

D3.3 - CENTAUR integrated platform including Urban Flood and Water&Food Indexes v1 (baseline)

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HISTORY OF CHANGES

Date	Version	Author	Change Description
09.02.2024	0.1	GMV	Initial version with a ToC and a draft of the content
29.02.2024	1.0	GMV, ECM, HEN, EG, VITO	First version of the document



TABLE OF CONTENT

1	EXECUTIVE SUMMARY	5
2	Introduction	5
2.1	CENTAUR PROJECT DESCRIPTION.....	5
2.2	SCOPE OF THE DOCUMENT	6
2.3	DEFINITIONS, ABBREVIATIONS AND COMPONENTS	6
2.4	APPLICABLE AND REFERENCE DOCUMENTS.....	7
3	Platform - Description	9
3.1	Overview	9
3.2	First release of the platform	10
4	Platform - Capabilities	10
4.1	Introduction.....	10
4.2	Restricted access.....	10
4.3	Displaying the catalogue.....	11
4.4	Displaying a product with its relevant information	12
4.5	Searching for a product by name	13
5	Platform – Integration steps	14
6	Conclusions	23

LIST OF FIGURES

Figure 4-1:	Landing page – Sign in	11
Figure 4-2:	Sign in	11
Figure 4-3:	CENTAUR Catalogue	11
Figure 4-4:	Product card – View button in the bottom right	12
Figure 4-5:	Product details	13
Figure 4-6:	Filtering product displayed.....	13
Figure 5-1:	UF-ID-1: Static map of precipitation associated with return period.....	14
Figure 5-2:	UF-ID-3: High-Resolution urban flood risk maps for various return periods.....	15
Figure 5-3:	UF-ID-4: raster product	16
Figure 5-4:	UF-ID-4: vector product	16
Figure 5-5:	UF-ID-5: damage assessment notes	16
Figure 5-6:	UF-ID-5: damage assessment.....	17
Figure 5-7:	UF-ID-5: roads	17
Figure 5-8:	UF-ID-5: final depth	17
Figure 5-9:	UF-ID-5: final extent	18
Figure 5-10:	UF-ID-5: final surface.....	18
Figure 5-11:	UF-ID-6: Social and traditional media data related to a flooding event	18
Figure 5-12:	UF-ID-7: Global Disaster Alert and Coordination System (GDACS) indicator	19
Figure 5-13:	WFS-ID-1: Meteorological drought indicator (Monitoring)	19
Figure 5-14:	WFS-ID-4: Drought severity	20
Figure 5-15:	WFS-ID-12: Livestock heat stress.....	20



Figure 5-16: WFS-ID-18: Rangeland land cover change 21
Figure 5-17: WFS-ID-21: Main roads 21

LIST OF TABLES

Table 1: Abbreviations and acronyms7
Table 2: Applicable and reference documents7



1 EXECUTIVE SUMMARY

The present document represents the deliverable D3.3 – CENTAUR Integrated platform including Urban Flood and Water & Food Indexes v1 (baseline) of CENTAUR project and is produced under the Work Package WP3 – Service deployment, in particular, under Task 3.2 and Task 3.3 that are in charge of the service integration, Urban Flood and Livelihood and food security.

The document includes an overview of the platform user interface provided to the end-user, highlighting its features and functionalities.

The current document is expected to have two releases: the first one with the functionalities integrated into the first release of the platform delivered in M15. The second one is scheduled for M32, marking the final release of the platform.

The information included in this document will be the basis for the next deliverable in Task 3.2 and Task 3.3: D3.4 – CENTAUR integrated platform including Urban Flood and Water & Food Indexes v2 (final setting).

2 INTRODUCTION

2.1 CENTAUR PROJECT DESCRIPTION

Climate change is a fact and its impact on human lives and security is continuously growing. The EU understood the importance and consequences of climate change a long time ago, adopting ambitious legislation in different policy areas. The Green Deal recognises that tackling climate change and striving for climate neutrality should be placed at the centre of societal and economic transformation. Over the last 50 years, more than 11.000 reported disasters related to extreme weather and climate conditions have caused over 2 million deaths and US\$ 3,64 trillion in losses. The number of disasters has multiplied by a factor of five during that period, mainly driven by climate and more weather extremes¹. In particular, the last twenty years have seen the number of major floods more than double, from 1.389 to 3.254, while the incidence of storms grew from 1.457 to 2.034². Floods and storms were the most prevalent events and floods are the most common type of disaster worldwide, accounting for 44% of total events registered in the last twenty years. A global temperature increase of the global climate is estimated to increase the frequency of potentially high-impact natural hazard events across the world. This could render current national and local strategies for disaster risk reduction and climate change adaptation obsolete in many countries. In total, between 2000 and 2019, there were 3,068 disaster events in Asia, 1,756 events in the Americas and 1,192 events in Africa.

Climate change is increasingly acknowledged within the EU's integrated approach to security. The related environmental degradation is recognized as a threat multiplier and an aggravating factor for political instability with serious implications for peace and security across the globe³. Nowadays, climate change is already causing people to migrate, and while migration should not be directly labelled as a security problem, implicitly the link between pressures on society and increased competition for resources is often made⁴. People living in places affected by violent conflict are particularly vulnerable to climate change and it is agreed that some of the factors

¹ World Meteorological Organization (2021). WMO atlas of mortality and economic losses from weather, climate and water extremes (1970–2019).

² UNDRR report: The human cost of disasters: an overview of the last 20 years (2000-2019).

³ Meyer, C., Vantaggiato, F. P., & Youngs, R. (2021). Preparing the CSDP for the new security environment created by climate change. European Union.

⁴ Schaik, L., Bakker, T. (2017). Climate-migration-security: Policy Brief Making the most of a contested relationship. Planetary Security.



that increase the risk of violent conflict are sensitive to climate change⁵. This way, it is estimated that 95 % of new displacements by conflicts in 2020 happened in countries that have high or very high vulnerability to climate change⁶. From 2008 to 2016, this represents over 20 million people per year who have been forced to migrate due to climate change effects⁷.

Within Copernicus Security and Emergency Services evolution, the objective of **CENTAUR** is to respond to societal challenges deriving from Climate Change threats by developing and demonstrating new service components for the **Copernicus Emergency Management Service (CEMS)** and **Copernicus Security Service - Support to EU External Action Service (CSS-SEA)**, aiming to:

1. Improve **situational awareness and preparedness** around climate change and its impact on complex emergencies and multi-dimensional (security) crises;
2. **Anticipate the occurrence and possible knock-on effects** of crisis events, in particular those triggered by climatic extremes, thus contributing to resilience and effective adaptation.

In the emergency domain, CENTAUR will address the flood-related threats to population, assets, and infrastructures in urban areas. In the Security domain, CENTAUR will address water & food insecurity. The two work streams will be connected via a cross-cutting component focusing on exposure and vulnerability to climate change, as well as resilience and societal capacity for managing environmental risks and social conflict. Across work streams, indicators and models will be validated by different methods. CENTAUR will integrate data coming from multiple heterogeneous sources, with a specific focus on those generated by other Copernicus services, and, in particular, those of the Climate Change Service). It will combine these with meteorological data, socio-economic data, and data coming from new sensors (e.g. traditional and social media). Thus, it will enhance current capacities to produce composite risk indexes and to perform multi-criteria analyses in the emergency and security domains.

2.2 SCOPE OF THE DOCUMENT

This report contains a description of the platform deployed in a hybrid cloud; further details of the environment are described in D3.5 – CENTAUR Integrated Platform Test Document ([RD08]).

2.3 DEFINITIONS, ABBREVIATIONS AND COMPONENTS

CENTAUR platform

This platform is referred to as all the services deployed in the CENTAUR project, which includes services described in D2.2, components designed in Task 2.7, and components detailed in D3.2 ([RD07])

⁵ W.N., J.M. Pulhin, J. Barnett, G.D. Dabelko, G.K. Hovelsrud, M. Levy, Ú. Oswald Spring, and C.H. Vogel (2014). Human security. In: Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part A: Global and Sectoral Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Field, C.B., V.R. Barros, D.J. Dokken, K.J. Mach, M.D. Mastrandrea, T.E. Bilir, M. Chatterjee, K.L. Ebi, Y.O. Estrada, R.C. Genova, B. Girma, E.S. Kissel, A.N. Levy, S. MacCracken, P.R. Mastrandrea, and L.L. White (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, pp. 755-791.

⁶ University of Notre Dame. (n.d.). Country index // Notre Dame Global Adaptation Initiative // University of Notre Dame. Notre Dame Global Adaptation Initiative. Retrieved January 23, 2022, from <https://gain.nd.edu/our-work/country-index/>.

⁷ WEF (2020). *The Global Risks Report 2020*, Insight Report 15th Edition. World Economic Forum, Geneva Switzerland, p. 102. <https://www.weforum.org/reports/the-global-risks-report-2020>.

Private cloud

A private cloud is a single-tenant environment, meaning all resources are accessible to one customer only—this is referred to as isolated access and is hosted on-premises.

Product

A product is either a dataset (i.e., the input to an indicator), indicator (i.e., the input to an index), or index ('final' product).

Public cloud

A Public Cloud is an on-demand computing service and infrastructure that is managed by a third-party provider and shared with multiple organizations using the public Internet.

Service

A service is an autonomous feature that the CENTAUR platform is composed of. The nature of a service could be from generating products to a repository of products. Services are described in detail in D3.2 ([RD07])

Table 1: Abbreviations and acronyms

Acronym	Description
AOI	Area of Interest
AWS	Amazon Web Services
CENTAUR	Copernicus Enhanced Tools for Anticipative response to climate change in the emergency and secURity domain
GDACS	Global Disaster Alert and Coordination System
M32	Month 32 in the CENTAUR project
RD	Reference Document
UF	Urban Flood
WFS	Water & Food Security

2.4 APPLICABLE AND REFERENCE DOCUMENTS

Table 2: Applicable and reference documents

ID	Document name
[RD01]	Copernicus Service in Support to EU External Action: https://sea.security.copernicus.eu/
[RD02]	Disaster Risk Reduction in EU external action - Council conclusions (28 November 2022): https://data.consilium.europa.eu/doc/document/ST-14463-2022-INIT/en/pdf
[RD03]	D1.1 - Report on Urban Flood and Water & Food security indicators v1.0 15/06/2023
[RD04]	D2.1 - Catalogue of CENTAUR data and related specifications
[RD05]	D2.2 - Urban Flood and Water & Food Insecurity Design

D3.3 - CENTAUR integrated platform including Urban Flood and Water&Food Indexes - v1

ID	Document name
[RD06]	D2.3 - Urban Flood and Water&Food Insecurity service pipelines v1 (baseline set up)
[RD07]	D3.2 - Platform Design Document (all the theoretical background related to service design and implementation) v2
[RD08]	D3.5 - CENTAUR integrated platform test document (baseline)

D3.3 - CENTAUR integrated platform including Urban Flood and Water&Food Indexes - v1

8



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3 PLATFORM - DESCRIPTION

3.1 OVERVIEW

The CENTAUR platform is made up of all the processing chains that are designed and implemented in the scope of CENTAUR project and described in D3.2 ([RD07]) and D2.2 ([RD05]).

This section contains an overview of the platform deployment, capabilities and the integration process status, see further details in sections 4 and 5.

The CENTAUR platform is deployed in a hybrid cloud, with two cloud options:

- Allocated in a private cloud: The services that produce the products are deployed in private clouds.
- Allocated in a public cloud: The services that provide the user the interfaces, the orchestration of the services that generate the products, and the catalogue are allocated in a public cloud.
 - The platform interface is a web application, where the end-user will be able to interact with the services that the CENTAUR platform provides.

Capabilities can be described as high-level functionalities that the platform offers to the end-user to enhance the situational awareness of the selected AOI in the project, such as displaying over a map a situation regarding urban flood or requesting the activation of a service to produce products relevant to the use case that the end-user is studying. Capabilities are not attached to specific products.

In the first release of the platform, the capabilities described in section 3.2 are available to the end-user, but not for all the products generated in the CENTAUR project. A subset of products has been inserted, see the process of integration of a product into the platform in section 5.

The CENTAUR platform has the following integration process status:

- The platform has integrated the following products for the cold use cases:
 - Urban Flood Domain:
 - UF-ID-1: Static map of precipitation associated with the return period.
 - UF-ID-3: High-Resolution urban flood risk maps for various return periods.
 - UF-ID-4: Inferred InSAR urban flood extent.
 - UF-ID-5: Enhanced urban flood damage assessment.
 - UF-ID-6: Social and traditional media data related to a flooding event.
 - UF-ID-7: Global Disaster Alert and Coordination System (GDACS) indicator.
 - Water & Food Security Domain:
 - WFS-ID-1: Meteorological drought indicator (Monitoring).
 - WFS-ID-4: Drought severity.
 - WFS-ID-12: Livestock heat stress.
 - WFS-ID-18: Rangeland land cover change.
 - WFS-ID-21: Main roads.
- The capabilities to access the products are described in section 3.2.

Until M32, there will be an iterative process to update the platform which aims to integrate all the services developed in the CENTAUR project.

3.2 FIRST RELEASE OF THE PLATFORM

The CENTAUR platform aims to generate products that enrich the situation awareness in 2 main domains: Urban Flood and Water & Food security. The features available in this first release of the platform include the following:

- Restricted access to products generated in CENTAUR project, see section 4.2, how to access the services.
- Products will be accessible through a catalogue. See how to display the catalogue in section 4.3.
- Search for a product. See how to filter the catalogue in section 4.5.
- Display a product with the relevant information attached to it, see section 4.4.

4 PLATFORM - CAPABILITIES

4.1 INTRODUCTION

This section contains a description of the capabilities provided to the end-user to support the use. Using a URL, the platform interface is displayed, and the landing page will give access to the login page.

4.2 RESTRICTED ACCESS

The user interface is deployed in a public cloud, and accessing the services requires grants that an administrator should provide to end-users. Once the end-user receives the credentials, by login, the services will be available.

The policy, at the time of this report, is that there will be 2 groups with limited permissions.

- Urban Flood group, all members will have access to the information granted to this group which will be services that generate Urban Flood indicators.
- Water & Food security group, all members will have access to the information granted to this group which will be services that generate Water and Food Security indicators.

Users are members of one previous group or administrators. Furthermore, a user can be a member of both groups.

Product grants are: view, download, and manage options. When the platform ingests them automatically, they are assigned a download option to the group that is related to them. However, this grant can be modified by the administrator.



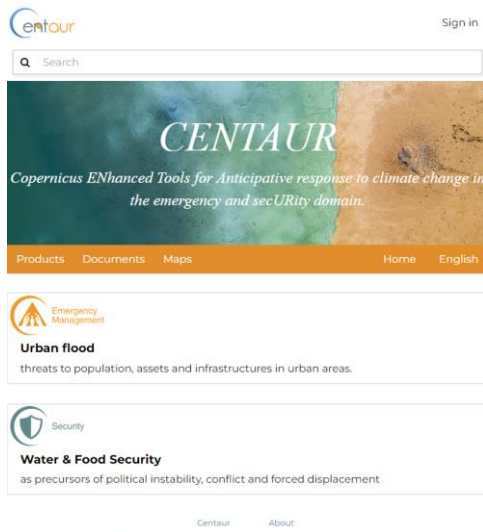


Figure 4-1: Landing page – Sign in

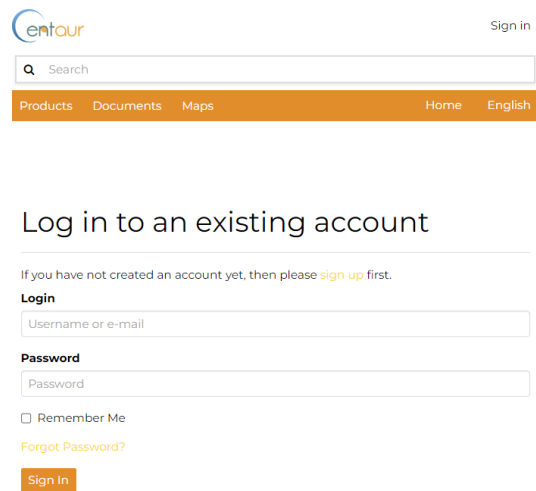


Figure 4-2: Sign in

4.3 DISPLAYING THE CATALOGUE

Once the end-user is logged in, through the main menu – option “Products”, the end-user can access the CENTAUR catalogue (Figure 4-3), displaying only the dataset which they are granted. Each product is ingested with relevant information, such as licence, copyright. The metadata can be updated by the user with manage permissions.

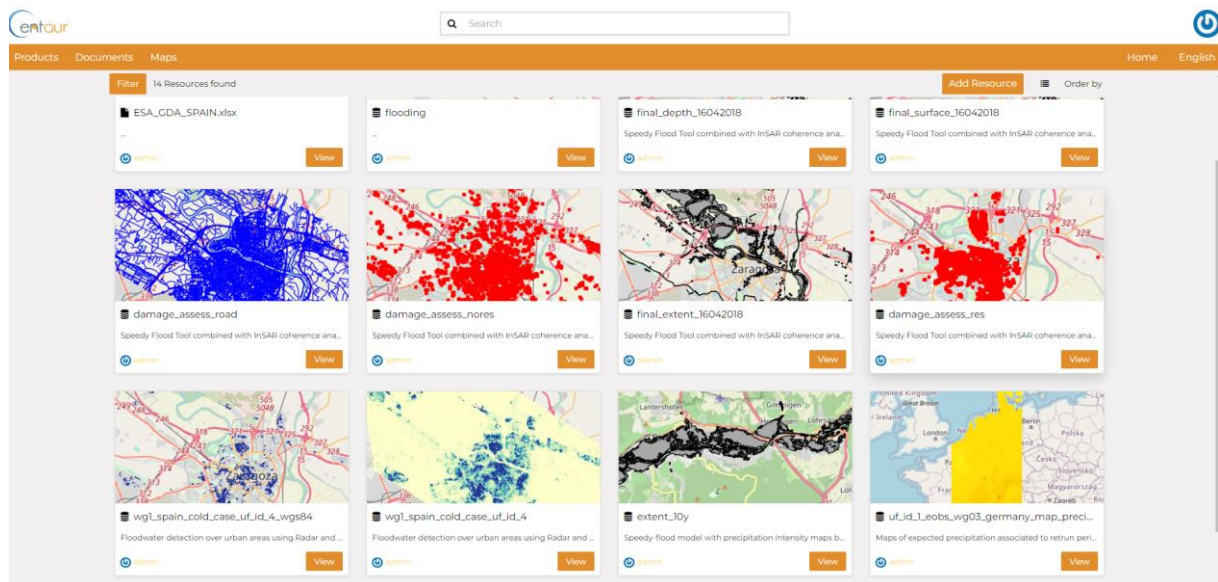


Figure 4-3: CENTAUR Catalogue

4.4 DISPLAYING A PRODUCT WITH ITS RELEVANT INFORMATION

Each product is represented by a card with a thumbnail, name, and the responsible for the product, see Figure 4-4.

Using the catalogue capability, a product can be selected and by clicking on it, further information will be displayed. Products with geo-reference are displayed over a map.



Figure 4-4: Product card – View button in the bottom right

By clicking the View button on the card, the product is displayed, see Figure 4-5.

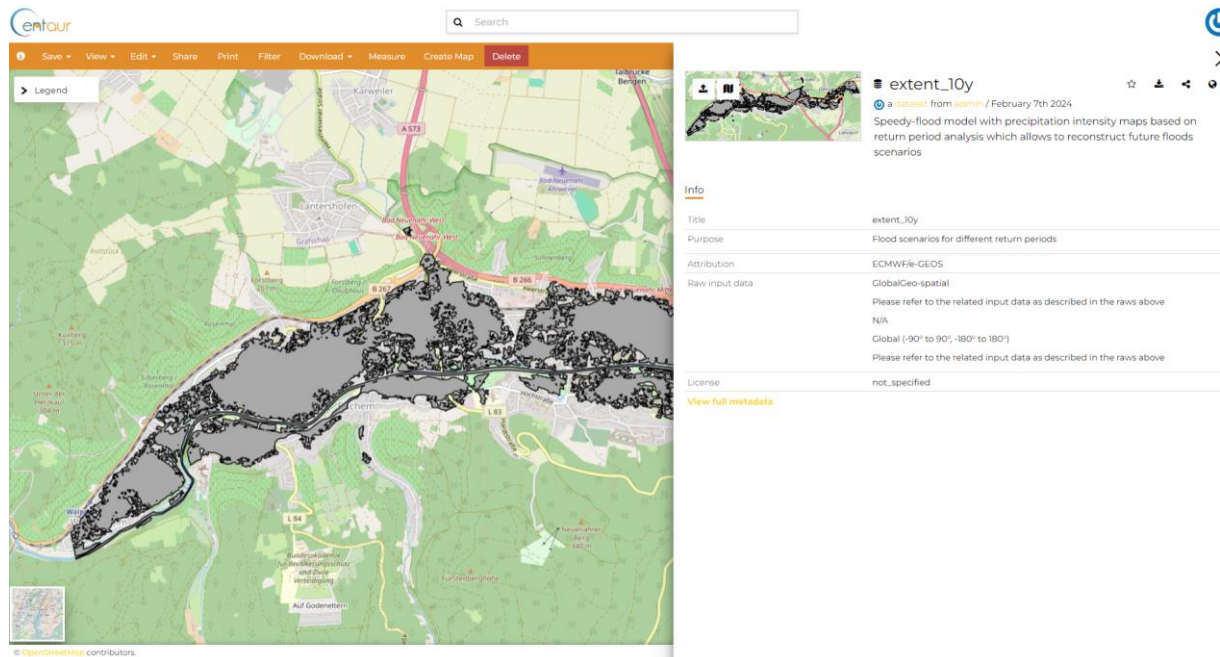


Figure 4-5: Product details

4.5 SEARCHING FOR A PRODUCT BY NAME

Using the catalogue page, a text field on the top of the page can be used for filtering the products that the page is displaying (Figure 4-6):

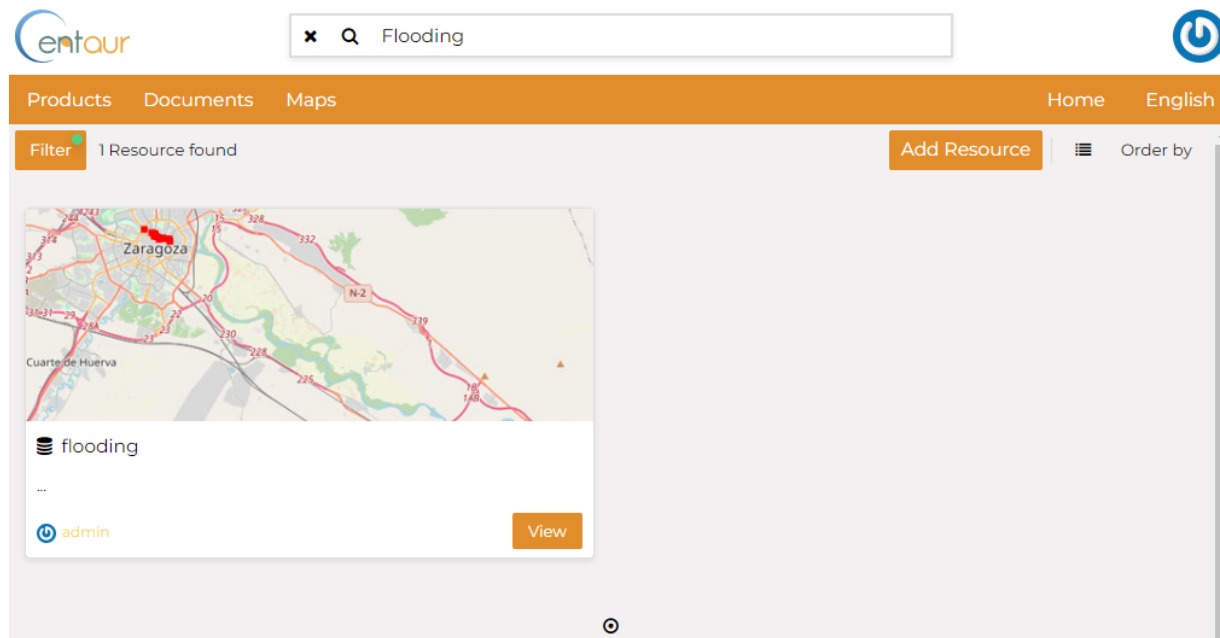


Figure 4-6: Filtering product displayed

5 PLATFORM – INTEGRATION STEPS

So far, the platform is integrating the products generated over the cold use cases in the Urban Flood and Water & Food Security services. This integration consists of defining:

- **Format:** A correct format to deliver each product, so that it can be seen properly by the end-user.
- **Style:** each product needs the style file to be applied when ingested into the catalogue so that the user displays the legend.
- **Relevant information:** while ingesting products, the metadata listed in D2.1 ([RD04]), is being attached to be accessible for the user.
- **Automatic process of ingestion:** Prepare the application to ingest the product automatically when it arrives in the temporal repository.
- **Groups:** Identify the group that can download the product.

Using cold use cases, the first release of the platform has been built. It covers the automatic ingestion and visualization of the products and the metadata associated with the next indicators:

- UF-ID-1: Static map of precipitation associated with return period.

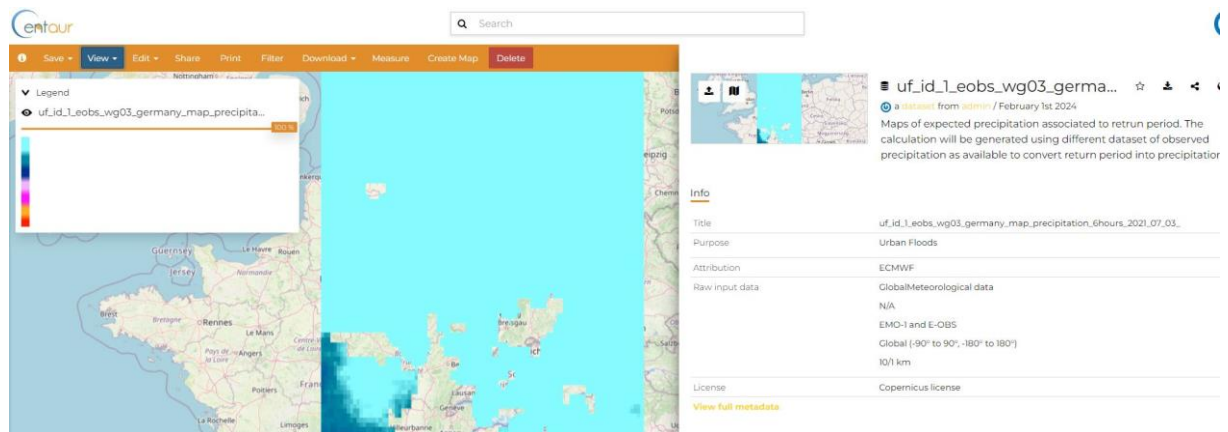


Figure 5-1: UF-ID-1: Static map of precipitation associated with return period

- UF-ID-3: High-Resolution urban flood risk maps for various return periods.

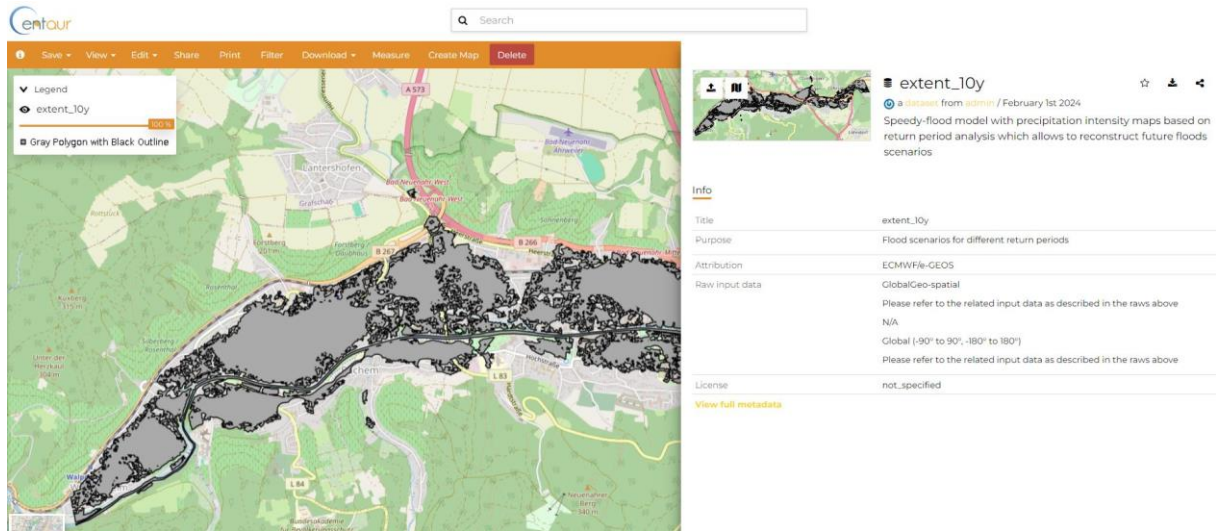


Figure 5-2: UF-ID-3: High-Resolution urban flood risk maps for various return periods

- UF-ID-4: Inferred InSAR urban flood extent.

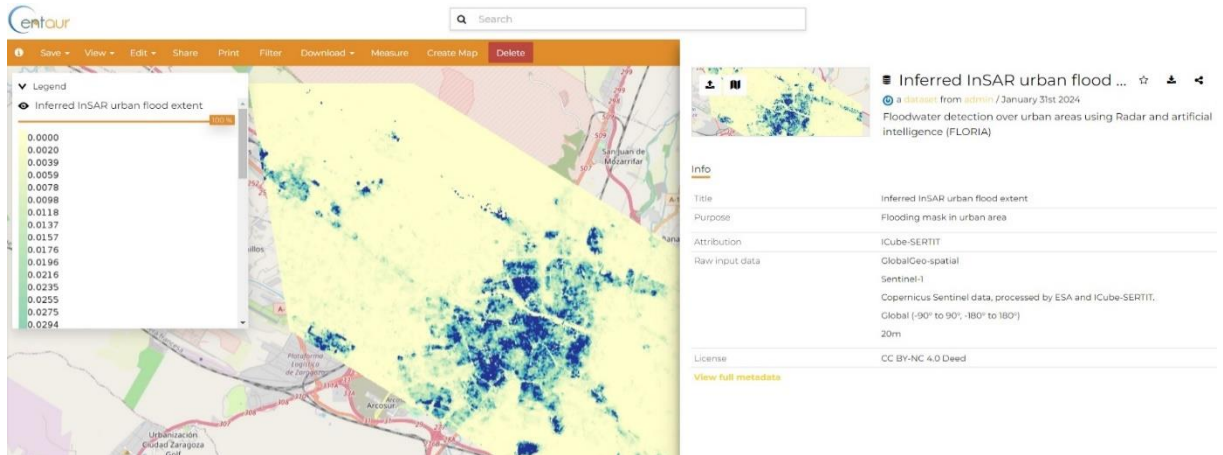


Figure 5-3: UF-ID-4: raster product

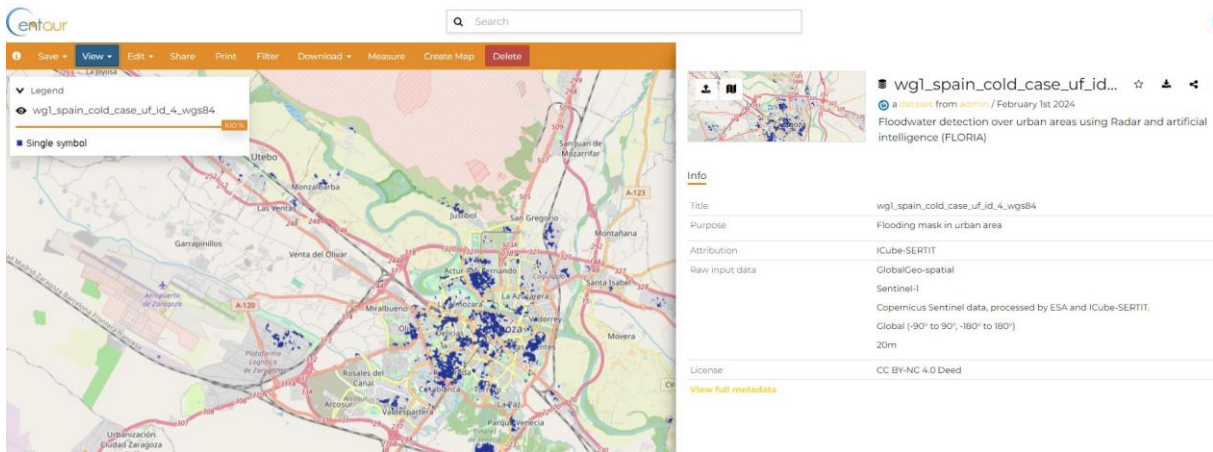


Figure 5-4: UF-ID-4: vector product

- UF-ID-5: Enhanced urban flood damage assessment.

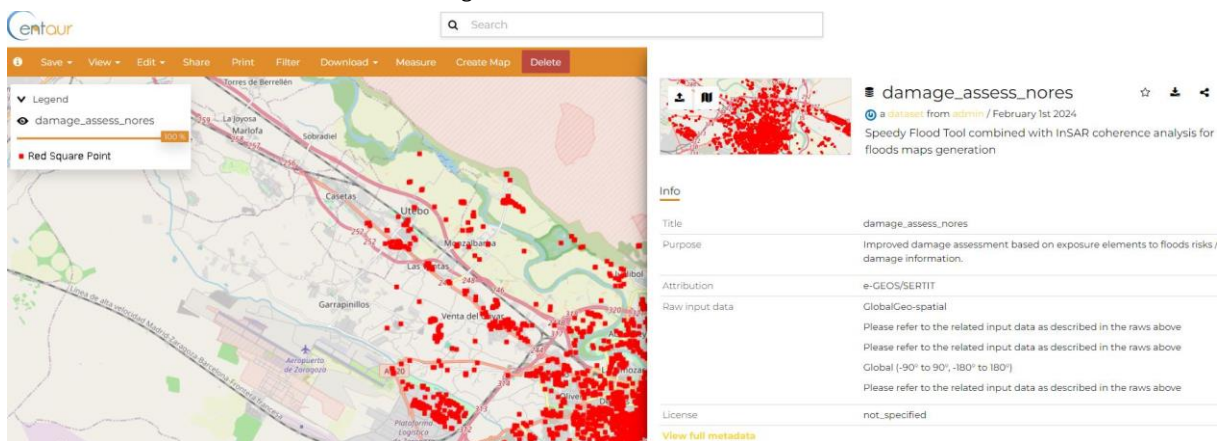


Figure 5-5: UF-ID-5: damage assessment notes

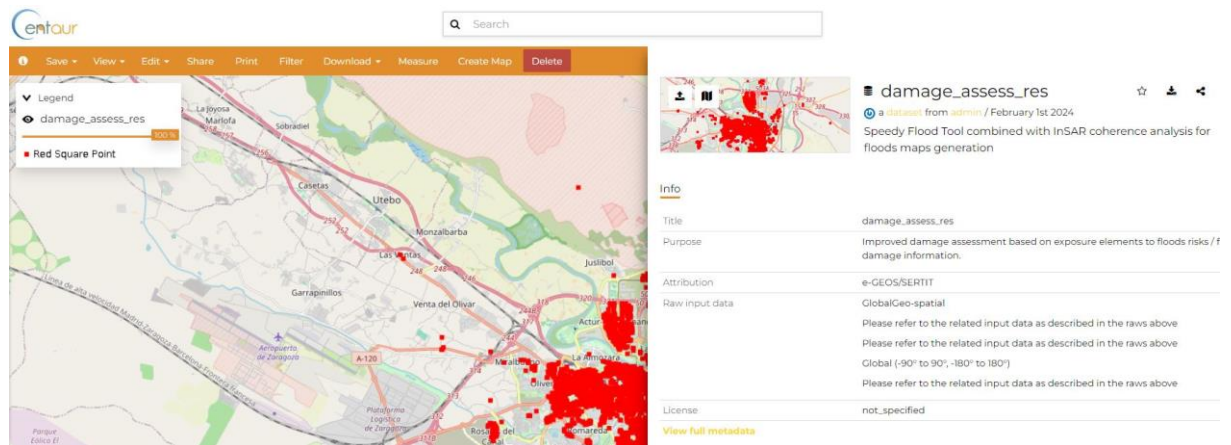


Figure 5-6: UF-ID-5: damage assessment

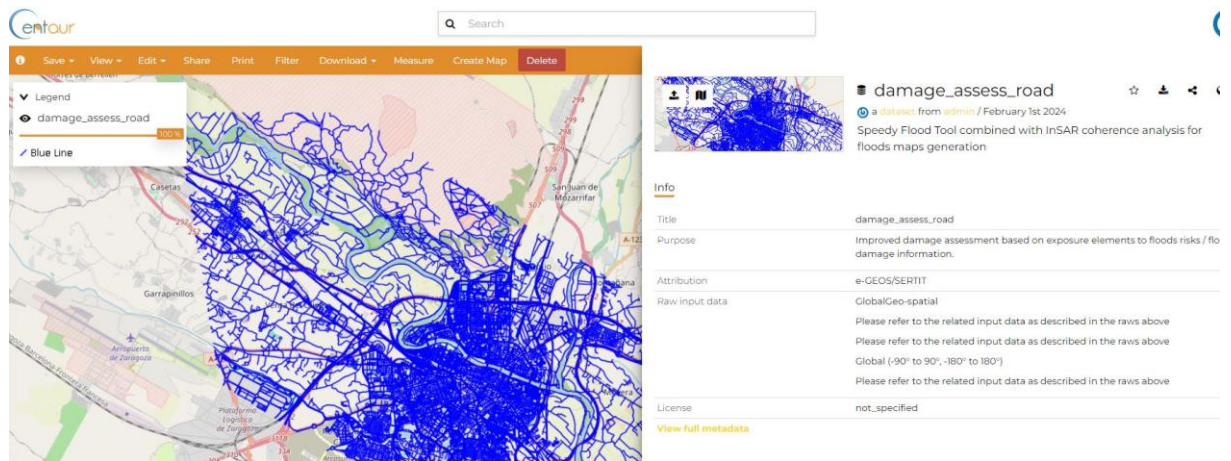


Figure 5-7: UF-ID-5: roads

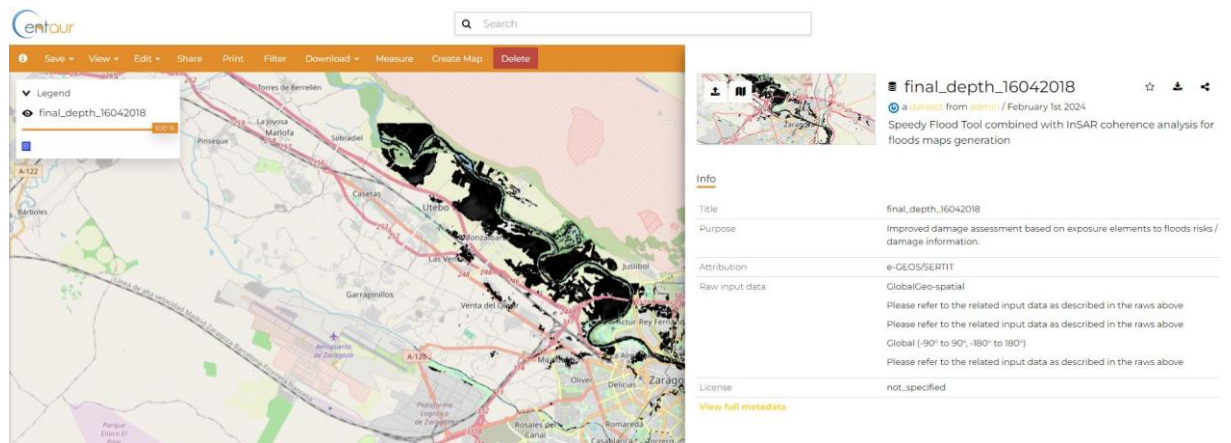


Figure 5-8: UF-ID-5: final depth

D3.3 - CENTAUR integrated platform including Urban Flood and Water&Food Indexes - v1

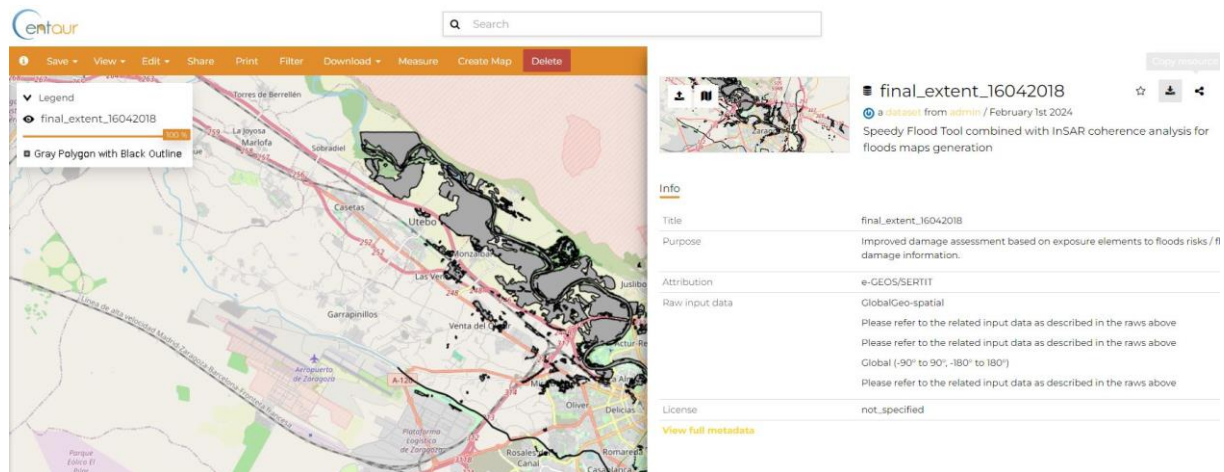


Figure 5-9: UF-ID-5: final extent

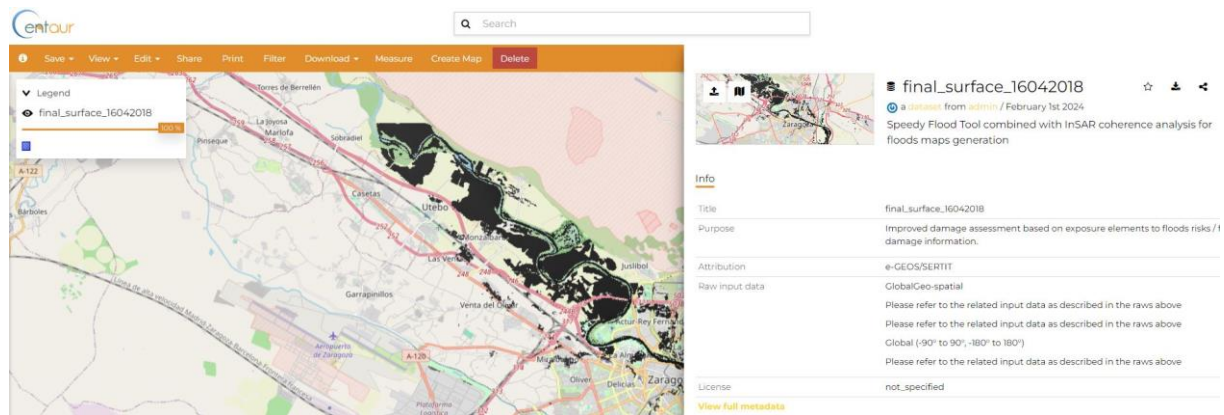


Figure 5-10: UF-ID-5: final surface

- UF-ID-6: Social and traditional media data related to a flooding event.

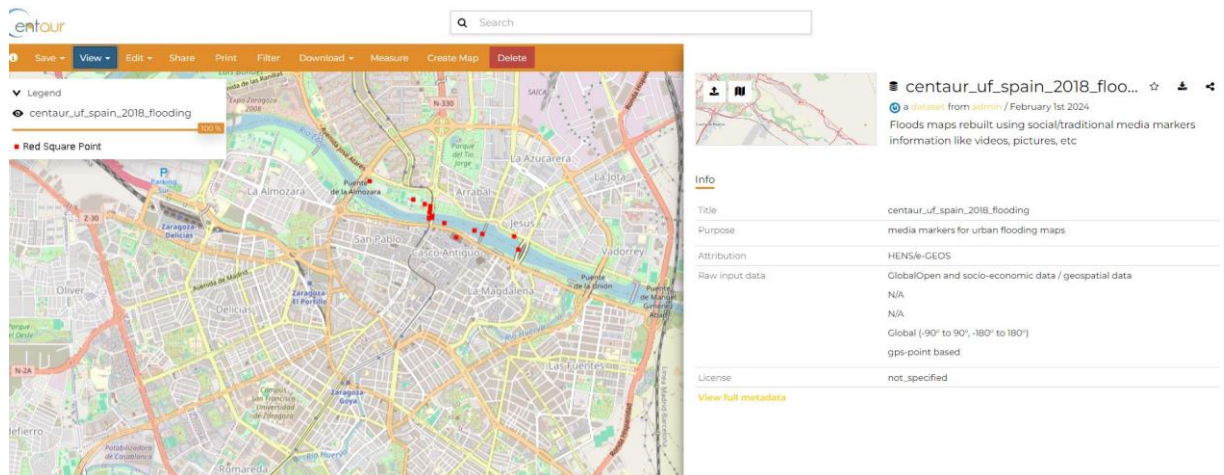


Figure 5-11: UF-ID-6: Social and traditional media data related to a flooding event

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- UF-ID-7: Global Disaster Alert and Coordination System (GDACS) indicator.

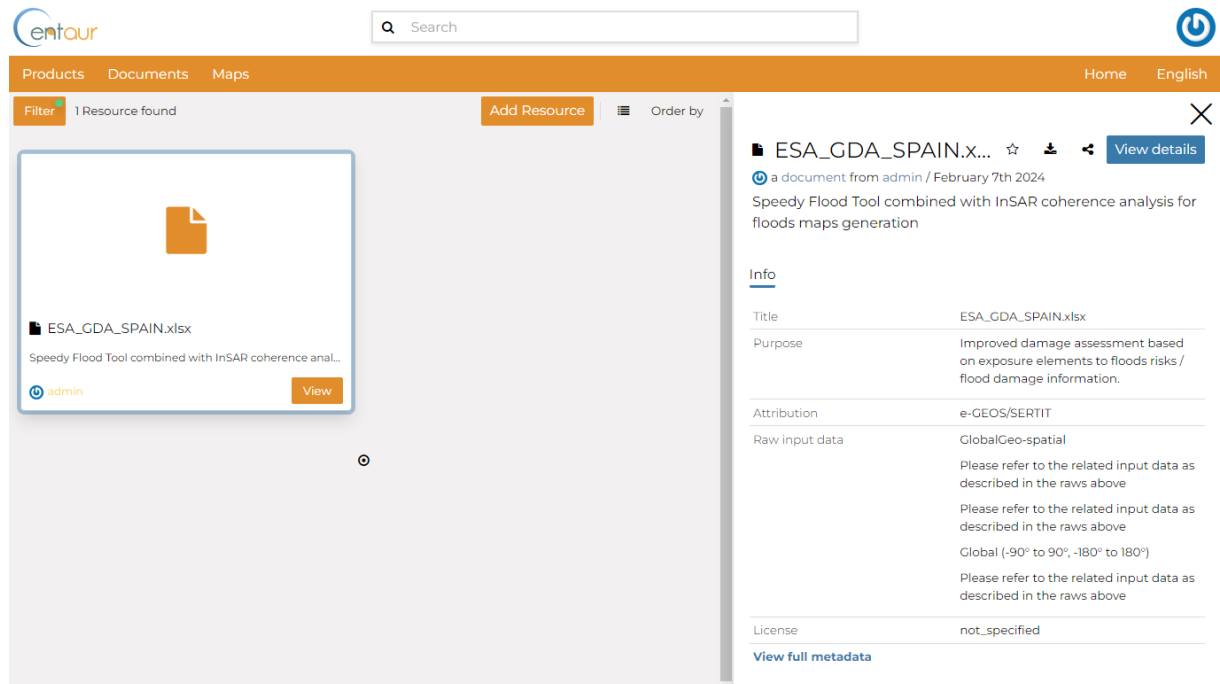


Figure 5-12: UF-ID-7: Global Disaster Alert and Coordination System (GDACS) indicator.

- WFS-ID-1: Meteorological drought indicator (Monitoring).

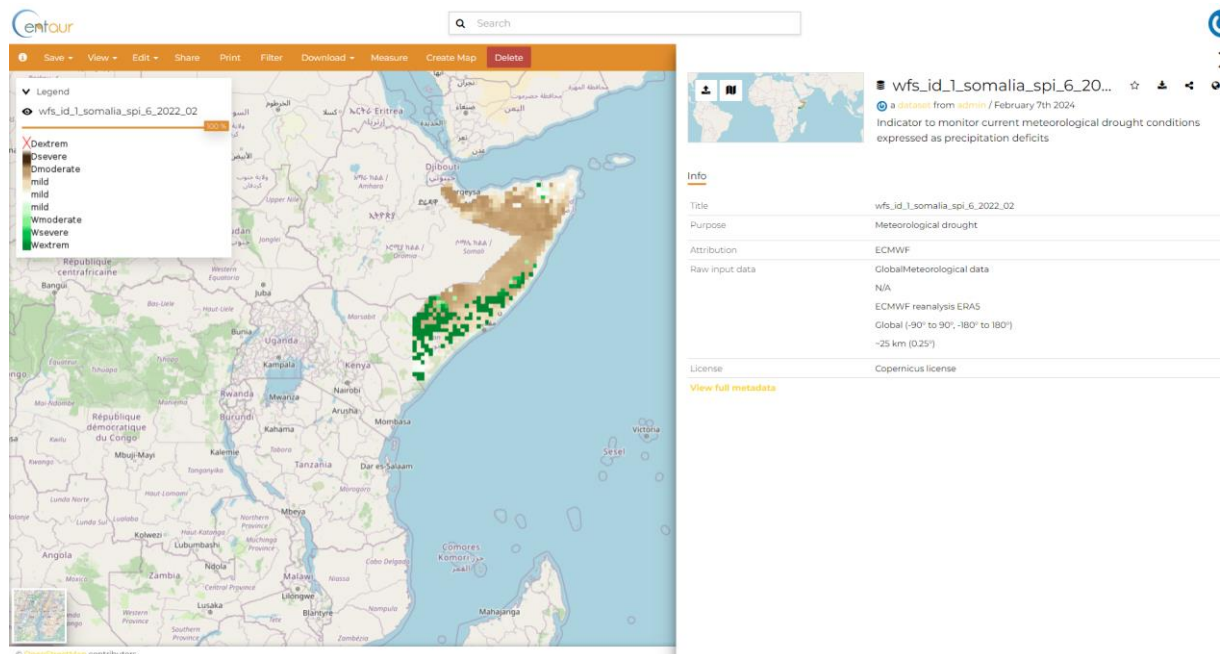


Figure 5-13: WFS-ID-1: Meteorological drought indicator (Monitoring)

- WFS-ID-4: Drought severity.

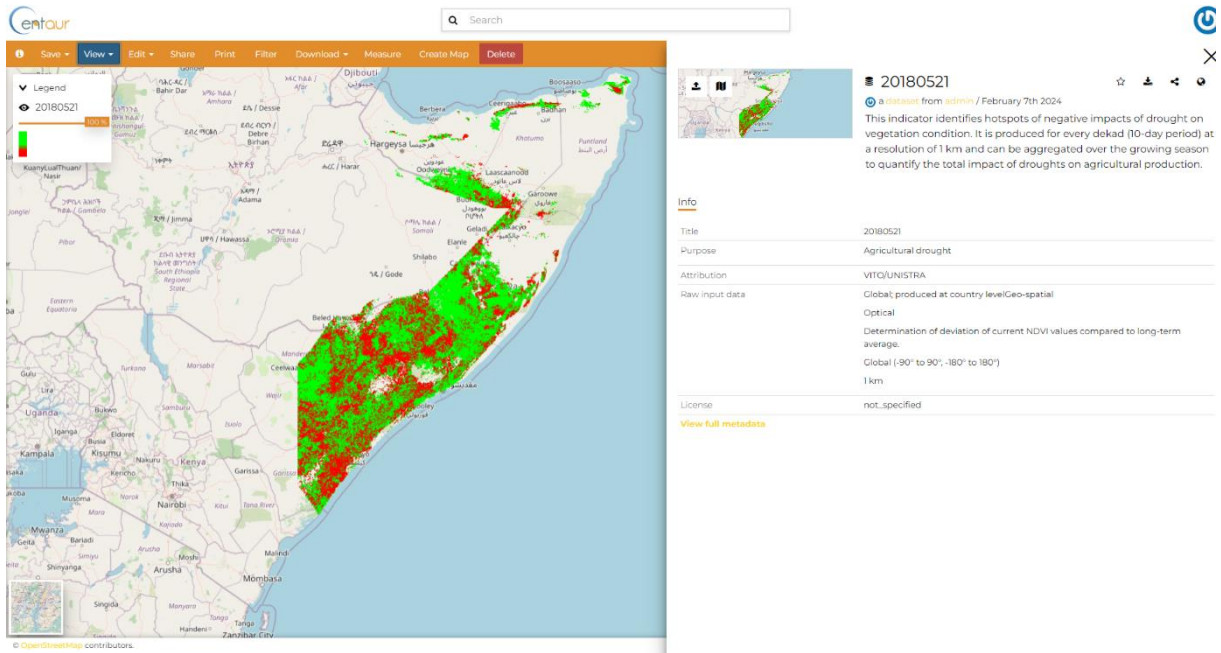


Figure 5-14: WFS-ID-4: Drought severity

- WFS-ID-12: Livestock heat stress.

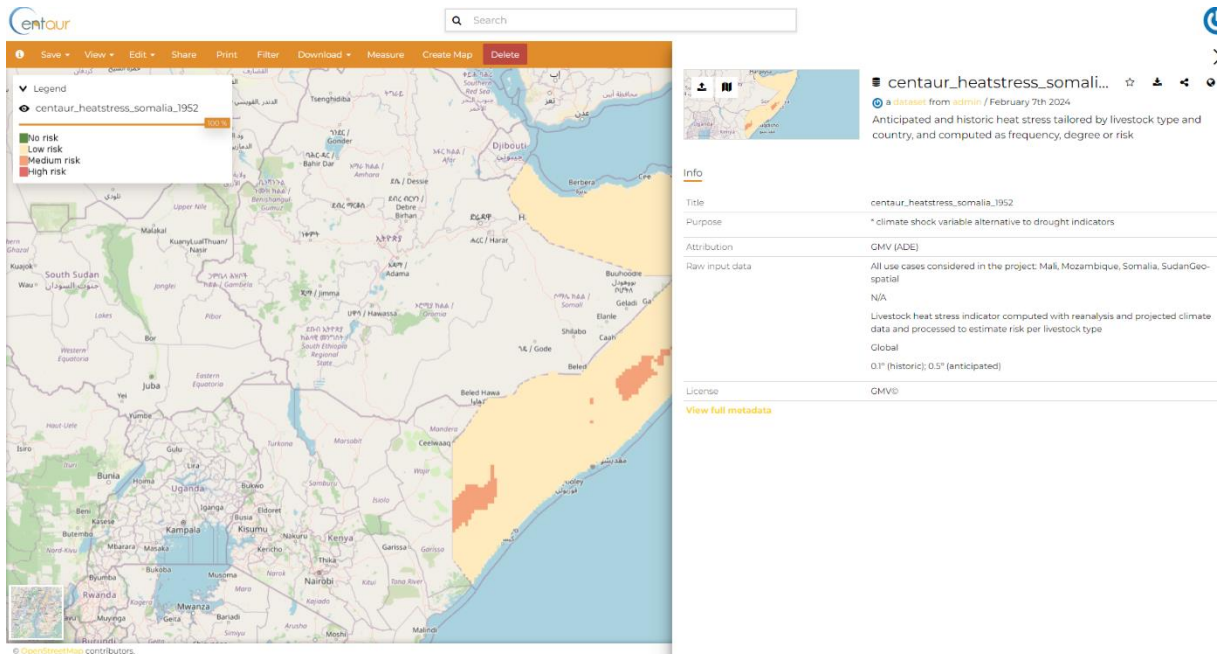


Figure 5-15: WFS-ID-12: Livestock heat stress

- WFS-ID-18: Rangeland land cover change.

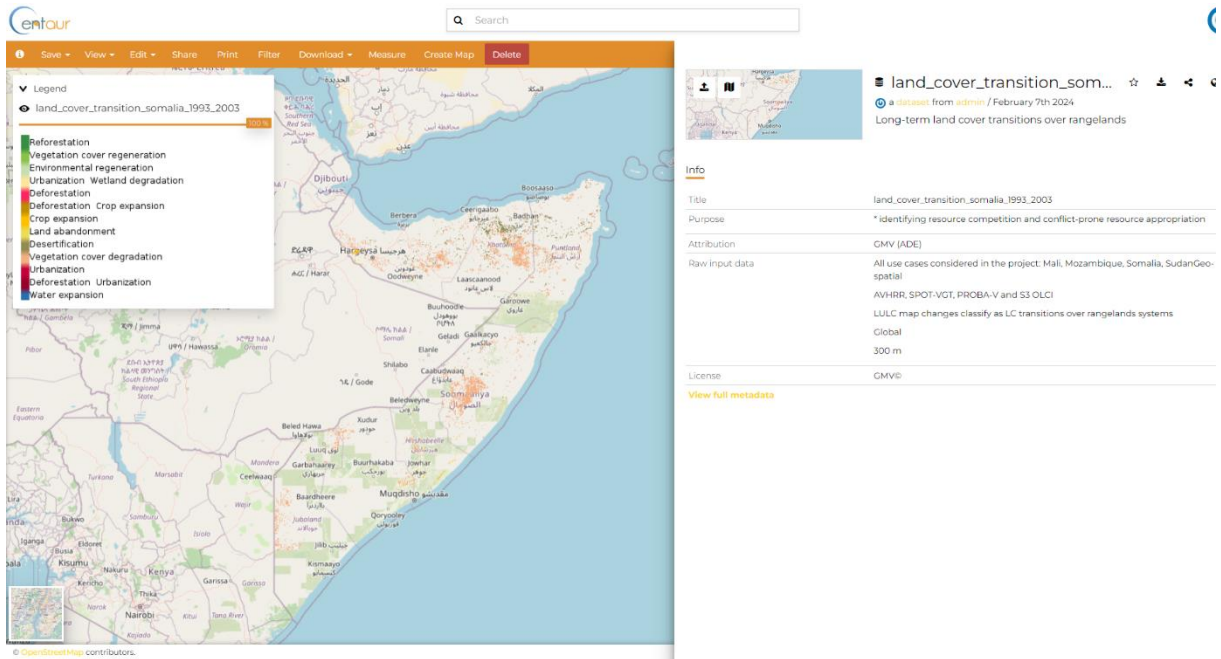


Figure 5-16: WFS-ID-18: Rangeland land cover change

- WFS-ID-21: Main roads

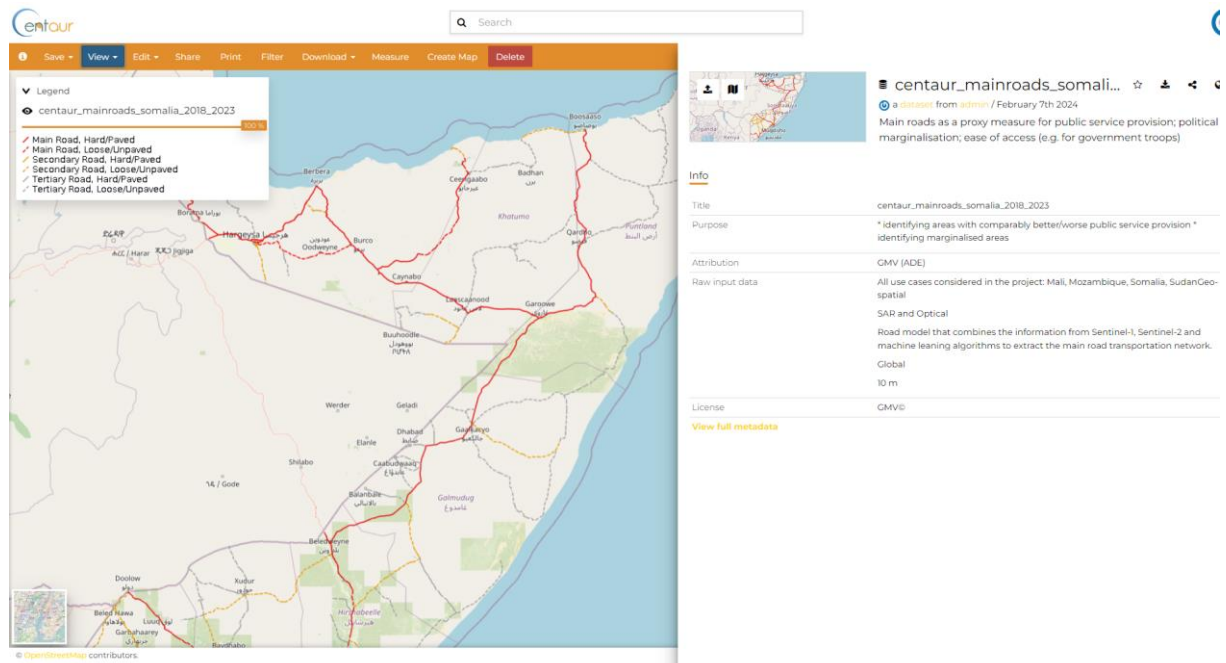


Figure 5-17: WFS-ID-21: Main roads

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When performing hot use cases, new capabilities will be included to fulfil the user requirements described in D1.1 ([RD03]), such as:

- Early-warning notification: allowing to the end-user to receive notification by email about events.
- Events/Alerts: List the events/alerts produce in the platform.
- Request the activation of services: allowing to the end-user request the generation of a product.

It is essential to deploy the first release of the platform with public access to let the end-user start working with it. The end-users feedback will be used to improve the platform.



6 CONCLUSIONS

The CENTAUR platform is built in an iterative process. The first release of the platform covers features such as insertion and visualization of the data, and restricted access to the data. The final release will be delivered in M32.

The iterative process consists of adding new features to the user, for example, displaying more products or having more services available and it includes refinements of visualisations (e.g., colour schemes, spatial and temporal extent and range displayed, etc.) and metadata descriptions. A complete overview will be presented in the final online version, accompanied by a report describing it, as in the second deliverable of this report, D3.4 CENTAUR integrated platform including Urban Flood and Water&Food Indexes v2 (final setting).





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