GeoSolutions

your one-stop-shop for geospatial open source software

One GeoNode
Many GeoNodes

Dott. Giovanni Allegri
Ing. Simone Giannecchini

OGC®
Member

Quick Facts

- Founded in late 2006
- Expertise
  - GeoSpatial Data Fusion, Web Mashups, Mobile Apps
  - OGC, ISO, INSPIRE Standards
- Supporting/Developing FOSS4G projects
  - MapStore, GeoServer, GeoNetwork, CKAN, GeoNode
- Offer
  - Enterprise Support Services
  - Deployment Warranty
  - Professional Training
  - End-To-End Projects (Integration)
- Clients
  - UN FAO (CIOK, FIGIS, NRL, FORESTRY, ESTG), UN WFP, World Bank, DLR, EUMETSAT, IRC, ARPAT, NATO CMRE, UNESCO, IGAD, UNEP, etc.
  - ER, BASF, DigitalGlobe, MDA,

Made in Italy

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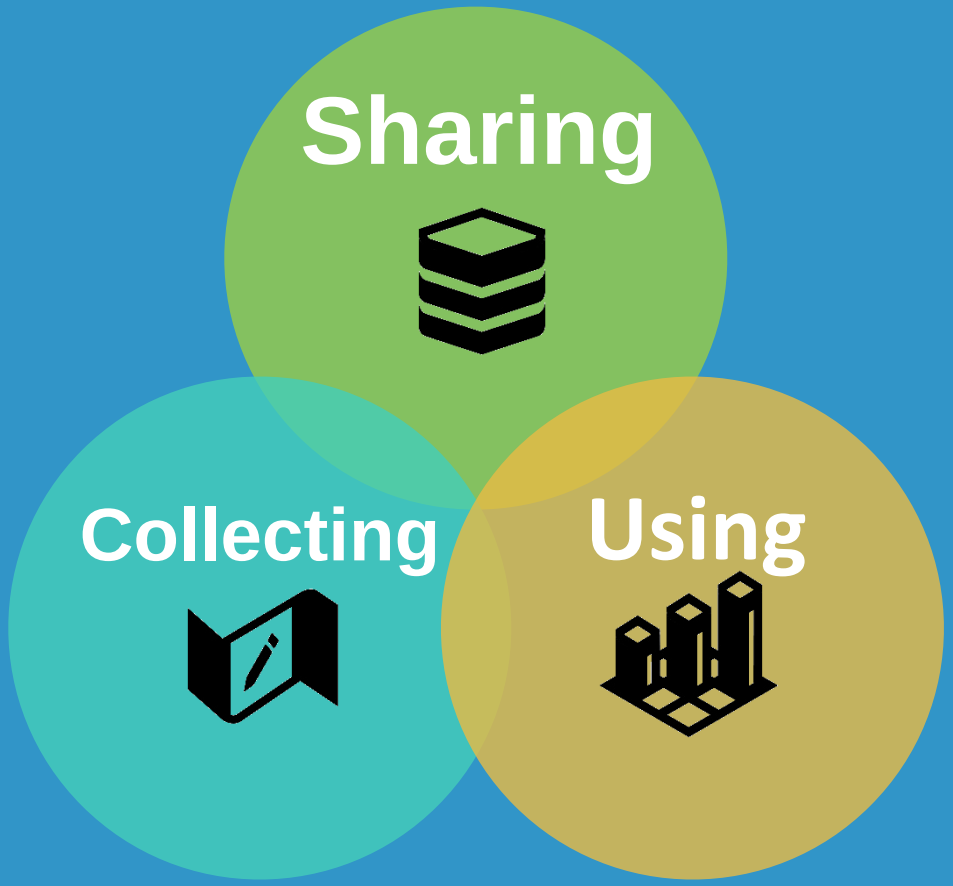
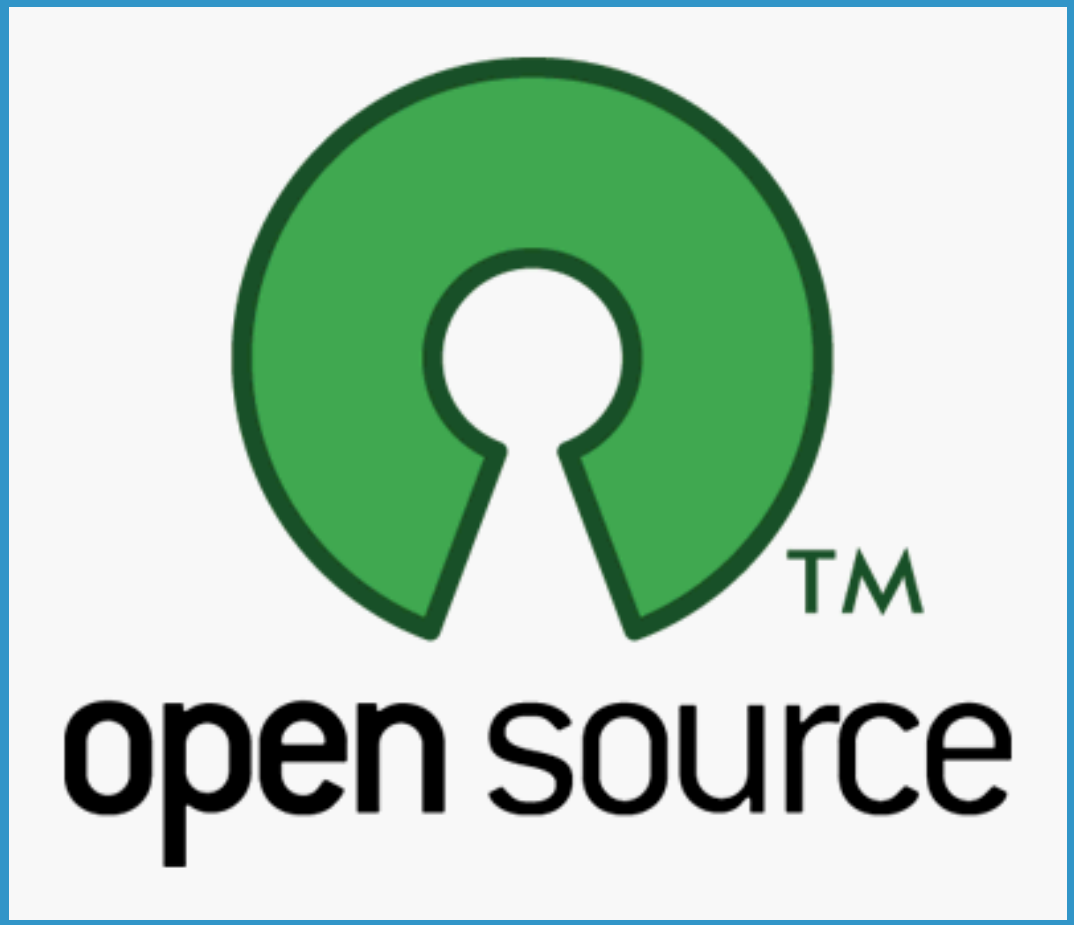
One GeoNode

GeoNode

Sharing, Collecting, Using Information to Inform Decisions



GeoNode



It's open source, Of course!

GeoNode

GeoNode

Is a platform for the management and publication of geospatial data. It brings together mature open-source software projects under an easy to use interface. With GeoNode, non-specialized users can share data and create interactive maps.

GeoNode

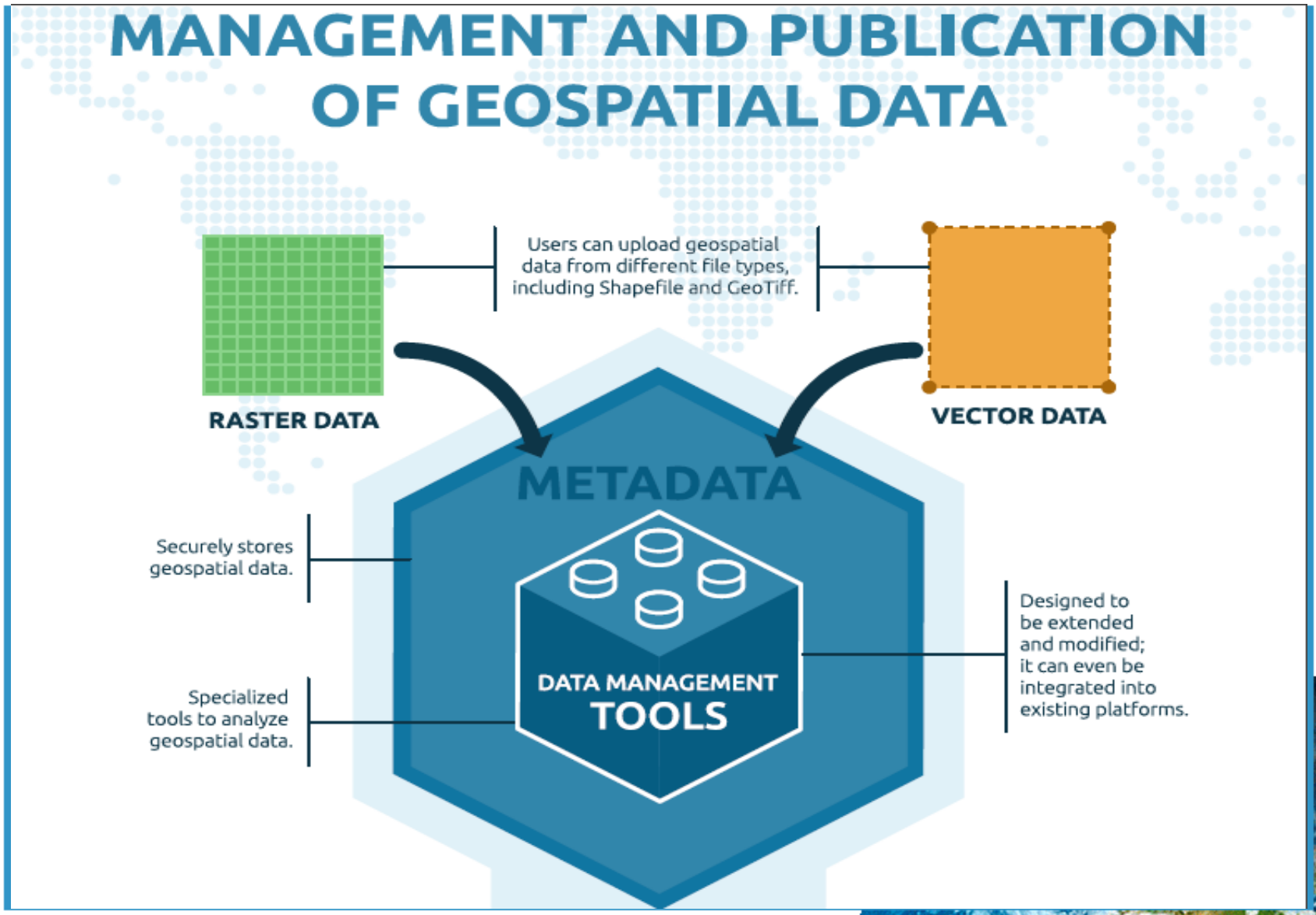
GEONODE IS MADE FOR

Users
who log into a GeoNode website and use its functionality.

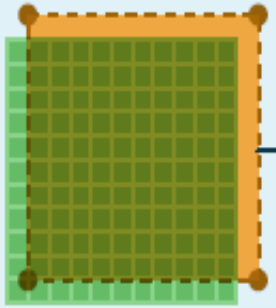
Administrators
who install and deploy GeoNode websites in production for their Users.

Developers
who write code to add functionality, integrate with other systems, fix bugs, and potentially help an Administrator setup a server and deploy a GeoNode instance for production.

GeoNode



GeoNode



Open standards are compatible with external layers from OpenStreetMap, Google Satellite or elsewhere.

DATA MIXING

Features a web-based styles editor to create maps.

MAPS CREATION / MAP VISUALIZATION

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GeoNode

What's it made of?

React

OpenLayers

Leaflet

django

GeoServer

pycsw

GDAL

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Many GeoNodes

Creating Downstream Applications

- **GeoNode** cannot address all use cases
  - Avoid reinventing the wheel
  - Avoid implicit/explicit forks

→ **Custom GeoNode Applications** to the rescue!

- **A proper "GeoNode Project":**
  - Start from a **template** (geonode-project)
  - Generate a "**materialized**" Django project
  - It extends the "**vanilla**" GeoNode
  - It provides a **custom Django app**
  - It addresses specific use cases
- [illegible] general interest?

Creating Downstream Applications

This approach offers several opportunities

- Customize GeoNode look and feel
- Extend its models without modifying GeoNode Core
- Extend its functionalities without modifying GeoNode Core
- Define a brand new end user interface

This approach allows us to

- make the most out of what GeoNode core offers
- without sacrificing **versatility**
- without sacrificing **specific project needs**

It's **doable**, we **did it** (or at least we tried to ☺)

Hold tight, awesome examples next!

Project 2: Afghanistan Disaster Risk

- **WB-GFDRR Project - Design and Implementation of Risk Management Modules to the Afghanistan Disaster Risk GeoNode**
- **Risk Management and Cost Benfit Analysis Modules**
  - Fill Afg gvt information gap on hazards by a multi-peril risk assessment and cost-benefit analysis covering the entire country
  - Extend GeoNode with modules able to easy the access to all this amount of analysis in a way that people can easily recognize
  - Create flexible/extensible modules to present different types of Cost Benefit Analysis
- **http://disasterrisk.af**

Afghanistan Disaster Risk

http://disasterrisk.af/

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Afghanistan Disaster Risk

Risk Data Extraction & Visualization Tool

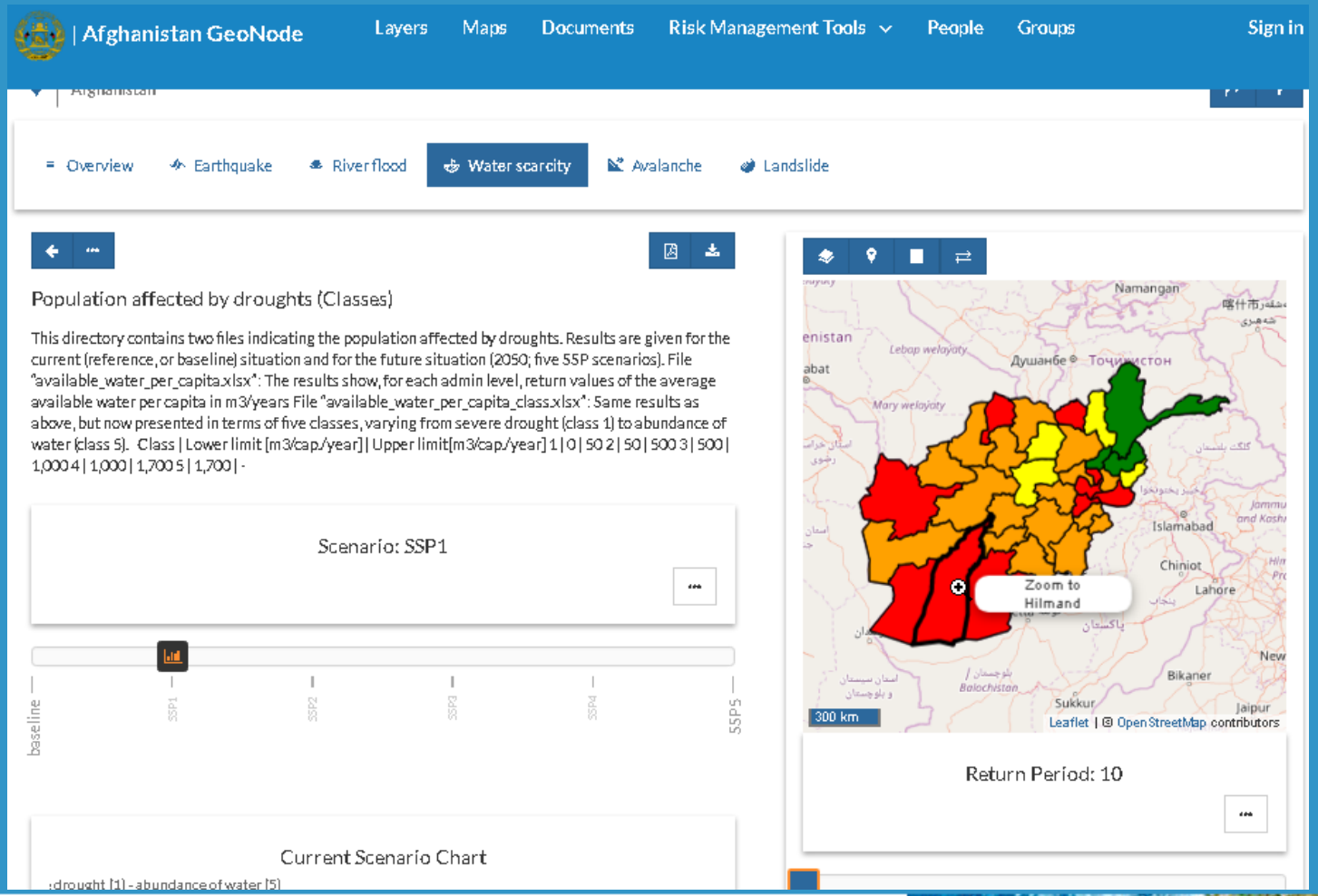
FROM THIS …

	REFERENCE	ISO	dmin_NAN	dmin_LEV	DIST_CODE	10	20	50	100	250	500	1000
0	Afghanist	AF	Afghanist	0	AF	2	2	2	2	2	2	2
1												
2	Afghanist	AF	Badakhsh	1	AF15	5	5	5	5	5	5	5
3	Afghanist	AF	Badghis	1	AF29	2	2	2	1	1	1	1
4	Afghanist	AF	Baghlan	1	AF09	2	2	2	2	2	1	1
5	Afghanist	AF	Balkh	1	AF18	2	2	2	1	1	1	1
6	Afghanist	AF	Bamyan	1	AF10	3	2	2	2	2	2	2
7	Afghanist	AF	Daykundi	1	AF22	2	2	2	2	2	2	2
8	Afghanist	AF	Farah	1	AF31	2	2	1	1	1	1	1
9	Afghanist	AF	Faryab	1	AF28	2	1	1	1	1	1	1
10	Afghanist	AF	Ghazni	1	AF11	2	2	2	1	1	1	1
11	Afghanist	AF	Ghor	1	AF21	2	2	2	2	2	2	2
12	Afghanist	AF	Hilmand	1	AF32	1	1	1	1	1	1	1
13	Afghanist	AF	Hirat	1	AF30	1	1	1	1	1	1	1
14	Afghanist	AF	Jawzjan	1	AF27	1	1	1	1	1	1	1
15	Afghanist	AF	Kabul	1	AF01	1	1	1	1	1	1	1
16	Afghanist	AF	Kandahar	1	AF33	1	1	1	1	1	1	1
17	Afghanist	AF	Kapisa	1	AF02	1	1	1	1	1	1	1
18	Afghanist	AF	Khost	1	AF26	2	2	1	1	1	1	1
19	Afghanist	AF	Kunar	1	AF13	3	2	2	2	2	2	2
20	Afghanist	AF	Kunduz	1	AF17	1	1	1	1	1	1	1
21	Afghanist	AF	Laghman	1	AF07	2	2	2	2	1	1	1
22	Afghanist	AF	Logar	1	AF05	1	1	1	1	1	1	1
23	Afghanist	AF	Nangarhar	1	AF06	1	1	1	1	1	1	1
24	Afghanist	AF	Nimroz	1	AF34	1	1	1	1	1	1	1
25	Afghanist	AF	Nuristan	1	AF14	5	5	5	5	5	5	5
26	Afghanist	AF	Paktika	1	AF25	2	2	1	1	1	1	1
27	Afghanist	AF	Paktya	1	AF12	2	2	2	1	1	1	1
28	Afghanist	AF	Panjsher	1	AF08	5	4	3	3	2	2	2
29	Afghanist	AF	Parwan	1	AF03	2	2	2	2	1	1	1
30	Afghanist	AF	Samangan	1	AF19	3	2	2	2	2	2	1
31	Afghanist	AF	Sar-e-Pul	1	AF20	2	2	2	2	1	1	1
32	Afghanist	AF	Takhar	1	AF16	3	3	3	2	2	2	2
33	Afghanist	AF	Uruzgan	1	AF23	2	2	1	1	1	1	1
34	Afghanist	AF	Wardak	1	AF04	2	2	2	2	1	1	1
35	Afghanist	AF	Zabul	1	AF24	2	2	2	2	1	1	1
36												

baseline | SSP1 | SSP2 | SSP3 | SSP4 | SSP5

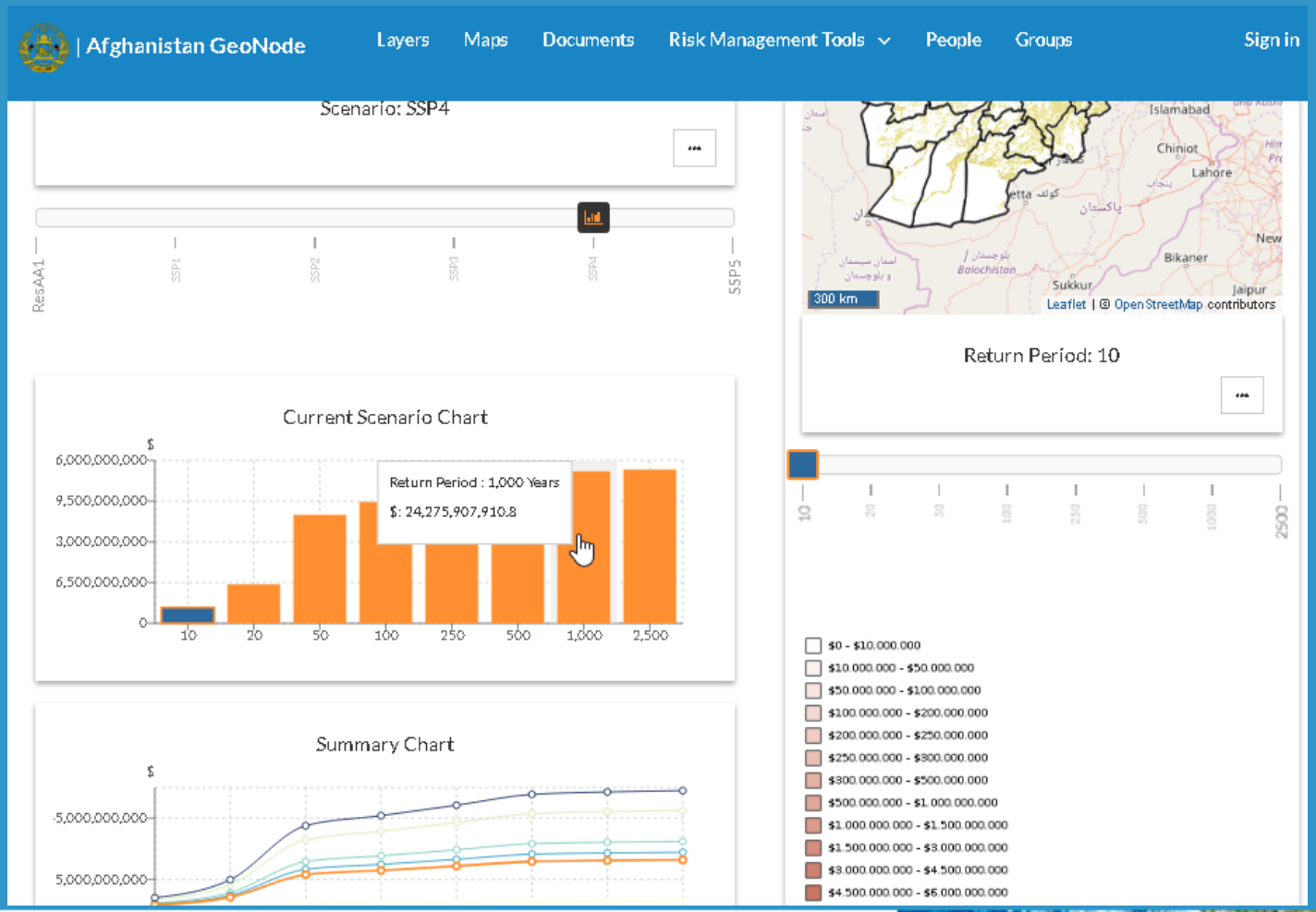
Afghanistan Disaster Risk

Risk Data Extraction & Visualization Tool
… TO THIS



Afghanistan Disaster Risk

Risk Data Extraction & Visualization Tool
… AND THIS



Afghanistan Disaster Risk

Cost Benefit Analysis & Decision Tool

FROM THIS …

			Base	AR1	BB2	CT1	DC1	DC2	DC3	AAL	
Base	Improved masonry (Engineered)	Scenario 0	0,04	0,345925926	0,345925926	0,061728395	0,183419753	0,02	0,003	$ 3.311.319,72	Average
AR1	Masonry/adobe/rubble stone masonry/unengineered	Scenario 1	0,04	0	0,691851852	0,061728395	0,183419753	0,02	0,003	$ 2.426.520,22	Adjusting masonry in rural and bad qualit
BB2	Brick masonry (horizontal reinforcement or otherwise)	Scenario 2	0,04	0	0	0,061728395	0,875271605	0,02	0,003	$ 2.303.303,02	Adjustment to RC (Low Code)
CT1	Timber frame - heavy infill masonry	Scenario 3	0,04	0	0	0,061728395	0	0,895271605	0,003	$ 1.467.846,08	Adjustment to RC (Moderate Code)
DC1	In-situ RC Frame with non-structural cladding	Scenario 4	0,04	0	0	0,061728395	0	0,447635802	0,450635802	$ 1.277.786,08	Improvement of Stock to code
DC2	RC frame with infill masonry	Scenario 5	0,04	0	0,345925926	0,061728395	0,172962963	0,356382716	0,023	$ 2.016.248,44	Rural School Improvement
DC3	In-situ RC Frame with shear wall		$ 1.706.672,69	$ 5.112.112,81	$ 2.554.341,24	$ 2.004.774,40	$ 2.376.243,58	$ 1.421.731,94	$997.145,69		

RP return period

see the full national risk analysis sheets for the vulnerability func

RP (years)	Scen_0	Scen_1	Scen_2	Scen_3	Scen_4	Scen_5
1	$ 203.747,27	$ 104.959,29	$ 82.733,36	$ 24.189,01	$ 14.715,88	$ 61.888,44
5	$ 3.890.050,48	$ 2.803.952,74	$ 2.595.331,58	$ 1.563.211,27	$ 1.313.202,30	$ 2.252.694,32
10	$ 7.599.026,72	$ 5.699.488,15	$ 5.412.514,69	$ 3.511.530,38	$ 3.042.032,84	$ 4.792.059,21
15	$ 10.527.220,44	$ 7.990.022,46	$ 7.668.474,19	$ 5.111.150,43	$ 4.486.369,28	$ 6.803.064,38
20	$ 12.931.983,15	$ 9.891.182,27	$ 9.565.617,36	$ 6.488.394,94	$ 5.710.804,90	$ 8.535.568,58
25	$ 15.120.793,71	$ 11.606.166,93	$ 11.300.904,41	$ 7.640.450,96	$ 6.801.010,37	$ 9.975.992,45
30	$ 16.892.920,38	$ 13.053.512,73	$ 12.713.560,91	$ 8.732.844,34	$ 7.763.728,82	$ 11.371.314,27
35	$ 18.665.047,04	$ 14.500.858,53	$ 14.126.217,40	$ 9.657.683,45	$ 8.678.593,54	$ 12.511.547,81
40	$ 20.215.532,79	$ 15.662.278,88	$ 15.357.814,94	$ 10.582.522,56	$ 9.446.470,75	$ 13.651.781,35
45	$ 21.568.552,75	$ 16.749.207,13	$ 16.424.303,95	$ 11.438.788,11	$ 10.214.347,96	$ 14.792.014,89
50	$ 22.921.572,71	$ 17.836.135,37	$ 17.490.792,97	$ 12.157.292,10	$ 10.982.225,18	$ 15.644.268,71
55	$ 24.274.592,67	$ 18.923.063,61	$ 18.557.281,99	$ 12.875.796,09	$ 11.622.963,20	$ 16.494.491,58
60	$ 25.627.612,63	$ 19.875.382,91	$ 19.592.629,90	$ 13.594.300,09	$ 12.213.369,30	$ 17.344.714,44
65	$ 26.628.040,97	$ 20.675.423,69	$ 20.390.787,52	$ 14.312.804,08	$ 12.803.775,39	$ 18.194.937,30
70	$ 27.576.986,44	$ 21.475.464,46	$ 21.188.945,15	$ 14.968.406,42	$ 13.394.181,49	$ 19.045.160,17
75	$ 28.525.931,92	$ 22.275.505,24	$ 21.987.102,77	$ 15.491.521,28	$ 13.984.587,58	$ 19.788.608,90
80	$ 29.474.877,40	$ 23.075.546,02	$ 22.785.260,39	$ 16.014.636,13	$ 14.574.993,68	$ 20.409.227,04
85	$ 30.423.822,87	$ 23.875.586,80	$ 23.583.418,01	$ 16.537.750,99	$ 15.064.127,62	$ 21.029.845,19
90	$ 31.372.768,35	$ 24.675.627,58	$ 24.381.575,63	$ 17.060.865,85	$ 15.490.900,06	$ 21.650.463,33
95	$ 32.321.713,83	$ 25.475.668,36	$ 25.179.733,25	$ 17.583.980,70	$ 15.917.672,50	$ 22.271.081,47
100	$ 33.270.659,30	$ 26.121.472,56	$ 25.920.967,06	$ 18.107.095,56	$ 16.344.444,94	$ 22.891.699,62
110	$ 34.790.398,45	$ 27.202.768,40	$ 27.006.472,79	$ 19.153.325,27	$ 17.197.989,83	$ 24.132.935,91
120	$ 36.074.117,37	$ 28.284.064,24	$ 28.091.978,52	$ 19.994.117,88	$ 18.051.534,71	$ 25.374.172,20
130	$ 37.357.836,28	$ 29.365.360,09	$ 29.177.484,26	$ 20.733.103,13	$ 18.905.079,60	$ 26.345.118,80
140	$ 38.641.555,20	$ 30.446.655,93	$ 30.262.989,99	$ 21.472.088,37	$ 19.680.764,58	$ 27.174.913,00
150	$ 39.925.274,12	$ 31.527.951,77	$ 31.348.495,72	$ 22.211.073,62	$ 20.277.346,48	$ 28.004.707,21
160	$ 41.208.993,03	$ 32.609.247,62	$ 32.434.001,45	$ 22.950.058,86	$ 20.873.928,38	$ 28.834.501,41

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Afghanistan Disaster Risk

Cost Benefit Analysis & Decision Tool
… TO THIS

| Afghanistan GeoNode | Layers | Maps | Documents | Risk Management Tools | People | Groups | Sign in

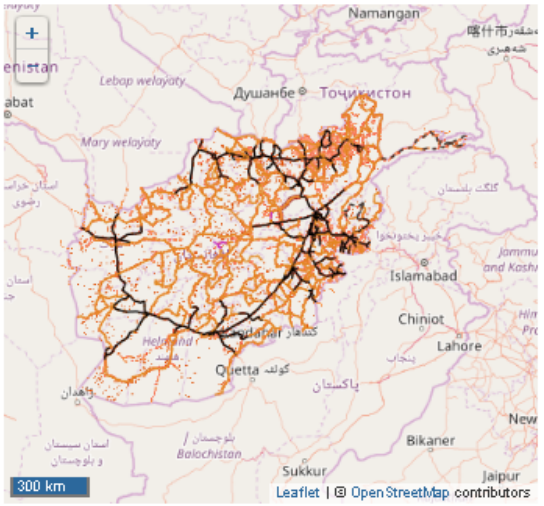
Overview | Earthquake | Riverflood | Waterscarcity | Avalanche | Landslide

Doshi-Bamyan Road Case Study

A case study of the Doshi-Bamyan Road was undertaken to examine the effect of earthquakes on the potential path of the road. Current analysis depicts the risk reduction of meters of roads damaged along several Return Periods (10y, 50y, 100y, 250y, 500y, 1000y, 2500y) and for different damage scenarios (Slight, Moderate, Extensive, Complete), by applying Structural Retrofitting and Geotechnical Engineering methods.

50 Year Lifetime Benefit (assuming constant increase of benefits)

		Using AAL (mean)		Using median of 50 year lifetime
Cost of Project:		$16,677,797.81		$16,677,797.81
Existing Losses:		$16,080,589.68		$2,278,557.93
Retrofitted Losses:		$6,649,654.07	assuming NPV, discount etc as set out in report	$341,783.69
Potential Savings:		$9,430,935.61		$1,936,774.24
B/C ratio		0.565478471582561		0.116128895860483

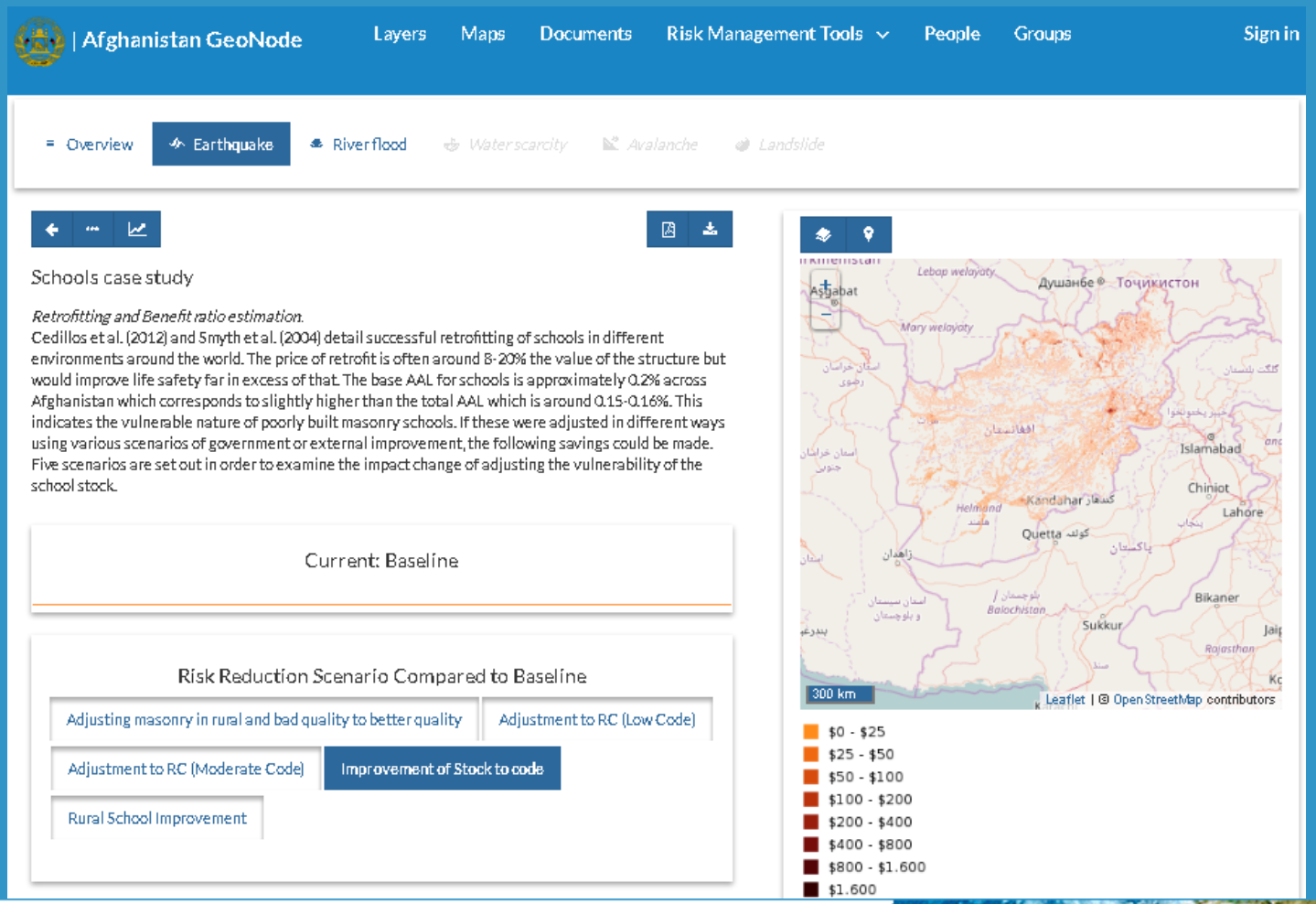


Current: Baseline

Current situation; without Structural Retrofitting and Geotechnical Engineering

Afghanistan Disaster Risk

Cost Benefit Analysis & Decision Tool
… AND THIS



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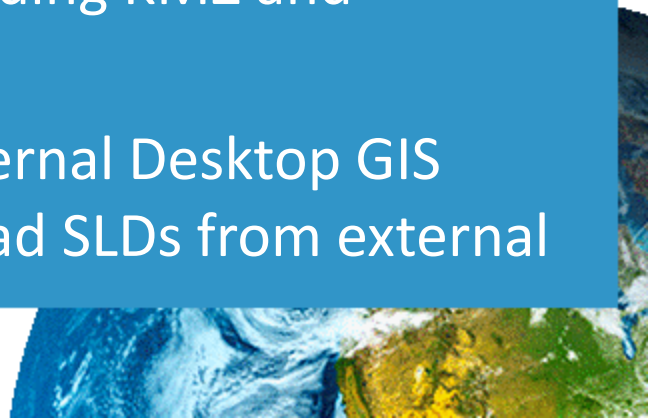
Project 3: UNESCO IHP-WINS

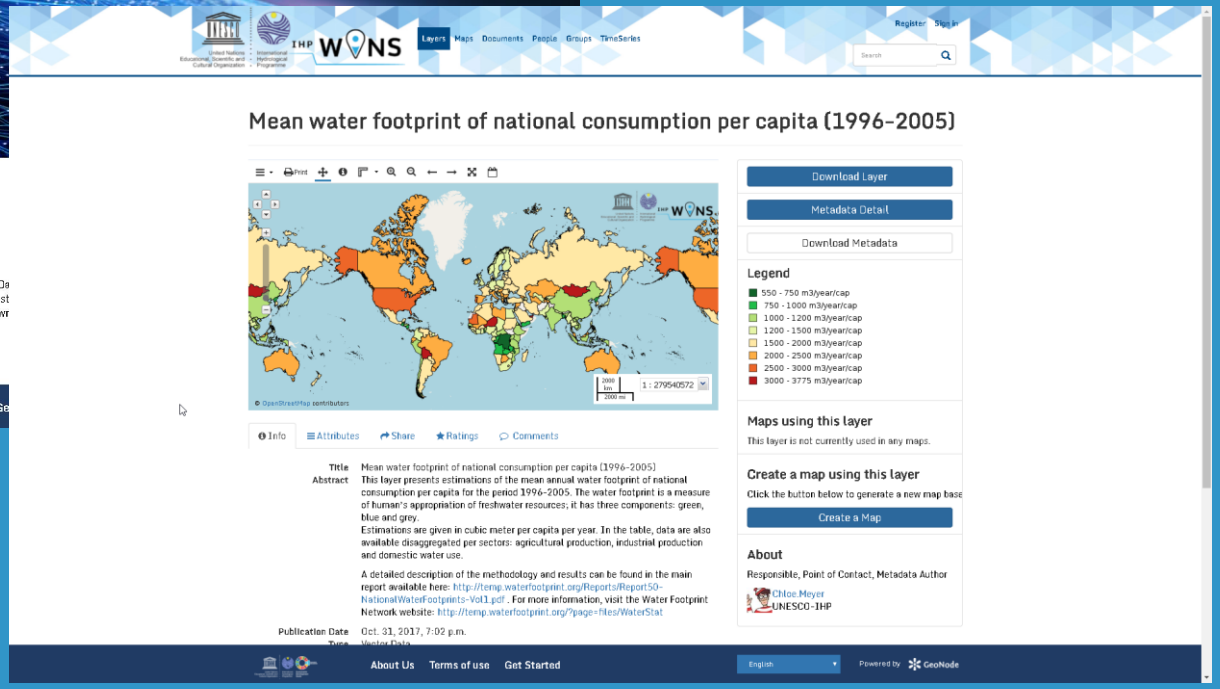
- **UNESCO Project - Water Information Network System by the International Hydrological Programme of UNESCO**
- **Enable a publishing workflow for spatial Layers**
  - Give real powers to Group Managers
  - Isolate GeoNode Groups private data
  - Each dataset must be approved by an editor before it can become public
- **Improve the contributors experience**
  - Introduce the possibility of uploading KMZ and Temporal Series
  - Improve the integration with external Desktop GIS clients, and allow people to upload SLDs from external resources

- **http://ihp-wins.unesco.org**



UNESCO WINS

http://ihp-wins.unesco.org/



UNESCO WINS

GeoNode Data Maps About

Upload Layers

Drop files here

or select them one by one:

Choose Files

Files to be uploaded

LSMensCSR5r3120_0_T_tendance_235678_trend

Google Earth KMZ

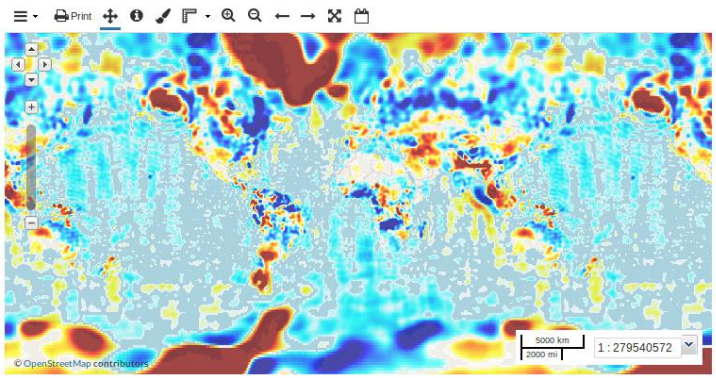
- LSMensCSR5r3120_0_T_tendance_235678_trend.kmz Remove

Select the charset or leave default

KMZ Raster Upload

GeoNode Data Maps About

LSMensCSR5r3120_0_T_tendance_235678_trend



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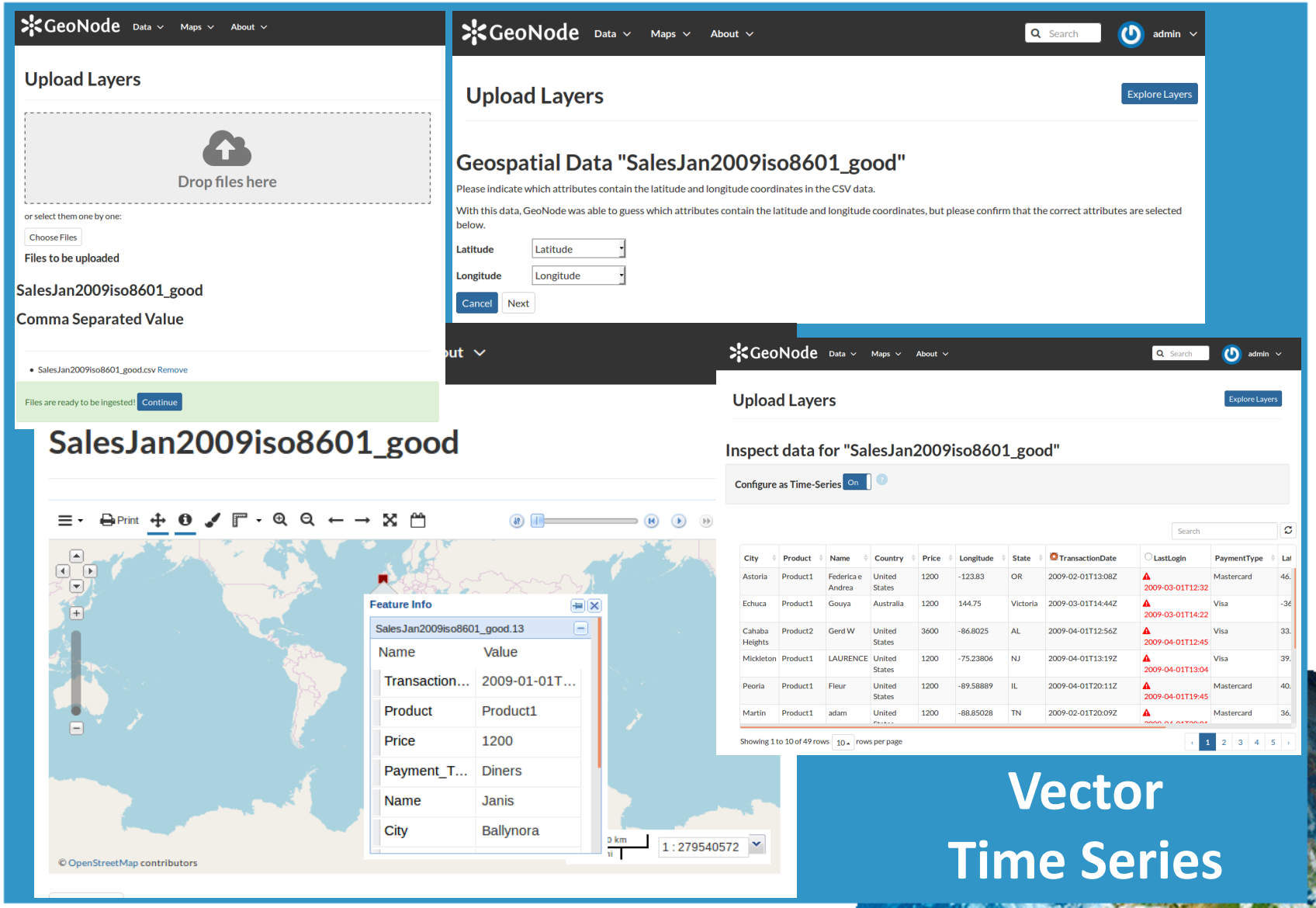
UNESCO WINS



Vector Time Series

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UNESCO WINS

GeoNode Data Maps About

Notification Settings

Notification Type	Email
User following you Another user has started following you	☑
User requested access A new user has requested access to the site	☑
Account activated This account is now active and can log in the site	☑
Request to download a resource A request for downloading a resource was sent	☑
Layer Created A Layer was created	☑
Layer Updated A Layer was updated	☑
Layer Approved A Layer was approved by a Manager	
Layer Published A Layer was published	

GeoNode Data Maps About

Back to Inbox

Create Message

To users

To groups

Test Group

Subject

Hi

Content

Test Message

GeoNode Data Maps About

Messages

Inbox All

With	Subject	Last Sender	Preview	Delete?
Test Group	Hi	me	Test Message...	Delete

Improved Notifications

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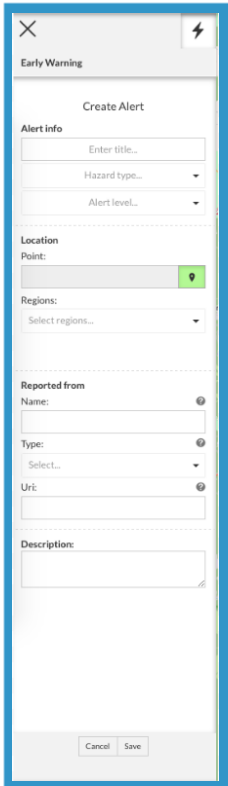
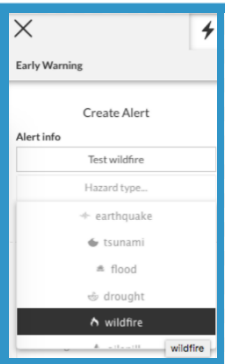
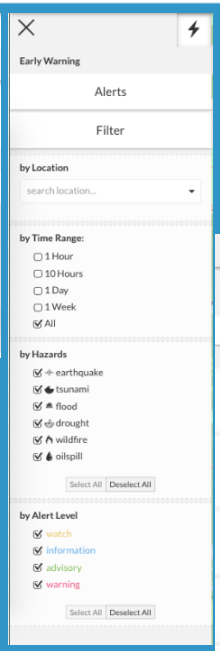
Project 4: DECATASTROPHIZE

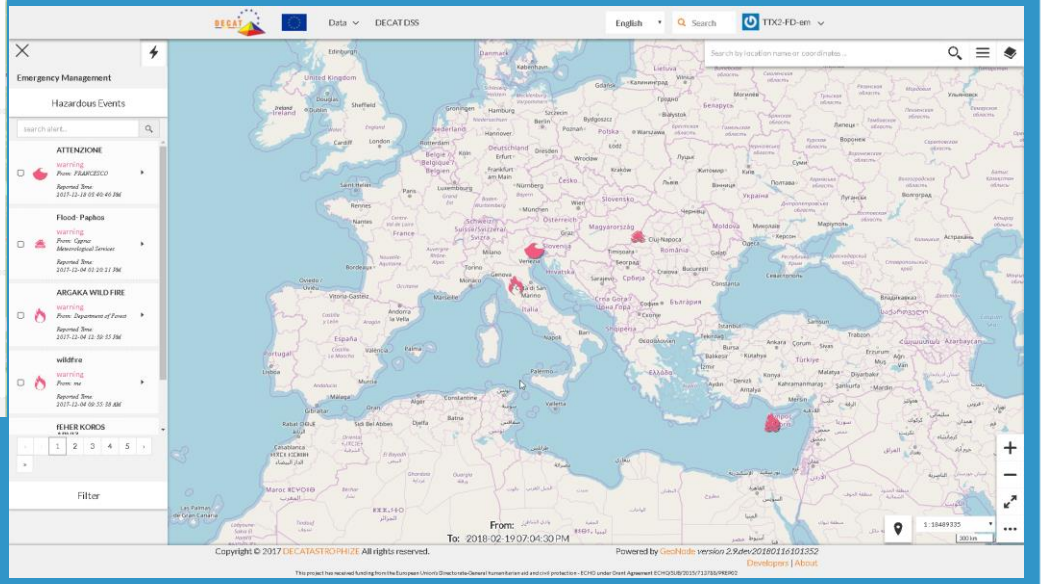
- **EU Project**
- *"Towards Better Protection of Citizens against Disaster Risks: Strengthening Early Warning Systems in Europe"*
- **3 Phases Approach to Emergency Preparedness**
  - Early Warning & Alert
  - Impact Assessment
  - Emergency Management
- GeoNode Custom Application
  - Various GeoNode Enhancements
  - Various GeoNode Extensions
- **http://decat.geo-solutions.it**

DECATASTROPHIZE – Early Warning



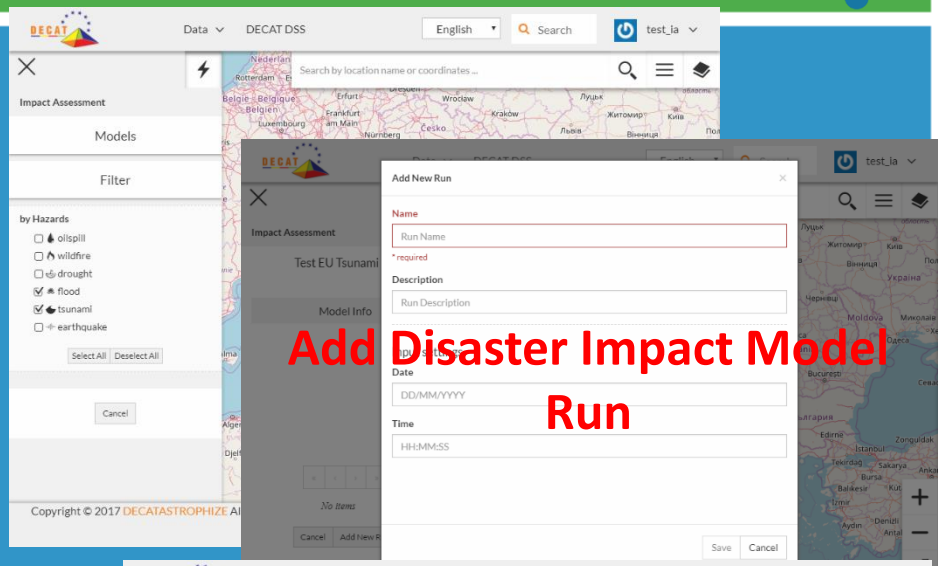


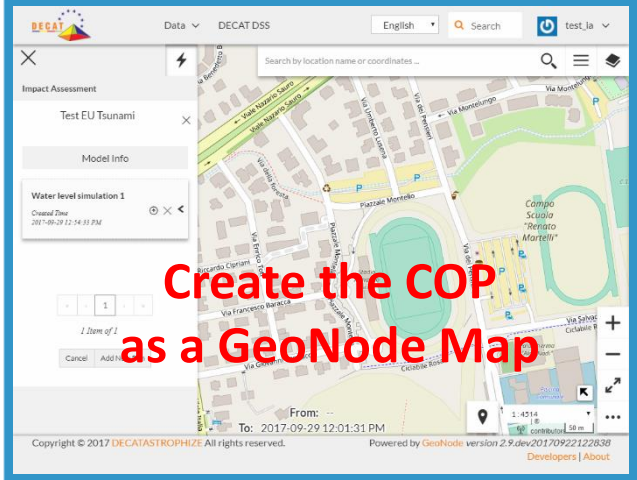


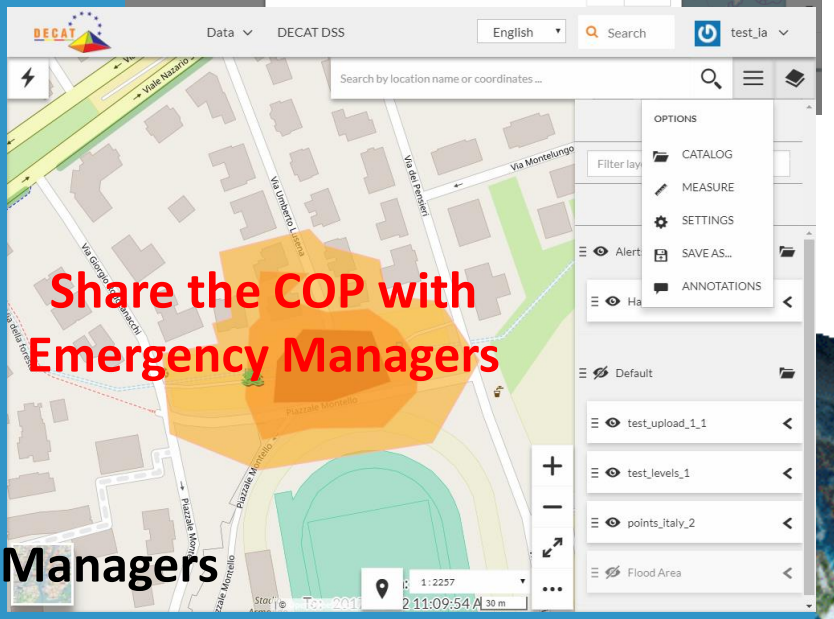


- Early Warning
- Collect Alerts for potential disasters
- Promote to disaster when confirmed
- Early Warning Module (front-end and back-end)
- Single Page Front-End (based on MapStore)
- Custom Back-End

DECATASTROPHIZE – Impact Assessment







- Impact Assessment
- Upload of disaster models runs
- Create Update COP for Emergency Managers

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DECATASTROPHIZE – Emergency Management

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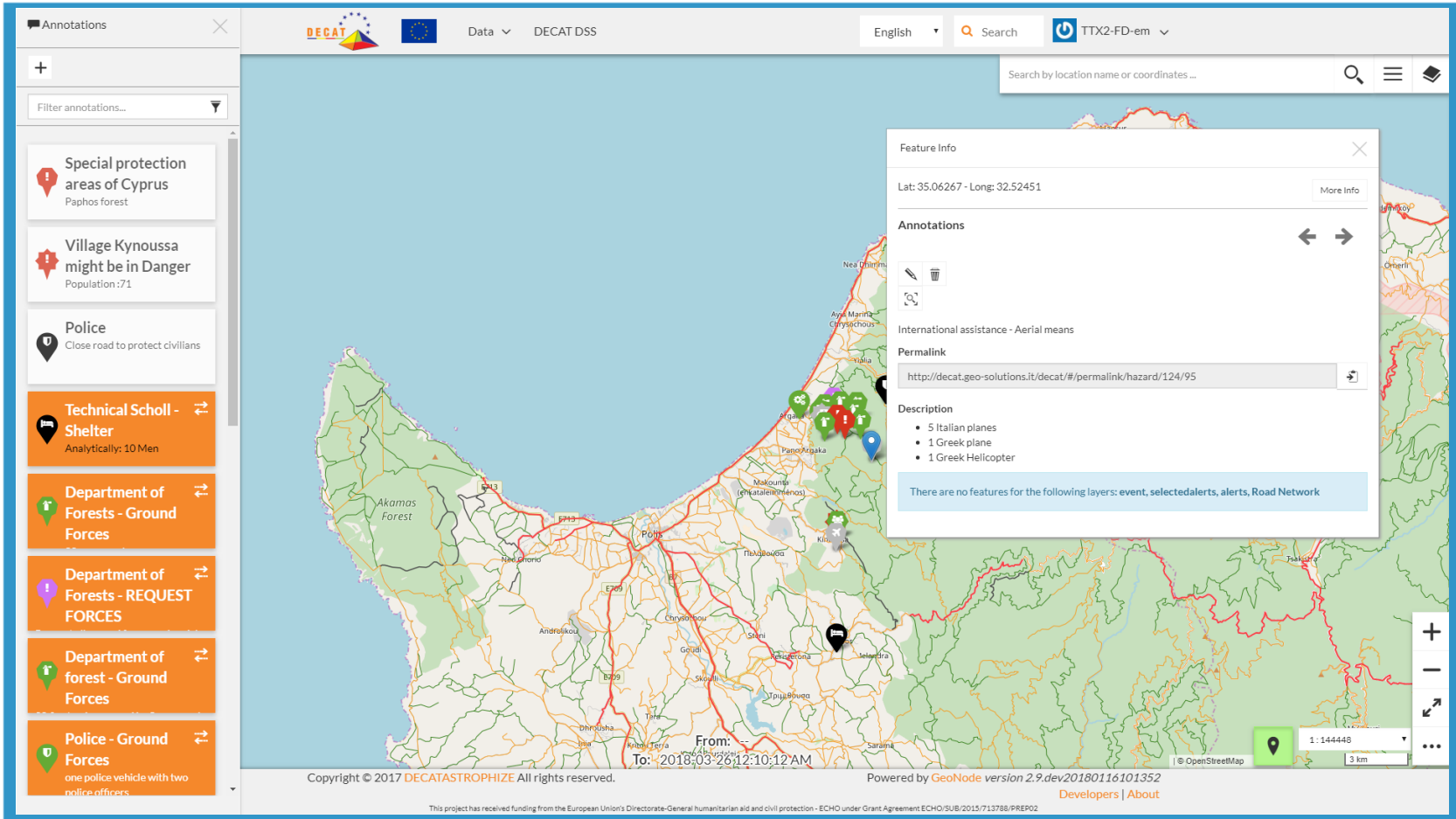
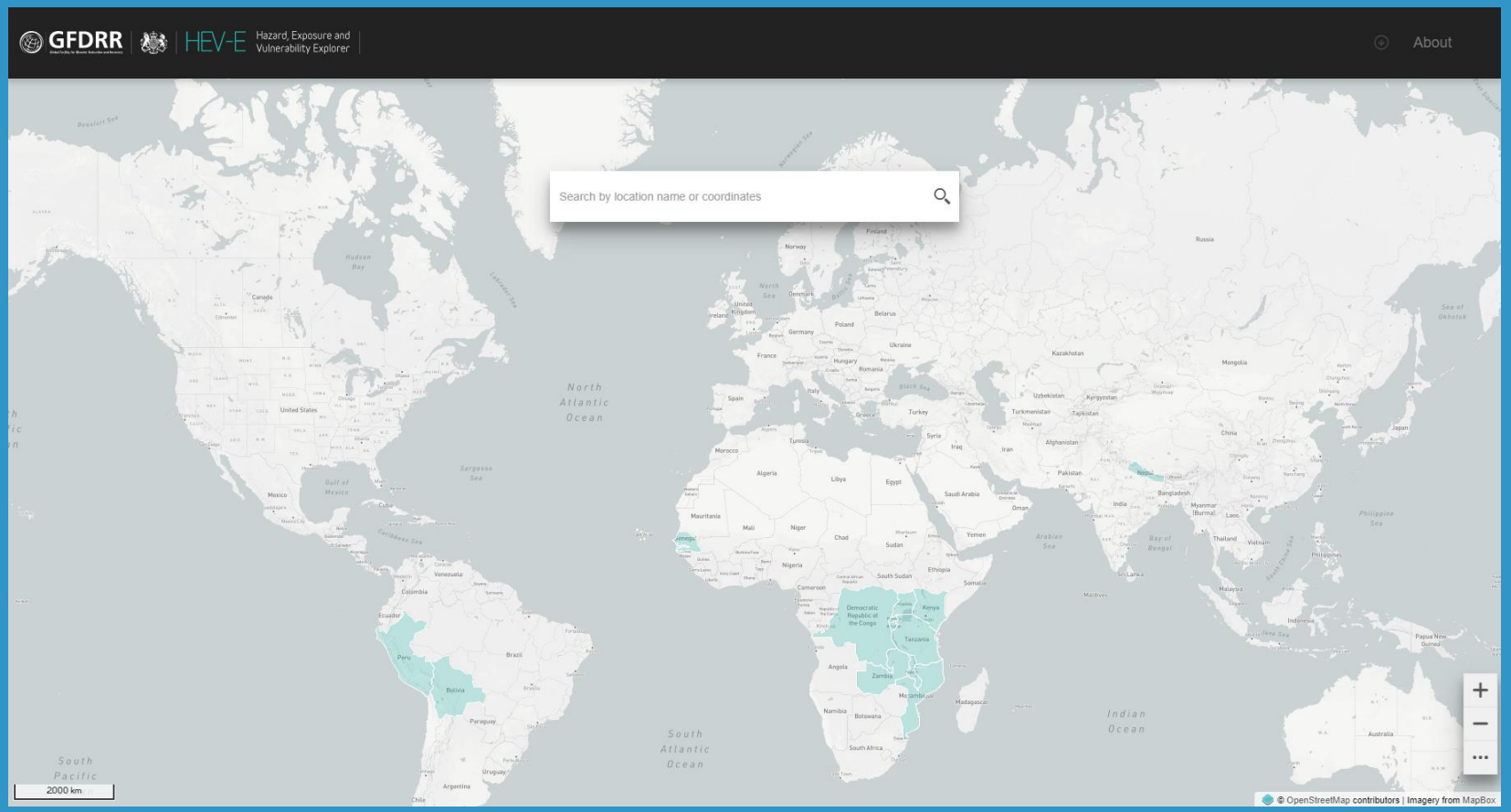


- Emergency Management → coordinate field interventions
- Use Impact Assessment COP as back-end layers
- Collaborative Map Annotations Module (front-end and back-end)

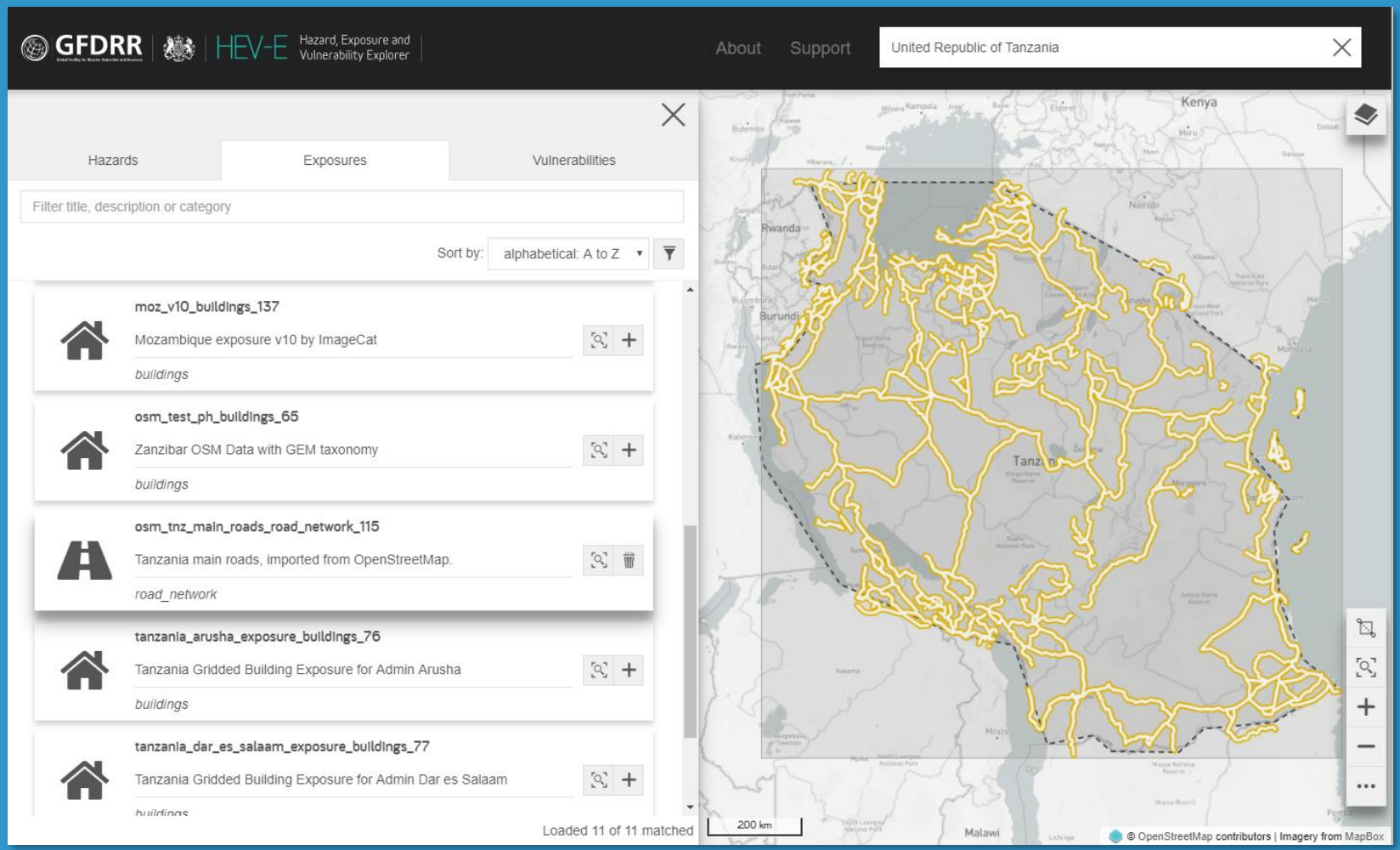
Project 5: HEV-E

- **GFDRR and UK Department for International Development**
- *"Hazards, Exposures and Vulnerabilities Explorer"*
- **Explore, preview and download risk related global data**
  - Hazards (British Geological Survey)
  - Exposures (GEM)
  - Vulnerabilities (University College London)
- GeoNode Custom Application
  - Custom API + GeoNode API
  - Custom frontend (REST API)

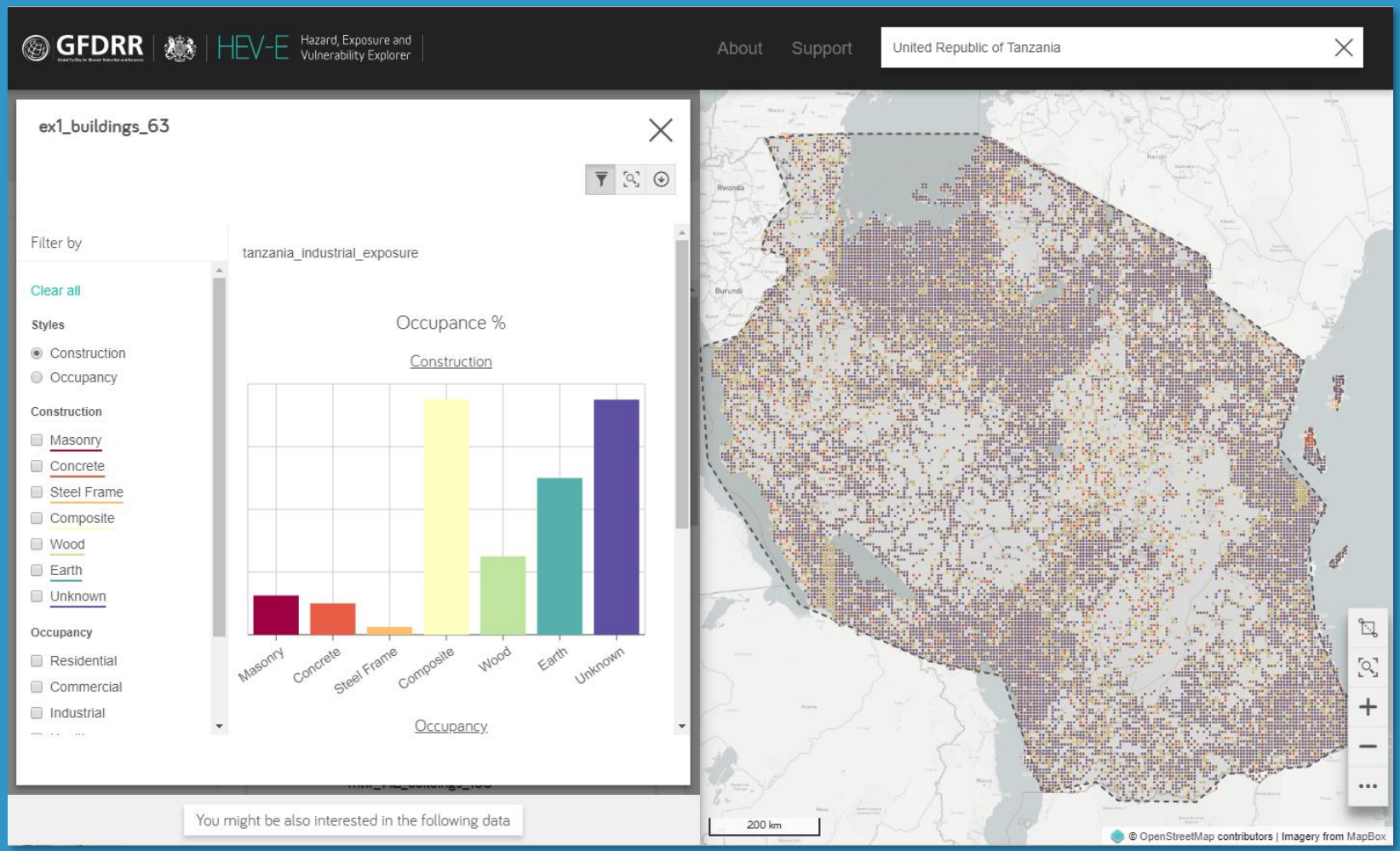
HEV-E



HEV-E



HEV-E



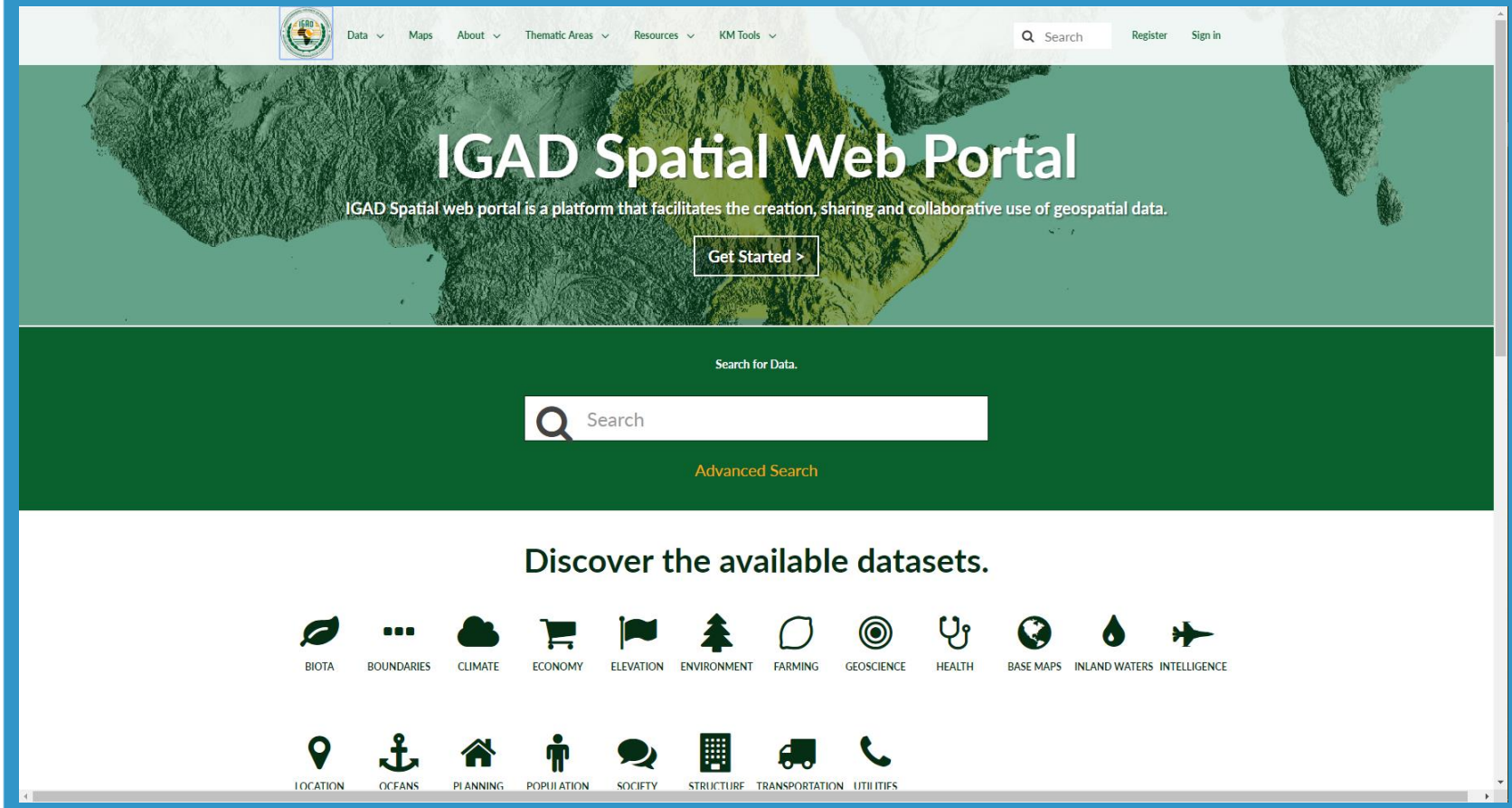
Project 6: IGAD GeoPortal

- **Intergovernmental Authority on Drought and Development and Biodiversity**
- *"An integrated geoportal for IGAD's and Biodiversity Development Program resources"*
- **Thematic Data and Document catalog**
  - Thematic areas categorization
  - Data management by country and cross border areas
  - Harvesting and remote services hub
- **GeoNode Custom Application**
  - Custom template and models
  - Extended remote services (WMS, GeoNode, ArcGIS REST)
  -

de remote instances

IGAD GeoPortal

http://igad-dev.geo-solutions.it



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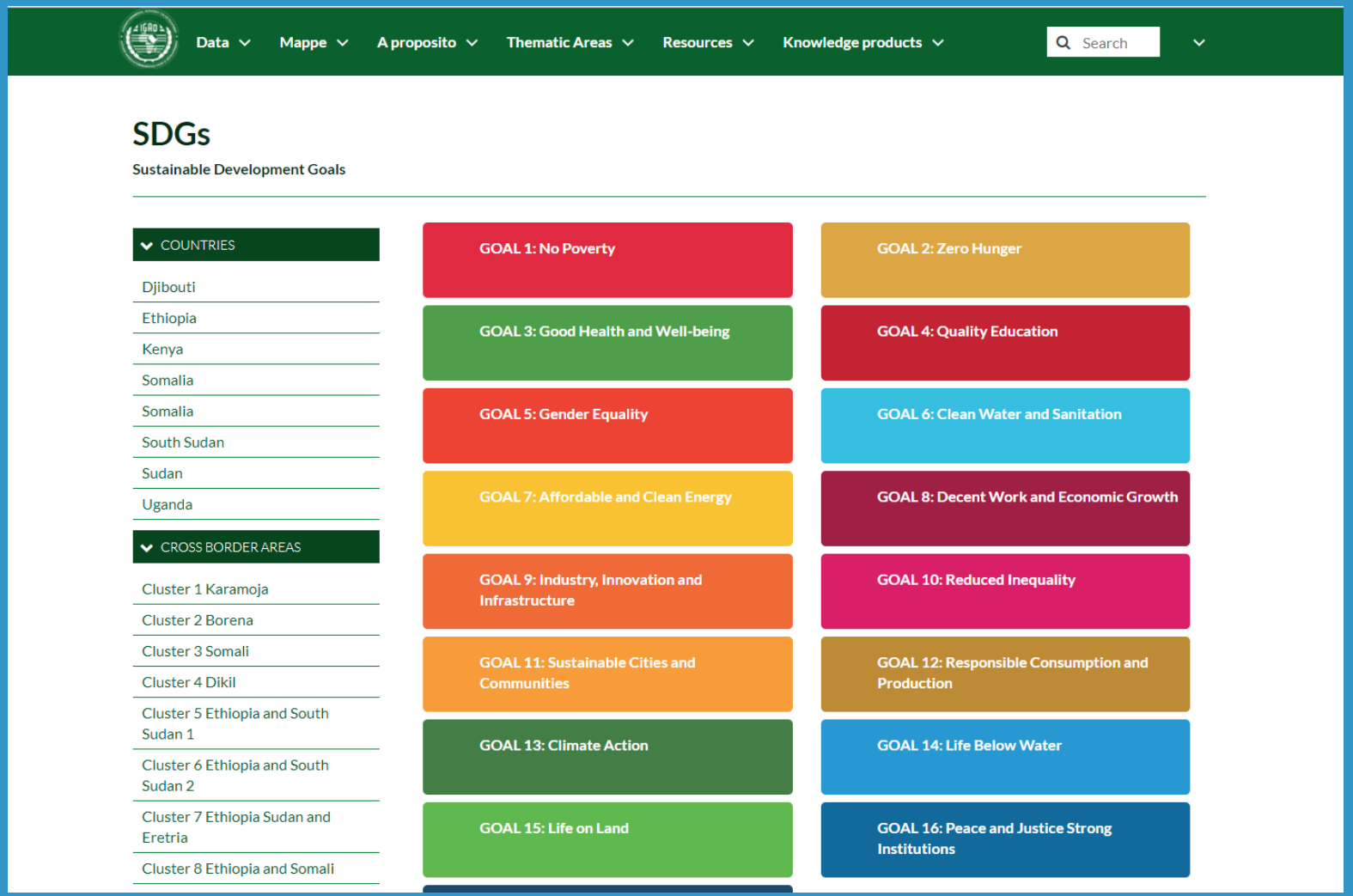
IGAD GeoPortal



IGAD GeoPortal

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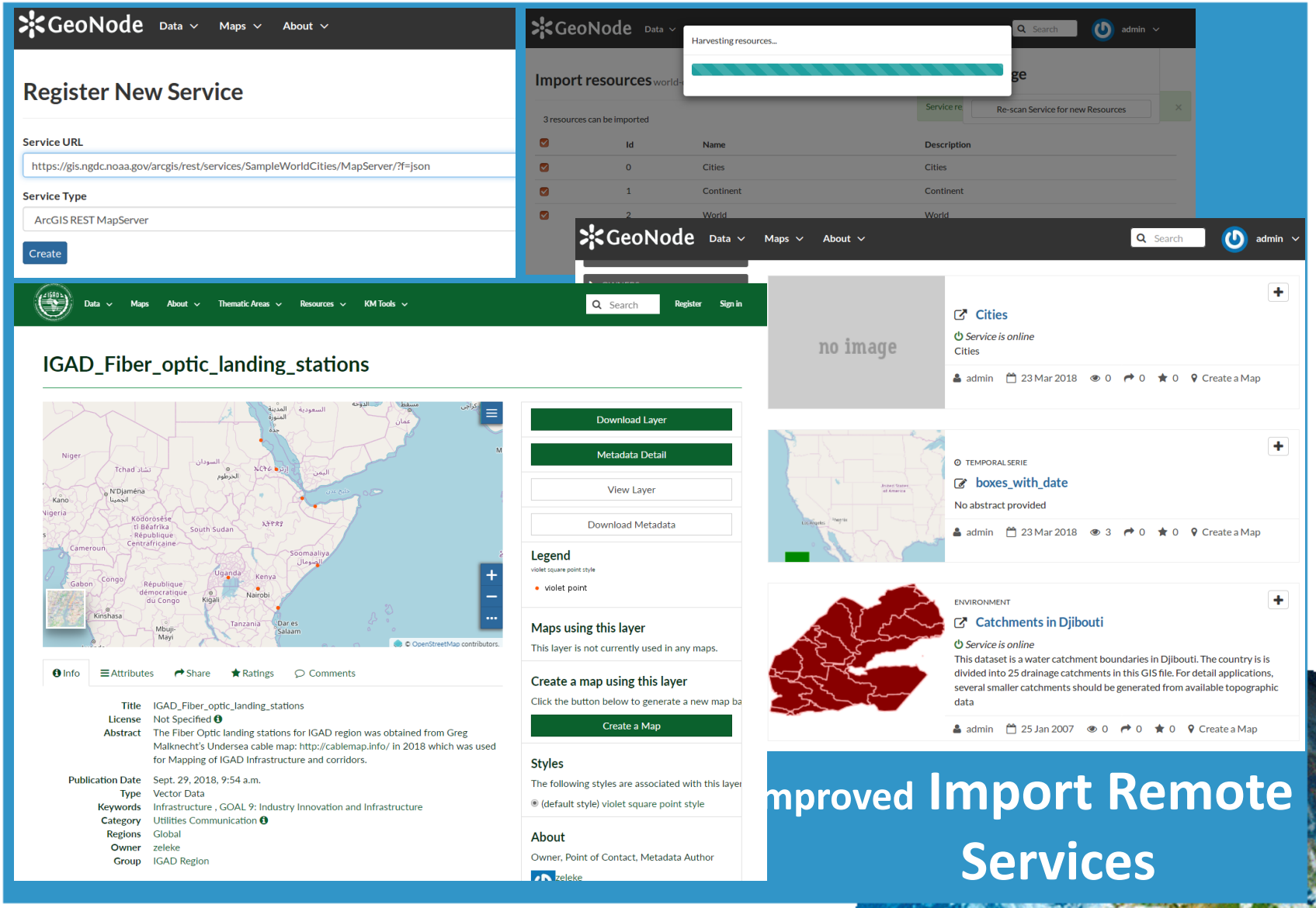

Improved Import Remote Services

IGAD GeoPortal

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GeoNode Data Maps About

Upload Layers

Drop files here

or select them one by one:

Choose Files

Files to be uploaded

SalesJan2009iso8601_good

Comma Separated Value

- SalesJan2009iso8601_good.csv Remove

GeoNode Data Maps About Search admin

Upload Layers

Explore Layers

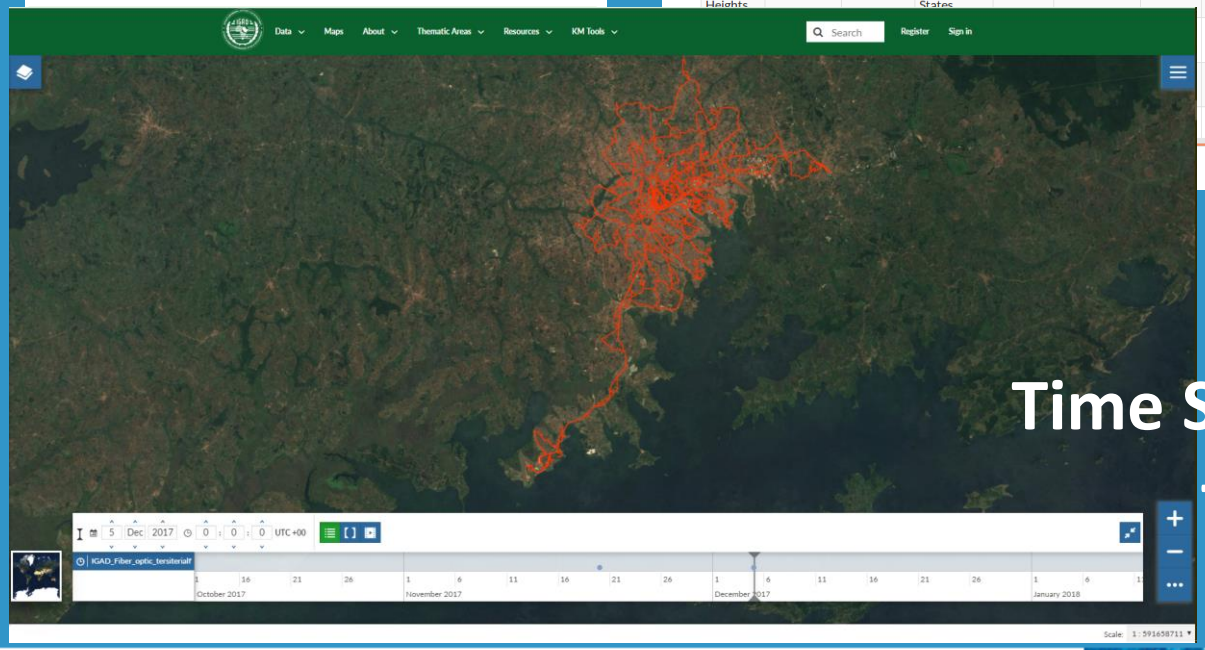
Inspect data for "SalesJan2009iso8601_good"

Configure as Time-Series On

Search

City	Product	Name	Country	Price	Longitude	State	TransactionDate	LastLogin	PaymentType	Lat
Astoria	Product1	Federica e Andrea	United States	1200	-123.83	OR	2009-02-01T13:08Z	2009-03-01T12:32	Mastercard	46.
Echuca	Product1	Gouya	Australia	1200	144.75	Victoria	2009-03-01T14:44Z	2009-03-01T14:22	Visa	-36
Cahaba Heights	Product2	Gerd W	United States	3600	-86.8025	AL	2009-04-01T12:56Z	2009-04-01T12:45	Visa	33.
							2009-04-01T13:19Z	2009-04-01T13:04	Visa	39.
							2009-04-01T20:11Z	2009-04-01T19:45	Mastercard	40.
							2009-02-01T20:09Z		Mastercard	36.

‹ 1 2 3 4 5 ›



Time Series import from CSV

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Too Many GeoNodes?

The Future

Objectives for next major version

- Improved Upload and Data Storage
- Multiple data sources
- Abstraction for Mapping Engines (GeoServer, QGIS Server, ...)
- Federation
- Single Page Application Front-End (at least for users)
- Streamlined Deployment and CI/CD
- ...

Better Upload

- **Now**
  - Direct upload of files
  - No throttling, no asynch upload
  - No clear separation between uploaded data and published resources
  - No proper data storage system
  - No configurable preprocessing
- **Future**
  - **Data Sources**
    - File upload
    - Remote sources (S3, Dropbox, FTP, etc.)
  - **Data Storage System**
    - Asynch & Pull upload
    - Quota & bandwidth management
    - Object Storage Support
  - **Configurable ingestion pipelines**
  - **Pluggable data source providers**
    - Point clouds
    - 3D models
    - Etc.

Multiple backend services

- **Now**
- **Remote Services**
  - OGC WMS
  - Remote GeoNode
  - ArcGIS REST MapServer
- **No AuthN/AuthZ support**

- **Future**
- **Backend Services**
  - No more dicothomy between local and remote services.
- **Authentication / Authorization**
  - backend providers will, eventually, integrate AuthN/AuthZ services with GeoNode Security Layer

Multitenancy

- **Now**
  - **GeoNode Groups**
    - Stretching this concept we can at most compartimentize published resources
    - Groups share underlying data, users and UI. Separation only enforced through permissions management
  - **“geosites” contrib app**
    - Logical separation on top of Django sites concept
    - Still alive?
- **Future**
  - **Multiple lightweight GeoNode “nodes”**
    - **Data sharding**: data storage dedicated to single tenant (increased security and safety)
    - **Backend services**: AuthN and AuthZ backend services to partition resources authorizations between tenants
    - **Users/Groups partitioning**
  - **GeoNode “master” node**
    - Acts like a gateway to single tenant GeoNodes
    - Authentication service
    - Routing of requests (APIs, services) to tenant’s GeoNodes

Single Page Front-End

Goals

- design a replicable and versatile approach to implement custom frontends
- extend and enhance GeoNode's APIs, both as exposed methods and API architecture
- enhance the geonode-project approach

Next GeoNode should be a **modular framework**

- Independent GUI
- Quickly adapt/extend to custom requirements

Deployment

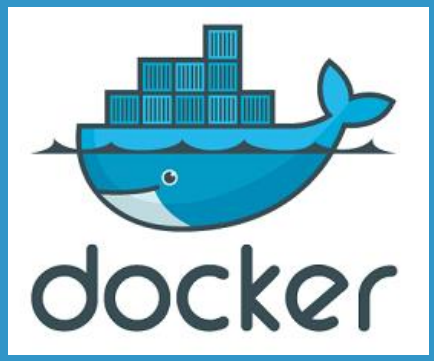
GeoNode's stack containerization is helping in managing complex deployments and streamlining DevOps activities.

We are testing **Docker** images and settings layout as defined in upstream GitHub repositories.

They prove to be an effetctive approach now and even more in the future, when we will be able to connect multiple data sources, backends and GeoNode nodes.

Our use cases are giving us the opportunity to

- stress the Docker approach
- improve it
- bring back to the community.



Nice, but meanwhile?

- **Improvements to GeoNode 2**
  - Improved custom clients pluggability
  - MapStore based client as the default client
  - Improved security layer, proxy views and auth token management
  - Some impovements planned to Remote Services security and Groups / Users partitioning
- **Code Hardening**
  - More Unit Tests
  - More Manual Tests
  - More Documentations

Nice, but meanwhile?

- **Refactoring and cleaning up of GeoNode 2**
  - Contrib apps go outside of the core
  - Other contrib apps moved to core → monitoring,
- **Release Schedule Support**
  - More Frequent (i.e. Timeboxed)
  - Formalize Proces
- **Contribute to the transition to Pyhon 3**

That's all!

http://www.geo-solutions.it/contacts

info@geo-solutions.it

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