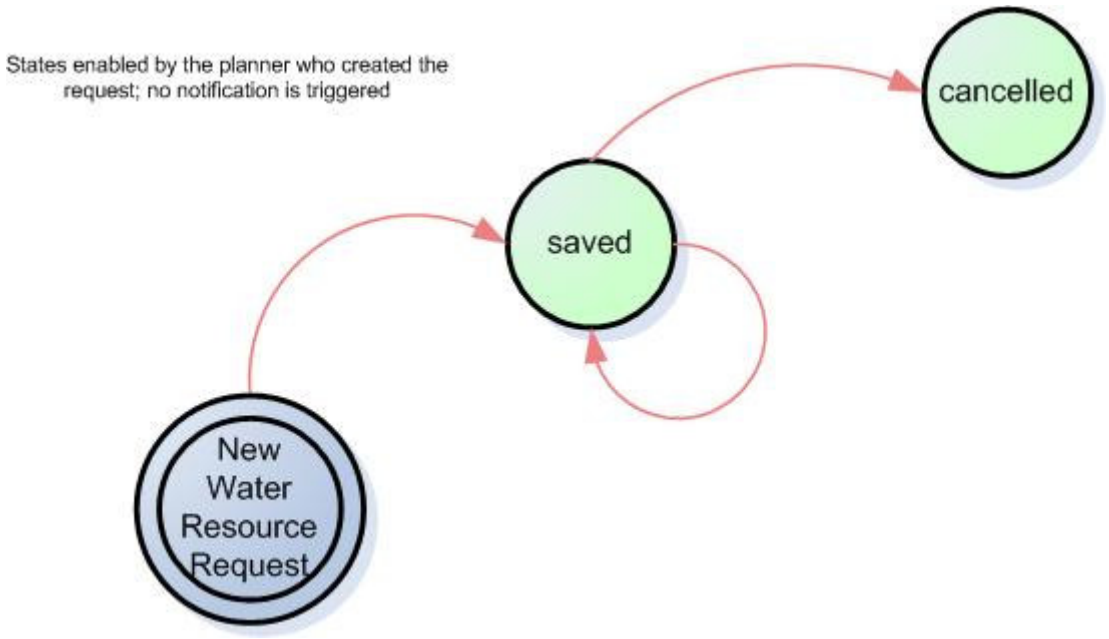

Figure 27: a) Change of states of an executive water resource request: the transition from one state to the other is always enabled by a planner user and no notification is triggered

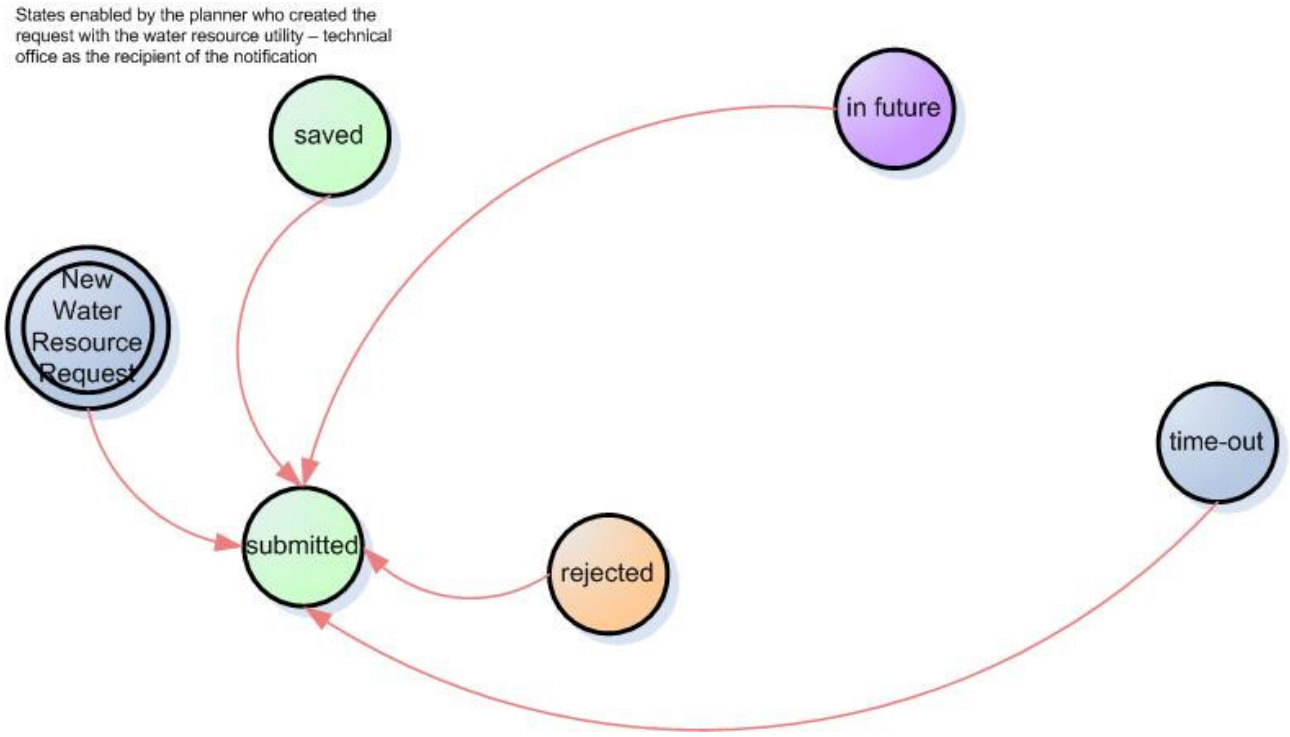

Figure 28: b) Change of states of an executive phase water request: the transition from one state to the other is always enabled by a planner user and ends with a notification to the water resource utility – technical office

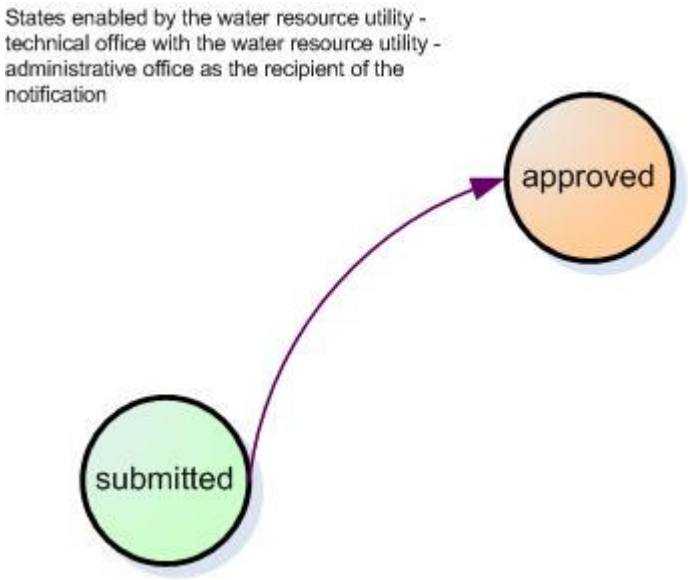

Figure 29: c) Change of states of an executive phase water request: the transition from one state to the other is always enabled by the water resource utility – technical office and ends with a notification to the water resource utility – administrative office

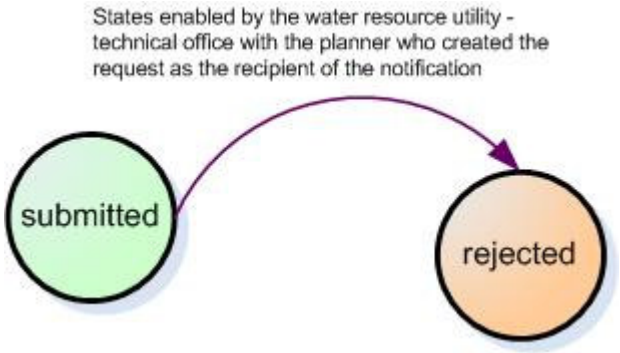

Figure 30: d) Change of states of an executive phase water request: the transition from one state to the other is always enabled by the water resource utility – technical office and ends with a notification to the planner who created the request

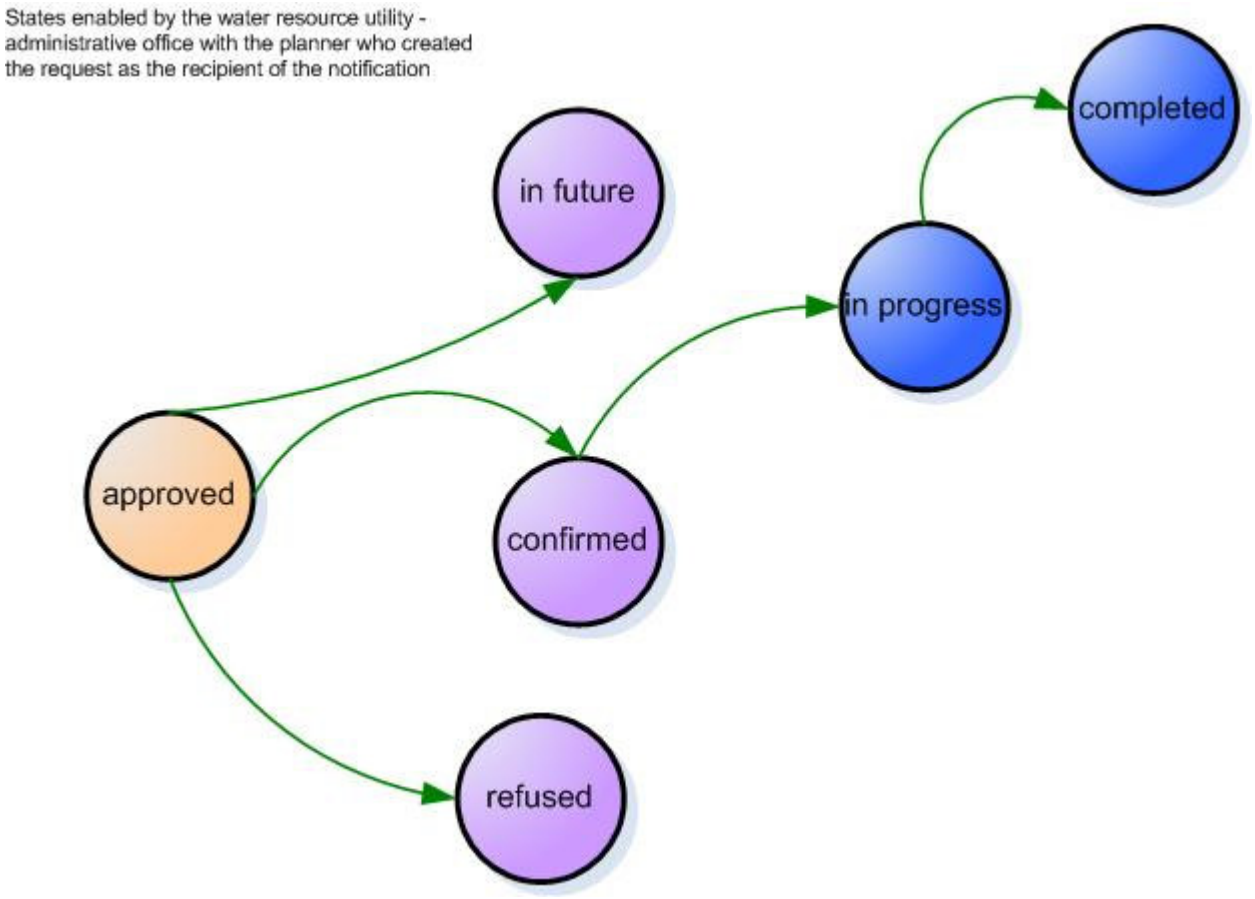

Figure 31: e) Change of states of an executive phase water request: the transition from one state to the other is always enabled by the water resource utility – administrative office and ends with a notification to the planner who created the request

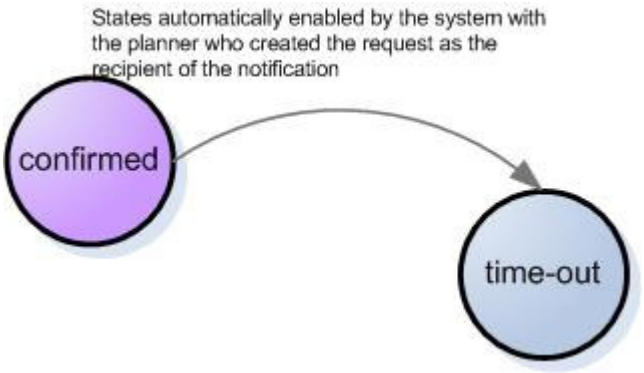

Figure 32: f) Change of states of an executive phase water request: the transition from one state to the other is automatically enabled by the system and ends with a notification to the planner who created the request

Generation of a printed copy

It is possible to generate a pdf file of a water resource request to create an electronic copy and if required also a printed copy. The generated file will contain information associated to the request both, non-geographical, represented in a table format, and geographical, displayed as an image.

The pdf file will contain also a special bar code, called QR-Code. This code will allow a user to trace the origin of the electronic version stored in the system starting from the printed copy. This operation requires a QR-Code scanner, which is provided for in the majority of modern tablets and smart phones as an application.

EPANET

Upon receiving a water resource request the water resource utility – technical office has to perform a technical assessment and decide whether to approve or reject a request. To carry out this task, it is necessary to perform simulations on the distribution network and eventually decide which modifications are needed to satisfy the request. These operations are executed with an external simulation software called EPANET.

The system needs to deliver an interface towards EPANET to allow a user to import and to simulate the new request inside the existing distribution network.

The operation of the interface is shown in Figure 33. The user needs first to upload the EPANET model of the distribution network; then the system will add the information relating

to the water resource request and will produce a new updated EPANET model file, which the user needs to download.

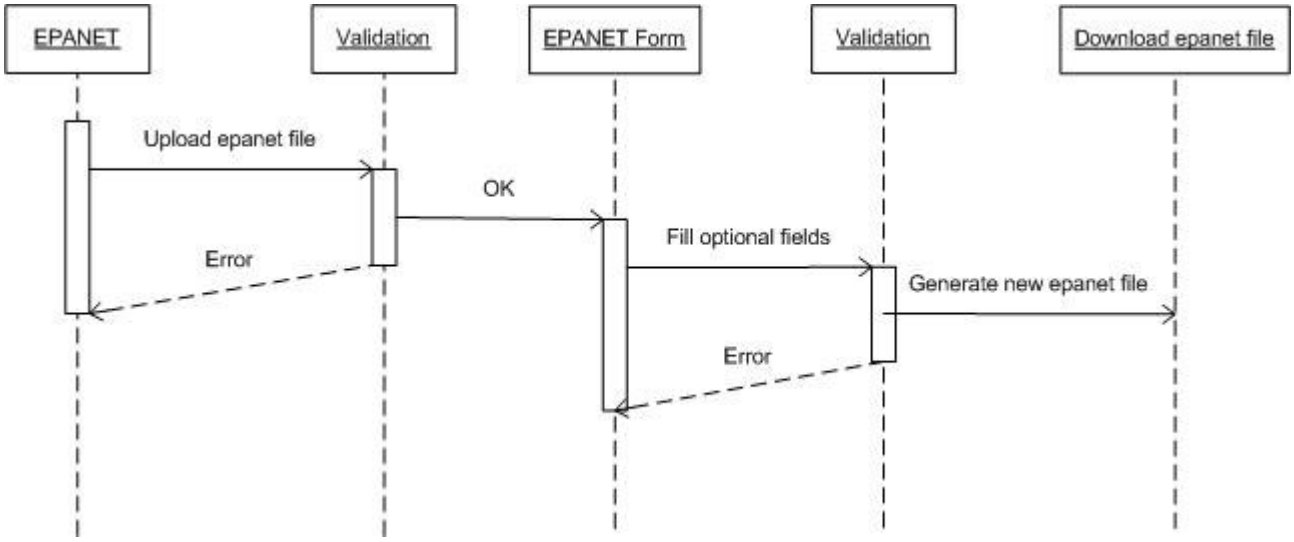

Figure 33: EPANET scenario

The Information the system needs to add is represented in the distribution network nodes (the *junctions*, in jargon EPANET); Figure 34 shows which are the parameters to initialised[2] for each *junction*:

- junction id
- x-coordinate
- y-coordinate
- description
- tag
- elevation
- base demand
- demand pattern

[2] are related to EPANET specifications

- demand categories
- emitter coeff.
- initial quality
- source quality

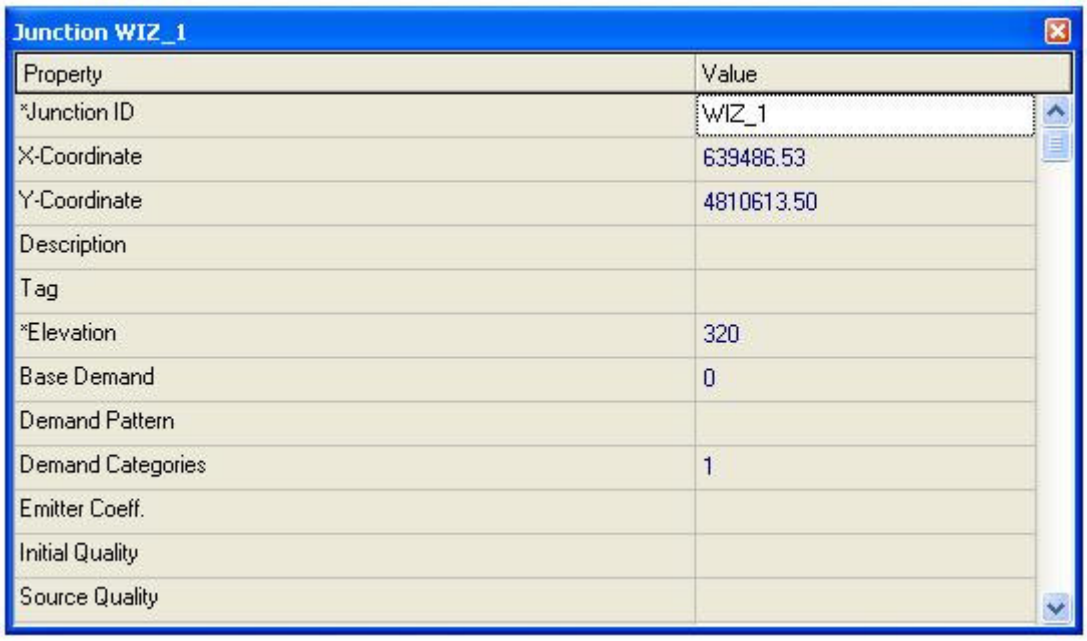

Figure 34: Fields of a Junction, according to the EPANET specification

Some of these parameters are automatically calculated by the system while others need to be inserted by the user (and these are optional). The following information is automatically inserted by the system:

- unique identifier of the centroids of the various areas that make up the request (*junction_id* field)
- intended land use (*description* field)
- coordinates x,y of the centroids (field *x-coordinate* and *y-coordinate*)
- elevation of the centroids (field *elevation*)
- water demand associated to each centroids (field *base demand*)

On the other hand, the user will be asked to insert the following information:

- tag
- demand pattern
- demand categories
- emitter coefficient
- initial quality
- source quality

This information is true for all inserted centroids; however the user can decide to parameterise data for all centroids by using particular placeholders; those credited are the following:

- incremental id
- name of the water resource request
- date of creation of the water resource request
- name of the planner who created the water resource request
- last name of the planner who created the water resource request

Parameters configuration for the water demand calculation

The water resource utility – technical officer user can modify all parameters through which the system can automatically calculate the associated water demand of a given water resource request. The parameters refer to:

- a list of all categories that can be associated to a specific area
- a group of characteristics associated to each category
- conversion indexes to calculate the population equivalent starting from the characteristics of the category
- formula, which relate to the categories, in order to calculate the water demand starting from the population equivalent

Quality / Fault

On one hand, this functionality allows a citizen to express his opinion on the perceived water quality. The system provides a map on which a citizen needs to indicate a spot and subsequently indicate a quality level. It is intentionally possible to view opinions expressed by other citizens on the perceived quality: markers on the map, differently coloured based on the quality level, will indicate the spots inserted by other citizens.

On the other hand, the citizen can use a similar functionality to indicate a fault. Also in this case, after indicating a spot on the map close to the fault, a user needs to choose one among the possible faults and report a warning to the water resource utility.

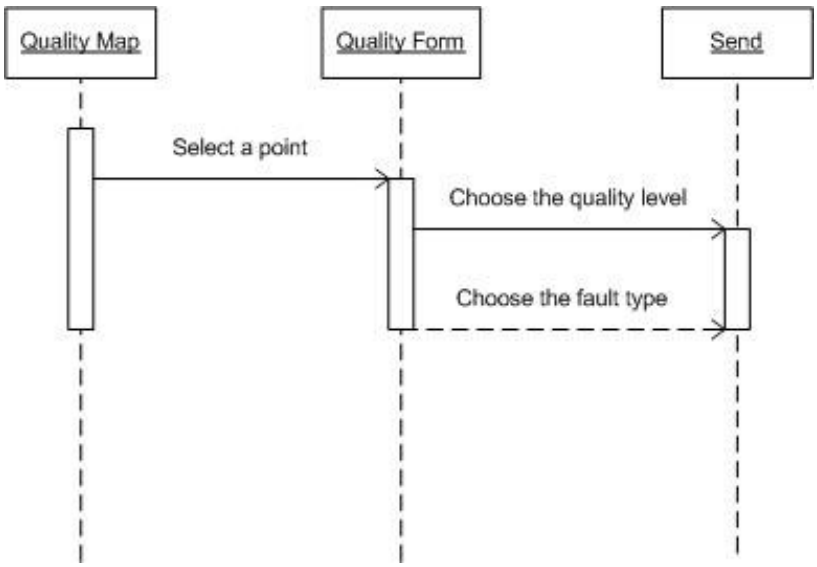

Figure 35: Scenario for expressing an opinion on the quality or indicating a fault

Management of user profiles

The *system manager* user is mainly responsible for managing the user profiles. He can not only view the different user profiles and eventually update some information, but also block a certain account so that it is impossible for the related user to log in.

Within the user management, the most important functionality is certainly the account activation. As already described in paragraph Registration, the *system manager* needs to approve the account upon registration; a user whose account is not approved, will access the system with the *citizen* role. The activation may occur through the web portal, or to simplify the procedure through a link, which will be sent by email to the *system manager* whenever there is a new registration; in this case, by a simple click on the link contained in the email, the system will automatically activate the account.

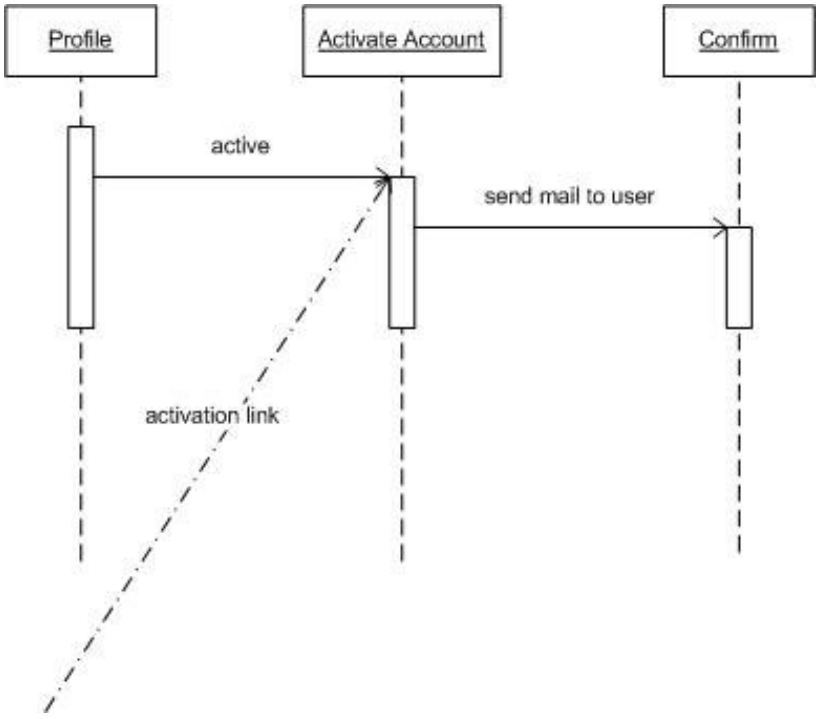

Figure 36: Activation of a user account scenario

Finally, as system manager and in support of the water resource utility – technical office, the *system manager* user can modify the parameters for the water demand calculation; the functionalities are those listed in the paragraph 'Parameters configuration for the water demand calculation'.

Extensions management

The *IT developer* user can write and upload extensions or plugin. The system accepts extensions as archives in a .zip or .tar format. For more information on the archive's content, the file format and examples, refer to the document 'WIZ: Plugins and extensions'.

The system delivers also an interface through which the *IT developer* user can manage the plugins provided for in the system. In particular, for each plugin, the user can view:

- the name of the plugin
- a description on the functionalities provided
- the user who created it
- the version
- the state of the plugin installation

This information can not be modified; however the user can decide to enable or disable the different installed plugins. A disabled plugin can not be used by the different users anymore: it remains installed in the system, so that it can be re-enabled if necessary, but it can be considered cancelled indeed.

W*S Services

The system has to allow geographical date sharing to foster operability among different systems. Sharing occurs by using the WMS services (OpenGIS Web MAP Service Implementation Specification) and WFS (OpenGIS Feature Service Implementation Specification) defined by the OGC (OpenGIS Consortium). The use of the WMS/WFS services entails two important and unquestionable advantages for the final users of the geographical data: uselessness of local data duplication and certainty that a reliable data version will be used since data is distributed by the same person who created it.

The system will receive requests by the different user clients and will send them to the server WMS/WFS. The latter will execute the request returning data either as an image or as a vector. Client applications that file a request do not necessarily have to be web-based.

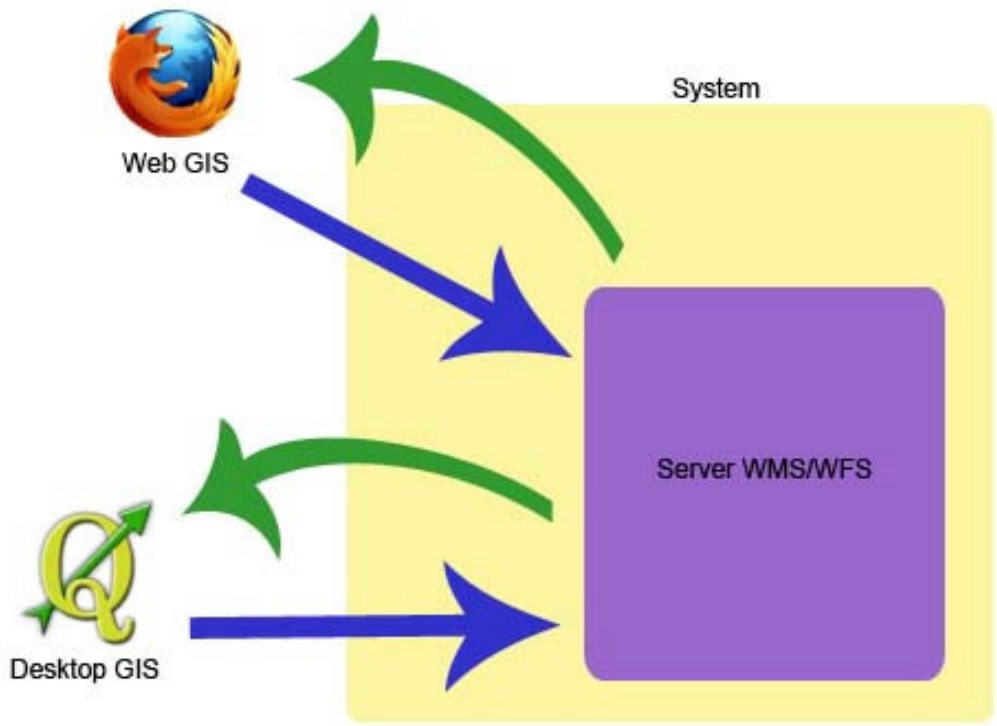

Figure 37: Interaction chart of WMS-WFS services

The WMS/WFS services that are made available are the following:

- city-state boundaries
- boundaries of the service areas
- Confini delle aree di servizio
- Areas of the water resource requests
- Orthophotos[3]
- Regional technical map[3]

[3] Uploaded from the website of the Tuscan Region through the service 'Geoscopio'

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Phone: +39 050 931630
E-mail: s.dimare@cpr.it

- Sources
- Facilities
- Distribution Network

Non functional requirements

Non functional requirements represent the characteristics the system needs to have but do not directly affect the functionalities, which are offered to the single users.

Maintainability

The system has to be easily modifiable to correct possible errors and/or improve its quality by introducing new functionalities. In particular, in order to speed up the development and the introduction of new functionalities, the system foresees a plugin mechanism by which an expert user can upload new code and make it available to all other users.

Usability

The system is thought for a variety of users. It needs to be user-friendly and intuitive also to those who have a low computer literacy. Interfaces need to be clear and the functionalities available and easily visible at any time.

Robustness

In case of dysfunctional or unforeseen situations (e.g. incorrect input data), the system needs to restore its consistent state, possibly without loosing any data.

Security

The system has an access control policy such that a user can only access those services that apply to him. Access is granted by means of a username and password.

Performance

The system manages, treats and cross-checks a high quantity of geographical information. A high-performing hardware is required thus. The system has to interact simultaneously with hundreds of users maintaining the response time under 15 seconds. This value closely depends on the web system: if the response time is higher than 15

seconds, a user might think the system is blocked, as there is no feed-back following an operation.

Interface

The system is mainly web-based. All functionalities have a web access using a normal browser. Some information can be made available also without a browser by using the WMS/WFS services; however an internet connection is always compulsory.

Open source project

The source code of the system is Open Source. All libraries used and in general all software components of third parties included in the portal need to be compliant with the project concept and hence be Open Source in turn.

Standard OGC[4]

The system needs to exchange geographical information with other external entities. To ensure operability, the system needs to be able to upload data from external sources, which respect the OGC standard, but also provide data to others in respect of the OGC standard as well.

[4] Open Geospatial Consortium (http://www.opengeospatial.org/standards/)