REPORT ON DELIVERABLE 4.2.2

DAIAD@home software

PROJECT NUMBER: 619186
START DATE OF PROJECT: 01/03/2014
DURATION: 42 months

DAIAD is a research project funded by European Commission's 7th Framework Programme.

Dissemination Level	Public
Due Date of Deliverable	Month 40, 29/06/2017
Actual Submission Date	29/06/2017
Work Package	WP4 Consumer Data Analysis
Tasks	Task 4.4 DAIAD@home
Type	Prototype
Approval Status	Submitted for approval
Version	1.0
Number of Pages	35
Filename	D4.2.2_ DAIAD@home_software.pdf

Abstract

This report presents an overview of the Prototype Deliverable D4.2.2 "DAIAD@home software", which includes all software developed in the context of WP4. DAIAD@home consists of a web and mobile application, which convey water consumption information to consumers, as well as stimuli aiming to increase awareness and induce sustainable changes in water use.

History

version	date	reason	revised by
0.1	11/01/2017	First draft	Spiros Athanasiou
0.2	14/03/2017	Multiple revisions	Nikos Georgonamanolis, Stelios Manousopoulos
0.4	02/05/2017	Multiple revisions	Nikos Georgomanolis, Stelios Manousopoulos
0.5	28/06/2017	Updated figures and minor edits	Stelios Manousopoulos
0.6	08/06/2017	Revisions and improvements in various Sections	Yannis Kouvaras
0.8	20/06/2017	Revisions and improvements in various Sections	Giorgos Giannopoulos
1.0	29/06/2017	Final version	Spiros Athanasiou

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Executive Summary

This report presents an overview of the Prototype Deliverable D4.2.2 “DAIAD@home software”, which includes all software developed in the context of WP4. DAIAD@home consists of a web and mobile application, which convey water consumption information to consumers, as well as stimuli aiming to increase awareness and induce sustainable changes in water use. This version of DAIAD@home comprises the final major iteration of the system following the evaluation in the context of our real-world trials.

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1. Introduction

This report presents an overview of the Prototype Deliverable D4.2.2 "DAIAD@home software", i.e., DAIAD's *mobile and web applications for consumers*. DAIAD@home is the software that manages the whole lifecycle of consumption data at the household level. It comprises all the subsystems for gathering consumption data and metadata, the storage engines for storing and managing consumption data, the algorithms for analyzing them , the messaging framework, and interventions for providing information and stimuli to consumers. DAIAD@home is an open source software (Apache License v2.0) and is available from our public source code repository github.com/DAIAD.

The remainder of this document is structured as follows.

In Section 2, we provide an overview of the DAIAD@home mobile application and describe the data gathering and management flow. Then, we present a walkthrough of its various features, providing select screenshots and explanations regarding the system's intended use and operation.

In Section 2, we provide an overview of the DAIAD@home web application and its lifecycle within DAIAD's entire suite of web application and services. In the following, we present a walkthrough of its various features, providing select screenshots and explanations regarding the system's intended use and operation.

2. DAIAD@home Mobile

2.1. Introduction

In the Report for Prototype Deliverable D4.1.2, the architecture of the data management system is described in detail. Here, we briefly enumerate the key features of the data gathering and management functionality of DAIAD@home mobile application. Figure 1 illustrates the data lifecycle within DAIAD@home.

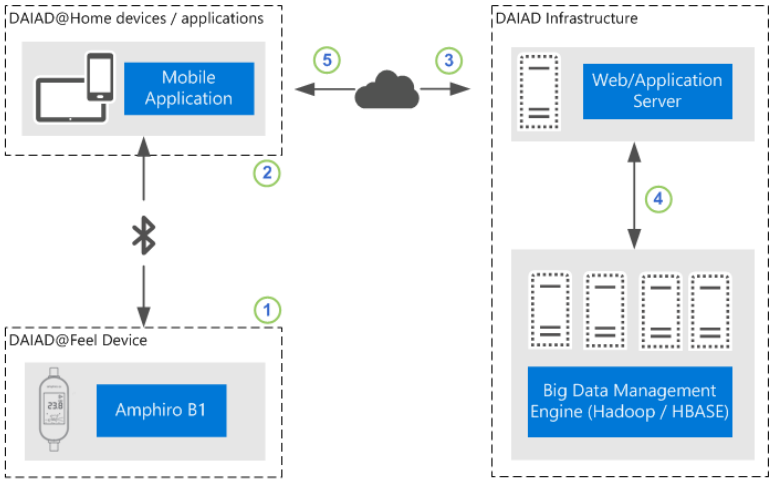


Figure 1: Data Lifecycle

2.1.1. Data source integration

In its current version, the mobile application is able to connect to an arbitrary number of amphiro b1 devices via Bluetooth 4.0. On the other hand, several mobile devices are able to connect to the same amphiro b1. Data from smart water meters (SWM) are pulled from the water utility's ICT infrastructure (*if available*) and stored locally at the DAIAD cluster. The uploaded data is paired to an existing DAIAD@home user based on the *unique* customer identification number supplied by the water utility, and become available to the DAIAD@home application. Consequently, DAIAD@home supports three (3) operations modes depending on the available data:

- *Amphiro b1-only*. The consumer only has access to amphiro b1 data from one or more devices. This operation mode has been evaluated in Trial B (St Albans), which studies the bottom-up deployment of the system without data from the water utility.
- *Amphiro b1 and SWM*. The consumer has access to Amphiro b1 data from one or more devices, as well as her SWM data. This operation mode has been evaluated in Trial A (Alicante), which studies the top-down deployment of the system with the cooperation of the water utility.

- *SWM-only*. The consumer only has access to her SWM data and can optionally add one or more b1 devices at any point, in which case the b1-related UI components automatically appear in the app.

2.1.2. Storage engine integration

Within the mobile device, an SQLite[1] relational database handles the storage of specific types of data gathered from amphiro b1 devices and users. Specifically, it is responsible of storing and managing data about users, devices and measurements. User data are stored as relational tuples that contain information about the user account such as authentication and identification data, as well as demographic characteristics (*e.g. gender, residence, age*). Device measurement data are also stored as relational tuples, with the corresponding table having *a fixed schema* (*see D4.1.2. for details*).

The data engine is also responsible for uploading profile and measurement data to the DAIAD application servers. Moreover, when measurement data is transferred, it is augmented with user profile and device information. This redundant information simplifies data storage operations at the server side and also helps data analysis, since it reduces the need for additional *join* operations. Finally, the application server executes batch processing on the collected data on predefined intervals and stores the results to the DAIAD cloud infrastructure.

2.2. Mobile app walkthrough

In this section, we present a walkthrough of the various features offered by the DAIAD@home mobile application, providing select screenshots and explanations regarding the system's intended use and operation. In our presentation we follow the common lifecycle of the application, starting from initial installation to every-day use.

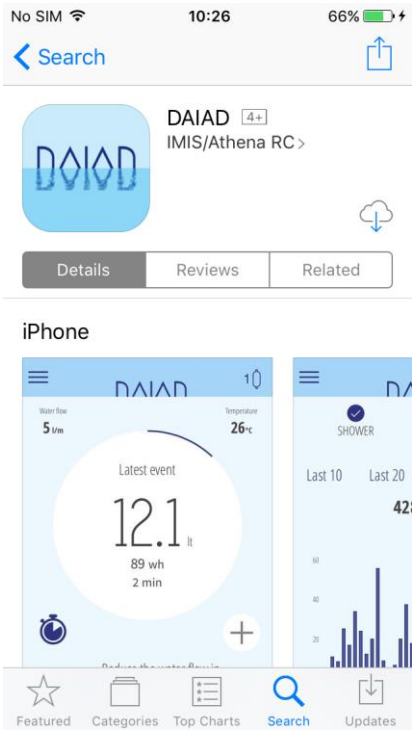
2.2.1. Installation

The user downloads and installs the application from the mobile app store (iOS, Android) as with any other application (Picture 1, Picture 2). The DAIAD@home mobile app (*communicated to users simply as DAIAD*) is available worldwide as a free application, currently available in English and Spanish. When the application is opened for the first time the user is greeted with a welcome screen (Picture 4) that serves to filter-out users *not belonging to our trials or not geographically situated in areas where the DAIAD system is in production operation*, but also raise interest for DAIAD for expanding its use in other locations.

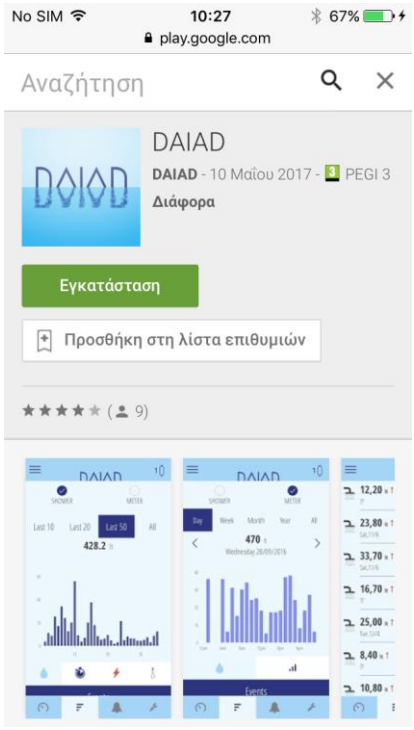
Specifically, the welcome screen provides information on DAIAD and allows users to sign up. The user location is automatically detected and if she is in the geographical regions of our Trial locations (*Alicante, St Albans, see* Picture 5) or locations where the DAIAD system will be available in a production setting, she can create an account using her white-listed email address (*i.e. the list of selected pilot participants*) as presented in Picture 6. In case the use location is not detected (*i.e. Location service off, or not allowed*) the user can pick from a list of locations where the DAIAD system is trialed (Error! Reference source not found.). If the user is in Alicante o r St Albans, she follows the above sign up process. If not, the user is encouraged to discover how she can use

[1] https://www.sqlite.org/

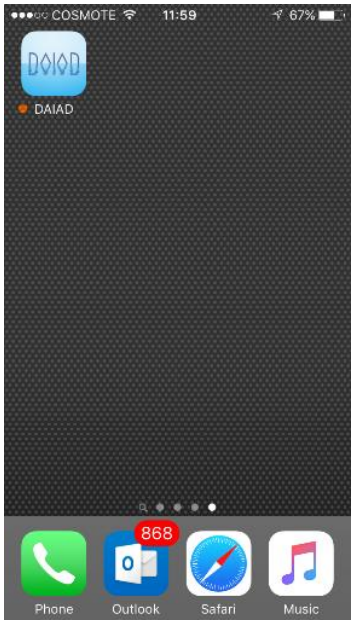
DAIAD in the future, by informing her water utility about DAIAD, purchasing a compatible device, or using an open hardware water meter. If the user has already created an account (e.g., in another device), then she can simply Log in using the same credentials (Picture 7). Finally, if the user has forgotten her password, then she can simply reset it (Picture 8); a follow-up email ensures the user retrieves the reset email to provides her new password.



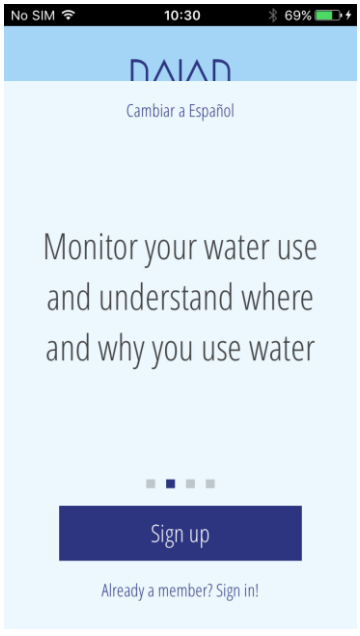
Picture 1: DAIAD at iTunes App Store



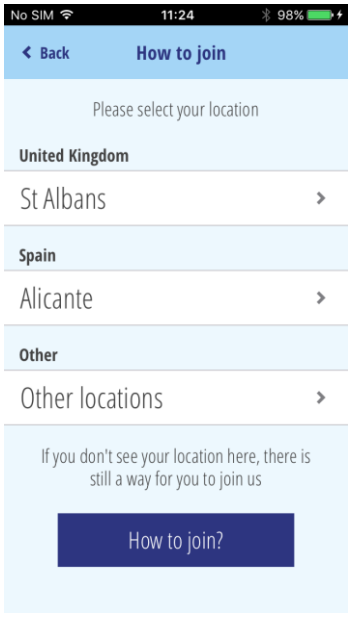
Picture 2: DAIAD at Google Play App Store



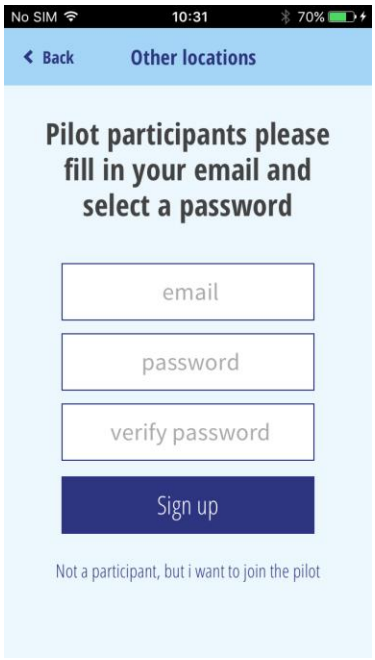
Picture 3: DAIAD installed



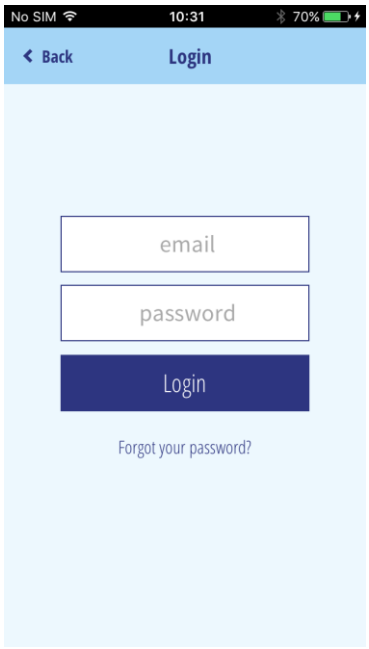
Picture 4: First page



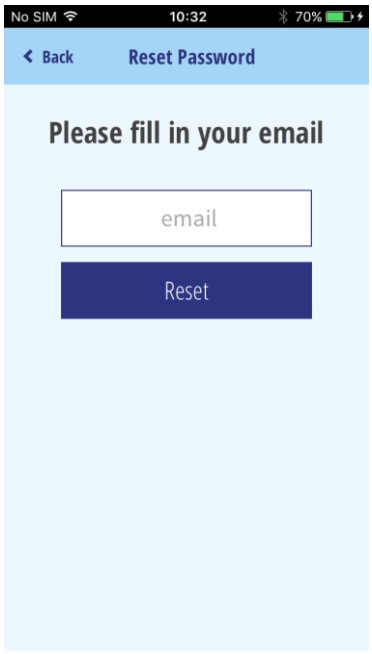
Picture 5: White-listed locations



Picture 6: Sign up form



Picture 7: Login form



Picture 8: Forgot password form

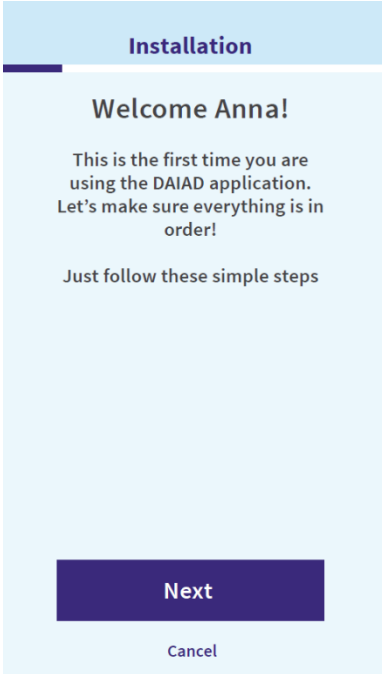
2.2.2. Initialization

After the sign-up processes is completed, the user is presented with a step-by-step guide for installing and initializing the DAIAD system (Picture 9). This guide can be completed at any time, i.e., right after sign up, or at the user's convenience at a later time. As such, the user can exit the application and when she opens it again, she can continue with the initialization.

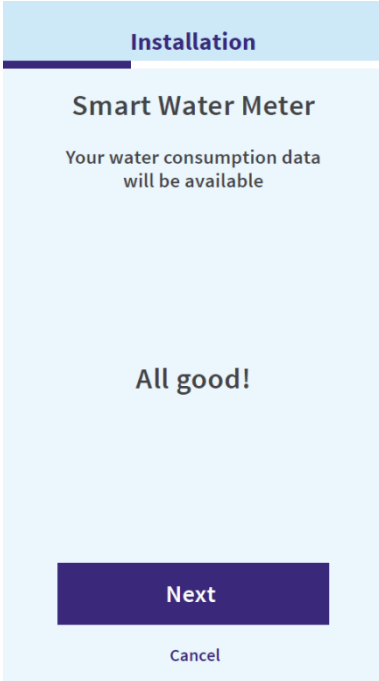
The initialization process involves a number of steps depending on the supported operation mode. These are presented automatically by the application in order to simplify and speed-up the process. In particular:

- *Amphiro b1-only*. The application first checks if Bluetooth is turned on (Picture 11). If not, the user is instructed to open it. In the next step, the user is instructed to install the amphiro b1 device and turn the water on (Picture 12). The application is automatically set in pairing mode and is waiting for the user to enter the pairing code presented in the LCD (Picture 13). With the successful code entered, the initialization process is complete (Picture 14).
- *Amphiro b1 and SWM*. The application follows exactly the same steps as in the previous case. Only an additional step in the guide is provided, where the user is simply informed that her SWM data are indeed available to the application (Picture 10). While this is not technically necessary as we already have access to this data, we consider this *verification* important for conveying a sense of interaction with the water utility.
- *SWM-only*. The application only informs the user that her SWM data are indeed available to the application. No other extra step is required.

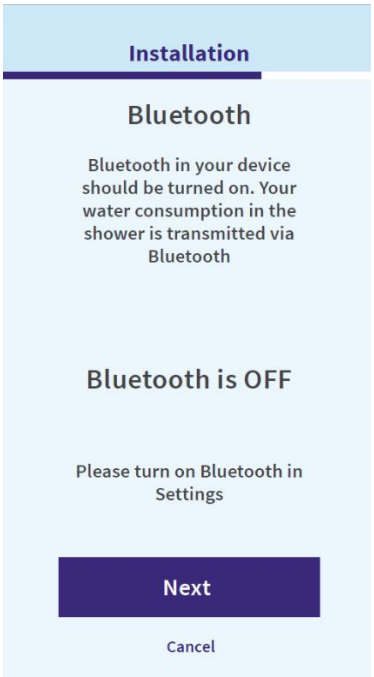
To install additional b1 devices (*more than one is supported*), the user can follow the relevant subset of this guide through the Settings sub-menu.



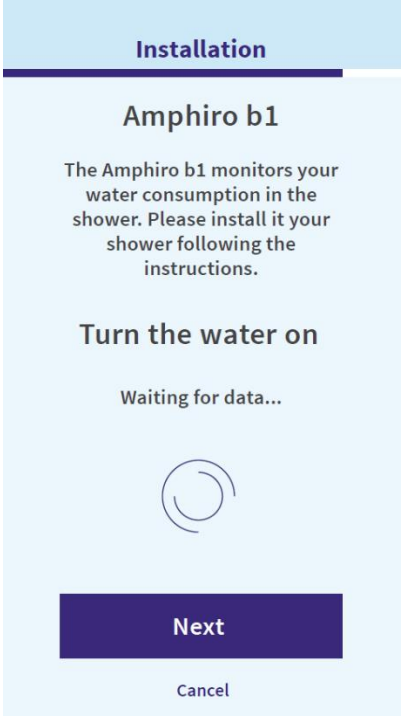
Picture 9: First step



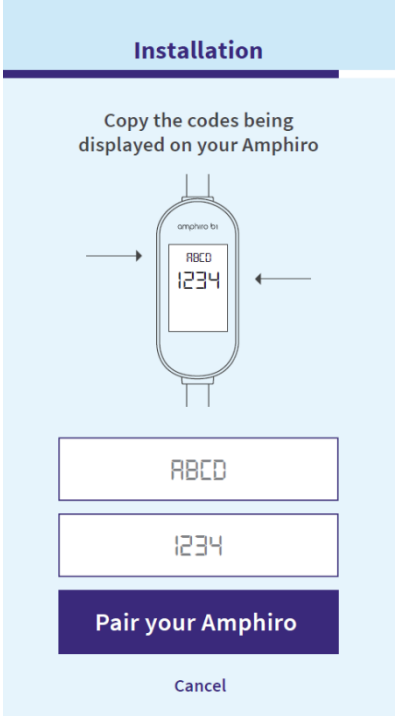
Picture 10: Checking SWM data



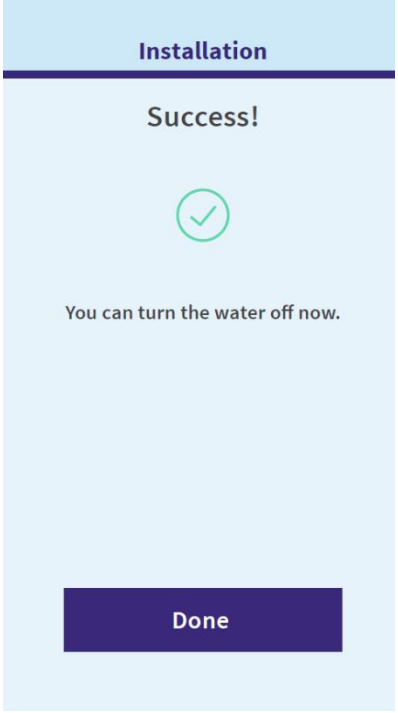
Picture 11: BT connectivity



Picture 12: Amphiro b1 installation



Picture 13: Enter PIN



Picture 14: Successful initialization

2.2.3. Learning mode

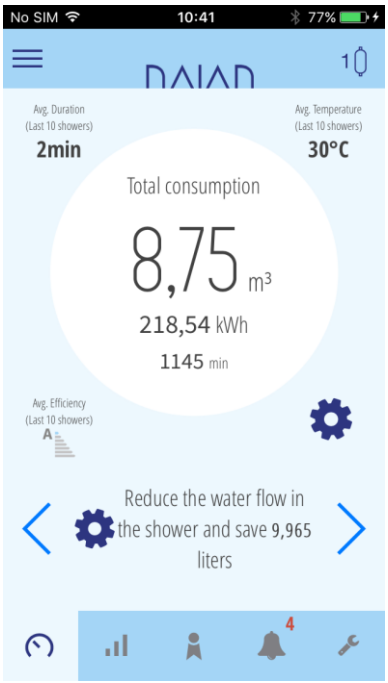
Specifically for the needs of the Trial, we have implemented a *learning mode*, i.e., a period during which we collect water consumption data from our trial participants, but do not provide *any information to them*. This serves the practical need to establish a *baseline* water consumption for our users with no interventions or stimuli that can affect their behavior and introduce bias.

Picture 15: Learning mode message

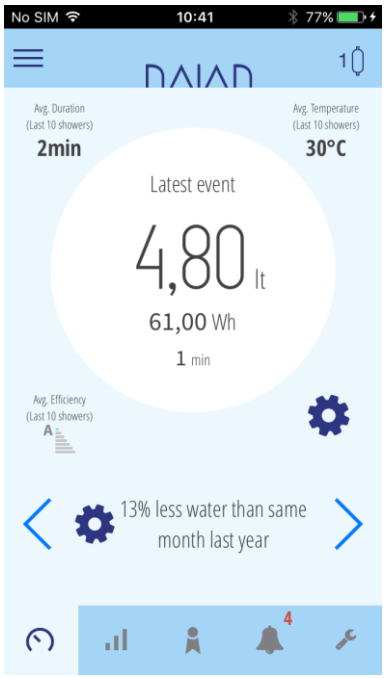
During this period, when the user opens the mobile application she is simply greeted with a message informing her about the learning mode (Picture 15). Similarly, the amphiro b1 display does not provide any information. The management of the learning mode (*start, end*) is remotely managed by the DAIAD system (*see D5.4.2 or D7.1/D72*). In the background, the mobile app silently retrieves any shower consumption data (*real-time, historical*) transmitted from the paired b1 devices via Bluetooth, stores them locally and transmits them to our server. When we consider that a baseline has been established, we can remotely set the application and the b1 out of the learning mode. When this happens, the user is informed by push notification and can start using the DAIAD@home mobile application. Further, all shower consumption data captured during this period are available within the app, thus populating it with data and content to facilitate the user's learning process and interaction.

2.2.4. Dashboard and Menu

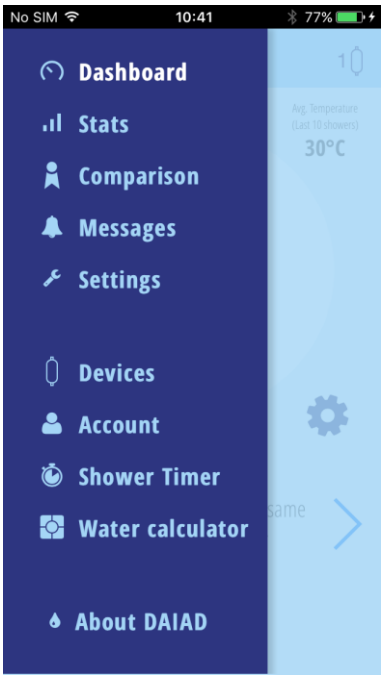
The Dashboard is the first screen available to users and provides in one glance information about water consumption, progress, and messages, as well as shortcuts to other application sections (*overview first, zoom and filter, then details on demand*). The top section of the dashboard provides a shortcut to the menu (left side), the DAIAD logo (middle), and a notification/shortcut for the installed b1 devices. The main information placeholder (*gauge*) provides information on the last consumption event or a user-selectable summary of water consumption (Picture 16, Picture 17). The 'complications' surrounding the gauge are user-selectable progress metrics. The lower part of the screen is devoted for presenting any relevant messages (*e.g. tips, recommendations, alerts*) based on their priority and links to the Messages section. The bottom part of the screen includes shortcuts to the other application sections. Finally, the menu (Picture 18) is visible throughout the application (*appears from the left side*) and offers shortcuts to other sections.



Picture 16: Dashboard, total consumption



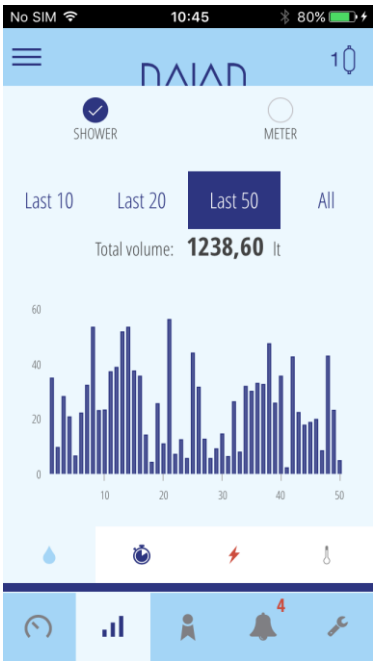
Picture 17: Dashboard, latest event



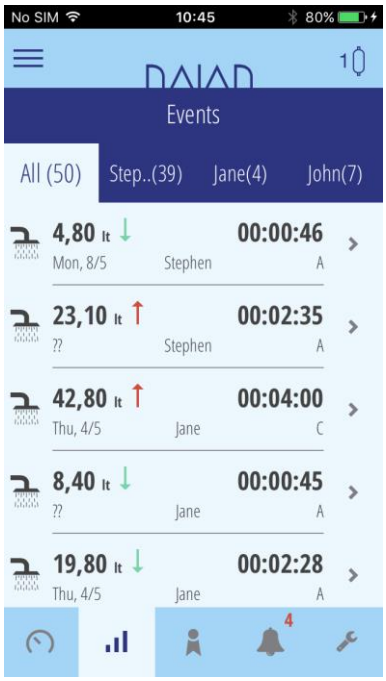
Picture 18: Menu

2.2.5. Analysis

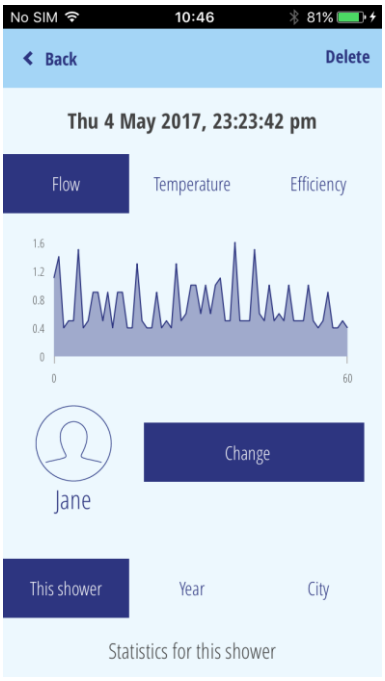
The analysis screen provides information about the historical water consumption of the consumer, along with a detailed analysis of its characteristics and specific consumption events. The user can select the data source (*SWM, Amphiro b1*) and then explore her consumption over time (*day, week, month, year*) and measuring units (*e.g. flow, energy*). These selections dynamically adjust the entire interface and the information provided (Picture 19, Picture 22, Picture 23). The bottom part of the screen presents individual or major consumption events which the user can then explore in detail (Picture 20). In the detail view (Picture 21), the user has access to detailed information and metrics for the specific event, its impact, as well as a simple what-if facility for exploring how her own behavior is translated in a large scale (*e.g. what if everyone in my city showered the same?*). Moreover, in the detail view, the water and energy consumptions are visualized in pictures (e.g. bottles, bulks, bulbs, home, city), providing a different visual representation of the shower event (Picture 25). The user can explore her shower events as well as showers from the other household members (Picture 26). The button 'Change member' in the middle part of the detailed view is used for assigning shower events to specific household member. Finally, the user can explore the data from both data sources in full screen mode (Picture 27). Further, the can explore her forecasted SWM consumption over time (*month and year*). The selections adjust the entire interface of the analysis screen and the information provided where both historical and estimated consumptions are separated with different colored lines (Picture 22, Picture 23). Specifically for SWM, the user is also provided with a depiction of water cost in relation to the consumption over the current billing period (*monthly for AMAEM*). It has been developed as a sub monitoring and controlling tool for consumers, enabling to monitor the total cost of consumed water daily since the start of the billing period and view the current price bracket for their consumption (Picture 28). Price brackets are colored dashed horizontal lines that represent upper consumption limits (*where the water cost changes*).



Picture 19: Consumption events

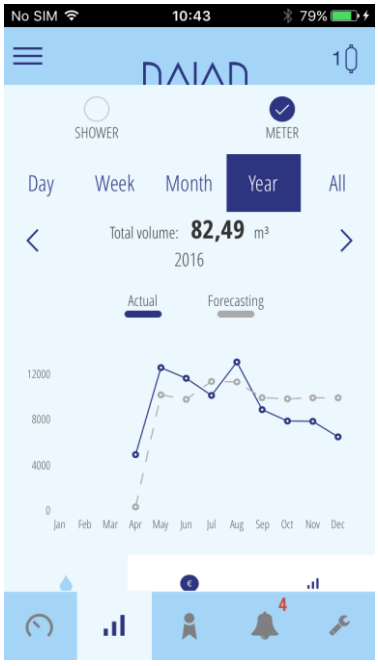


Picture 20: List of events

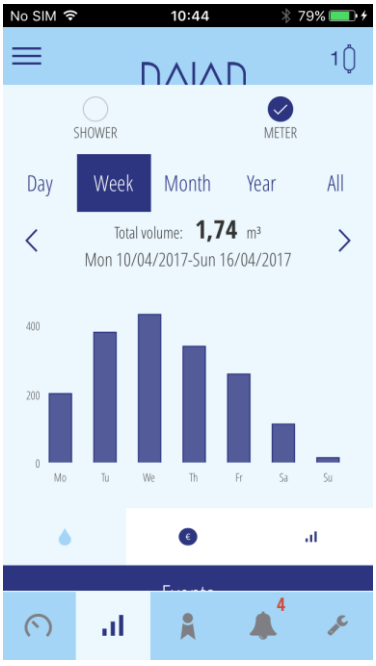


Picture 21: Single event

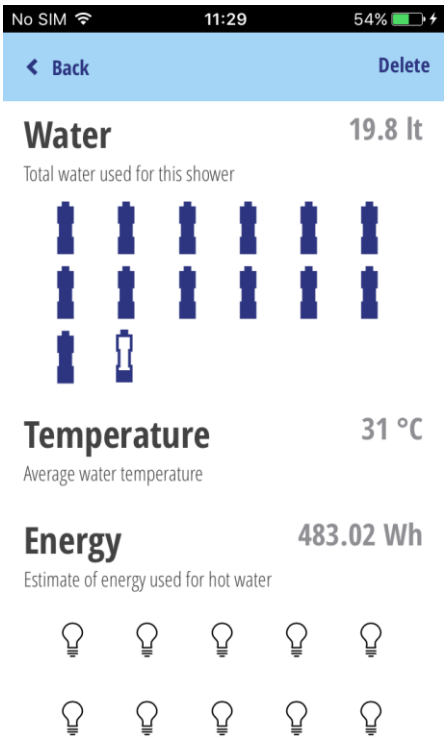
Picture 22: Graph, meter month



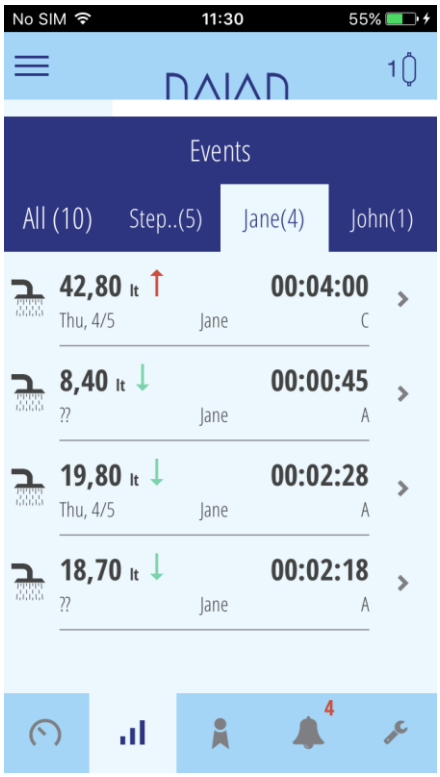
Picture 23: Graph, meter year



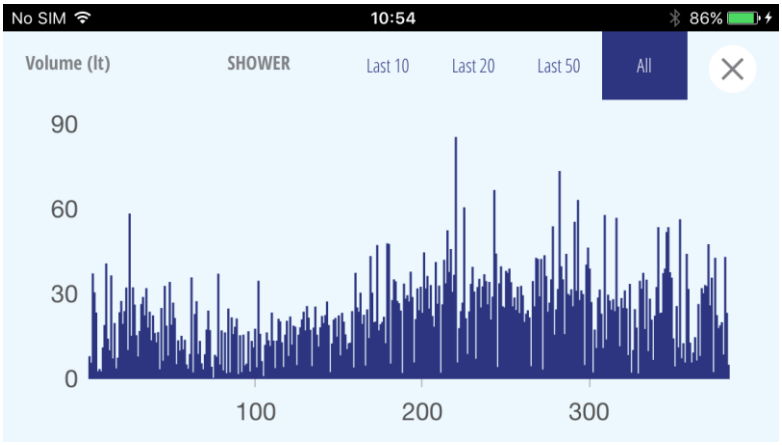
Picture 24: Graph, meter week



Picture 25: Consumption in pictures



Picture 26: Showers filtered by member

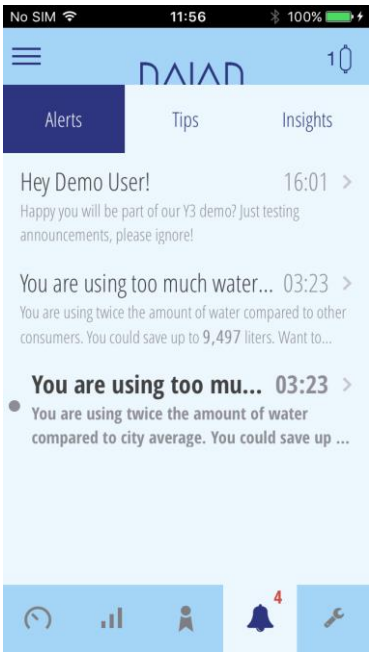


Picture 27: Graph, full screen

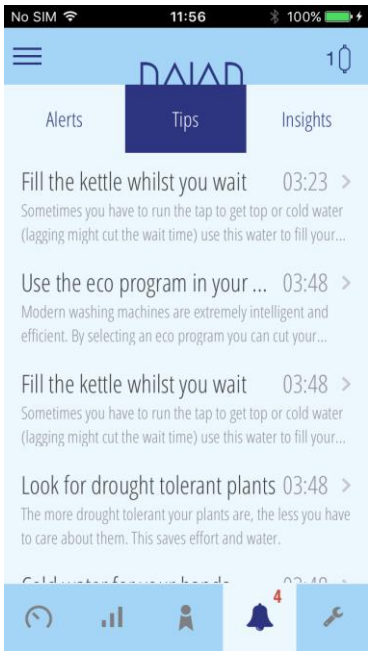
Picture 28: Price brackets

2.2.6. Messages

The Messages section includes three categories of content prompted to the user: alerts, tips, and insights. Alerts (Picture 29) inform consumers for events with a genuine sense of urgency, *e.g. in the cases of risk for damage, health & safety, significant exceedance of consumption, etc*. Tips (Picture 30) are messages that do not depend on consumption events/behaviors of the users; they comprise advices on improving water consumption behavior, regarding all types of household consumption. Insights (Picture 31) provide personalized information about the user's consumption, based on the analysis of her own consumption behavior.



Picture 29: Alerts



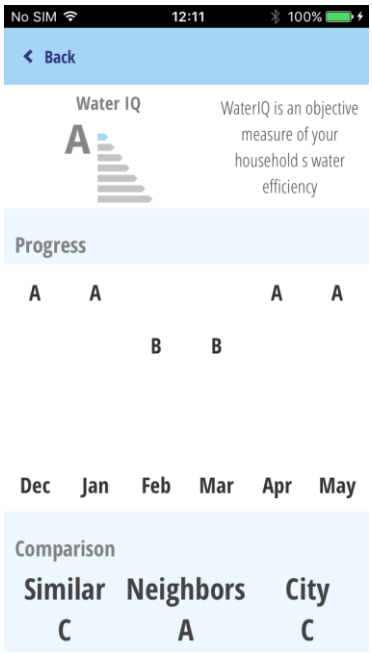
Picture 30: Tips

Picture 31: Insights

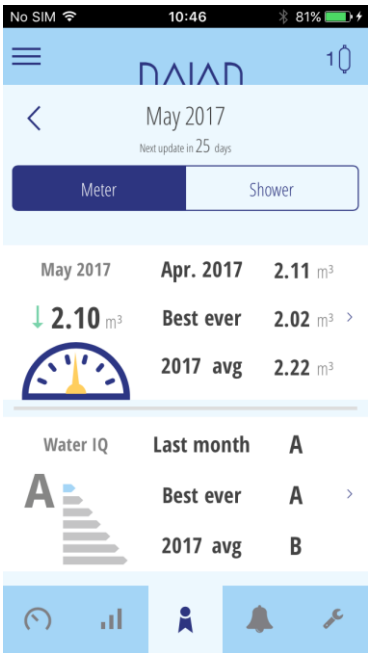
2.2.7. Monthly Reports

The Monthly Reports are focused on presenting an overview of water consumption data, as well as other consumption related information, on a monthly level, thus resembling in frequency a typical periodic water bill. Each monthly report presents statistics of water consumption for the selected reference month (*e.g., May 2017 in Picture 34*) as well as information about user's Water IQ (*Water IQ is an objective measure of a household's water efficiency, see D5.5.2 or D5.4.2*). In the reports screen, two different types of representations are used to display the monthly statistics. Horizontal bar charts, that compare the maximum and minimum user's daily water consumption in a chosen reference time, the average household's consumption, and finally the consumption of similar household's (Picture 35). Line charts, compare the user's, similar, neighbors and city consumptions in the last month and last six months (Picture 32). The Water IQ screen provides information about the progress of a household's water efficiency. This screen is separated in three parts where the very top part shows the status of the user's Water IQ in the reference month, the middle part compares the user's water efficiency in the last six months, and the bottom part of the screen compares the water efficiency between similar, neighbors' consumptions and city-wide consumption (Picture 33). Another section of the monthly reports is shower rankings, focused on presenting an overview of the household members shower consumption efficiency. It displays information about the total shower consumption data per household member in ascending order based on the best average water consumption. For each household member, a table is created containing information about the name of the member, the ranking position in relation to the other members, total taken showers, total volume, average duration and temperature (Picture 36). Furthermore, a line chart, with series of data, is used for the representation of the water consumption data per shower per member (Picture 37).

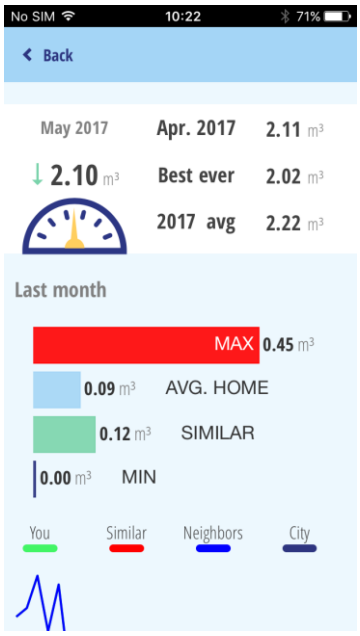
Picture 32: Monthly reports, graphs



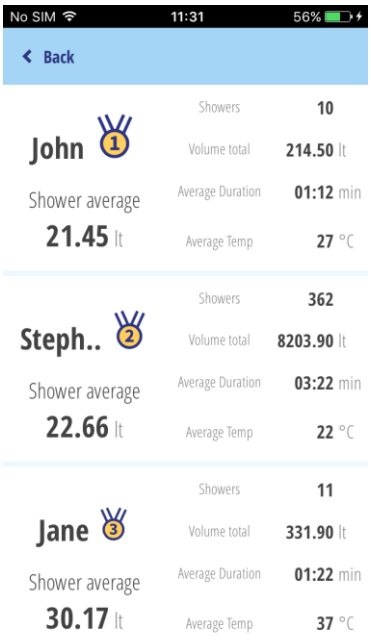
Picture 33: Monthly reports, water Iq



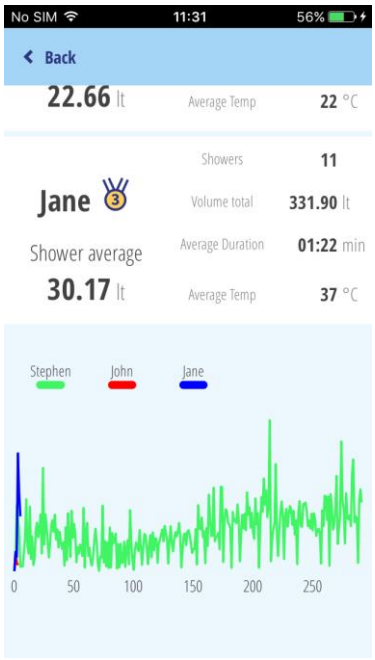
Picture 34: Monthly reports



Picture 35: Monthly reports, horizontal bars



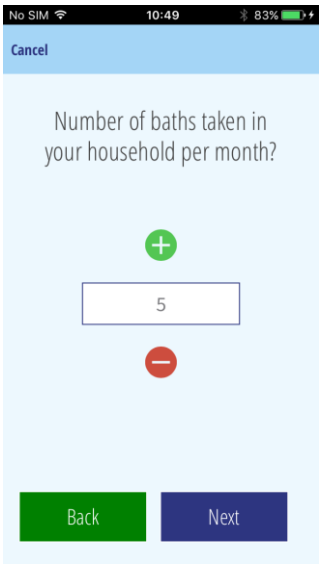
Picture 36: Members rankings



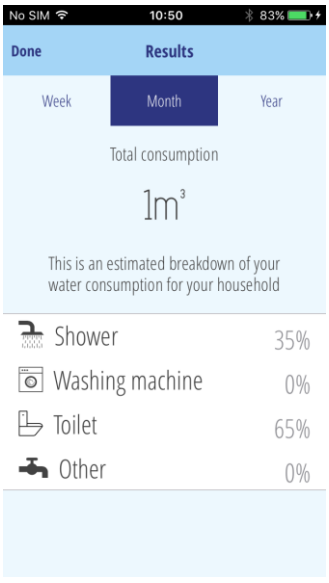
Picture 37: Graph, members rankings

2.2.8. Water Calculator

The application offers an optional Water Calculator (Picture 38), which asks step by step questions about the consumption habits of the user and deduces coarse grained estimations about total household consumption and how it is distributed (Picture 39). The data gathered can be applied in three ways. First, provide a consumption breakdown and profile in the Amphiro b1-only operation mode. Second, provide a seed to handle the "cold start" problem of our personalization algorithms. Third, allow us to establish the perceived water consumption behavior of the consumer and compare it with her actual consumption.



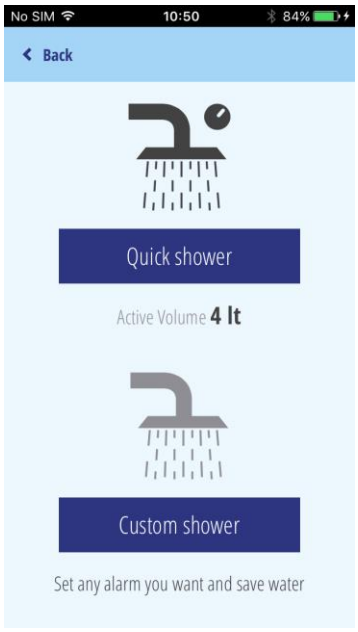
Picture 38: Water calculator question



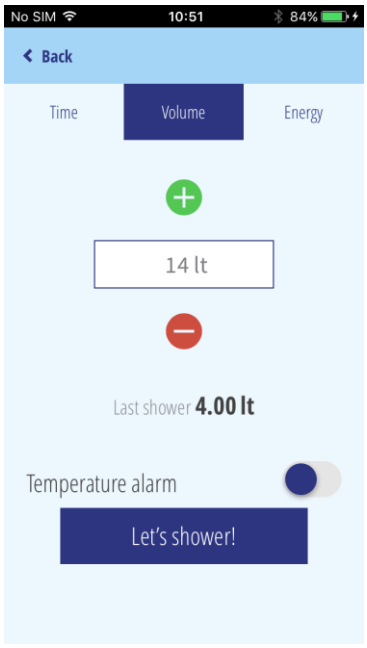
Picture 39: Water calculator results

2.2.9. Shower timer

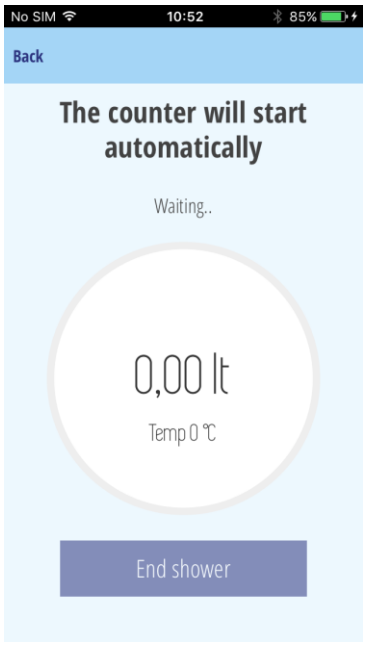
The application offers an intelligent shower timer (Picture 40 Picture 41), enabling the user to set individual goals and split water with other household members. For example, the user may select the "Custom shower" mode, configure the shower options by, e.g. setting the maximum shower duration and start her shower. If she exceeds the set threshold, the application will raise alarms; if she achieves a very quick or very efficient shower, the information will be registered for future reference and comparison. The timer screen consists of a simple central gauge that provides information about the active shower (e.g. 14lt and 30Celsius) based on the user's settings. By the time the application receives a real shower event the timer will start counting until is not receiving real events or the user end the shower manually (Picture 42).



Picture 40: Shower timer options



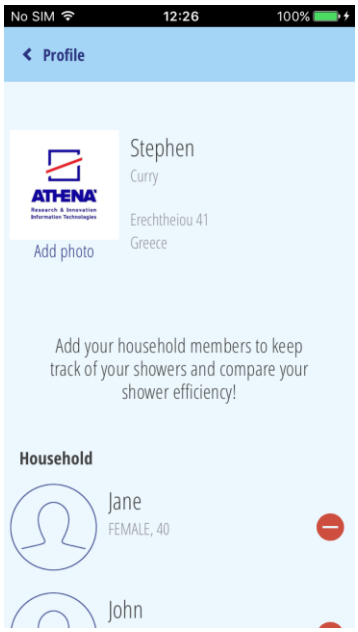
Picture 41: Shower timer options



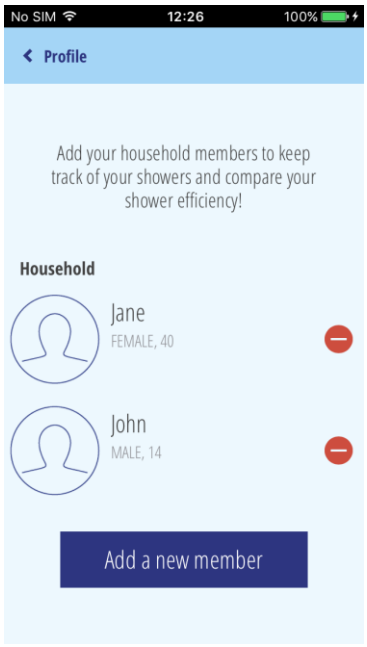
Picture 42: Shower timer options

2.2.10. Settings

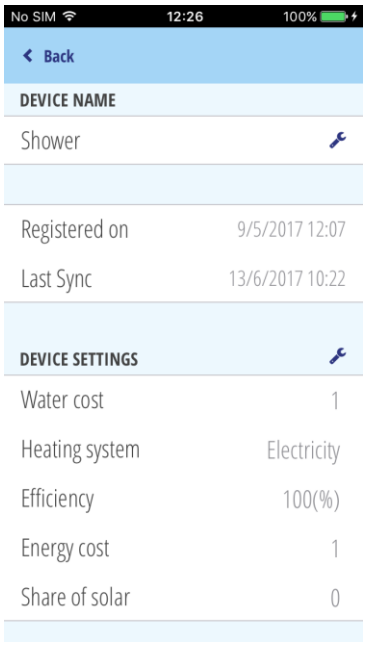
The application offers a Settings screen where the user can explore and edit her profile and application settings. In the Profile Settings screen (Picture 43), the user can add a new profile picture, or change an existing one and add/ remove household members (Picture 44). The application settings screen (Picture 45) provides information about the installed devices (amphiro b1, SWM) and application unit (*e.g., metrics or imperial*). For example, the user can edit the name for a specific device, or change device-related settings. The relevant subset of these settings are also wirelessly transmitted and applied to any connected b1 device.



Picture 43: Profile Settings



Picture 44: Household members



Picture 45: Application settings

3. DAIAD@home Web

3.1. Introduction

In the Report for Prototype Deliverable D4.1.2, the architecture of the data management system is described in detail. Here, we briefly enumerate the key features of the data gathering and management functionality of DAIAD@home web application.

3.1.1. Data source integration

In the DAIAD@home web application data for both smart water meters (SWM) and Amphiro b1 devices is fetched from the DAIAD backend infrastructure. In order to be visible to the web application, amphiro b1 device data needs to have been gathered and uploaded via the DAIAD@home mobile application, while data from SWMs needs to be have been made available by the water utility. Like the mobile application, the web application supports three (3) operations modes depending on the available data:

- *Amphiro b1-only*. The consumer only has access to amphiro b1 data from one or more devices. This operation mode has been evaluated in Trial B (St Albans), which studies the bottom-up deployment of the system without data from the water utility.
- *Amphiro b1 and SWM*. The consumer has access to Amphiro b1 data from one or more devices, as well as her SWM data. This operation mode has been evaluated in Trial A (Alicante), which studies the top-down deployment of the system with the cooperation of the water utility.
- *SWM-only*. The consumer only has access to her SWM data and can optionally add one or more b1 devices at any point, in which case the b1-related UI components automatically appear in the app.

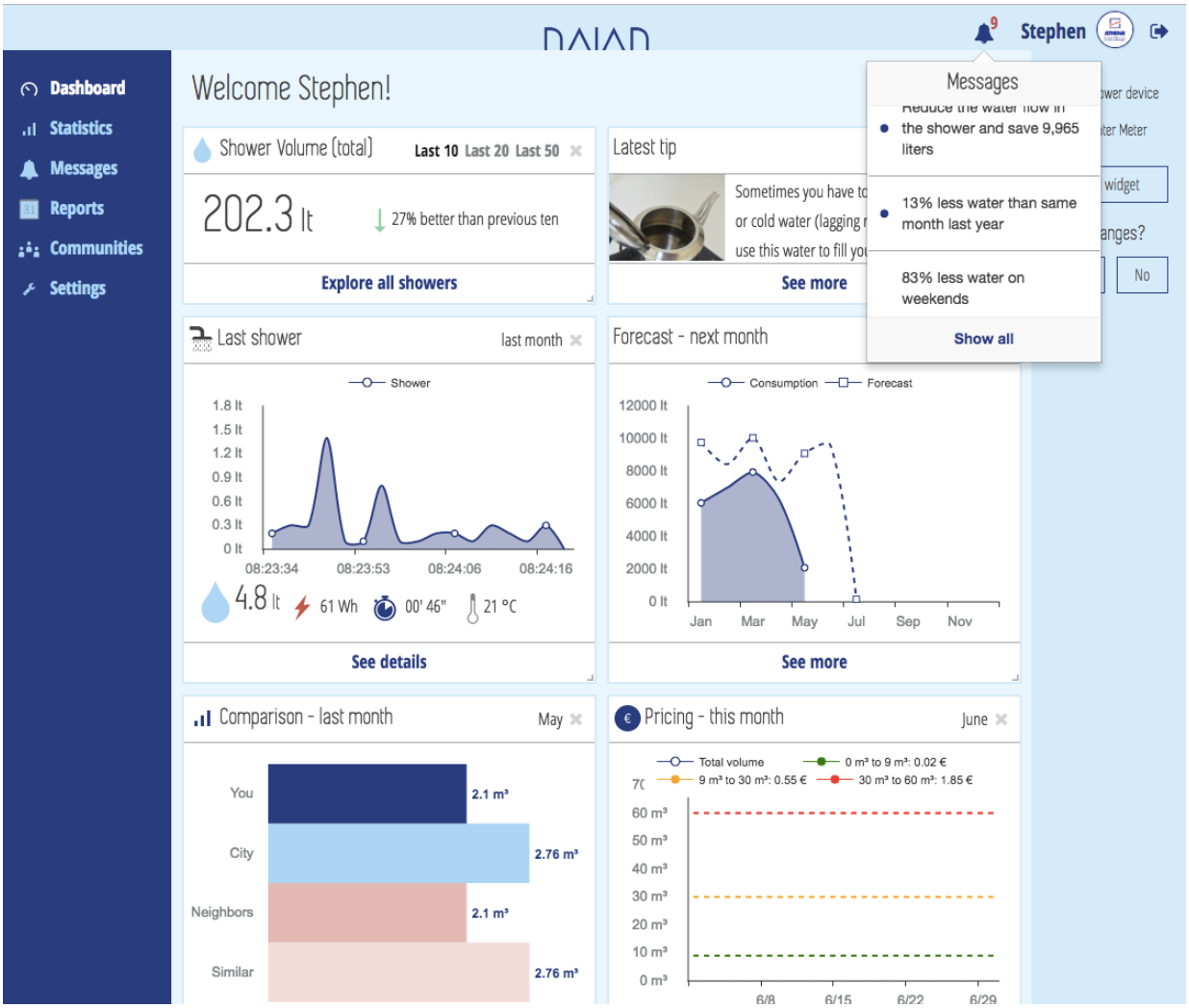
3.1.2. Data engine communication

No local storage is performed on the client-side, besides an in-memory cache for performance purposes. All operations for either fetching or saving, invoke HTTP calls of our Data API (see D1.4 for details) that perform load or save operations respectively on the DAIAD backend. The web application supports *user operations*, such as authentication and identification, *device settings operations*, and a subset of all the mobile application *measurement operations*, e.g., deleting measurements that are not showers, setting non-real-time shower date information, assigning showers to household members.

3.2. Web app walkthrough

The web application has been designed as a companion or standalone web app for the mobile application, allowing the user to log in using the same credentials, and have access to the same information and interventions in a more friendly and flexible manner that exploits the increased screen real-estate of a personal computer vs. a mobile device. The main application layout can be seen in Picture 46. The left sidebar

contains the main menu with links to all application sections, including the dashboard, statistics, messages, reports, communities and settings. The top bar displays the user's first name and display image, a log-out button, as well as a notifications button with the total number of unread notifications, which enables a popover list of the latest notifications when clicked. There is also a right sidebar that provides extra context-specific functionalities depending on the section, as well as a secondary top bar for subsection navigation.



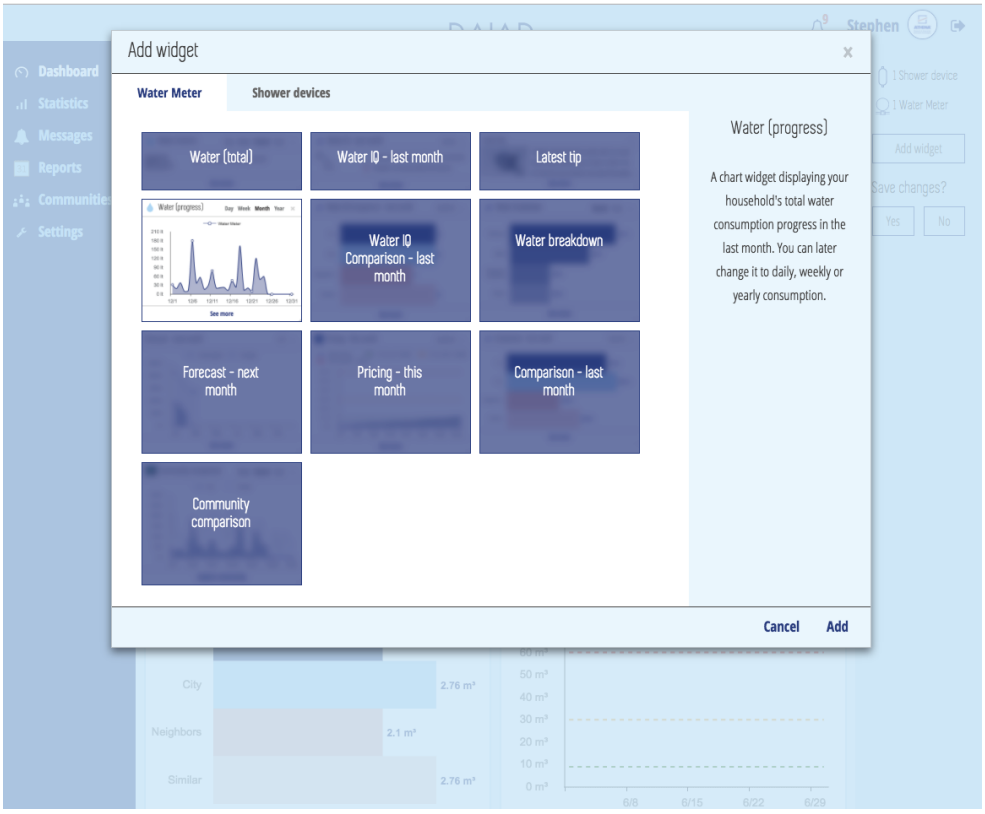
Picture 46: General application layout

3.2.1. Dashboard

The Dashboard (Picture 46) is the first page accessed by users and its purpose is to provide an overview of water consumption, as well as shortcuts to other application sections (*overview first, zoom and filter, then details on demand*. The information is displayed in the form of widgets that the user can select from a predefined set, with placement and resizing customization capabilities. The right sidebar displays the number of available shower devices/smart water meters, the add widget button, and a dynamic save confirmation dialog that appears when the user has performed any changes in the section.

The 'Add widget' button brings up a modal with the available widgets for either smart water meters or shower devices where available (Picture 47). The available widgets are displayed in a grid with a sample widget image

displayed on mouse hover, while the widget title and full description is displayed on click on the right side. The user can then press the 'Add' button to complete its addition to the dashboard.



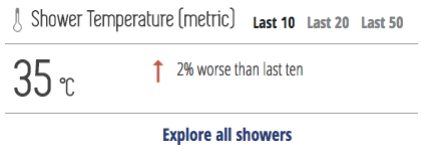
Picture 47: Add widget modal

Additionally, the user can drag the widget by the header, resize it if she wants by the icon on the bottom right, and can then save the changes by clicking Yes on the save changes dialog that appears in the right sidebar.

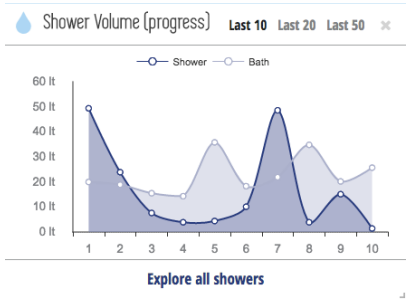
Each widget contains a header, a main area and a footer. The header displays the widget title on the left, any further information or options on the right, as well as an 'x' button that removes the widget from the dashboard. The main section of the widget displays its content. Finally, the widget footer contains a link to a more detailed view on another section of the application. For any changes to be saved in the dashboard section, whether rearranging or resizing widgets, adding or removing them, or changing widget options, the user needs to click 'Yes' on the save confirmation dialog that appears on the right sidebar whenever a change is detected. In the following we provide sample screenshots of all available widgets, Picture 48-Picture 56 for amphiro b1 devices and Picture 57-Picture 66 for smart water meters.

Picture 48: Shower volume total

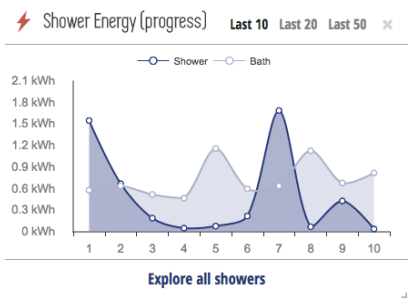
Picture 49: Shower energy total



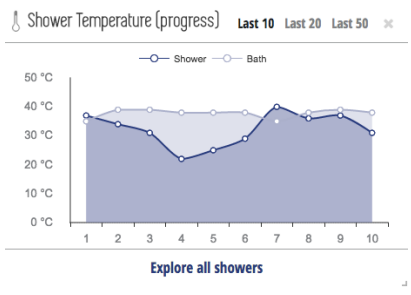
Picture 50: Shower temperature average



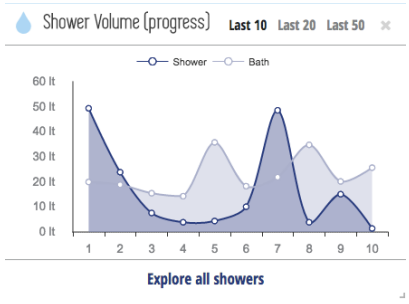
Picture 51: Shower volume progress



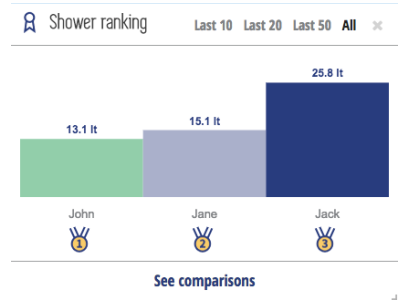
Picture 52: Shower energy progress



Picture 53: Shower temperature progress



Picture 54: Last shower



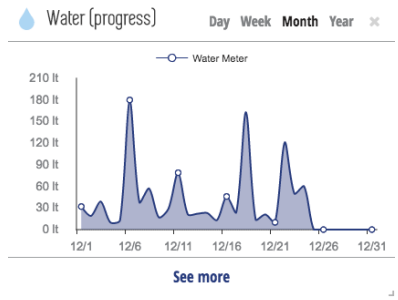
Picture 55: Shower ranking

Picture 56: Energy efficiency

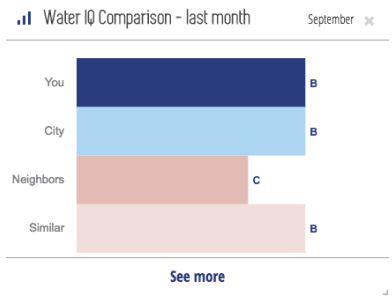
Picture 57: Total water

Picture 58: Water IQ for last month

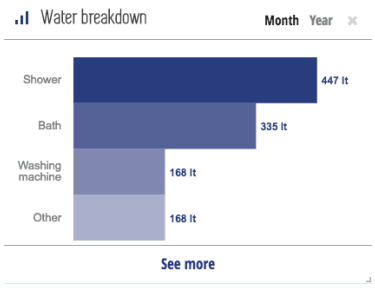
Picture 59: Latest tip



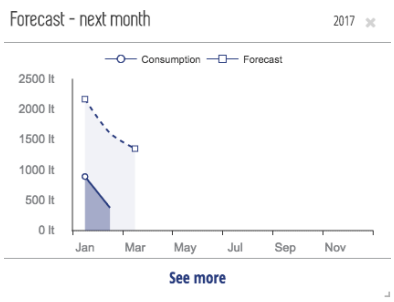
Picture 60: Water progress



Picture 61: Water IQ comparison for last month

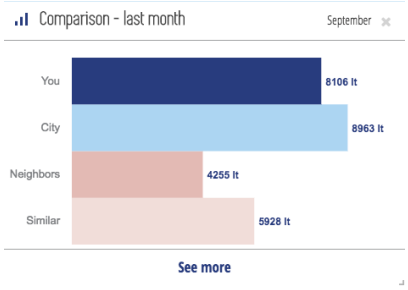


Picture 62: Water breakdown

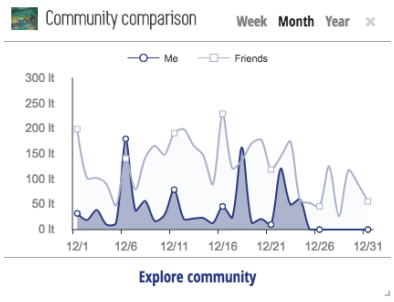


Picture 63: Next month forecast

Picture 64: Current month pricing



Picture 65: Last month comparison



Picture 66: Favorite community comparison

3.2.2. Statistics

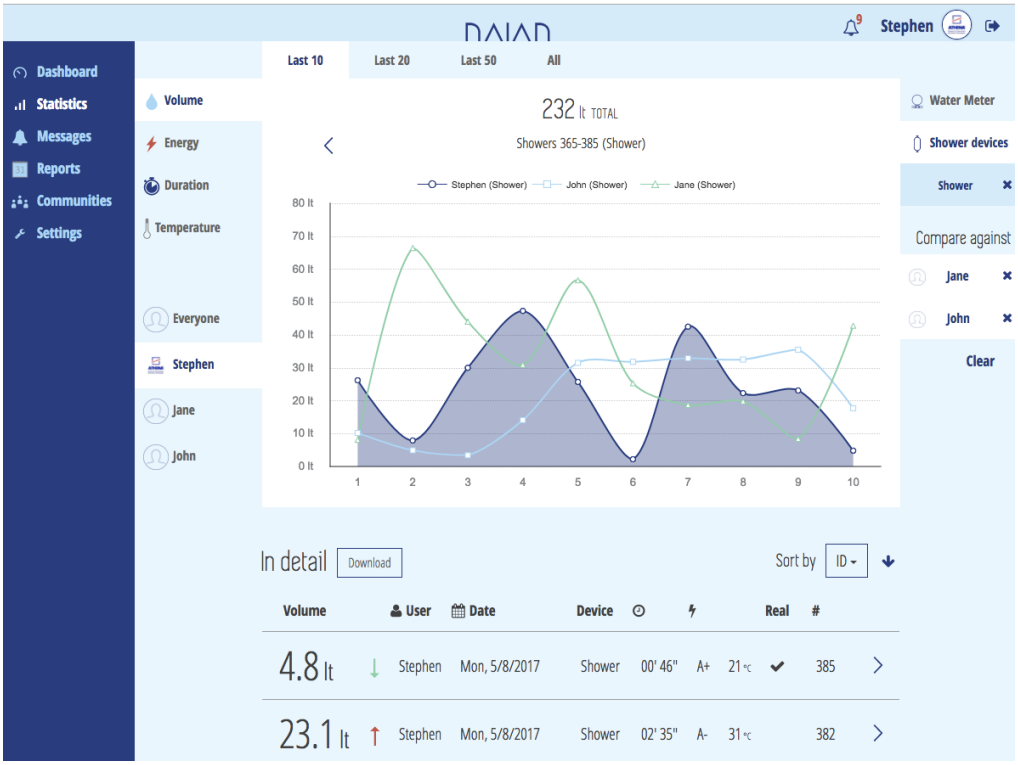
The analysis screen provides in-depth water-consumption information to the user, allowing her to select the data source (*SWM, Amphiro b1*) on the right sidebar, the time-period (*day, week, month, year*) on the top bar, measuring units (*e.g. volume, energy*) on the left sidebar, as well as one or more comparisons, (*e.g., neighbors, city*) on the lower part of the right sidebar. These selections dynamically adjust the entire interface and the information provided (Picture 67, Picture 68). The top part shows a chart, while the bottom part of the section presents individual consumption events which the user can then explore in detail. In the detail view, the user has access to detailed information and metrics for the specific event (Picture 69, Picture 70).

Available periods for smart water meters are *day, week, month, year and custom*. The custom option allows setting the start and end date and time individually to quickly find a specific period of interest. Note that, when year is selected, data is aggregated monthly, when month or week is selected data is aggregated daily, and when day is selected data is aggregated per hour (*i.e., in their original resolution for the case of Trial A*). Pagination is performed by clicking the next/previous arrows on top of the chart. There are four available modes for smart water meters in this section: *volume, forecast, cost and water IQ*. Volume simply displays the user's water consumption, forecast displays the current consumption with an estimated forecast of the user's consumption, cost displays the user's consumption within the water utility's price brackets for each month and its corresponding cost, while Water IQ presents the pre-computed Water IQ ranking. The user can compare herself depending on the active mode with her city, neighbors, favorite community (*see section 3.2.5*), similar users, as well as the user's own consumption in previous periods (Picture 67).

For amphiro b1 devices, the user can choose to see the last 10, 20, 50 or all showers. Pagination to previous/next showers is done using the arrows on top of the chart. Besides selecting different metrics (*volume, energy, duration and temperature*) the user can also browse showers for specific household members

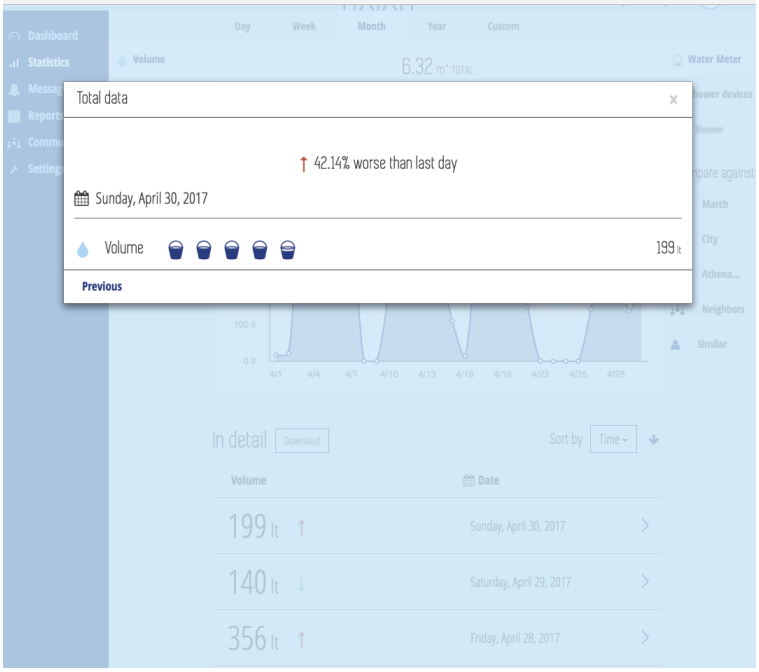
by selecting a user on the lower left part of the sidebar. In case a member is selected, comparison options against other household members appear on the lower right sidebar as seen in Picture 68.

Picture 67: Statistics section for SWM

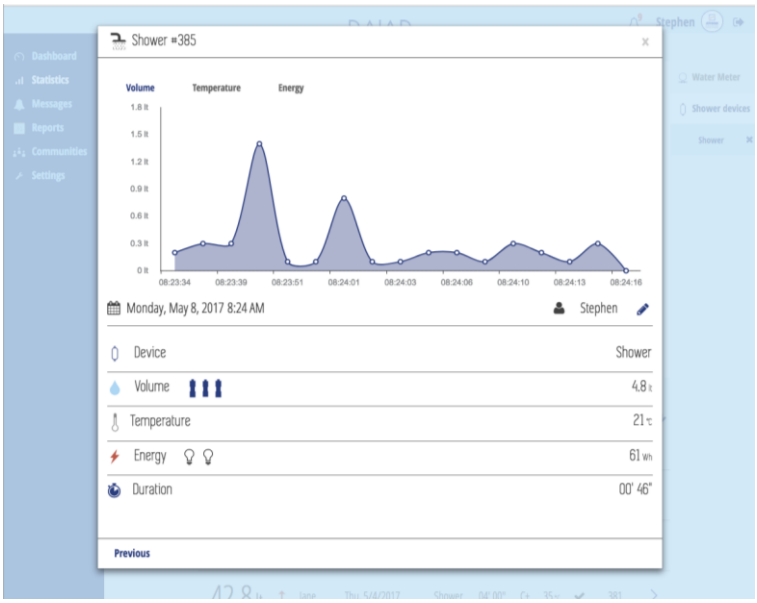


Picture 68: Statistics section for showers

The main statistics section is divided in two major parts, that provide alternative visualization of the same data. The top part displays a chart containing the user data and any comparisons selected, as well as a total or average metric, and the current period or shower indices. The bottom part displays the same data in the form of a list, while allowing the user to sort it (*e.g., by time, volume*). The download button allows the user to download the currently visible data in comma-separated value (CSV) format. By clicking on either the chart points or list rows, the user can bring up the event details modal (Picture 69, Picture 70), with more in-depth information for either a smart water meter aggregation period, or a shower. The listed events can be browsed either by clicking the next/previous buttons or by using the right/left keyboard arrow buttons. For smart water meters (Picture 69) the modal displays the time-period it spans, the aggregated water consumption, as well as its comparison to the immediate previous period and whether it is a minimum/maximum consumption event in the list. For a shower, the modal displays the time-series chart (*in case it is a real-time shower*), the exact time of the shower (*if available*), the associated volume, energy, temperature and duration, as well as the household member it corresponds to (Picture 70).



Picture 69: Details modal for a smart water meter aggregation period



Picture 70: Details modal for a real-time shower

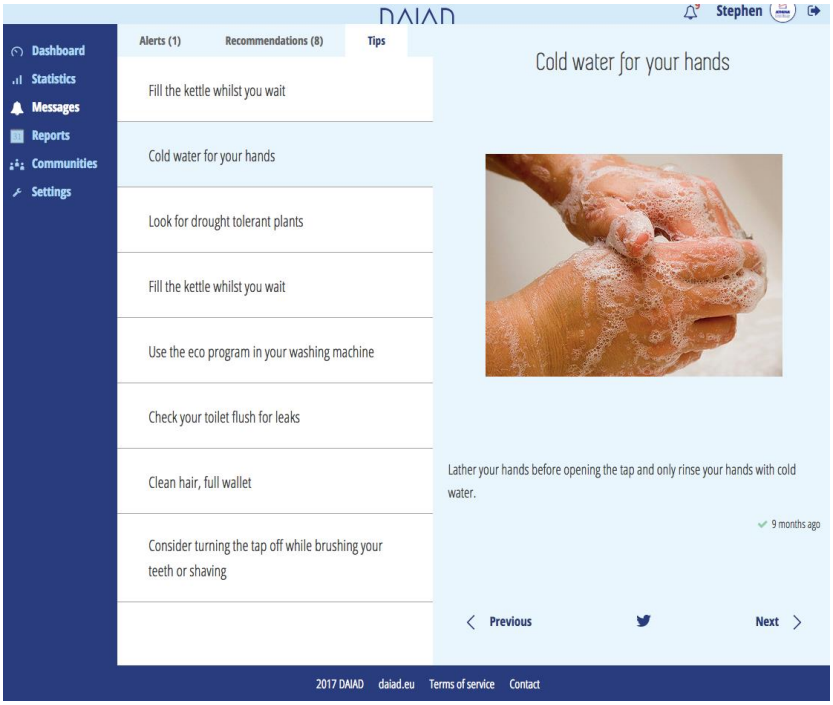
An edit button next to the displayed member allows the user to change specific details for the selected shower. Specifically, the user can edit the exact date of the shower using a datetime picker (*if it is not a real-time shower*), the correct household member from from a dropdown list (*each shower is assigned to the default household member initially*), or delete a shower event altogether by clicking on the delete shower button on the top-right, in case it is not actually a shower (Picture 71).

Picture 71: Edit operations on a non-real-time shower

3.2.3. Messages

The Messages section as in the mobile application includes three categories: alerts, tips, and insights (Picture 72). Alerts inform consumers for events with a genuine sense of urgency, *e.g. in the cases of risk for damage, health & safety, significant exceedance of consumption, etc*. Tips are messages that do not depend on consumption

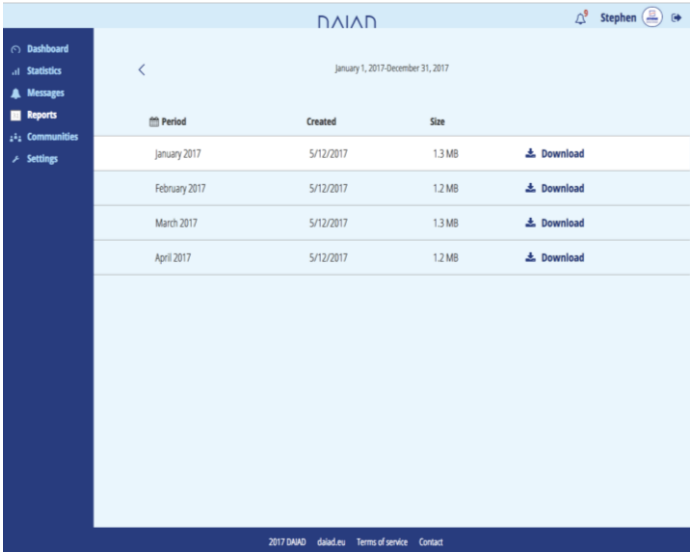
events/behaviors of the users; they comprise advices on improving water consumption behavior, regarding all types of household consumption. Insights provide personalized information about the user's consumption, based on the analysis of her own consumption behavior.



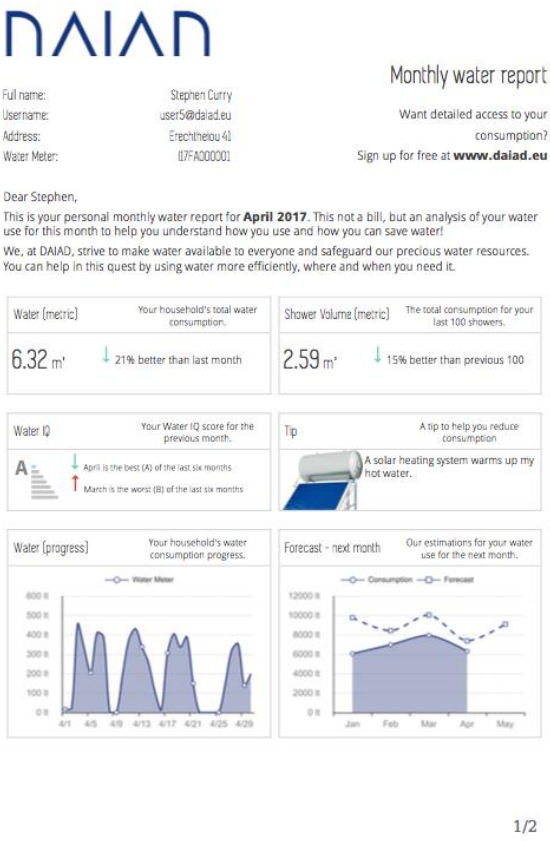
Picture 72: Indicative tip in messages section

3.2.4. Monthly Reports

In the Monthly Reports section, the user can find and download her monthly consumption reports in a PDF file format. The reports are listed on a yearly basis (Picture 73). The user can also browse to previous months to find a specific report she is interested in. Note that the reports are automatically produced on the backend for each user on the 3rd day of each reference month. A sample printed report can be seen in Picture 74.



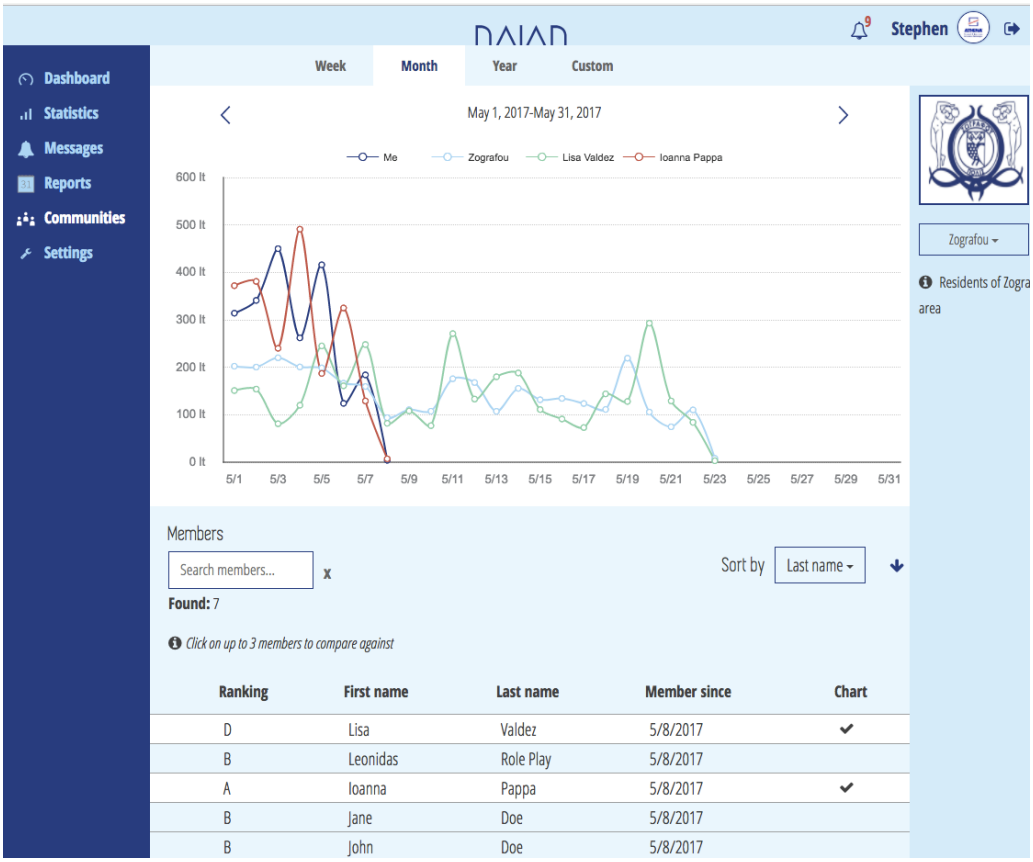
Picture 73: Reports section



Picture 74: Printed PDF report

3.2.5. Communities

In the community groups section, the user can *create*, manage, *join* and *compare* her water consumption against ad hoc community groups (Picture 75). A dropdown button on the right sidebar allows the user to switch between groups if she is a member of more than one. On the main section, the user can see her consumption against the average of the specific group. Further, she can search for individual members, or just browse through the available members on the lower part of the section and compare against up to three of them. The comparisons are only available in chart view. The community groups settings (*create, manage, join*) are available in the next section.

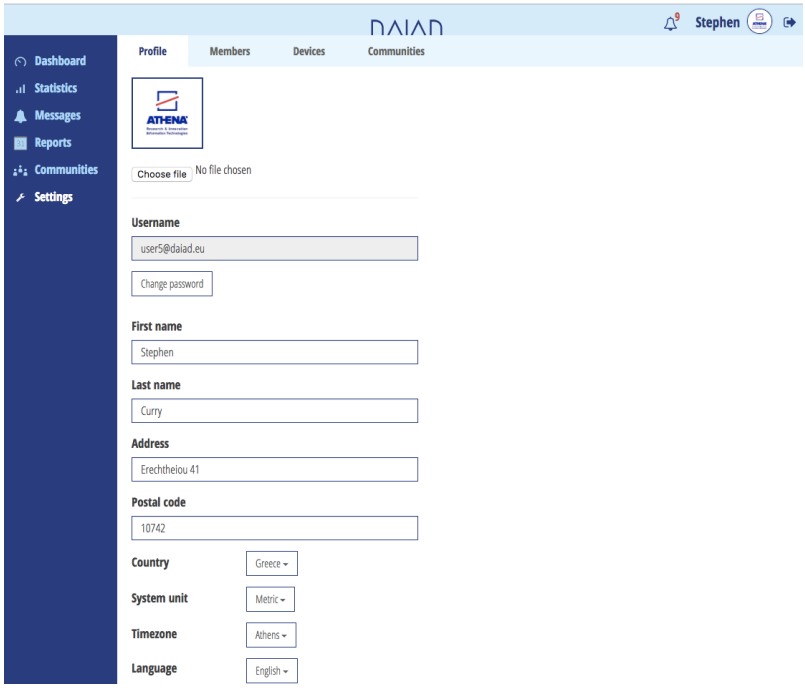


Picture 75: Community comparison chart

3.2.6. Settings

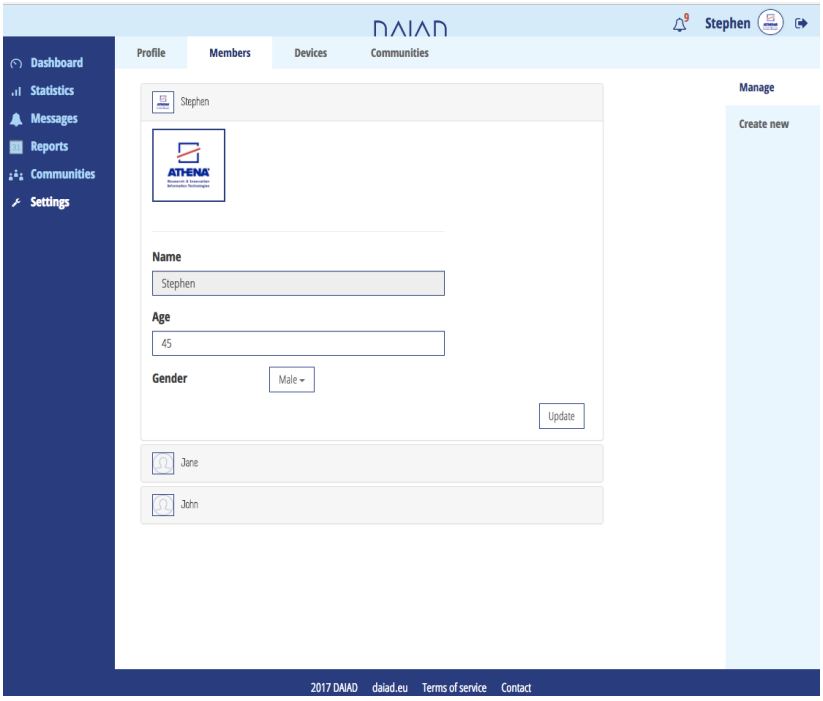
The Settings section allows the user to set profile, household members' and device options, as well as manage community groups. The submenu on the top bar allows the navigation between subsections, while further options in each subsection appear on the right sidebar.

In the profile subsection, the user can upload a display image, change her password, and update her information such as first name, last name, address, postal code, country, time-zone, language and preferred system units (Picture 76). It should be noted that the user needs to press the 'Update' button to save any changes and store the updated information in the user profile on the backend, with all changes persisted to the mobile application as well.



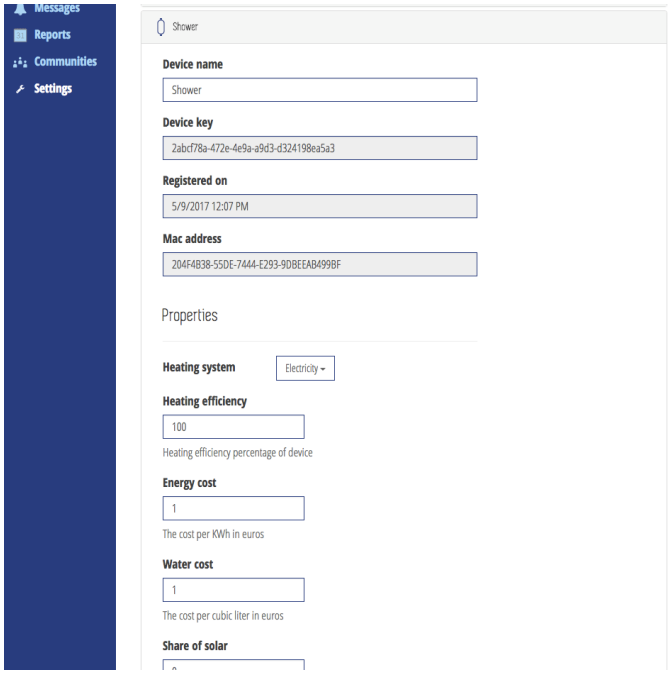
Picture 76: User profile settings

The household members can be managed in the members settings subsection, seen in Picture 77. Existing members are displayed in the form of an accordion, i.e., clicking each user brings up the edit form for her specific information, such as name, age, gender, display image. A new user can be added in the 'Create new' section on the right sidebar which brings up a similar form as in member edit. Note that the default member is linked to the application user and only the age and gender can be changed here. If the user wants to change the default member's name or display image she needs to do so in the Profile settings subsection.



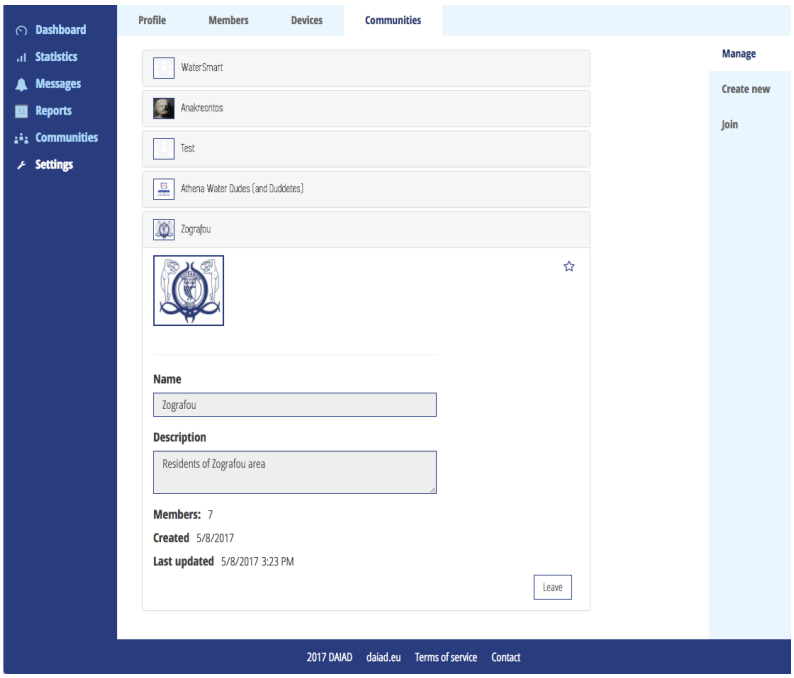
Picture 77: Household members edit section

Detailed information on the available devices can be found in the Devices subsection, shown in Picture 78. All devices are listed in the form of an accordion. Only amphiro devices have configurable options. These include the device name that is visible to the web and mobile applications, and several properties used for internal calculations, such as the heating system, heating efficiency, energy cost, etc., that the user can provide regarding her household.

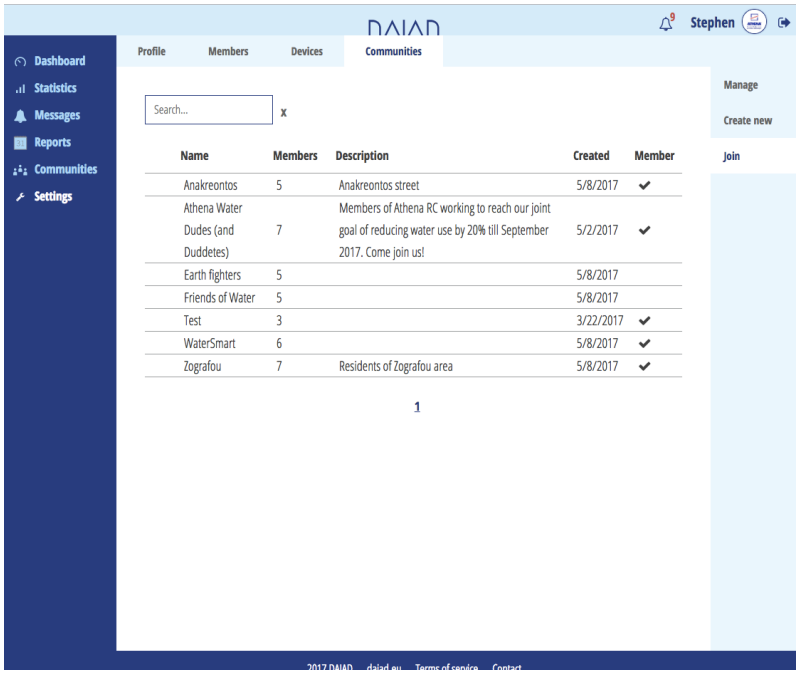


Picture 78: Device settings subsection

Finally, community management operations can be performed in the relative Settings subsection, as seen in Picture 79. On the right sidebar, the user can switch between Manage, Create New and Join subpages. In the default manage section the user can see her joined community groups in the form of an accordion, with further information (*e.g., name, date joined, number of members*) available for each one. The user can set a group as her favorite (*which affects the relative dashboard widget and Statistics section comparison option*) or leave the group if she desires. In case the user is the owner of the community group she can also rename, or delete it altogether. In the 'Create new' section the user can create a new group by filling in the form. In the Join section the user can see all the available community groups in her city and browse through them to find the one(s) that interest her, or search through them by name. Then the user can become a member simply by clicking the 'Join' button (Picture 80).



Picture 79: Manage communities subsection



Picture 80: Join communities' subsection