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groundtruth2.0

Environmental knowledge discovery of human sensed data

Deliverable D2.6

Customized platform for Kenyan Demo Case (First Version)

The Ground Truth 2.0 project has received funding from the European Union's Horizon 2020 Research and Innovation Program under grant agreement No. 689744. www.gt20.eu

Deliverable Title	Customized platform for Kenyan Demo Case (First Version)
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Abstract of Deliverable	Ground Truth 2.0 (GT2.0) aims to demonstrate that sustainable Citizen Observatories (COs) are possible. This is done using the innovative approach of combining the social dimensions of citizen observatories with enabling technologies, so that the implementation of the respective citizen observatories in six Demo Cases is tailored to their envisaged societal and economic benefits. This report presents the first version of the platform for the Kenyan DC Citizen Observatory that was developed jointly with end users during co-design sessions.

Versions and Contribution History

Version	Date	Modified by	Modification details
v0.1	16.01.18	Alberto Masa, Cristina Montachini	Template
v.02	22.01.18	Luchiri Omoto	Initial draft
v.03	23.01.18	Mohammad Gharesifard, Hans van der Kwast	Review, additions and comments
v.04	25.01.18	Cristina Montachini, Alberto Masa, Nicolas Luque	Review and comments
v.05	29.01.18	Luchiri Omoto	Fully revised draft

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List of abbreviations

CO	Citizen Observatories
GT2.0	Ground Truth 2.0

Executive Summary

Ground Truth 2.0 (GT2.0) aims to demonstrate that sustainable Citizen Observatories (CO) are possible. This is done using an innovative approach combining the social dimensions of citizen observers with enabling technologies so that the implementation of the respective citizen observatories is adapted to the social and economic benefits anticipated.

For each demonstration case, a technological architecture is being designed and set up. The Maasai Mara Citizen Observatory is a platform being developed by, for and with key stakeholders actively involved in balancing biodiversity conservation and livelihood development in the wider Mara region.

The Mara National Reserve is administered by Narok County government. In order to manage the reserve and to create sustainable business opportunities for its citizens and tourists, the county government needs reliable biodiversity data. These are currently lacking. The Ground Truth 2.0 citizen observatory will build on the VirtualKenya platform and aims to initiate communication between local governments, policy makers and reserve managers on the one hand and Mara visitors on the other.

Through an app, visitors, tour guides, researchers, wardens and others can highlight biodiversity and environmental issues. The app also logs vehicle movement and speed and warns when official tracks are deserted. In addition, meteorological data are collected by one of the partners to predict species distributions. Big screens at lodges will feature all the observations.

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1. Introduction

1.1 Background

The Ground Truth 2.0 project will deliver the demonstration and validation of six scaled-up citizen observatories in real, operational conditions, with four European and two African demonstration cases. It will demonstrate the technological feasibility, the sustained use and the societal and economic benefits of such citizen observatories. The ultimate objective is the global market uptake of the concept and enabling technologies.

One of the main objectives of WP2[1] is to enable adequate customization, deployment and upscaling of the required technical solutions in each demonstration case. Considering the different starting points and the differences in the cases' requirements, the aim is to set up a technological architecture in each case, taking into account both common modules as well as particular ones.

Within this frame, the Task T2.1, Technical design and integration of components per demonstration case, will settle the specific requirements of each demonstration case, based on the users' requirements made during the work carried out as Task T1.3, Functional design. The Task T2.1 is being developed with the purposes of: make the technical design of the Demo Case; develop standard integration between demonstration cases; and configure the technological platform in each demonstration case.

1.2 Purpose of the document

This document is one of the Task T2.1 outputs. It describes how, starting from the functional design of the Kenya Demo Case, going through the technical design and integration of IT components, the first version of the CO platform was developed.

1.3 Structure of the document

The present document is divided into 4 sections in order to give a comprehensive overview of the customized platforms of each Demo Case.

Section 1 presents an introduction to the document, giving details about the background, the purpose and the structure the document.

Section 2 is a summary of the Functional Design for the platform. It describes the results of the planning carried out by the co-design group that participate in the DC. The co-design group, through co-design work sessions, defined and validated the Vision, Mission and Objectives of the Citizen Observatory, the customized Functional Design and the Technical Design.

Section 3 presents the platform architecture validated by the co-design groups of the DC, designed to satisfy the user requirements of the customized Functional Design, the selection of technological tools and the mock-up developed to obtain feedback from the co-design group.

Finally, Section 4 presents and describes the first version of the platform, created based on the customized Functional Design and the feedback from the co-design group.

[1] Ground Truth 2.0 - Environmental knowledge discovery of human sensed data, D0.A extract FINAL for kick-off, 1.3.3. WT3 Work package descriptions

2. Summary of Functional Design for the platform of the Demo Case

During the co-design sessions, different activities were carried out to identify the challenge of the Kenya Demo Case Citizen Observatory and to define the Mission, Vision and Objectives. Then, the functional design for accomplishing these premises was developed.

2.1 Mission, Vision and Objectives of the Citizen Observatory.

Vision: We envisage a society in which all stakeholders are working together to ensure the balance between sustainable livelihoods and biodiversity management in the Mara ecosystem.

Mission: The citizen observatory will constitute a multi-stakeholder platform for generating and sharing of data, information and knowledge to improve policy making and implementation for sustainable livelihoods and biodiversity management in the Mara ecosystem.

Objectives: The following four objectives were defined:

- To provide a monitoring system for biodiversity, livestock and crop, land and water resources, and climate across the Mara ecosystem by 2017.
- To establish a repository on Mara biodiversity, livestock and crop, land and water resources, and climate information that is accessible to all stakeholders by the end of 2017.
- To develop a platform by the end of 2018 for the engagement of citizens, government, research and the private sector to promote practices that create the balance between livelihoods and biodiversity in the Mara ecosystem.
- To improve data, information and knowledge generation and sharing on biodiversity and livelihoods between citizens, practitioners, researchers and policy makers by 2018 for informed policies and policy implementation.

The vision, mission and objectives are summarized in Figure 1 below.

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Figure 1. Mission, Vision & Objectives

2.2 Functional Design

The design of the observatory was guided by the feedback from the local stakeholders that were engaged in three workshops. The key main stories that came out of the process were summarised as:

1. Supporting implementation of plans and policies with monitoring and information sharing;
2. Use of a knowledge hub to access existing data, information and services;
3. Evaluate research activities or policy and stewardship results;
4. Discuss and set observatory agenda;
5. Participate in policy consultations and planning;
6. Platform to submit their data and process is for use.

Through reach outs and creating awareness, policy agendas can then be influenced. The functional design is shown in Figure 2 below.

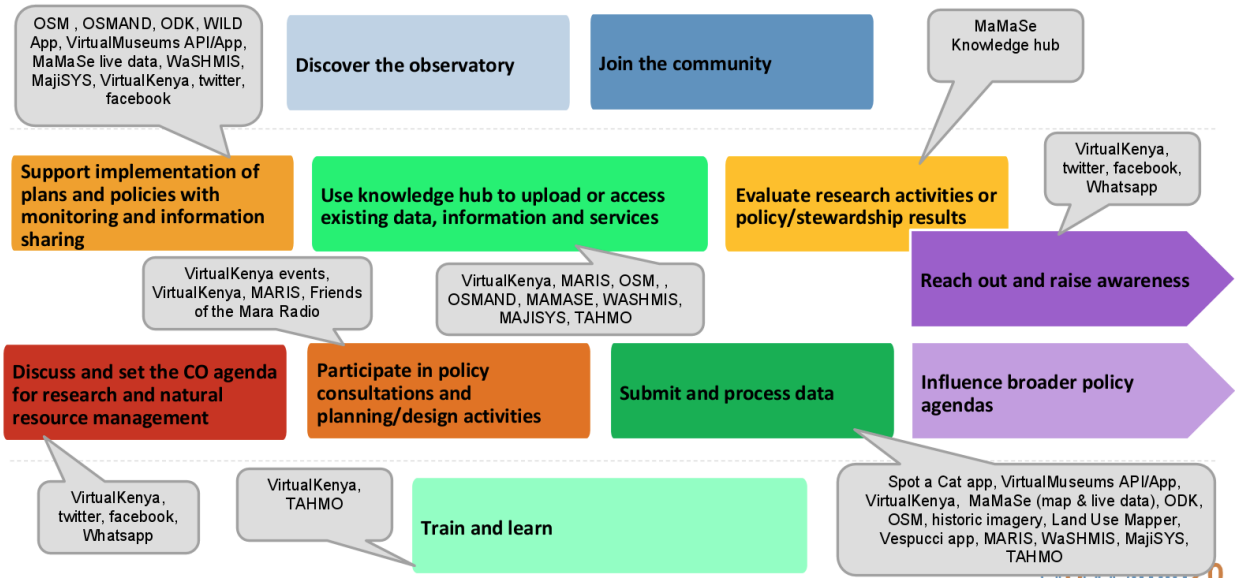

Figure 2. Functional Design diagram

2.2.1 Tools for the development of the platform

VirtualKenya

VirtualKenya is based on a Spatial Data Infrastructure tool called Geonode. VirtualKenya has a large repository of spatial-related data on Kenya. This data is used together with other data from other sources, to share, analyse and process information in the Mara.

MARIS- Mara Rangeland Information System

This is a system that can monitor grasslands and find sustainable and resilient livelihood scenarios in pastoral grasslands, where applicable in the near presence of wildlife, respecting the carrying capacity of the ecosystem with awareness of the market opportunities and threats as well as other information to manage pastoral grasslands.

TAHMO

The Trans-African HydroMeteorological Observatory (TAHMO) aims to develop a vast network of weather stations across Africa. Current and historic weather data is important for agricultural, climate monitoring, and many hydro-meteorological applications.

TAHMO has four weather stations in the project area whose data is collated into the Mara CO portal.

Mobile App

This is a tool based on Open Data Kit, developed and customised by Upande ltd for use in the Mara regions to collect biodiversity related data, such as data on wildlife sightings, pastoralists, fences, human-wildlife conflicts etc.

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2.2.2 Data Collection and data aggregation

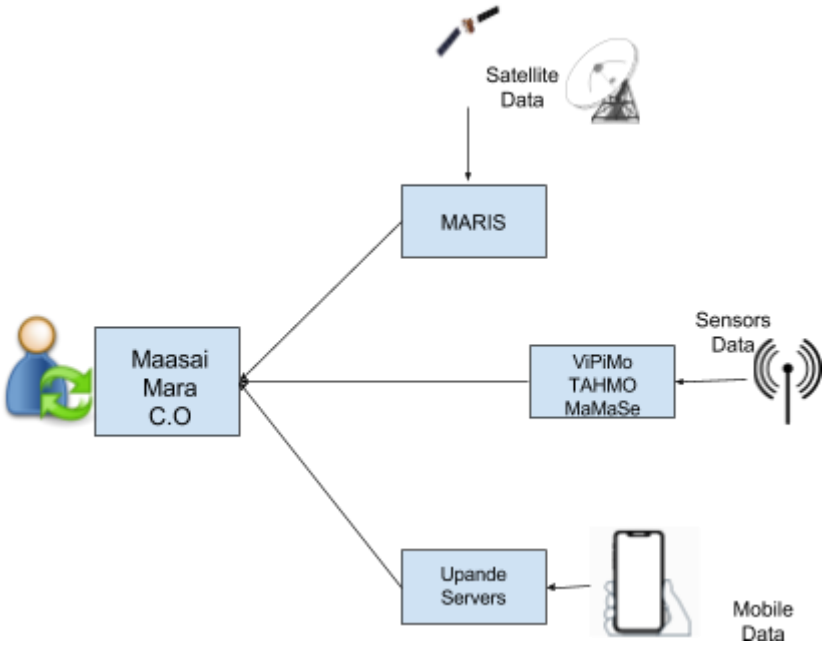


Figure 3. Data collection process

The Mara CO gathers data and information in the following four ways (summarized in Figure 3):

1. Satellite Imagery

Data are collected from satellite imagery and processed through the MARIS system.

Timelines: Satellite data are relayed every ten days.

Storage and Analysis: ILWIS Servers are processed within a day. This is then displayed on the MARIS servers where the Mara CO portal pulls the data from, in near real time.

2. Deployed Sensors

Data are received from sensors deployed 'on the ground' in the project area. This includes the Weather stations equipment (Windvane, Windsock, thermometers, Raingauge) and IoT Sensors (river depth).

Timelines: This data is gathered daily and transmitted almost in real-time.

Storage and Analysis: Data storage and processing are done in cloud servers offering 24 hours availability. However the display is set to specific intervals.

3. Mobile Data Collection Devices

Timeline: This is data collected by users who have downloaded the app and can therefore be submitted at any time/ period.

4. Storage & Analysis

Submitted data is processed from the server (cloud) side and displayed on the Maasai Mara CO portal.

The Maasai Mara CO does not store or process data but only pulls information from the various services listed above. Interaction from users is however possible, whereby users' feedback is channeled directly to the main service providers.

2.2.3 Monitoring and assurance of the technical performance of the platform

Internal Operational Guidelines

The platform utilises tools developed under international standards and licensing that therefore meet operational thresholds.

Also the technical lead has developed a framework outlining responses to maintenance of the platform. These include:

- Automated alerts on system failures
- Guidelines on response time, persons responsible etc.
- Maintenance schedules

2.2.4 Standardization of data management

Operational Guidelines

The platform utilises tools developed under international standards and licensing that therefore meet data management thresholds.

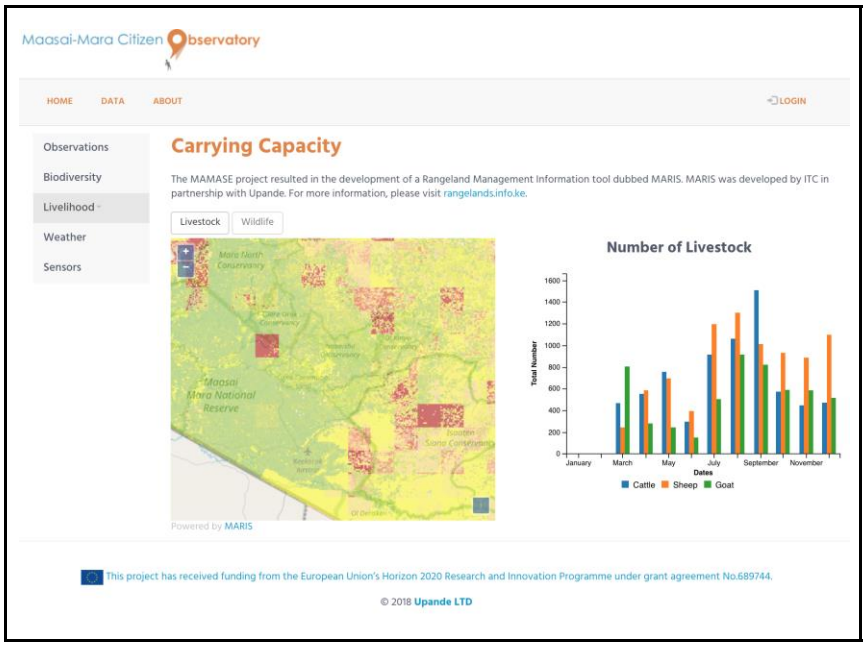
Also the technical lead is developing a framework outlining the data management process. These include:

- Checklist on management tasks
- Guidelines on managing data.
- Automated checks when designing data collection tools so as to reduce processing time and errors
- Ensuring backup of data, both raw and refined data.

2.2.5 Enhanced services

The services pulled into the Maasai Mara Citizen Observatory Portal employ visualisation tools both for charts and also spatial data platforms (Figure 4).

More enhancements are expected in the next versions of the platform.



1. Geonode for spatial data (Openlayers as default platform)

and

2. C3 JS for the graphs

Figure 4 Visualisation and Graphical modelling tools

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3. Platform technical design and integration of components of the Citizen Observatory

3.1 Platform architecture and selection of technological tools to use

The Maasai Mara CO has five core components, which involve gathering data and sharing it. Figure 5 shows the technical design and integration of the components.

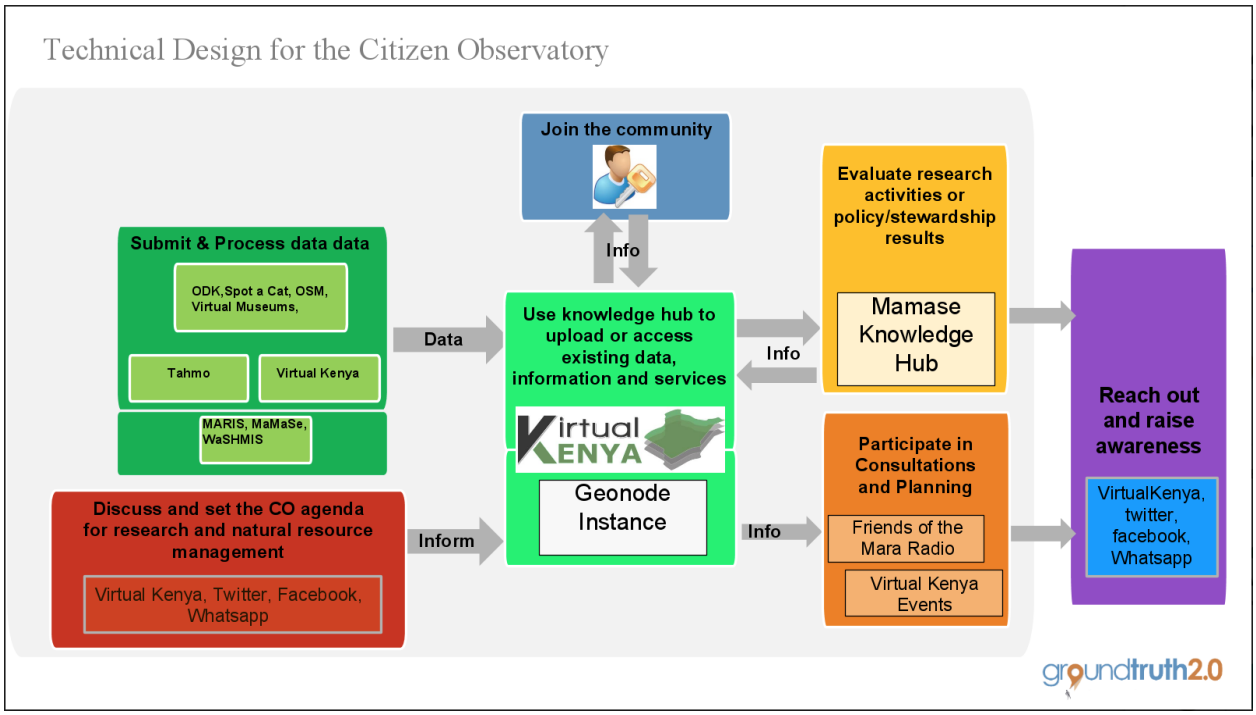

Figure 5 Technical Architecture of the Kenya Demo Case platform (first version)

On the left side, there are two sources of data for the observatory that users cannot directly interact with through the platform, but they provide part of the main sources of data. This is data from automated sources such as sensors, satellites, and public gathered data through apps and social media.

The third source of data for the platform, which is interactive, is the Community of stakeholders and those who sign up to the platform. Members share information about their activities, stakeholder organisations, etc.

A fourth source of data comes from the MaMaSe knowledge hub, an existing platform that already has data on the Mara ecosystem, contributed by its online community.

The processed information is then disseminated through the CO web platform for participation and consultation purposes.

3.2 Mock-up and feedback

The feedback from the Mock Up sessions is summarized in Table 1 below.

Table 1 Feedback from Mock-Up Session

Mobile App
1. Who are the consumers of the data Everybody will need the data in one way or another hence important to process it for the various consumers. 2. Who are the users of the application As is, the apps will probably work for the more tech savvy. E.g. rangers 3. What language will be used in the apps Preference for Swahili and Maa if possible 4. Linkages between the various data e.g. rainfall and Human Wildlife conflict This is so as to make sure every data shared is important for locals 5. Have we studied the current systems in place and how information flows Need to find collaborations with any existing systems in place. 6. How does the local get feedback on data they submit/create Look into ways data collected by locals or stakeholders gets back to them e.g HWC reports. 7. How much will apps cost Will determine if uptake will be great. Can only be bought if benefit is greater.
USSD/Web Application
1. USSD is much easier for a wider audience (also pastoralists) 2. The Web will be suitable for some stakeholders 3. Who should pay? End Users, Service providers. Individual account could be paid for at different levels, Organisations can sponsor or subscribe. Traffic from the C.O. can be monetised. 4. C.O. should be popularised.
Climate Service
1. The climate service should have a link with the new Narok county govt Climate policy. We should look for cooperation with the local met office in Narok 2. Conservancies have a need to monitor the climate 3. Linking meteo data/models with Mara Rangeland Information System (MARIS - MaMaSe/ITC) can enable predicting carrying capacity 4. Local experts could broadcast local weather predictions via radio. This could be teachers from the TAHMO schools. 5. Because smartphone penetration increases we should also provide information through a local weather app 6. Advertisements and announcements should pay for services 7. Rainfall predictions are important for farmers 8. Apps like (skiza) that push info in the form of audio messages to users (language is important) should be considered. 9. We should look at branding of materials (educational books) 10. Scientists/authorities need the data in tabular form 11. Link to knowledge hub linking to different meteo data providers (TAHMO, Met office, low cost stations, project stations, etc.) 12. Make agreements with different meteo data providers 13. Centralised access through hub 14. Policies/agreements are needed for use/linking the data from the different providers 15. Weather information is useful for tourists, we should look at a link with biodiversity

After that, the next issues are added in Table 2: the division of tasks (taking into account the different profiles of the DC partners), definition of the task to be done, the tools that will be used for the development of the task and who will be the responsible for it.

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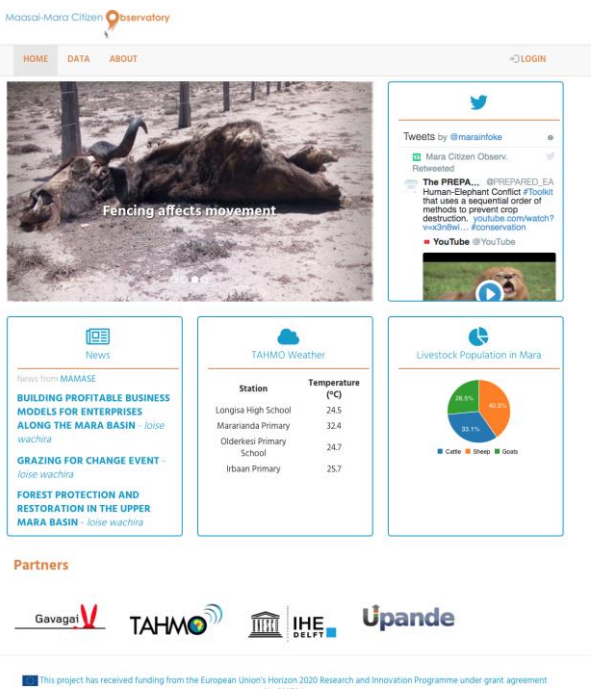
Table 2 Necessary tasks to develop the first version of the CO from the mock-up

Task	Tools	Responsible
Register internet domain http://mara.info.ke/,	Kenic.co.ke Digital Basket	Upande
Set up architecture of the web platform	Wagtail/Django	Upande
Design Logo of the Maasai Mara Citizen Observatory	WagTail Geonode C3 JS for graphs	Upande

4 Presentation and description of contents of the Citizen Observatory platform (First version)

The aim of this section is to present the contents of the first version of the Citizen Observatory platform. Figure 6 shows the different pages of the platform.

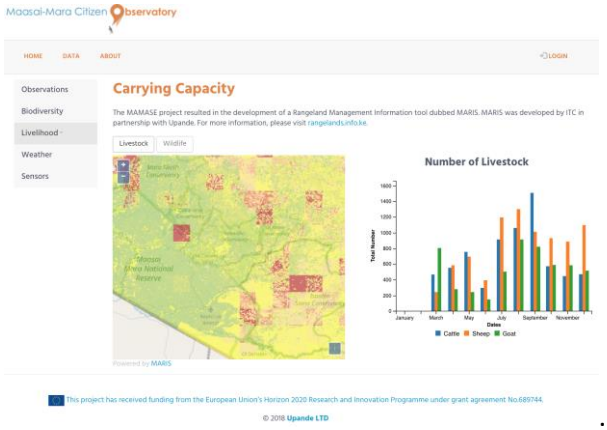


Home page:

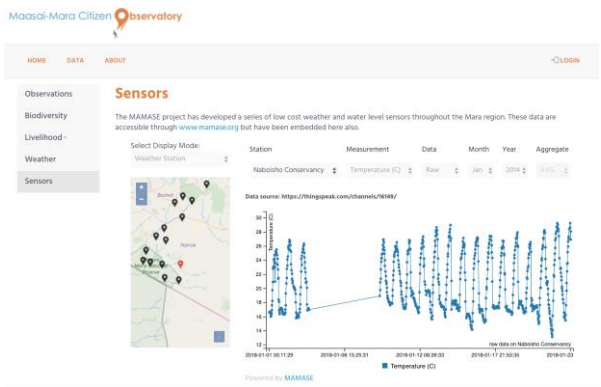
Provides Snapshots of the Data visualised on the portal under the Data Menu.

Partners and

information from social media.



Livelihoods Sub-Page: Showing Conservancies carrying capacity from MARIS Data.



Sensors Sub-Page: Weather info from a station from MaMaSe

Mobile App

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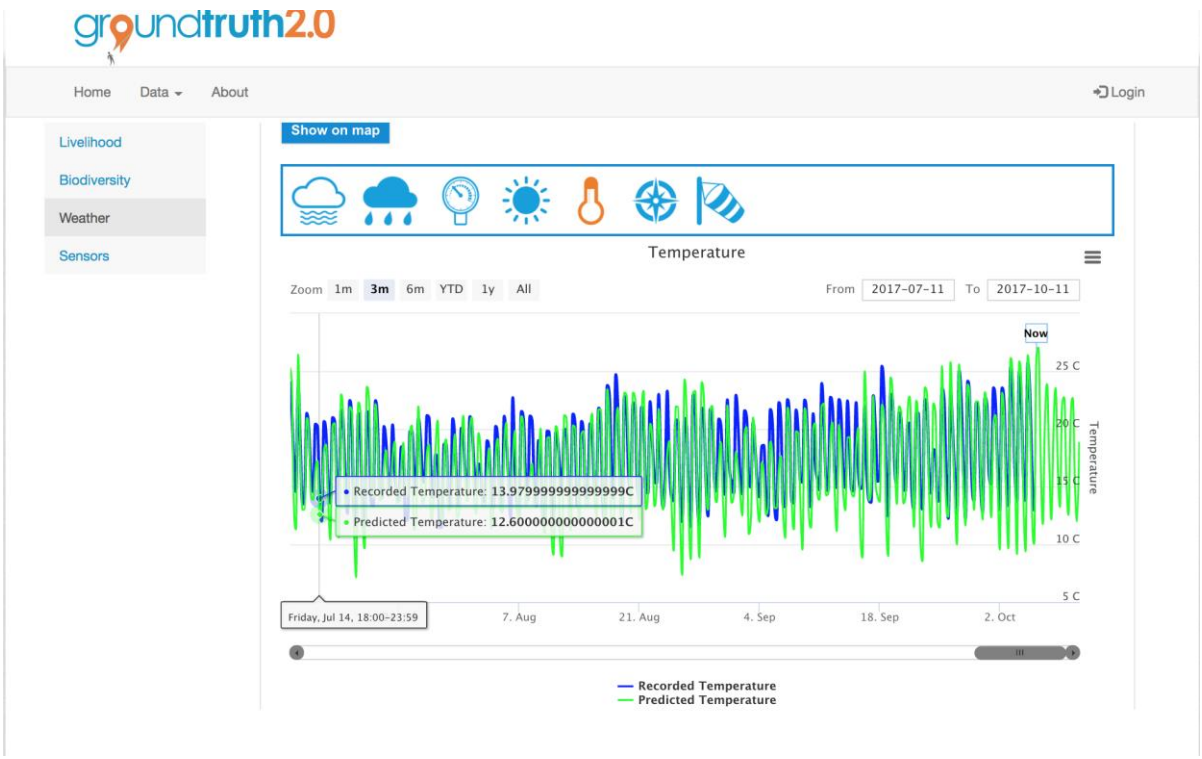

Weather Data

Figure 6 Platform web pages

Data Menu

The data Menu has 5 sub menus:

- *Observations* sub menu: information from data collected via mobile app. This includes data collected from mapping human-wildlife conflicts, fences, spotted animals, tracks and settlements/Points of Interest and livestock market information.
- *Biodiversity* sub menu: pulls information from MaMaSe and VirtualKenya SDI's.
- *Livelihoods* sub menu: has two sections, namely:
    - The *Markets*: gets data from the mobile app on the different prices of livestock at the livestock markets covered.
    - The *Carrying Capacity*: pulls information from MARIS (Mara Rangelands Information Systems), which utilizes satellite data.
- *Weather* sub menu: pulls data from TAHMO weather stations located at the Mara ecosystem.
- *Sensors* sub menu: users can select a specific location (weather station) and then click on icons to observe Humidity, Precipitation, Pressure, Radiation Temperature, Wind Direction and Speeds.

The following table (Table 3) provides an overview of the development of the technical platform, and how the Functional Design is linked with the development of the first version of the platform.

Table 3 Platform implementation (first version)

First Version Platform Implementation					
HEADLINES	**SUBHEADLINES**	**YES/NO**	**WHY NOT?**	**TOOL**	**WHERE?**
HOME	News	yes	NA	Wagtail CMS & Custom RSS feed	http://mara.info.ke/
	Weather	Yes	NA	Wagtail CMS	http://mara.info.ke/
	Charts	Yes	NA	Wagtail CMS & c3 JS	http://mara.info.ke/
	Social Media Stream	yes	NA	Wagtail CMS & Twitter feeds API	http://mara.info.ke/
Data	Observations	yes	NA	Wagtail CMS	http://mara.info.ke/data/observations/
	Biodiversity	yes	NA	Wagtail CMS & Geonode API	http://mara.info.ke/data/biodiversity/
	Livelihoods	yes	NA	Wagtail CMS & Custom Code for MARIS	http://mara.info.ke/data/livelihood/
	Weather	yes	NA	Wagtail CMS & TAHMO API	http://mara.info.ke/data/weather/
	Sensors	yes	NA	Wagtail CMS & MaMaSe API	http://mara.info.ke/data/sensors/
About C.O.		yes	NA		http://mara.info.ke/about/

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The following table (Table 4**Error! Reference source not found.**) shows the different sections of the platform, the content of the section and the relation with the Story Map and Headlines.

Table 4 Summary of contents of each page of the platform (first version)

Section	Content of the section	Story Map Headline User card
Observations	The App being developed allows citizens (local & tourists) to collect key data from the field ranging from biodiversity sightings, to human wildlife conflict locations to updating of fences and roads.	Use knowledge hub to upload or access existing data, information and services-View maps and visualizations
Biodiversity	Pulls data from VirtualKenya and other sources with biodiversity data concerning the Mara region	Participate in policy consultations and planning/design activities
Livelihood	Pastoralism is the main form of livelihood for the Maasai Mara region, with local communities having lived among wildlife for thousands of years. With population increase, ranching, fencing, horticulture, weather variability and tourism becoming more profound, the pressure on grazing lands is under increased threat.	Support implementation of plans and policies with monitoring and information sharing-monitor status of a resource
Weather	The weather information which is relevant to the pastoralists, researchers and other large scale farmers.	Use knowledge hub to upload or access existing data, information and services
Sensors	Display data, from low cost sensors, on water levels (currently at the Mara river. Can be expanded to other water points) and weather data.	Participate in policy consultations and planning/design activities.