SCOREwater

Smart City Observatories implement REsilient Water Management

DELIVERABLE D3.2

IMPLEMENTATION OF THE SCOREWATER PLATFORM BASED ON EXISTING COMPONENTS, TAILORED BY THE SPECIFICATION DELIVERED BY WP1

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ABBREVIATIONS

Abbreviation	Definition
API	Application Programming Interface
CKAN	Comprehensive Kerbal Archive Network
ETL	Extract, Transform, Load
FIWARE	Future Internet WARE
JSON	JavaScript Object Notation
ICT	Information and Communications Technology
IoT	Internet of Things
NGSI	Next Generation Service Interface
OCI	Open Container Initiative
SDG	Sustainable Development Goals
SME	Small and Medium-sized Enterprise

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PROJECT ABSTRACT

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

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

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

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EXECUTIVE SUMMARY

This deliverable builds upon the information provided in D3.1. It is meant to describe the progress on the implementation of the SCOREwater Platform instances of the SCOREwater-platform for all 3 cities (Amersfoort, Barcelona and Gothenburg). For each city a first version of the platform has been created, with a focus on the essential FIWARE-components. At this moment the instances of the platform will be available only for the participants in the SCOREwater project. Their feedback and test results will be used to further improve the SCOREwater platform and make it wider available for external parties.

In parallel with the installation of the platform, a limited number of real time data sources have been integrated, with a focus on sensor data. Connectors have been developed to collect, store and provide the data from these sensors in the SCOREwater Platform. Connecting data sources is also an ongoing process. Until now the focus was on getting all components of the platform up and running and test the whole flow from the origin of the data (sensor) to the provisioning of the API. The coming period will focus on finetuning, extending and documenting all the different steps.

The sensor data is transformed to match (FIWARE) data models and standard APIs. These APIs will be listed in the marketplace with different plans and policies (subscription models and security and privacy measures). The software for the data market is available and in the coming period the underlying processes, documentation and developer onboarding will be further developed.

Examples of the implementation progress are described in this deliverable.

NOTE: This is a living document. The implementation of the platform and the connection of new sensors and data sources is an ongoing process. This document will regularly be updated to add new achievements.

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1. INTRODUCTION

Deliverable 3.1 describes the user stories and software options for the SCOREwater platform components. This deliverable 3.2 describes the components, models and API´s that are selected for the SCOREwater platform and their implementation in each city.

For the SCOREwater platform we adopt the FIWARE-architecture. The high level overview of the FIWARE set up is shown in the picture below. The idea behind FIWARE is a curated framework of open source platform components which can be assembled together and with other third-party platform components. The main and only mandatory component of any “Powered by FIWARE” platform or solution is the Context Broker generic enabler. Additional FIWARE components are available, to deal with 1) interfaces to Internet of Things (IoT) and third-party systems, 2) Context Processing, Analysis and Visualization and 3) Context Data/API management, publication, and monetization

Deployment tools provide the software infrastructure a platform is hosted on. The SCOREwater platform is a cloud solution, running in Civity´s own datacenter in The Netherlands. All software used to run this cloud environment is based on open source software (Openstack). The infrastructure is running on virtual machines with the CentOS 7 operating system. It uses the de facto industry standards (HAProxy) for load balancing and Apache httpd to serve http and https. PostgreSQL and MongoDB databases are currently available within the SCOREwater infrastructure. Installation and configuration of additional database systems, specifically to support time series, is an option for the next phase.

For each component of the SCOREwater platform Open Container Initiative (OCI) images (aka Docker images) are created. These can be run on various platforms. Documentation and guides to deploy these Docker images will be supplied in the next phase.

All software used for the SCOREwater platform is available under an open source license. An open source license allows for the unlimited redistribution of software.

2. THE SCOREWATER PLATFORM

Based on the schema below, we will explain the choices made for the SCOREwater Platform. This scheme is a high level overview of building block within the FIWARE-architecture (FIWARE, 2020). The current focus in the implementation of the SCOREwater platform was on the “Core Context Management”, with the FIWARE Context Broker (paragraph 2.1). Also the Data Management (CKAN) and API-management components (3Scale) have been deployed (paragraph 2.2). And to connect sensors to the platform, some interfaces to IoT-sensors have been implemented (paragraph 2.3). Paragraph 2.4 describes the progress on the central identity management solution that is used in all other components. Regarding the “context processing, analysis, visualization” components the focus has been on the implementation of the first available FIWARE data models (paragraph 2.5) and standard APIs.

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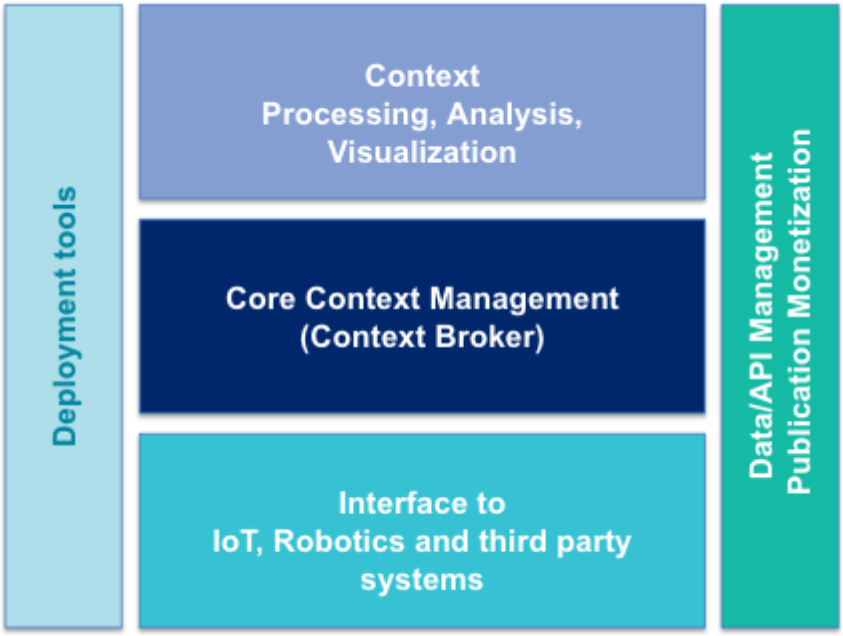

Figure 1 FIWARE catalogue

The generic features of the SCOREwater platform are shown below (details can be found in D3.1). The progress of the implementation and software choices, based this high level FIWARE-architecture is taken as reference for the next paragraphs. In the scheme a reference to the related paragraphs is added.

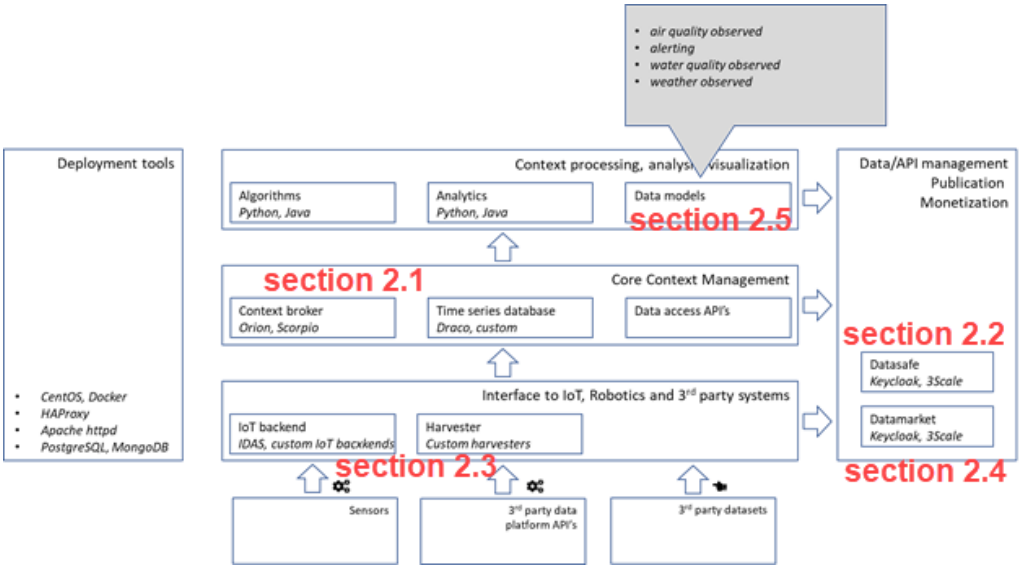

Figure 2 Components of the SCOREwater platform

As described in Deliverable 3.1, the criteria defined in the ISO25010 model (International Standards Organization, 2020) to evaluate the software product quality is used to select the appropriate software components for the SCOREwater platform. Based on these ISO-criteria, alternative software solutions/components have been compared, choices have been made and implementation has started. This model is used to explain the choices made for each component.

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Figure 3 ISO 25010 characteristics and sub characteristics

2.1. CORE CONTEXT MANAGEMENT: CONTEXT BROKER

The "Core Context Management" component is about the Context Broker. The Context Broker is the central component of any FIWARE platform and needed to be recognized as "FIWARE compliant". It receives messages with sensor data from the IoT agents and publishes updates with those data (FIWARE, 2020). Components interested in those updates subscribe to those updates (publish-subscribe paradigm). The table below shows the analysis of the Orion Context Broker, based on the ISO-criteria. Other Context Broker software solutions are also implementations of the FIWARE NGSI API, which ensures compatibility in the future (or easy migration to a different Context Broker solution). Choosing the FIWARE Orion Context Broker for the SCOREwater Platform does not limit or restrict future flexibility or adaptability of the platform.

Table 1. ISO-criteria for Orion Context Broker component.

Orion Context Broker	
Functional suitability	☒ The "original" FIWARE context broker. Reference implementation for the FIWARE NGSI-API.
Performance efficiency	☒ Messages are processed in real time. Performance is an issue when there is insufficient memory available on the servers that host the Context Broker.
Compatibility	☒ NGSI (legacy) and NGSI version 2. No support for NGSI-LD (yet)
Usability	n/a
Reliability	☒ Able to handle the expected load as demonstrated by for instance Snifferbike (Provincie Utrecht, Civity, SODAQ, RIVM, 2020)
Security	☒ To secure the Orion Context Broker the central Access- and Identity Management solution is used (Keycloak)
Maintainability	☒ Support from FIWARE (community)
Portability	☒ Written in C++, runs in both CentOS and Docker, uses a MongoDB database

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With regard to the selection of the Context Broker, it is important to notice that it should be able to receive and publish NGSI version 2 and NGSI-LD entities. Currently there is not one solution that supports both. The SCOREwater platform has now integrated the Orion Context Broker. This component is able to publish NGSI v2. For the current demonstration projects this is sufficient. The difference between NGSI version 2 and NGSI-LD is explained in a FAQ from FIWARE[1] and a tutorial about linked data[2]. The NGSI API is quite similar and since we work in individual data sets in the first phase, the NGSI version 2 in combination with the Orion Context Broker allows for a quick start.

In a next phase we will investigate support for FIWARE NGSI-LD. This might imply installation of a second context broker (Scorpio). Both solutions can exist next to each other.

2.2. INTERFACES TO IOT- AND THIRD-PARTY SYSTEMS

One building block in the FIWARE-architecture are the interfaces to Internet of Things (IoT) and third-party systems (so called IoT agent or Translators). IoT sensors usually upload the data they produce in some highly optimized proprietary format. Purpose of the IoT backend is to receive those messages, convert the proprietary sensor data format to FIWARE NGSI v2 and pass the standardized data on to the context broker.

Within the SCOREwater project the first interfaces have been developed to collect sensor data and connect them to the Orion Context broker. These interfaces transform highly optimized proprietary (sensor) data format to a standardized FIWARE-format. For the demonstration projects custom connectors have been developed. The FIWARE IDAS Generic Enabler that consists of a number of IoT agents which interface with devices using some widely used IoT protocols (LWM2M over CoaP, JSON or UltraLight over HTTP/MQTT or OPC-UA) are not yet used/available.

The custom IoT agents are tailor made (in Java) for a specific sensor and allow for a highly optimized translation from the proprietary sensor data format to NGSI.

For Gothenburg the IoT-agents collect sensor data from one weather station and SCOREwater partner Talkpool. It is connected to the Context Broker and stored automatically in CKAN. The pictures below show the two data sources in the CKAN-instance of Gothenburg (“SCOREwater sensors” and “Rainfall Vatten I Goteborg”). Now that this process (sensor à IoT-agent à Context broker à CKAN) is in place, additional data sources can easily be added.

Note: the naming (title, metadata) of the data sources is still to be decided. The picture below shows data sources on the test server, and its main purpose is to show that the whole process works correct.

[1] https://fiware-datamodels.readthedocs.io/en/latest/ngsi-ld_faq/index.html
[2] https://github.com/FIWARE/tutorials.Linked-Data

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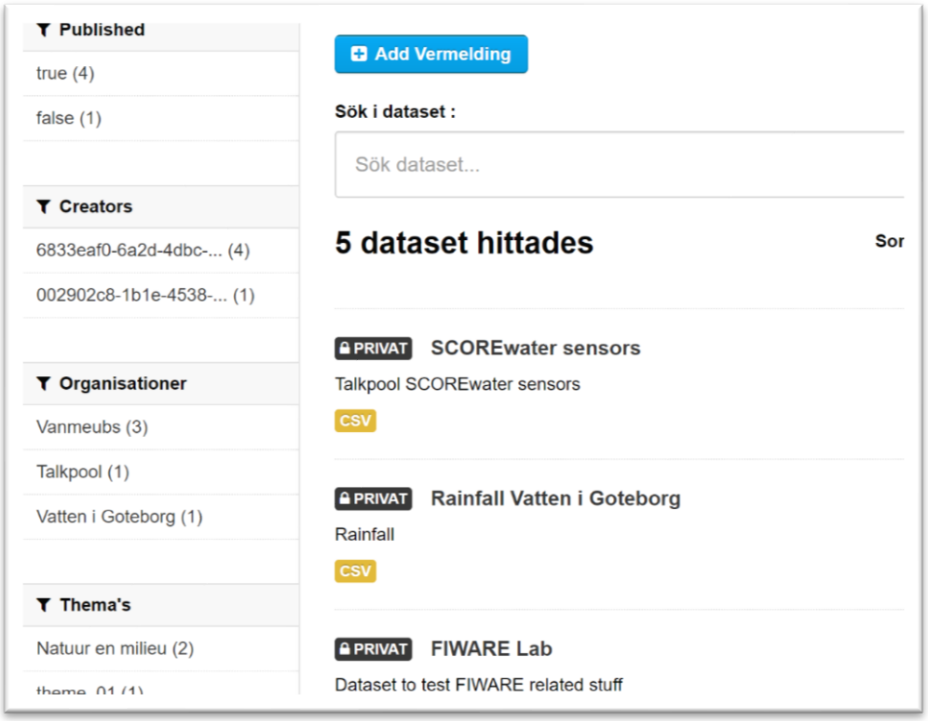

Figure 4 Data sources from sensors and 3rd party systems in (test) CKAN-instance Gothenburg

Figure 5 shows the detailed information form “SCOREwater sensors” (see Figure 4). The green button makes it possible to access the data through the CKAN API. The table shows the individual records for the sensors (at the time the screenshot was taken, the dataset contained 3820 records)

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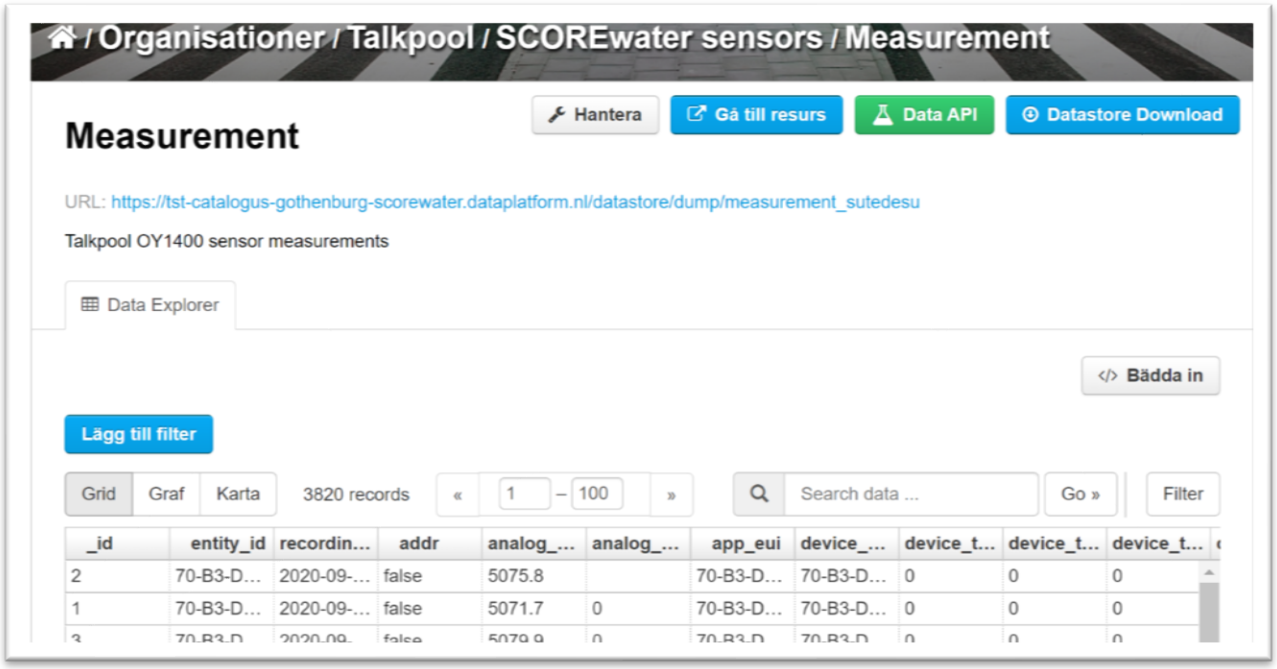

Figure 5 Measurements from Talkpool-sensors in Gothenburg, stored in CKAN-instance Gothenburg

In section 2.3 more information is available about the transformation of the data to comply with FIWARE data models. These data transformations are work in progress and sensor implementations are ongoing. This has to do with the fact that FIWARE data models for water are in its early phases and not available for every topic that relates to SCOREwater. Furthermore, the connection to sensors in each city is somewhat delayed due to COVID-19 and limitations regarding physical installation of sensors. More details on data models, sensor data and data transformations will be shared in the next update of this deliverable.

2.3. DATA/API MANAGEMENT

2.3.1. DATA MANAGEMENT: CKAN

The data management module in the SCOREwater platform allows data providers to manage their datasets and others to actually use the datasets.

An obvious choice in the implementation of the SCOREwater platform for each city was the implementation of CKAN. CKAN is the (open) data management component for harvesting/uploading data, describing metadata and provisioning of data (download and/or API) (CKAN, 2020). Harvesting means that CKAN collects the data (at a certain interval) from an external source (for example ArcGis or Geoserver). Uploading means that an external source pushes the data to CKAN (for example with so-called ETL-tools). CKAN has options for public and private data sources, which allows the owner of the data to decide whether the data is open or only shared with certain in- and external parties. The table below is based on the analysis done in D3.1.

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Table 2. ISO-criteria for CKAN Data Management component.

CKAN	
Functional suitability	☒ CKAN allows organizations the publish metadata and data
Performance efficiency	☒ CKAN is used by numerous big organizations attracting a lot of traffic. Performance is related to the way data is provided and its size. Static data sets are provided as files (download) or available through the CKAN API (served from a PostGreSQL DB). Performance can be tuned through the infrastructure
Compatibility	☒ CKAN can support all the relevant standards
Usability	CKAN can be customized to specific needs. All functions are available through its own API which allow for custom made user interfaces and integration with other solutions.
Reliability	☒ CKAN is used by numerous big organizations attracting a lot of traffic without reliability issues
Security	☒ Authorization and authentication using username and password, OAuth2
Maintainability	☒ Support from community
Portability	☒ Written in Python, runs in both CentOS and Docker, uses a PostgreSQL database

Based on this choice, a CKAN-instance (docker image) has been created for each city. For Amersfoort the existing open data platform is reused, because it is already built with CKAN.

The CKAN-instance offers support for metadata-standards (DCAT and ISO19139) and different data-formats (CSV, XLS, Shape, Geopackage, JSON, GeoJSON, etc.). All functions of the open data platform should be available via a user interface and an API[3]. The city of Amersfoort already made over 40 datasets available in their open data portal. The other cities will start with sensor data from demonstration projects.

Figure 6, 7 and 8 presents the CKAN-instances for Amersfoort, Barcelona and Gothenburg, respectively.

[3] https://docs.ckan.org/en/2.9/

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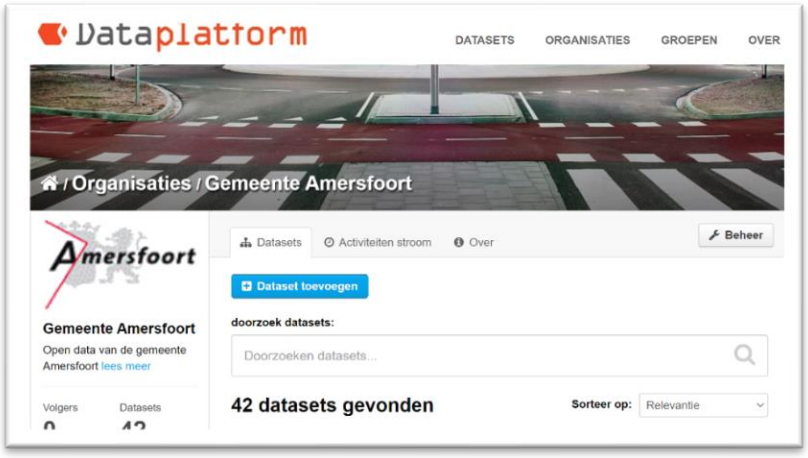

Figure 6 CKAN-instance Amersfoort - ckan.dataplatform.nl

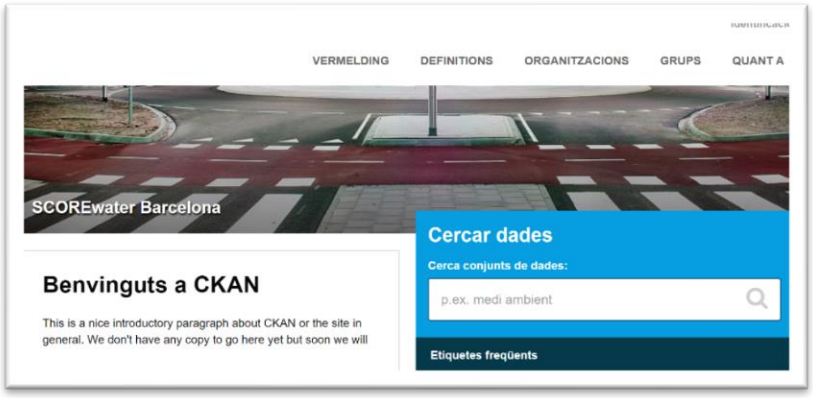

Figure 7 CKAN-instance Barcelona - https://acc-catalogus-barcelona-scorewater.dataplatform.nl/

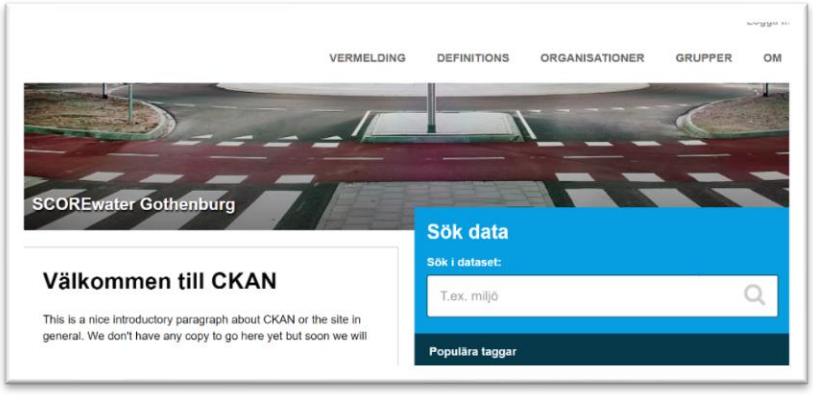

Figure 8 CKAN-instance Gothenburg - https://acc-catalogus-gothenburg-scorewater.dataplatform.nl/

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2.3.2. API-MANAGEMENT: DATA MARKET (3SCALE)

An important component of the SCOREwater platform is the Data Market. It offers the one stop shop for "data consumers" to available data from different data owners/providers. Data consumers can search for data, subscribe to data, test and learn about data (and their API´s). The goals of the Data Market can only be achieved if prerequisites for data owners/providers and the platform owners are met, like access control, security and monitoring.

The Data Market is a combination of software components, API´s and processes. FIWARE has described this in their Biz-ecosystem, which is a joint effort of FIWARE-components and a set of APIs provided by TM Forum. The goal of the Data Market is to allow the monetization of different kind of data assets.

Within the SCOREwater platform the first step is implemented, which is the deployment of API-management solution. The SCOREwater platform uses 3Scale as solution for this (see table below). Reasons to choose this solution are that is fully open source, supported by Red Hat (if needed) and proven technology.

Table 3. ISO-criteria for 3Scale API-management component.

3Scale	
Functional suitability	☒ 3scale provides an extensive management console to define/manage plan and policies for API´s (including statistics and billing) and a API-gateway to provide access to API´s
Performance efficiency	☒ to be experienced in projects
Compatibility	☒ to be experienced in projects
Usability	☒ Installation of the open source version of 3Scale is cumbersome
Reliability	☒ to be experienced in projects
Security	☒ To secure the 3Scale API-management solution it is integrated with the central Access- and Identity Management solution (Keycloak)
Maintainability	☒ Supported by RedHat
Portability	☒ to be experienced in projects

3scale is fully open source. To install this open source version in a cloud environment the documentation does not provide clear guidance. Installation was tedious. The Red Hat supported version (based on the open source software) appeared much easier to install. Attention is needed to guarantee the availability of fully open source version, without additional vendor support.

Implementing the API-management component in the SCOREwater platform is a combination of technical and organizational aspects. Defining the APIs, policies, plans, access and billing is a generic activity. Configuring these options in 3scale is not restricting future use of other API-management solutions, since these organizational aspects are technology independent.

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The concept behind the API-management solution within the SCOREwater platform is shown below (Figure 9). There is a master service, with a specific tenant for each city. Within each tenant APIs can be specified, with appropriate subscription plans. Applications are the solutions created by developers that use one or more APIs.

The first draft of the documentation about the 3Scale implementation is available at: https://www.docs.civity.nl/docs/3scale_api_management_intro. This online documentation will be further extended with examples on how to configure the API´s and use them in the developer portal.

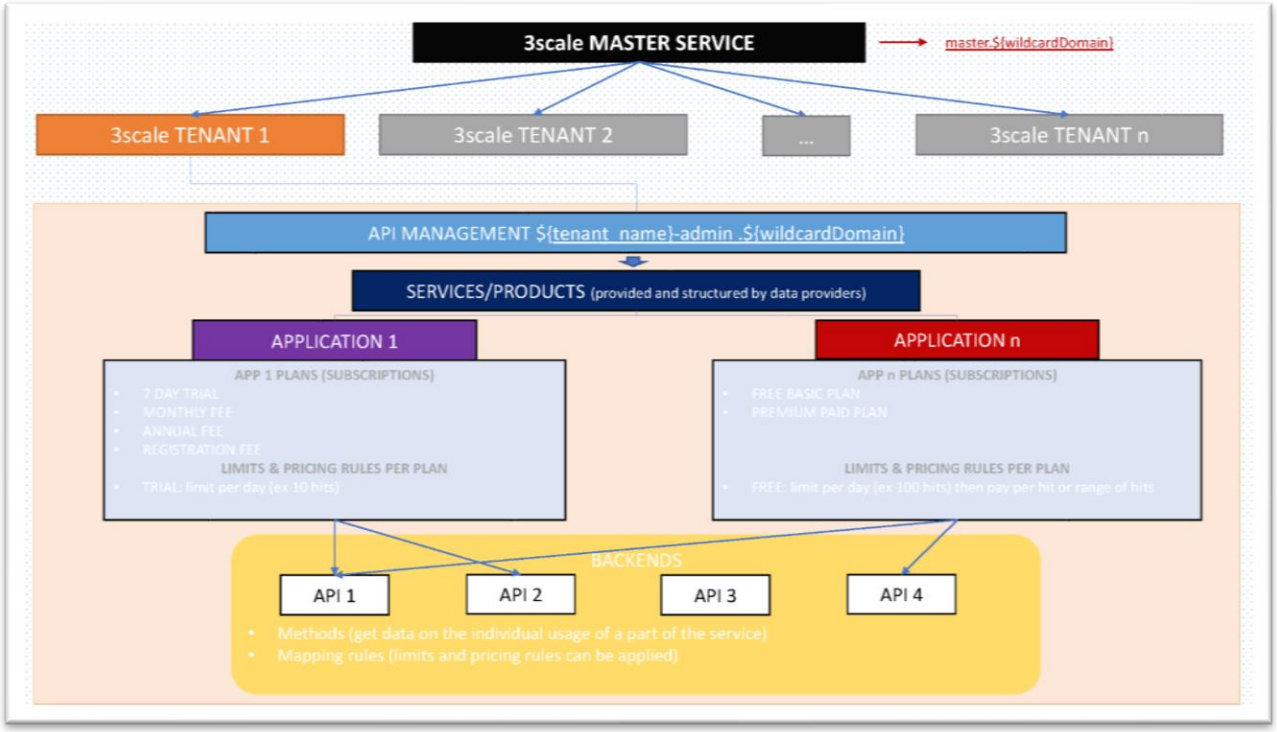

Figure 9 The concept behind API-magment in the SCOREwater platform

Each project of the 3 cities in the SCOREwater is a tenant within the central API-management solution. Tenants are fully independent from each other. The pictures below show some examples of the configuration of API´s within 3Scale. One of these examples is the Meet je Stad (measure your city) API.

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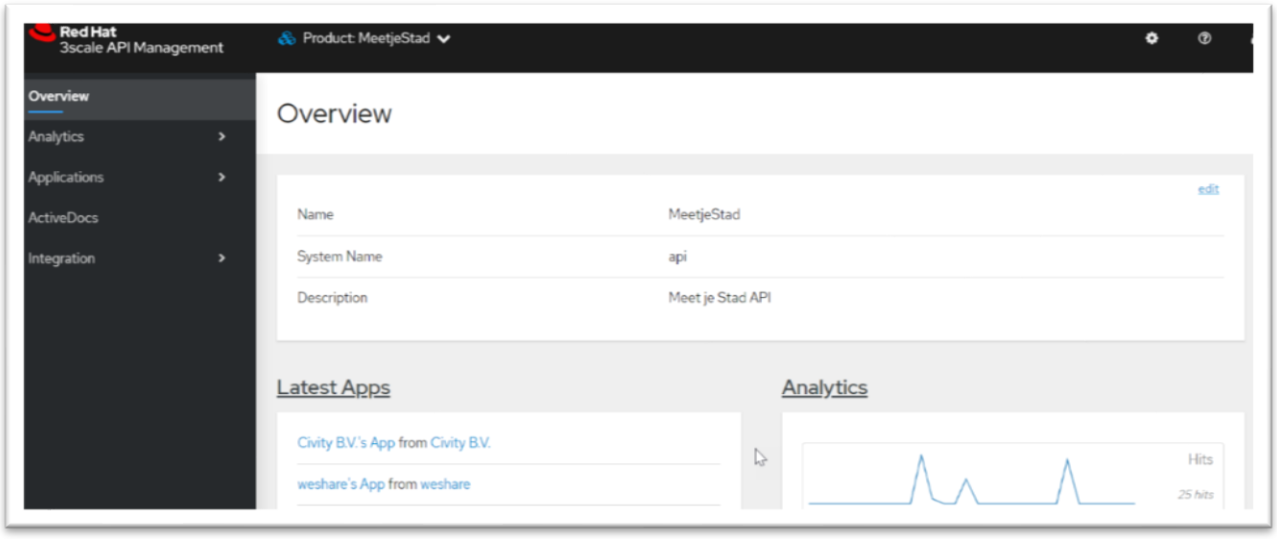

Figure 10 The Admin console of the 3Scale API-management solution

Part of the 3Scale implementation is the developer portal. It allows developers to subscribe to APIs, get insight in statistics (usage), invoices and documentation. The pictures below show the first draft of the developer portal. This developer portal is a first version, mainly based on the standard software (3Scale) and the coming period the focus will be on extending and finetuning this Data Market, and test it with developers. These next steps involve further configuration of the API-management solution, integration of existing APIs, setting up usage plans/policies and billing. Integration with the TM Forum Open API is also scheduled. Figure 12 and Figure 13 show the first steps to adapt the Data Market to the SCOREwater platform. It shows a first example of different subscription plans (start up, professional, enterprise) that can be used to test monetization of APIs. And it shows the standardized documentation for an API.

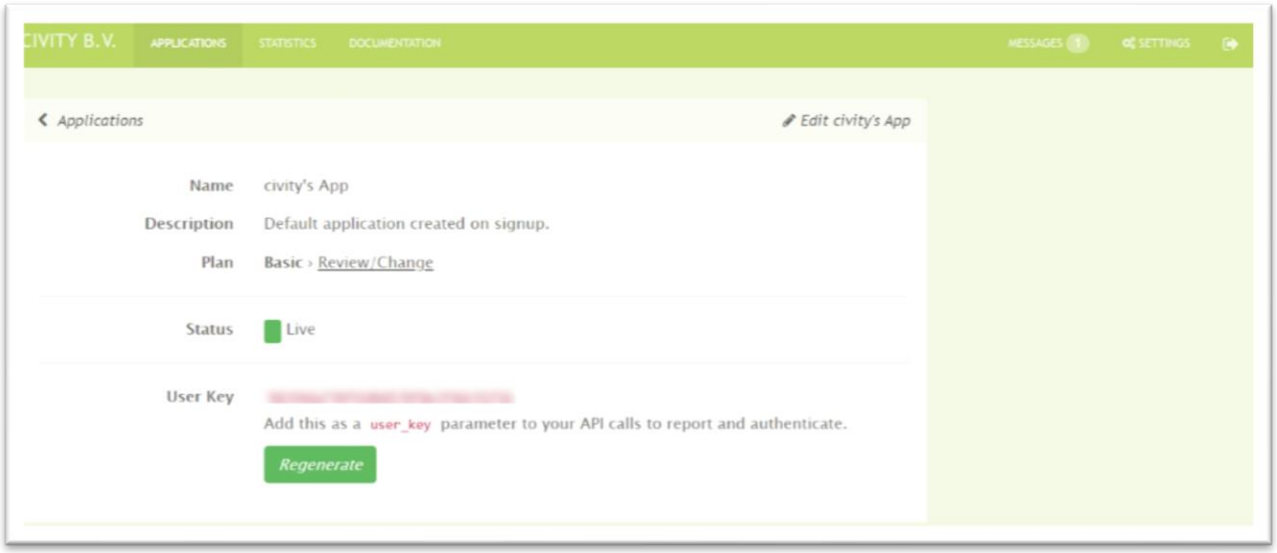

Figure 11 Example of developer portal with information for developer (plan, status, api-key)

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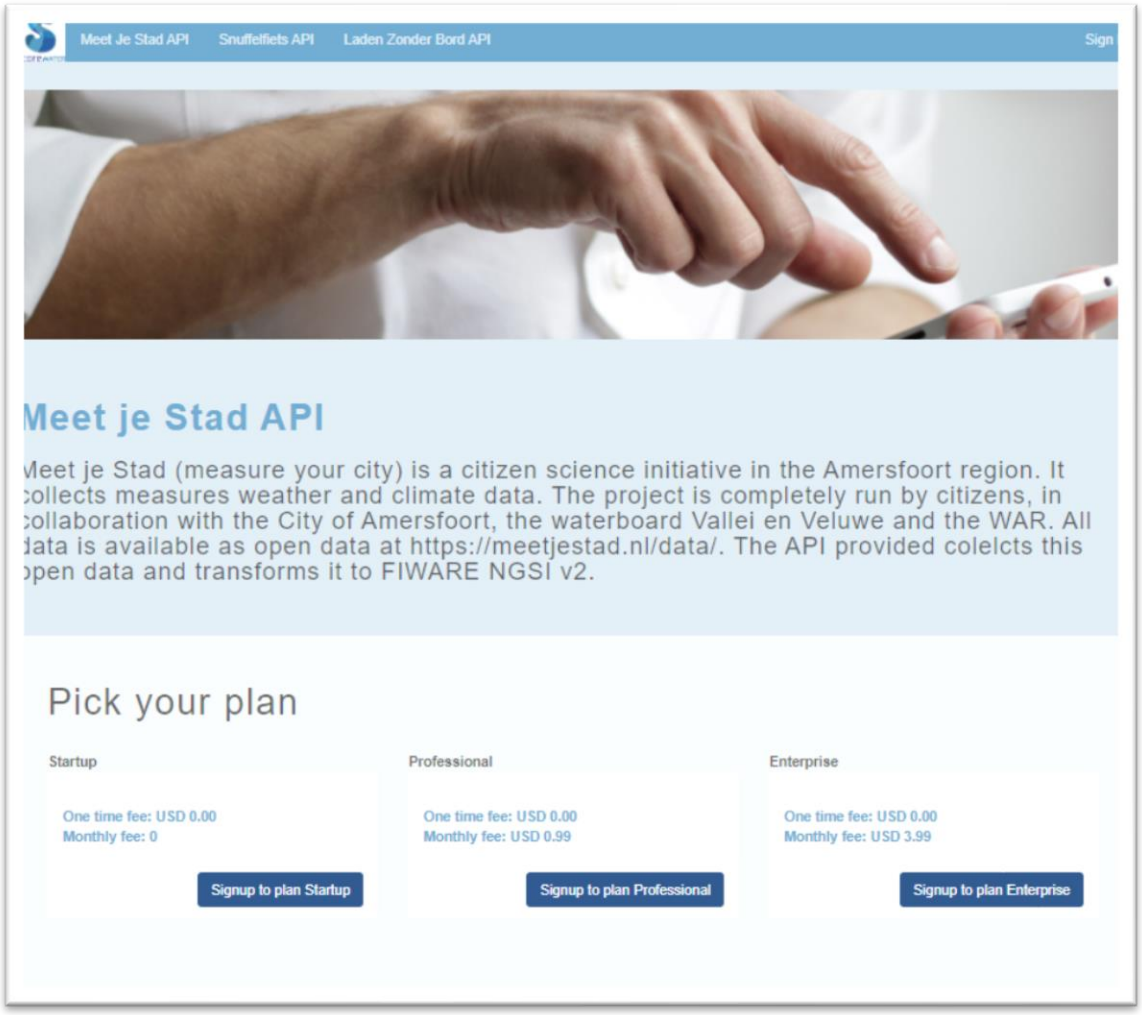

Figure 12 Example of developer portal with different subscription plans for Measure your city API

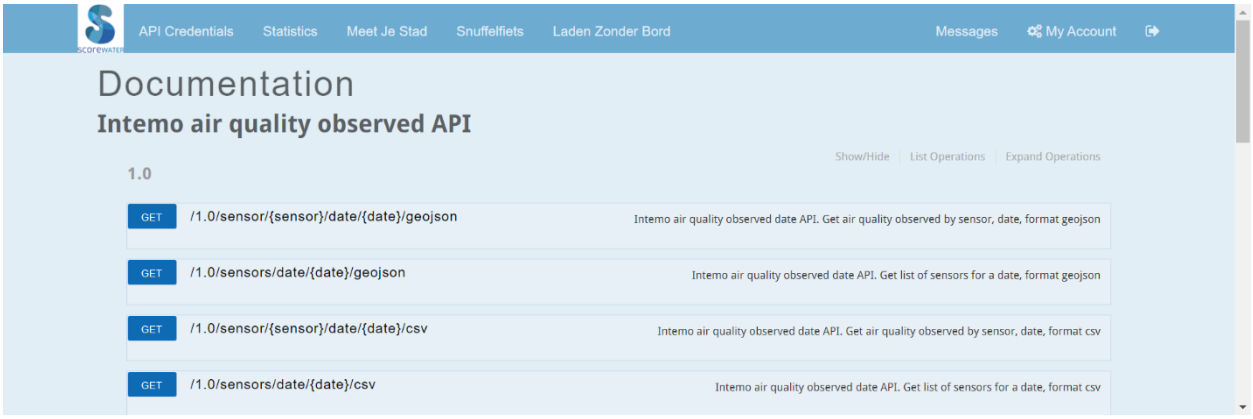

Figure 13 Example of developer documentation to test an API

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The next step in developing the Data Market will be the implementation of the TM Forum open API´s for catalog management, ordering management, inventory management, usage management, billing, customer, and party APIs, as described by FIWARE ."[4]

2.4. IDENTITY- AND ACCESS MANAGEMENT

Identity- and access management is not mentioned as specific building block in the high level FIWARE-architecture (Figure 1Figure 1 FIWARE catalogue), but it is an essential component that is used in all other software components. It takes care of centralized user management for all components.

To manage access to the different components of the SCOREwater platform and grant authorization, the platform has a central identity- and access management solution: Keycloak. This open source component offers support for centralized management, standard protocols (OpenID Connect, OAuth 2.0 and SAML 2.0), single sign on, identity brokering and more. All components within the SCOREwater platform (CKAN, 3Scale, Context broker) use this solution.

Table 4. ISO-criteria for Keycloak identity management component.

Keycloak	
Functional suitability	☒
Performance efficiency	☒
Compatibility	☒ supports all open standards
Usability	Easy integration with CKAN, 3Scale and Context Broker
Reliability	☒
Security	n/a
Maintainability	Supported by Red Hat
Portability	☒

2.5. STANDARDS: DATA MODELS AND API´S

Another part of the SCOREwater platform is the implementation of standard data models and API´s. They are directly connected to the Orion Context broker (NGSI). When possible, the FIWARE-data models are used, as described at https://smartdatamodels.org/. For several topics this is still work in progress and data models for water are still in their early stages (as mentioned in D3.1). If there is no appropriate FIWARE data model available, open, standard models from outside the FIWARE ecosystem will be recommended. These models might be added to the FIWARE-list of data models in a later stadium.

The FIWARE NGSI (Next Generation Service Interface) API is implemented in SCOREwater. This API defines[5]:

- a **data model** for context information, based on a simple information model using the notion of context entities

[4] https://github.com/FIWARE-TMForum/Business-API-Ecosystem
[5] https://fiware.github.io/specifications/ngsiv2/stable/

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- a **context data interface** for exchanging information by means of query, subscription, and update operations
- a **context availability interface** for exchanging information on how to obtain context information (whether to separate the two interfaces is currently under discussion).

The main elements in the NGSI data model are context entities, attributes and metadata, as shown in the figure below.

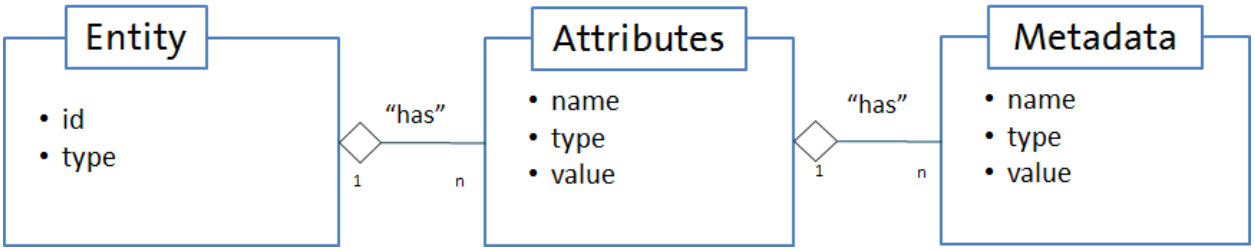

Figure 14 NGSI data model

For air quality the FIWARE-model "Air quality observed" (FIWARE, 2020) is used. The air quality data collected (for example from Measure your city and Snifferbike) will be harmonized with this model.

The weather data on temperature and humidity that will be collected (Meetjestad (measure your city)) will be made available and harmonizing according to the FIWARE datamodel "weather observed" (FIWARE, 2020).

2.5.1. DATA MODELS FOR AMERSFOORT CASE

Within the frame of the Amersfoort case, the SCOREwater platform deals with data regarding air quality, weather and water.

Air quality

For air quality there is a FIWARE-model "Air quality observed" (FIWARE, 2020). This model has been implemented in the Snifferbike project.

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Weather

The citizen science-project “Meet je stad” (measure your city) collects data that is made available through the SCOREwater platform. This initiative measures temperature and humidity to research the effects of climate change in Amersfoort. The data on temperature and humidity are converted to the FIWARE datamodel “weather observed” (FIWARE, 2020), as is shown in the screenshot below.

Figure 15 shows a part of the Measure your City API with the different methods to get data through the API.

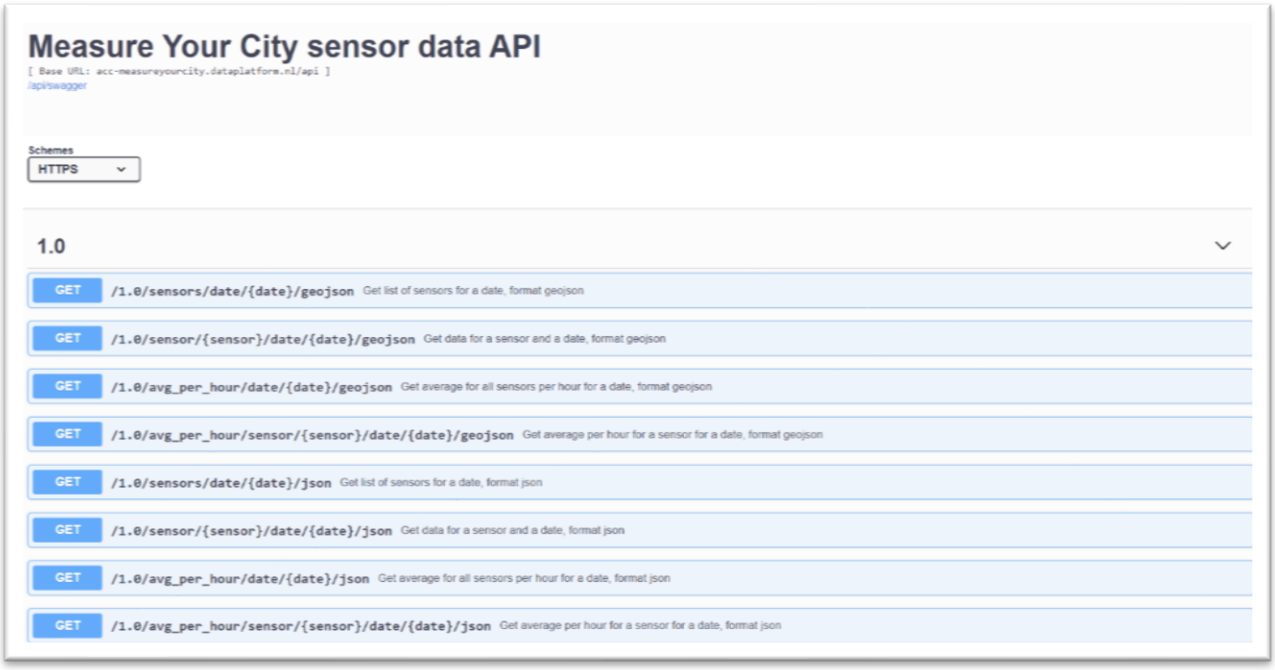

Figure 15 Meet je Stad (measure your city) standardized API

2.5.2. DATA MODELS FOR BARCELONA CASE

The Barcelona case deals with sewage system information. Currently there is no existing FIWARE data model for sewer systems. We have to look for existing other models that can be used within the SCOREwater platform (and collaborate with other EU-projects).

In the next update of this document, additional information will be added about the new FIWARE data models for the water sector. Multiple sensors in Barcelona will be connected to the SCOREwater platform and data will be made available through FIWARE NGSI APIs.

2.5.3. DATA MODELS FOR GOTHENBURG CASE

The Gothenburg case deals with wastewater quality.

As a first step, the sensors from Talkpool and the sensor data from a weather station in Gothenburg is connected to the SCOREwater platform. The picture below shows the raw and harmonized data from the weather station in Gothenburg, as it is stored in the PostGreSQL database. The “full text” (as shown within the purple box in Figure 16) from the sensor is mapped to the appropriate FIWARE data model (purple box in Figure 17). Both the raw data (Figure 16) and the harmonized data (Figure 17) are stored in the PostGreSQL database, which is the foundation underneath CKAN (Figure 18). The table in Figure 18 with 283 records is the information as shown in Figure 17.

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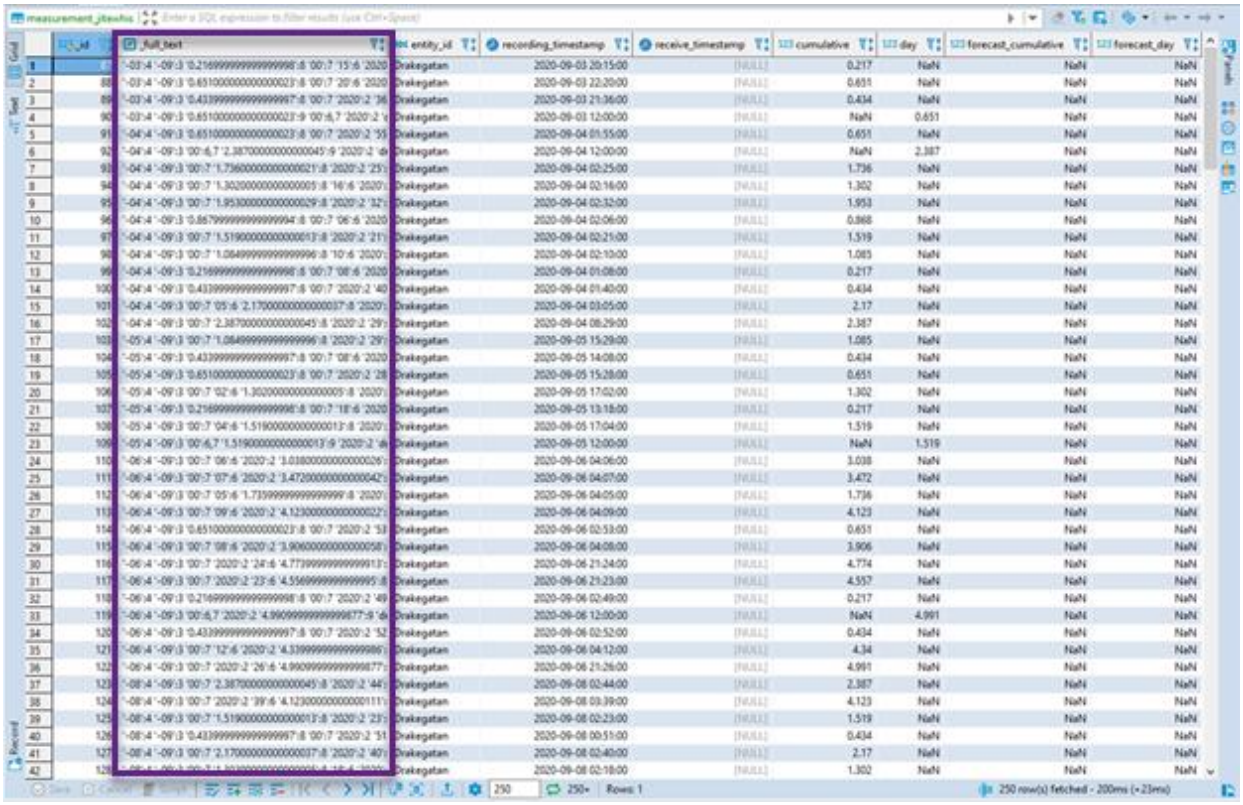

Figure 16 Example of the raw weather data received from the Gothenburg weather station

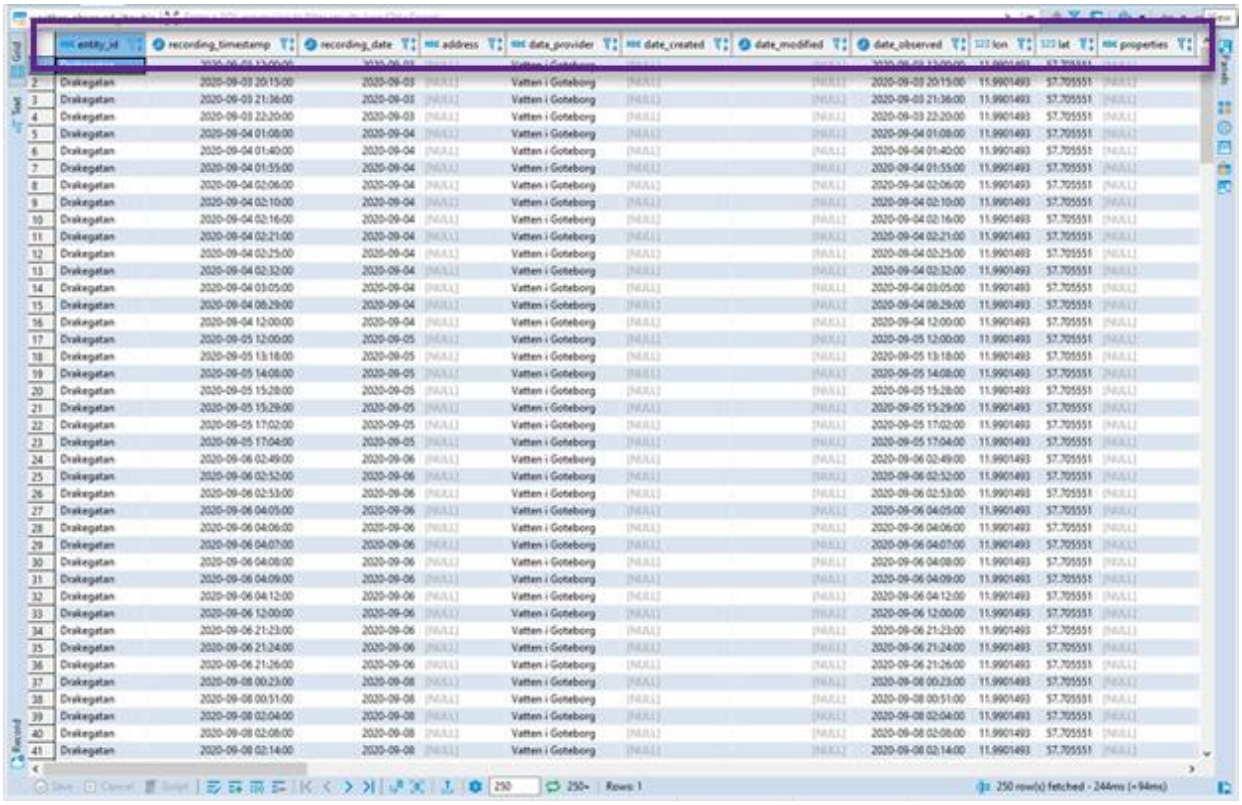

Figure 17 Example of the formatted weather data from the Gothenburg weather station

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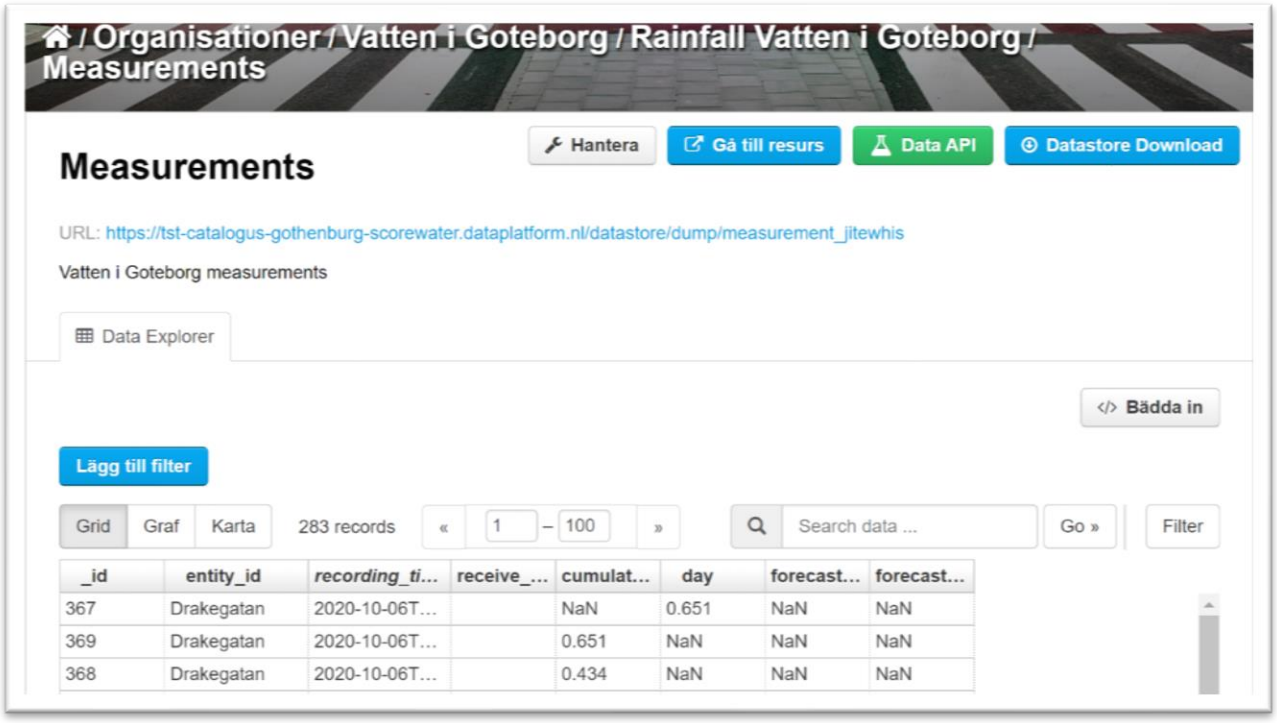

Figure 18 The raw weather data received from the Gothenburg weather station in CKAN

Figure 19 shows an API-documentation example from the dataset “Rainfall Vatten I Goteborg” as visible in Figure 4. This API-documentation, based on the standard data model will be used in the Data Market and add different subscription models (plans) to it. These subscription models allow for monetization of data sources and monitoring of usage. Figure 20 shows the results from an API-call in JSON-format

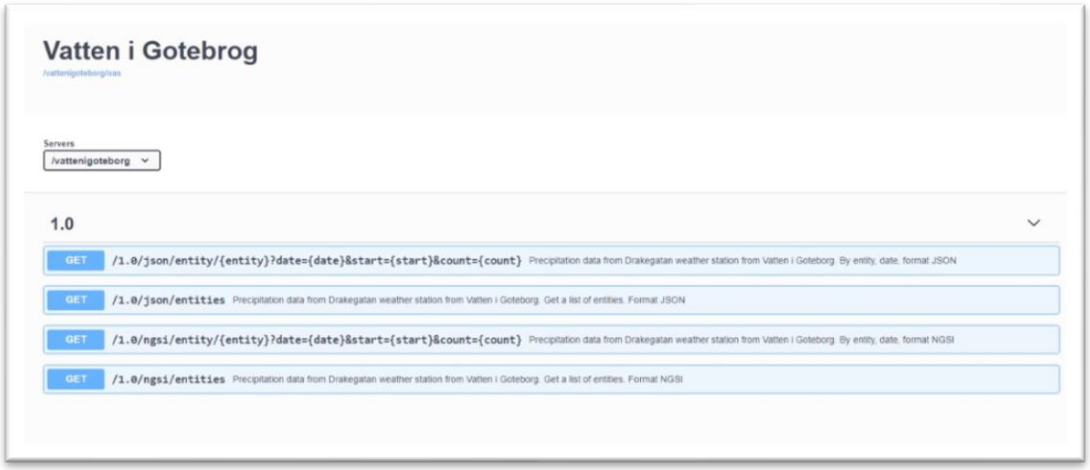

Figure 19 Harmonized API from the weather station sensor in Gothenburg

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```
{
  "openapi": "3.0.2",
  "info": {
    "title": "Vatten i Gotebrog"
  },
  "servers": [
    {
      "url": "/vattenigoteborg"
    }
  ],
  "paths": {
    "/1.0/json/entity/{entity}?date={date}&start={start}&count={count}": {
      "get": {
        "tags": [
          "1.0"
        ],
        "parameters": [
          {
            "name": "entity",
            "description": "Entity to get data for",
            "schema": {
              "type": "string"
            },
            "in": "path",
            "required": true
          },
          {
            "name": "date",
            "description": "Date to get data for (yyyy-MM-dd, e. g. 2020-04-19)",
            "schema": {
              "type": "string"
            },
            "in": "path",
            "required": true
          },
          {
            "name": "start",
            "description": "Index of first record to return",
            "schema": {
              "type": "integer"
            },
            "in": "path",
            "required": true
          },
          {
            "name": "count",
            "description": "Number of records to return",
            "schema": {
```


Figure 20 Harmonized API-results from the weather station sensor in Gothenburg

Waste water (and Sewer systems)

For the waste water case in Gothenburg we suggest to use the FIWARE-model “water quality observed” (FIWARE, 2020). This Water Quality data model is intended to represent water quality parameters at a certain water mass section. The wastewater that is measured by the sensors send their data to the SCOREwater platform. The common water quality parameters and the concentration of chemical agents are part of the model. For the Barcelona-case we will use the same model.

2.6. SUMMARY

This deliverable describes the implementation of the SCOREwater Platform in the three cities. The platform consists of the technical components, the data models and the open API´s. This document is a snapshot of the progress in October 2020. In an ongoing process, new sensors, data sources and models, and developer documentation will be added. This document will therefore periodically be updated with new information. The updated versions will be stored in the SCOREwater Sharepoint.

The technical SCOREwater Platform is available and the first integrations with data sources from the three cities have been established. In the Data Market testing has begun to apply different subscription plans to data sources.

The Data Market will be a central component in the future steps. It provides access to developers who want to use the data to create new solutions. The data market combines the technical (FIWARE) and business agreements (TM Forum Open APIs). The technical implementation is ready, and the focus will now shift towards the business topics: billing, policies/plans, service levels, etc. Future steps are aimed toward adding more data sources and sensors, new IoT-agents, additional data models (when they become available within the FIWARE community) and extending the Data Market with integration of the TM Forum Open APIs. The results will particularly be useful for WP2 (Data Analytics and Machine Learning techniques), WP4 (Large scale demonstrations) and WP6 (Exploitation and replicability). It enables new solutions, business models and reuse.

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ANNEX 1 – STOCKTAKING

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

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

STRATEGIC OBJECTIVES

Table 5 lists those strategic objectives of SCOREwater that are relevant for this Deliverable and gives a brief explanation on the specific contribution of this Deliverable.

Table 5. Stocktaking on Deliverable's contribution to reaching the SCOREwater strategic objectives.

Project goal	Contribution by this Deliverable
The SCOREwater platform will be based on existing open source software components, standards and data models.	This deliverable selected the components and technologies, standards and models that will be used for the SCOREwater platform.
Identify existing systems and applications, and provide a functional and technical analysis of these systems and applications, including relevant standards, connections and data.	Deliverable 3.1 has identified and described solutions and alternatives for the SCOREwater platform, based on a software quality model. This deliverable describes the solutions that are selected for the SCOREwater Platform
A prerequisite of the project is to base the SCOREwater platform on FIWARE	This deliverable has identified gaps in FIWARE components, standards and data models

PROJECT KPI

Table 6 lists the project KPI that are relevant for this Deliverable and gives a brief explanation on the specific contribution of this Deliverable.

Table 6. Stocktaking on Deliverable's contribution to SCOREwater project KPI's.

Project KPI	Contribution by this deliverable
Open source software by default	This deliverable has selected open source components, models and standards to be implemented in the SCOREwater platform. This Deliverable will contribute to multiple KPI's, but more about that will be available in a next update of this document.
FIWARE as prerequisite	This deliverable has identified and selected FIWARE components that are suitable for the SCOREwater platform

ETHICAL ASPECTS

Table 7 lists the project's Ethical aspects and gives a brief explanation on the specific treatment in the work leading up to this Deliverable. Ethical aspects are not relevant for all Deliverables. Table 7 indicates "N/A" for aspects that are irrelevant for this Deliverable.

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Table 7. Stocktaking on Deliverable's treatment of Ethical aspects.

Ethical aspect	Treatment in the work on this Deliverable
Justification of ethics data used in project	N/A
Procedures and criteria for identifying research participants	N/A
Informed consent procedures	N/A
Informed consent procedure in case of legal guardians	N/A
Filing of ethics committee's opinions/approval	N/A
Technical and organizational measures taken to safeguard data subjects' rights and freedoms	In accordance with D9.2 where applicable
Implemented security measures to prevent unauthorized access to ethics data	In accordance with D9.2 where applicable
Describe anonymization techniques	In accordance with D9.2 where applicable
Interaction with the SCOREwater Ethics Advisor	N/A

RISK MANAGEMENT

Table 8 lists the risks, from the project's risk log, that have been identified as relevant for the work on this Deliverable and gives a brief explanation on the specific treatment in the work leading up to this Deliverable.

Table 8. Stocktaking on Deliverable's treatment of Risks.

Associated risk	Treatment in the work on this Deliverable
Technical immaturity of FIWARE components	Selection of open source alternatives, collaboration with other EU-funded projects and FIWARE-foundation.
Missing of incomplete standards and data models	Collaboration with other EU-funded projects, FIWARE-foundation and other standardization bodies to develop open standards and data models.

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scoreWATER

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