



OEIL

**Observatoire de
l'environnement**
Nouvelle-Calédonie

A fire monitoring system by OEIL

Measure the extent of fire pressure on biodiversity to help implementation of appropriate natural resource management measures

Fabien Albouy, deputy director
Adrien Bertaud, head of environment department

Fire alert and monitoring system - Fiji



OEIL

Observatoire de
l'environnement
Nouvelle-Calédonie

OUR MISSIONS



Our Goal

Facilitate the decision of stakeholders on the measures to be taken to maintain the environment **in a good state**





The observatory :

a non-profit organization

supported by public authorities

**24 member organisations : local authorities,
environmental associations, local communities, etc.**

www.oeil.nc



CONTENTS

- CONTEXT
- OBJECTIVES
- DATA SOURCES
- METHOD
- FIRE ALERT SYSTEM
- GEDI: geoportal & data analysis platform
- RESULTS
- NEXT STEPS



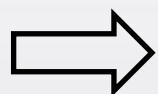
Bushfires represent a major pressure on the environment that remains poorly characterized

Lack of information

- Observation and reporting deficit
- Location and estimation of non-exhaustive and unreliable surfaces



Lack of monitoring of the environmental impacts



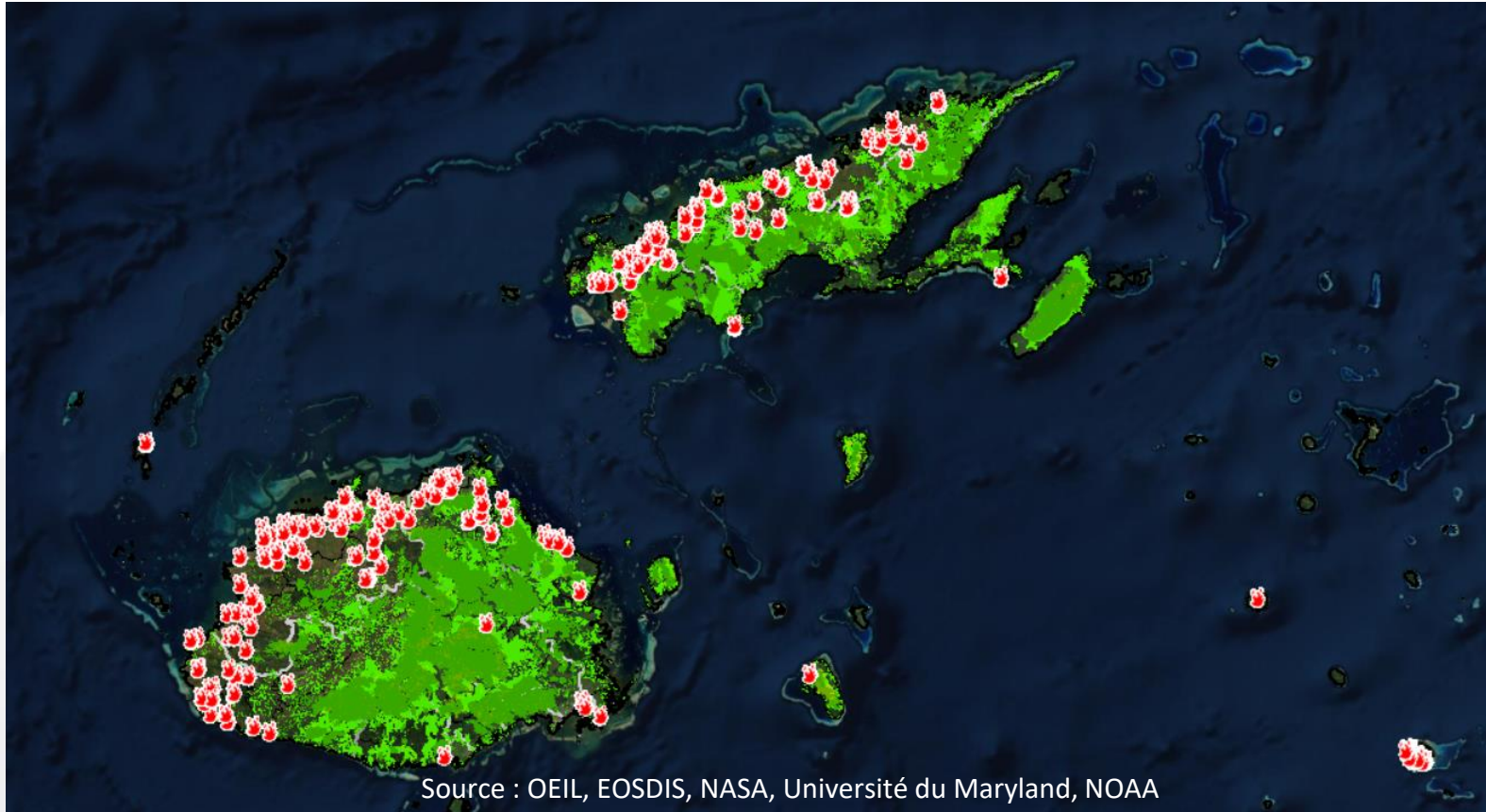
One of the work areas of the Observatory of the environment



OBJECTIVES

Provide reference data to characterize fires in order to :

- Monitor the impact of fires: environment,...



OBJECTIVES

Provide reference data to characterize fires in order to :

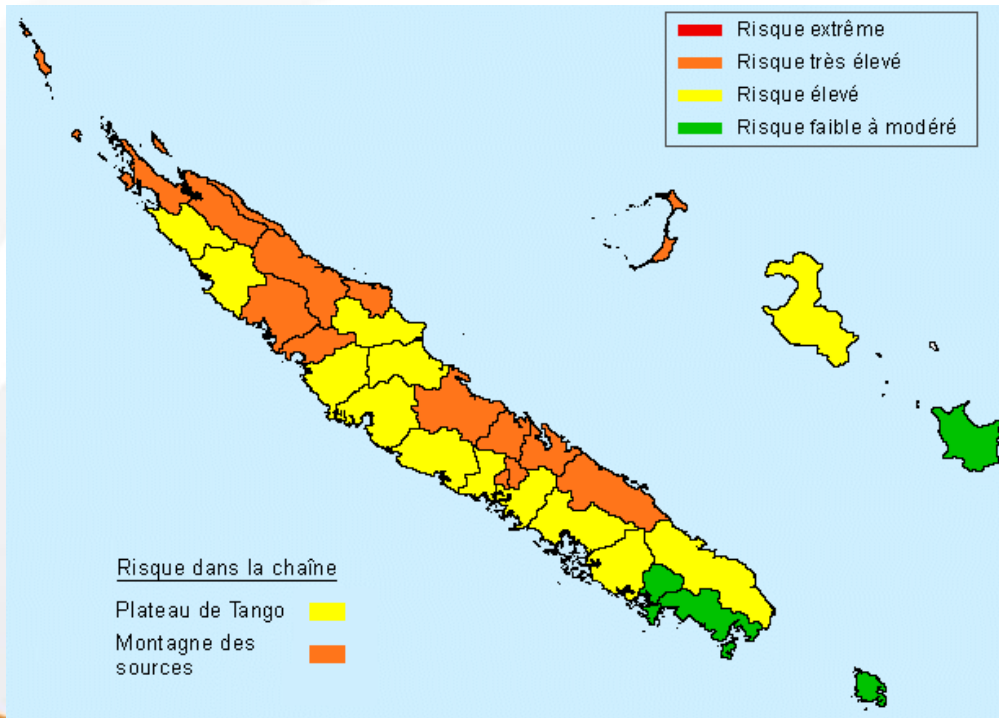
- Monitor the impact of fires: environment,...
- **Inform the stakeholders and the population**



OBJECTIVES

Provide reference data to characterize fires in order to :

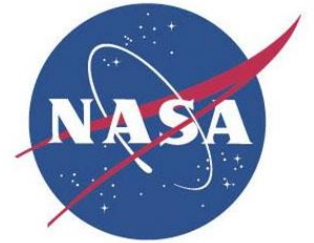
- Monitor the impact of fires: environment,...
- Inform the actors and the population
- **Support the management**



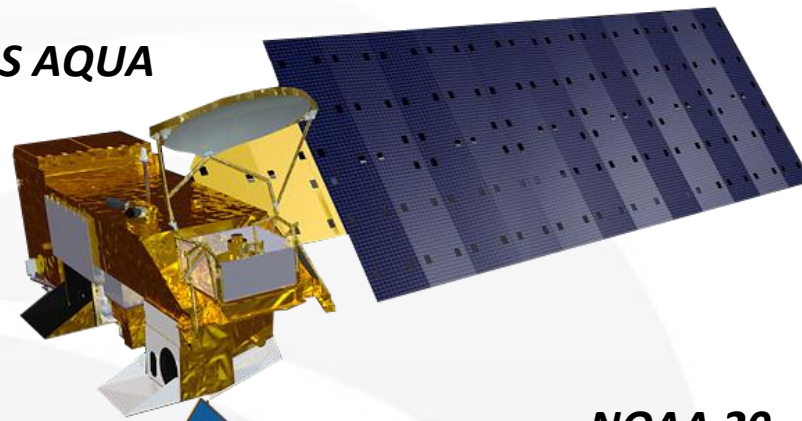
DATA SOURCES

Free remote sensing satellite imagery exploitation

❑ **MODIS AQUA & TERRA, SUOMI NPP, NOAA 20**



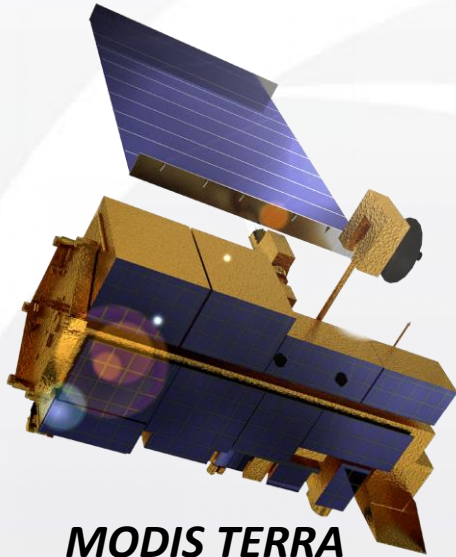
MODIS AQUA



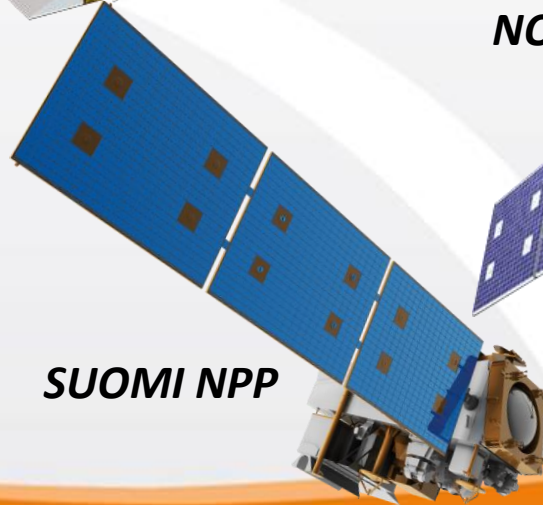
NOAA 20



MODIS TERRA



SUOMI NPP



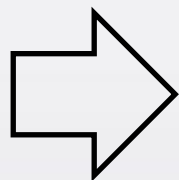
DATA SOURCES

MODIS AQUA & TERRA (NASA, University of Maryland)

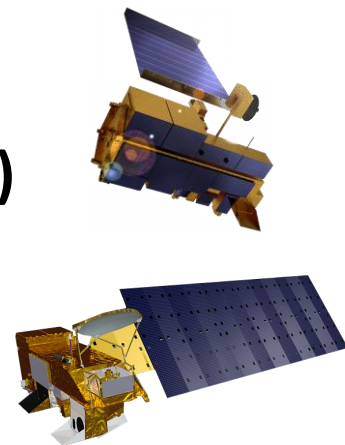
☐ daily detection of hotspots (for both sat.)

- Spatial resolution: pixel 500/1000 m
- Start date: november 2000
- Detection only for the most intense and important fires

Needs data cleanup to get rid of undesired detections of industrial, volcanic heat sources, etc



- **Allows an interesting extension of the data chronicle**
- **Limited use of fire alerts**
- **Not suitable for environmental impact assessment**



DATA SOURCES

SENTINEL

- Début chronique



- Résolution spatiale

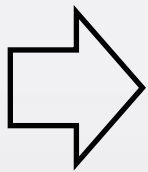


Décamétrique

- Revisite



Tous les 5 jours



- **Helpful with pressure characterization**
- **Useful for alert giving and firefight triggering**
- **Gives a first approach to consider environmental impacts**

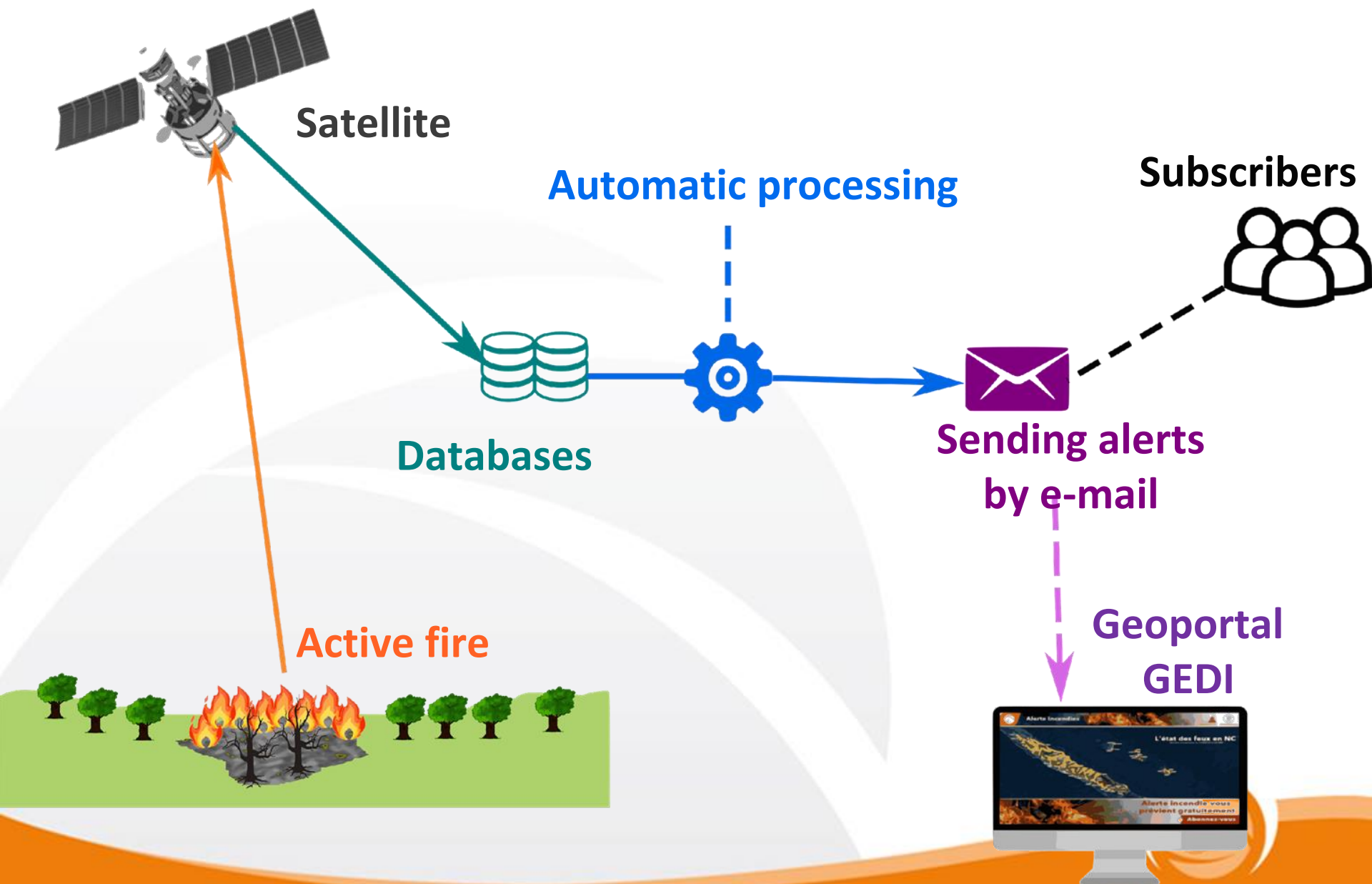


Methods

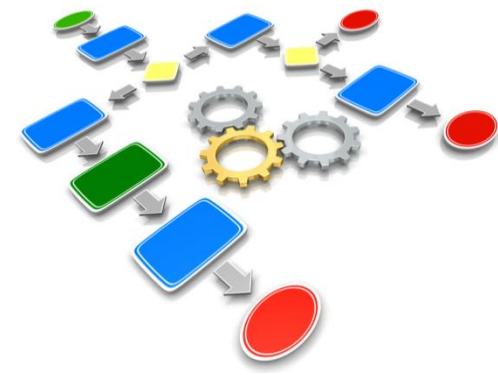
- Fire Alert System
- Burned area processing chain



METHOD



METHOD



Work process 1 Fire detection received

- Extract and capitalize the relevant data
- **Create potential fire areas in a GIS layer**

Rules of Data Management

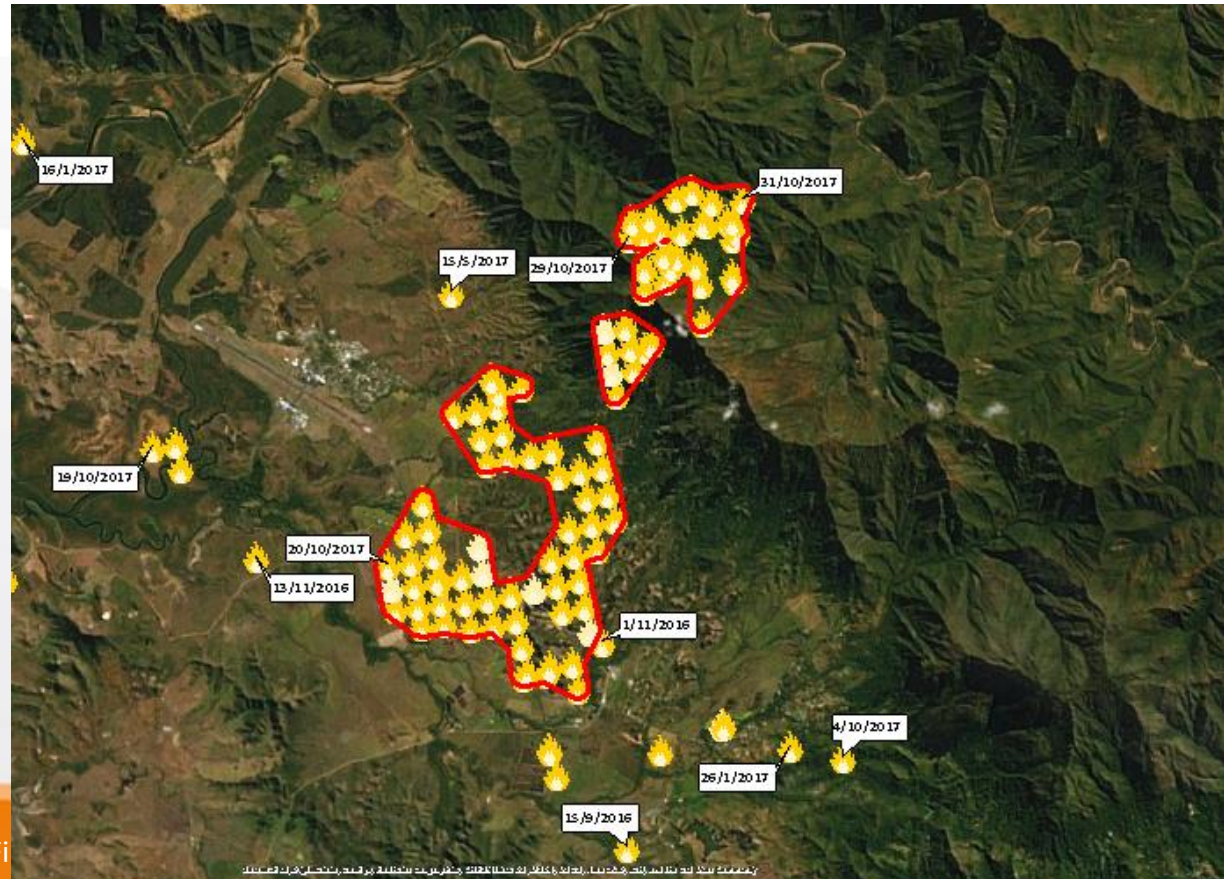
- Distance
- Time

Results

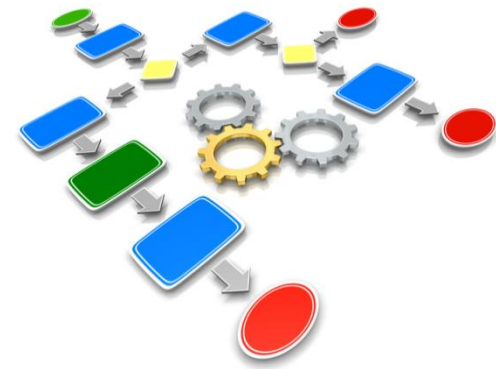
Points -> Polygon

Detections -> Burned area

Date -> period

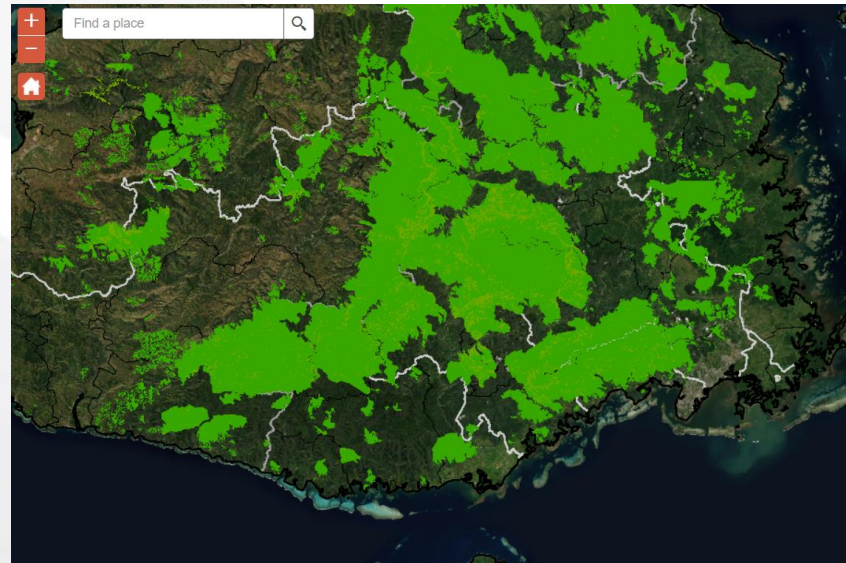
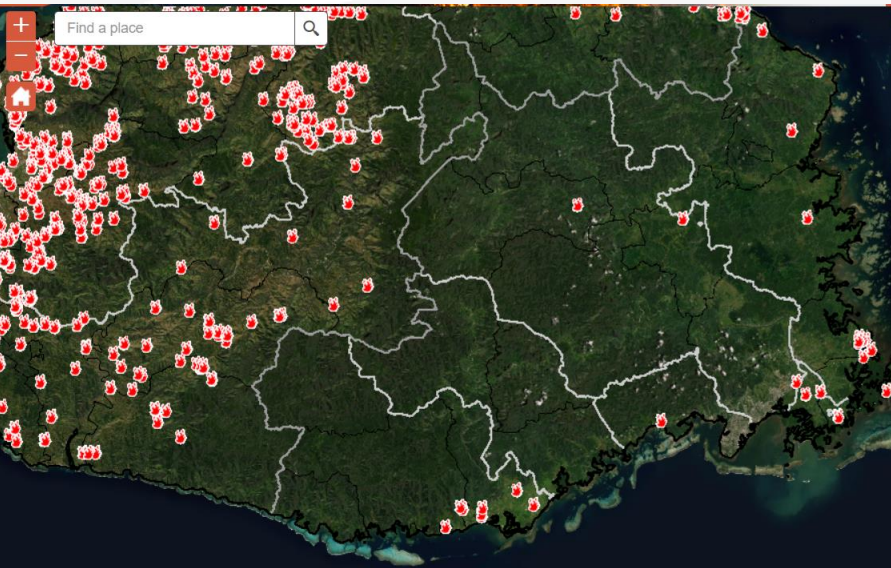


METHOD

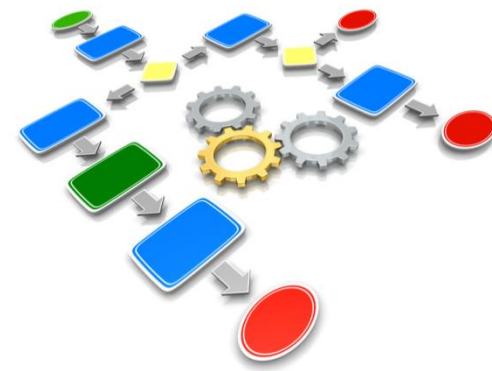


Work process Fire detection received

- Extract and capitalize the relevant data
- Create potential fire areas in a GIS layer
- **Cross the area of fire with GIS layers of interest**



METHOD



Work process ? Fire detection received

- Extract and capitalize the relevant data
- Create potential fire areas in a GIS layer
- Cross the area of fire with GIS layers of interest
- **Broadcast the information**

**GEDI
Geoportal**



[https://geoportail.oeil.nc/
FireAlert](https://geoportail.oeil.nc/FireAlert)



**Fire Alert
Service**

[https://www.oeil.nc/fr/page/
fire-alert-subscribe](https://www.oeil.nc/fr/page/fire-alert-subscribe)



METHOD



Using NASA firms that provides fire alerts/informations

- powered with data from four satellites:
SUOMI, NOAA 20, MODIS Aqua & MODIS Terra
- 6 passings per day
- time to send alert from detection: between 2h-4h most of the time



SUOMI (VIIRS) : 23:00 - 02:00 & 12:00 - 15:00

NOAA 20 (VIIRS): 23 :00 – 1 :00 & 12h – 13h

MODIS Terra: 9:00 - 11:00 OR 22:00 - 00:00

MODIS Aqua: 00:00 – 02:00 OR 13:00 - 14:30





Using NASA firms that provides fire alerts/informations

- powered with data from four satellites: SUOMI, NOAA 20, MODIS Aqua & MODIS Terra
- 6 passings per day
- time to send alert from detection: between 2h-4h most of the time

Detection limit

- The fire is too small or not warm enough
- the fire may have started and ended between satellite passes
- cloud cover, heavy smoke, or tree canopy may obscure a fire
- (occasionally the instruments are inoperative)



FIRE ALERT SERVICE



Fire Alert

LINK: <https://www.oeil.nc/fr/page/fire-alert-subscribe>

A subscription page
allowing users to
register accordingly to
their preferences

- Geographical
- Thematic
- Temporal

Fire Alert - Subscribe

Accueil > Fire Alert - Subscribe

Welcome to the Fire Alert subscription page !

Fill out the following form and subscribe to the email fire alert service: it is up to you to decide how often you will receive the alerts, and which criteria should select the fires that will be notified to you*.

NEW SUBSCRIPTION:

[To edit your account, please scroll down to the bottom of the page and use the ACCOUNT UPDATE function]

EMAIL ADDRESS

e.g. name@domain.com

EMAIL DELIVERY FREQUENCY ?

Immediate

SELECT ONE OR MORE AREAS OF INTEREST ?



FIRE ALERT SERVICE



Fire Alert

LINK: <https://www.oeil.nc/fr/page/fire-alert-subscribe>

A subscription page
allowing users to
register accordingly to
their preferences

- Geographical
- Thematic
- Temporal

EMAIL DELIVERY FREQUENCY ?

Immediate

SELECT ONE OR MORE AREAS OF INTEREST ?

☒ COUNTRY

☒ Fiji

☐ DISTRICT

☐ Central Division

☐ Eastern Division

☐ Northern Division

☐ Western Division

SELECT ONE OR MORE THEMES (OPTIONAL) ?

☒ ECONOMY

☒ Agriculture

☒ Roads

☒ Forestry

☒ ENVIRONMENT

☒ CloseForest

☒ OpenForest

☒ Mangrove

FIRE ALERT SERVICE

An email

- contains basic information accordingly to the preferences selected

Period	Area	Fires count	Burned area (in ha)	Thematic	Sub-Thematic	Source	Open map
24/11/2021	Naitasiri	1	0.00	Economy	Roads	VIIRS	Link
24/11/2021	Naitasiri	1	1.83	Environment	OpenForest	VIIRS	Link
24/11/2021	Nadroga_Navosa	1	24.31	Economy	Forestry	VIIRS	Link

Data sources: FOSDIS, O5//, The Fijian Government



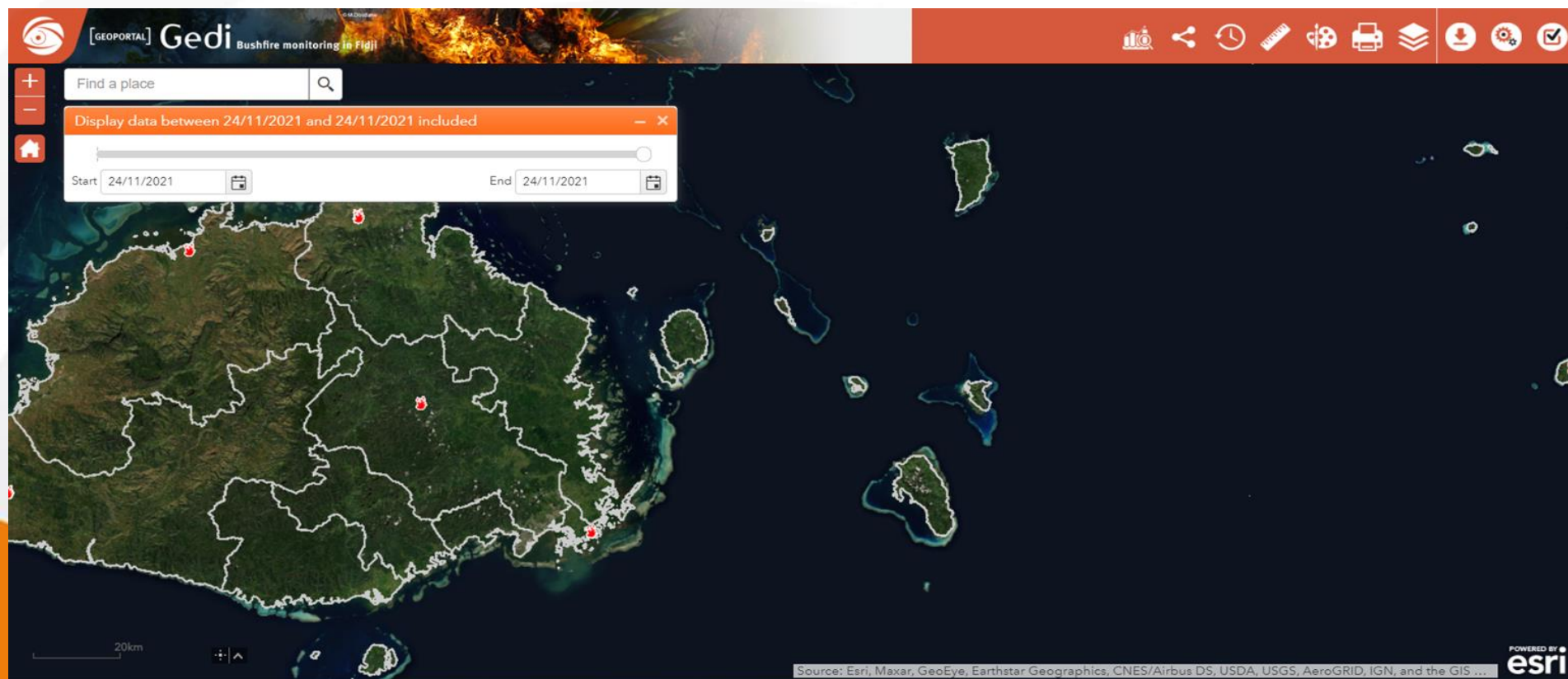
FIRE ALERT SERVICE

An email

- contains basic information accordingly to the preferences selected
- Refers and redirects to a geoportal

Period	Area	Fires count	Burned area (in ha)	Thematic	Sub-Thematic	Source	Open map
24/11/2021	Naitasiri	1	0.00	Economy	Roads	VIIRS	Link
24/11/2021	Naitasiri	1	1.83	Environment	OpenForest	VIIRS	Link
24/11/2021	Nadroga_Navosa	1	24.31	Economy	Forestry	VIIRS	Link

Data sources: FOSDIS, O5//, The Fijian Government



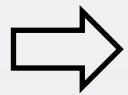
FIRE ALERT SERVICE

- **Inform at the earliest** about the current fires



Users:

Fire management stakeholders (government,...)
Environment Managers, civil society, concerned civilians...



Email Alerts Subscription Service
indicating the active fires detected from the satellites



It is not a substitution to the official information circuit but a contribution



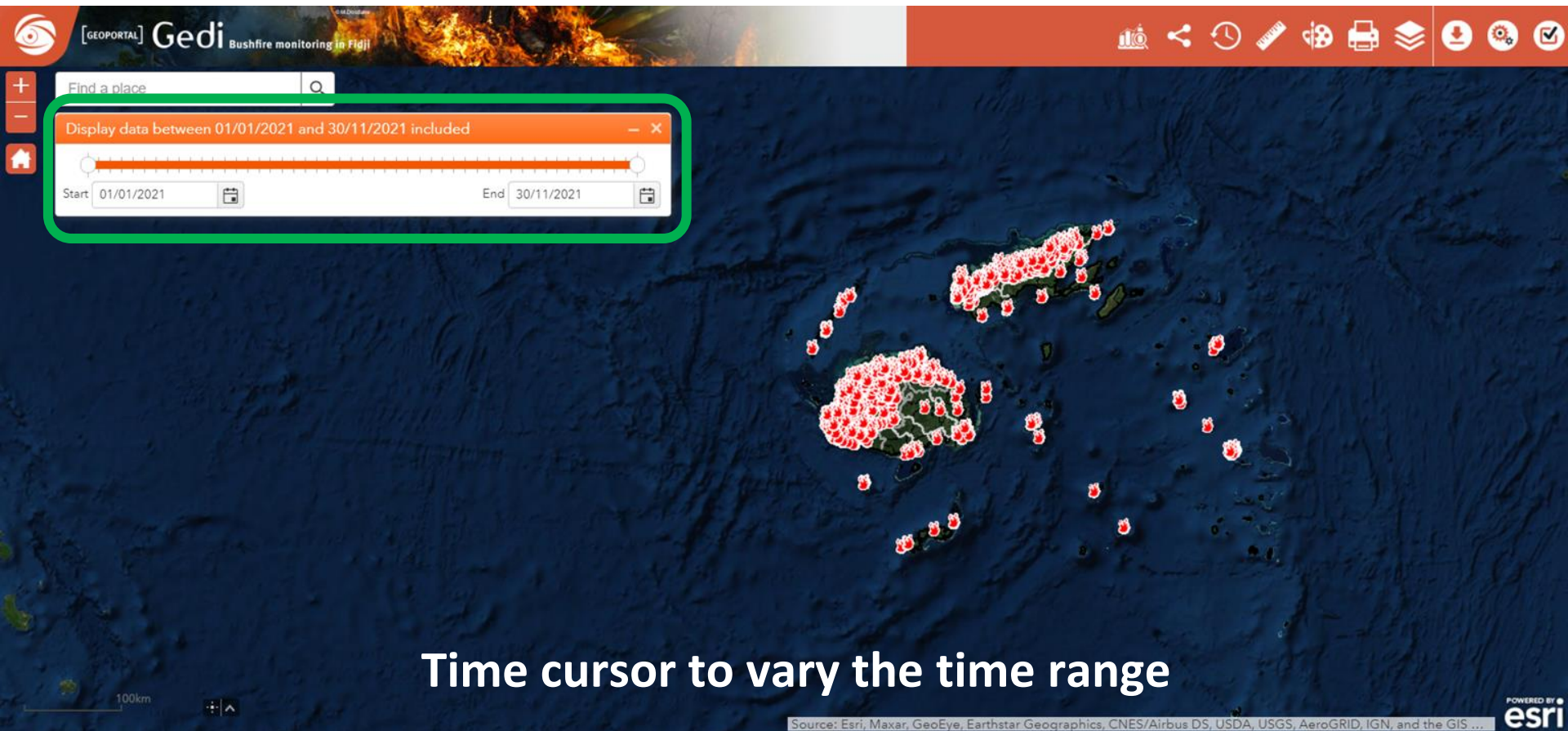
GEDI: Data Consulting and Analysis Platform

LINK: <https://geoportail.oeil.nc/FireAlert>



Webmap, Displaying fires for the last 12 months

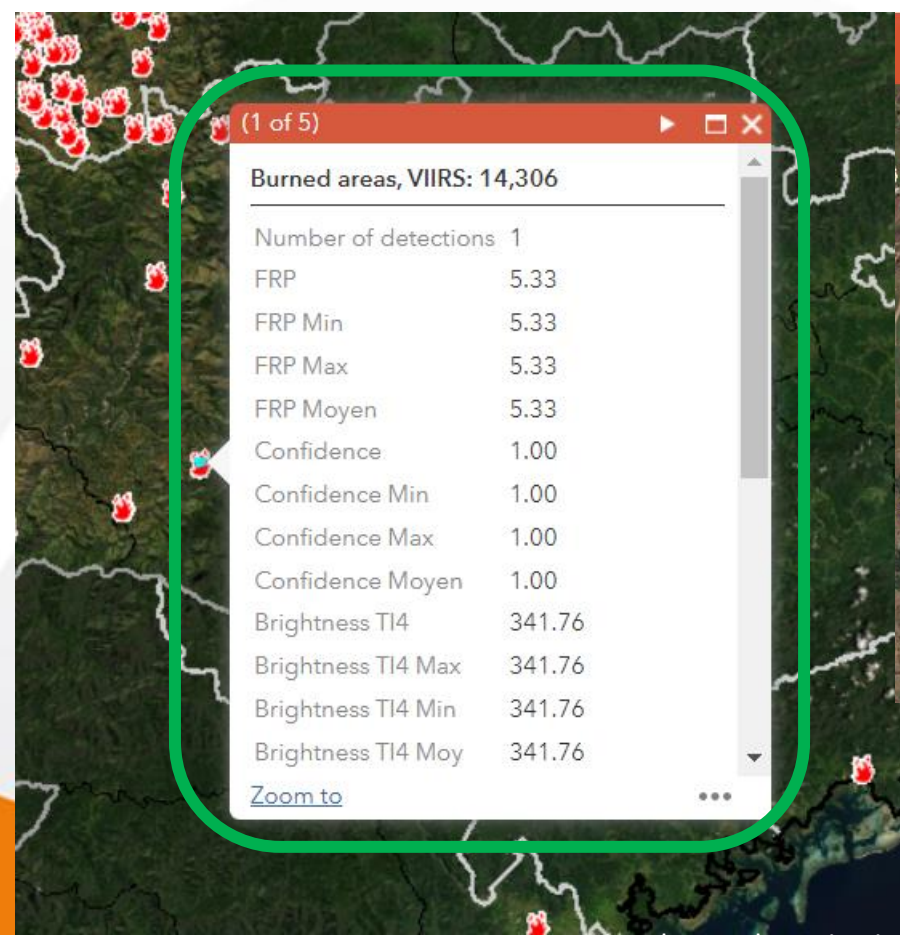
GEDI: Data Consulting and Analysis Platform



GEDi: Data Consulting and Analysis Platform

Tooltip providing data on burnt points and surfaces

Other tools: Measures, labels, print, layers, basemap



GEDi: Data Consulting and Analysis Platform

The screenshot displays the GEDi web application interface. The main map area shows a satellite view of Fiji with numerous red circular markers indicating fire alerts. The top navigation bar includes the GEDi logo and the text "Bushfire monitoring in Fiji". A search bar with the placeholder "Find a place" is located on the left. On the right, a toolbar contains various icons, with the "Analysis" icon (a magnifying glass over a map) highlighted by a green square. Below the toolbar, the "Analysis" sidebar is open, showing "Step 1 : Area of Interest". This step includes a section "Select one or several areas of interest" with a list of checkboxes: "Country", "District" (selected), "Central Division" (checked), "Eastern Division", "Northern Division", "Western Division", "Province", and "Tikina". A warning message states: "Warning : Temporal evolution is displayed only for one area." Below this is a "Next step >" button. The sidebar also shows a list of steps: "Step 2 : Analysis date range", "Step 3 : Source", "Step 4 : Themes", and "Results", each with a dropdown arrow.

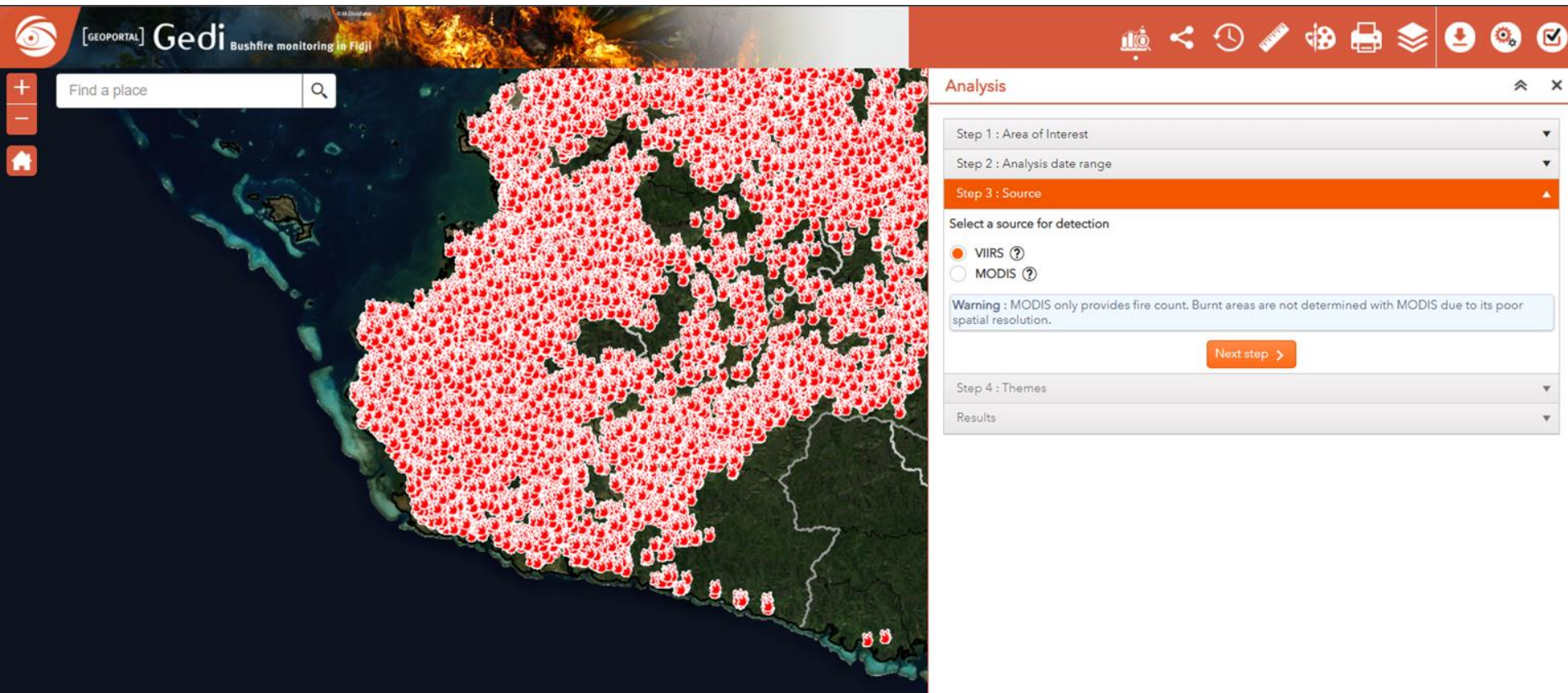
Cross-analysis – Selecting an area of interest

GEDi: Data Consulting and Analysis Platform

The screenshot displays the GEDi web application interface. On the left, a map of Fiji is shown with a dense distribution of red circular markers, each containing a white flame icon, representing fire alerts. A search bar at the top left contains the text "Find a place". The top right of the interface features a red navigation bar with various icons for map functions like zoom, pan, and layers. On the right side, an "Analysis" sidebar is open, showing a sequence of steps: "Step 1 : Area of Interest", "Step 2 : Analysis date range" (which is currently selected and highlighted in orange), "Step 3 : Source", "Step 4 : Themes", and "Results". Under "Step 2", there is a section titled "Select date range for Analysis" with input fields for "Start" (01/01/2021) and "End" (30/11/2021), each accompanied by a calendar icon. A "Next step >" button is located below these fields.

Cross-analysis – Selecting a date range

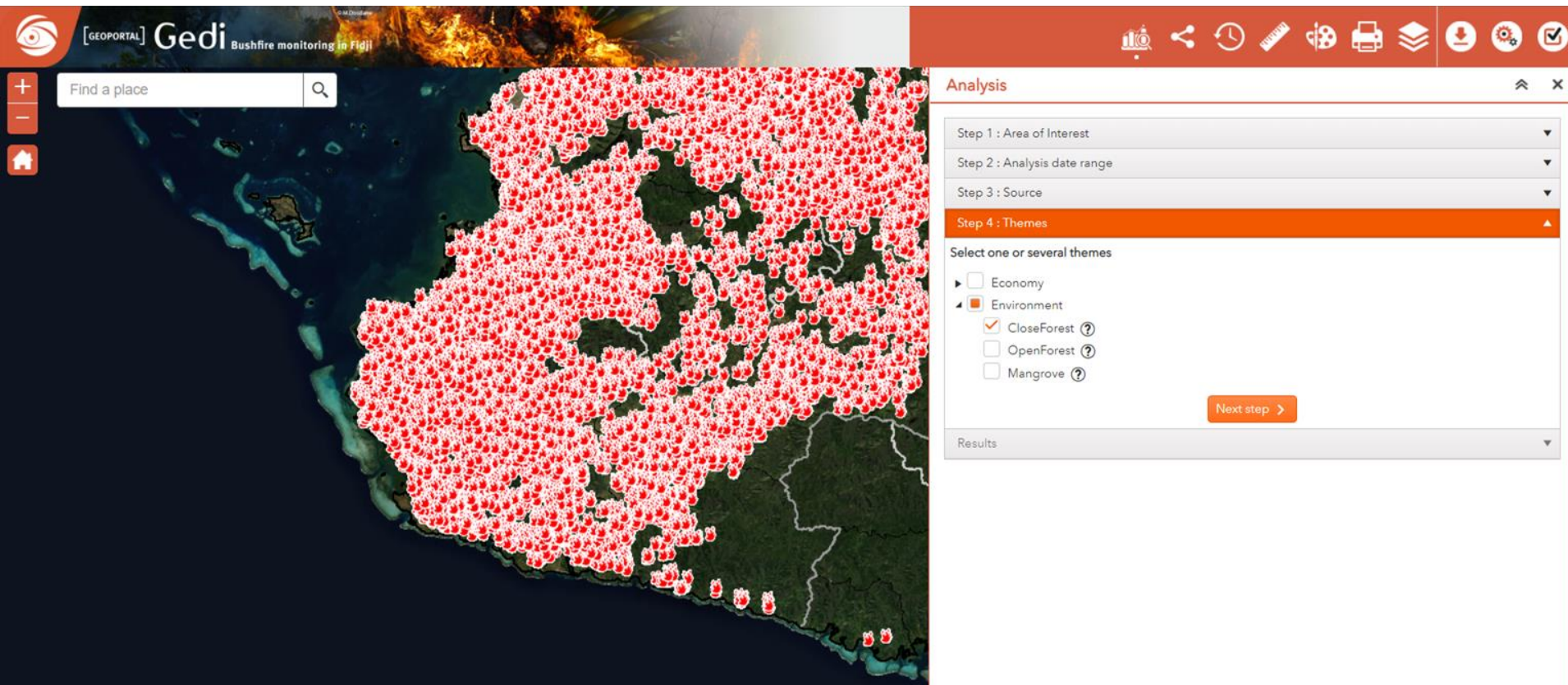
GEDi: Data Consulting and Analysis Platform



The screenshot displays the GEDI web interface. On the left, a map of Fiji is shown with a dense distribution of red circular markers representing fire detections. Above the map is a search bar with the text "Find a place" and a magnifying glass icon. The top navigation bar includes the GEDI logo and the text "Bushfire monitoring in Fiji". On the right, an "Analysis" sidebar is visible, containing a list of steps: "Step 1 : Area of Interest", "Step 2 : Analysis date range", "Step 3 : Source", "Step 4 : Themes", and "Results". The "Step 3 : Source" step is currently selected and highlighted in orange. Below this step, there is a section titled "Select a source for detection" with two radio button options: "VIIRS" (selected) and "MODIS". A warning message states: "Warning : MODIS only provides fire count. Burnt areas are not determined with MODIS due to its poor spatial resolution." Below the warning is a "Next step >" button. The top right of the interface features a row of icons for various functions like sharing, zooming, and printing.

Cross-analysis – Selecting the detection source

GEDI: Data Consulting and Analysis Platform



The screenshot displays the GEDI web application interface. The main map area shows a satellite view of Fiji with numerous red circular markers indicating fire alerts. The interface includes a top navigation bar with the GEDI logo and a search bar. On the right, there is an 'Analysis' sidebar with a list of steps: Step 1: Area of Interest, Step 2: Analysis date range, Step 3: Source, and Step 4: Themes. Step 4 is currently selected, showing options to select one or several themes. The 'Environment' theme is selected, and the 'CloseForest' sub-theme is checked. A 'Next step >' button is visible. The bottom of the interface features a large orange banner with the text 'Cross-analysis – Selection of thematic layers' and a GEDI logo.

Analysis

- Step 1 : Area of Interest
- Step 2 : Analysis date range
- Step 3 : Source
- Step 4 : Themes**

Select one or several themes

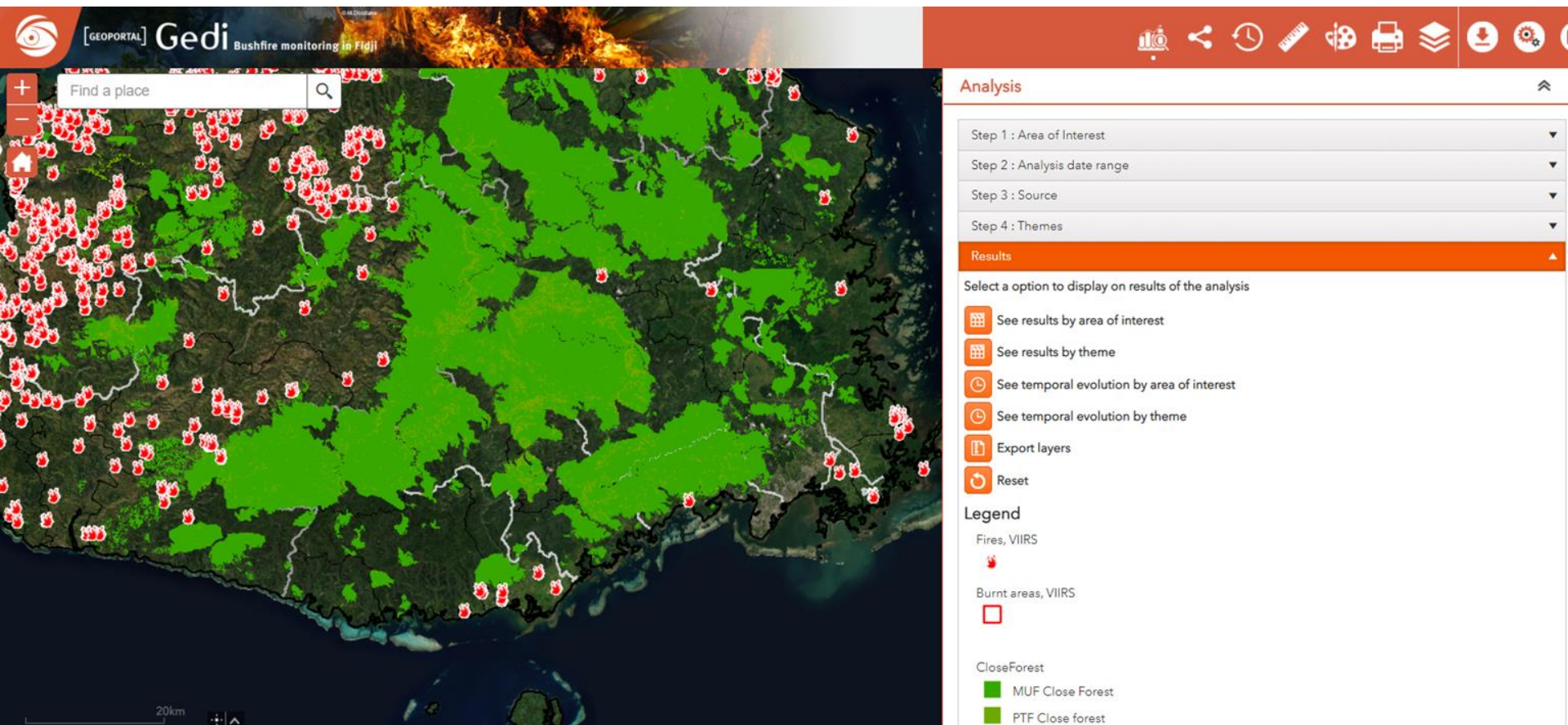
- ☐ Economy
- ☒ Environment
 - ☒ CloseForest ?
 - ☐ OpenForest ?
 - ☐ Mangrove ?

Next step >

Results

Cross-analysis – Selection of thematic layers

GEDi: Data Consulting and Analysis Platform



Cross-analysis – Displaying results, filtering the map and adjusting the caption

GEDl: Data Consulting and Analysis Platform

Fire statistics from 1/01/2021 to 30/11/2021

Aggregation period: Day Week **Month** Year

Export to Excel Export to PDF

Drag a column header and drop it here to group by that column

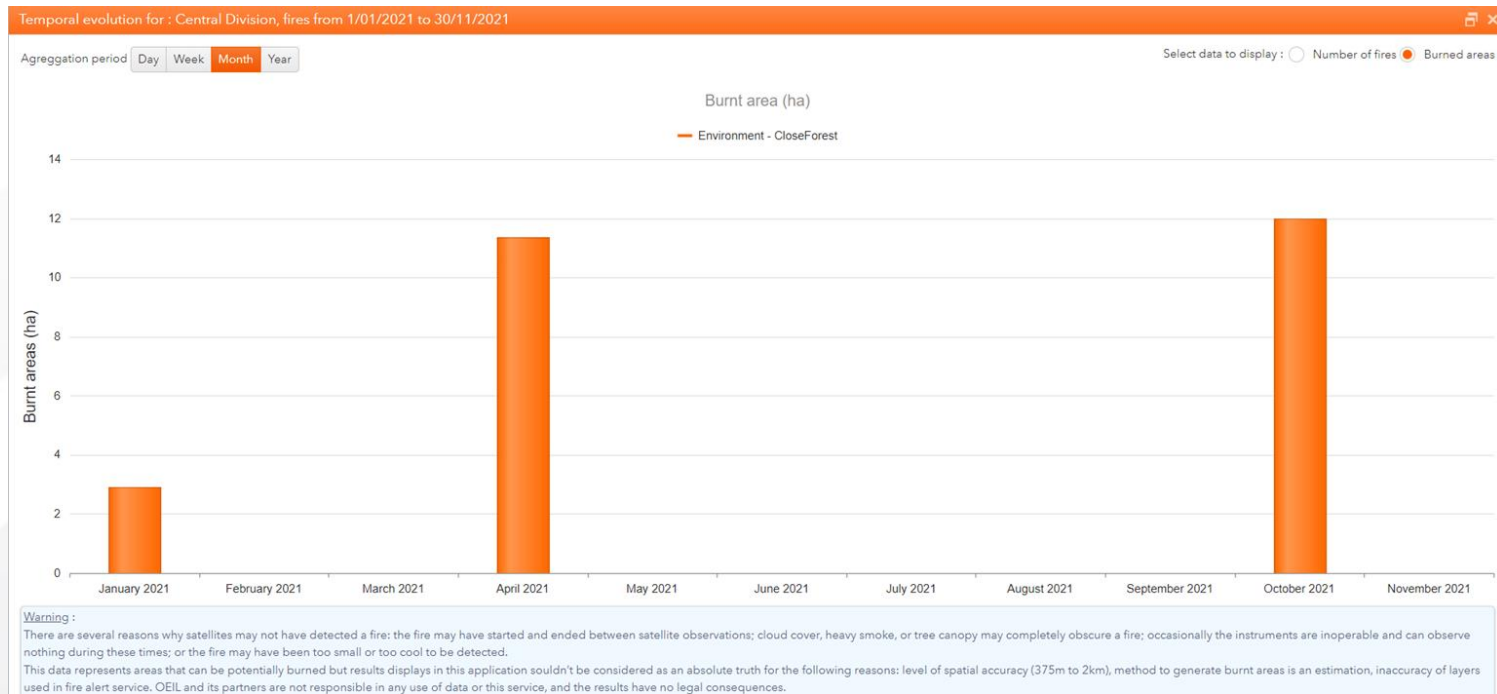
Period ↑	Area ↑	Thematic ↑	Sub-thematic ↑	Fires count	Burnt area (ha)
January 2021	Central Division	Environment	CloseForest	1	2.91
April 2021	Central Division	Environment	CloseForest	1	11.37
October 2021	Central Division	Environment	CloseForest	2	11.98
				Total : 4	Total : 26.26

Warning :
There are several reasons why satellites may not have detected a fire: the fire may have started and ended between satellite observations; cloud cover, heavy smoke, or tree canopy may completely obscure a fire; occasionally the instruments are inoperable and can observe nothing during these times; or the fire may have been too small or too cool to be detected.
This data represents areas that can be potentially burned but results displays in this application couldn't be considered as an absolute truth for the following reasons: level of spatial accuracy (375m to 2km), method to generate burnt areas is an estimation, inaccuracy of layers used in fire alert service. OEIL and its partners are not responsible in any use of data or this service, and the results have no legal consequences.

Cross analysis – Displaying results as a table



GEDl: Data Consulting and Analysis Platform



Cross-analysis – Displaying results as a chart



GEDi: Data Consulting and Analysis Platform

[illegible]

Export.pdf

1 / 1

61%

Export to Excel

Export to PDF

Drag a column header and drop it here to group by that column

Period ↑	Area ↑	Thematic ↑	Sub-thematic ↑	Fires count	Burnt area (ha)
January 2021	Central Division	Environment	CloseForest	1	2.91
April 2021	Central Division	Environment	CloseForest	1	11.37
October 2021	Central Division	Environment	CloseForest	2	11.98
				Total : 4	Total : 26.26

Cross-analysis – Excel and PDF Export

GEDI: Data Consulting and Analysis Platform

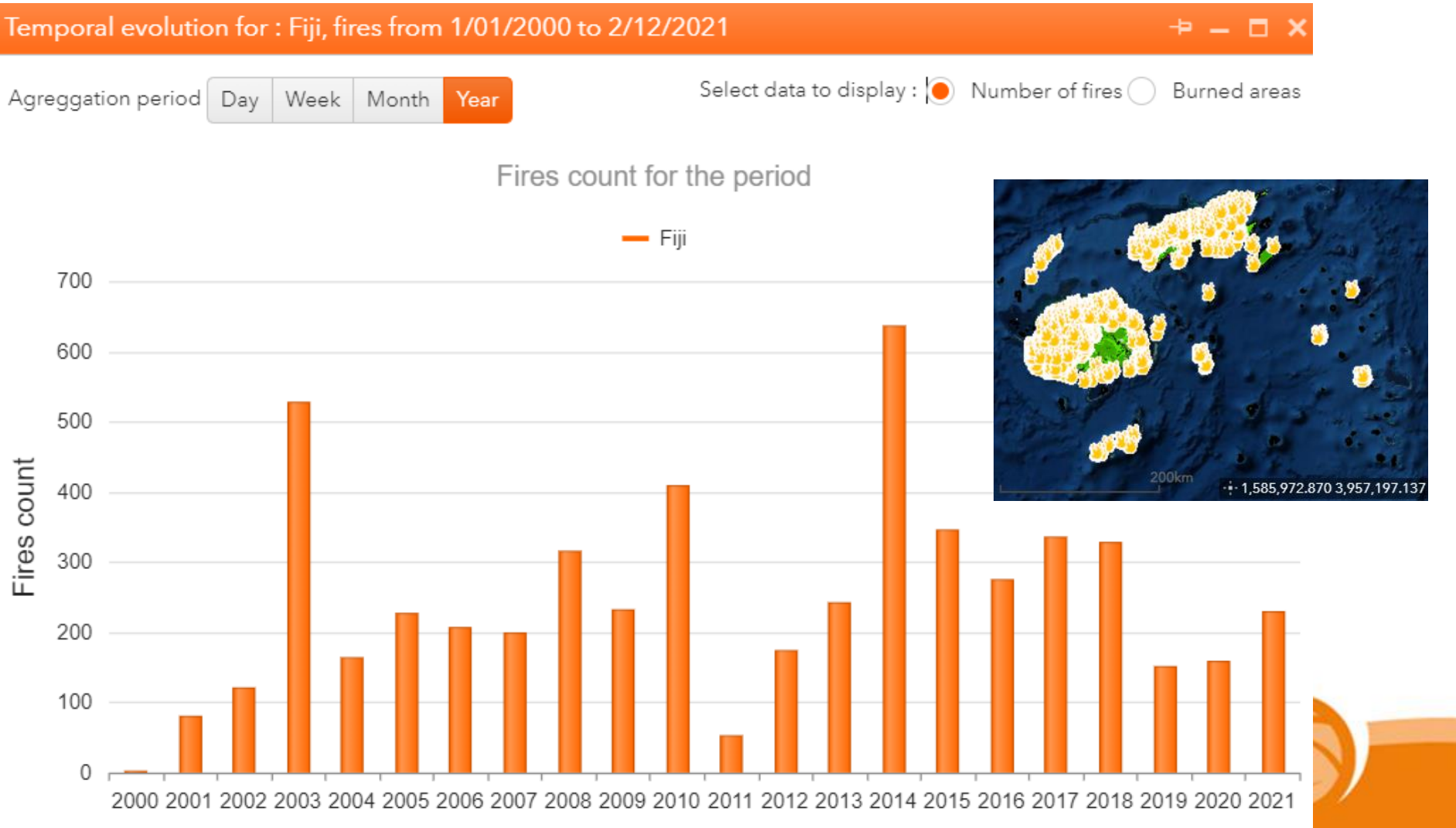
The screenshot displays the GEDI web application interface. The main map shows a satellite view of Fiji with numerous red fire alert icons and green shaded areas representing burnt regions. A search bar at the top left contains the text "Find a place". A "Share map" dialog box is open, showing a URL: <https://geoportal.oeil.nc/FireAlert/?xmin=1858461.0989807341&ymin=3841103...> and a "Copy link" button. The right sidebar contains an "Analysis" panel with steps: Step 1: Area of Interest, Step 2: Analysis date range, Step 3: Source, and Step 4: Themes. Below these is a "Results" section with options to display results by area of interest, theme, or temporal evolution, along with "Export layers" and "Reset" buttons. A "Legend" section at the bottom right identifies "Fires, VIIRS" (red icon), "Burnt areas, VIIRS" (red square), and "CloseForest" (green squares for MUF and PTF).

Sharing analysis

RESULT

S

Exemple: annual fire count in Fiji since 2001 (MODIS)



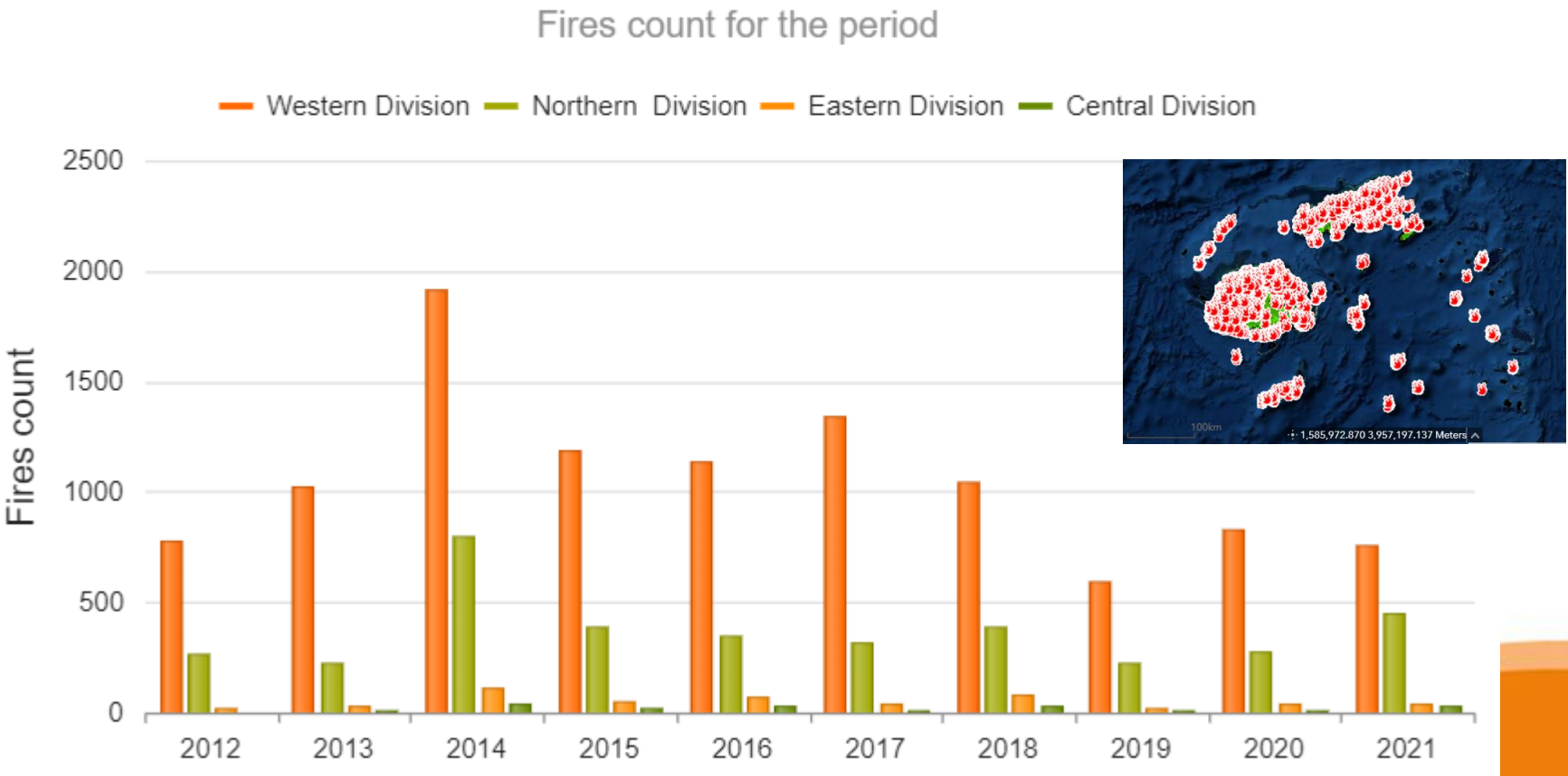
RESULT

S

Exemple: annual fire count per geographical area (VIIRS)

Temporal evolution for : Western Division, Northern Division, Eastern Division, Central Division, fires from

Agregation period Day Week Month Year Select data to display : ☒ Number of fires ☐ Burned areas



RESULT

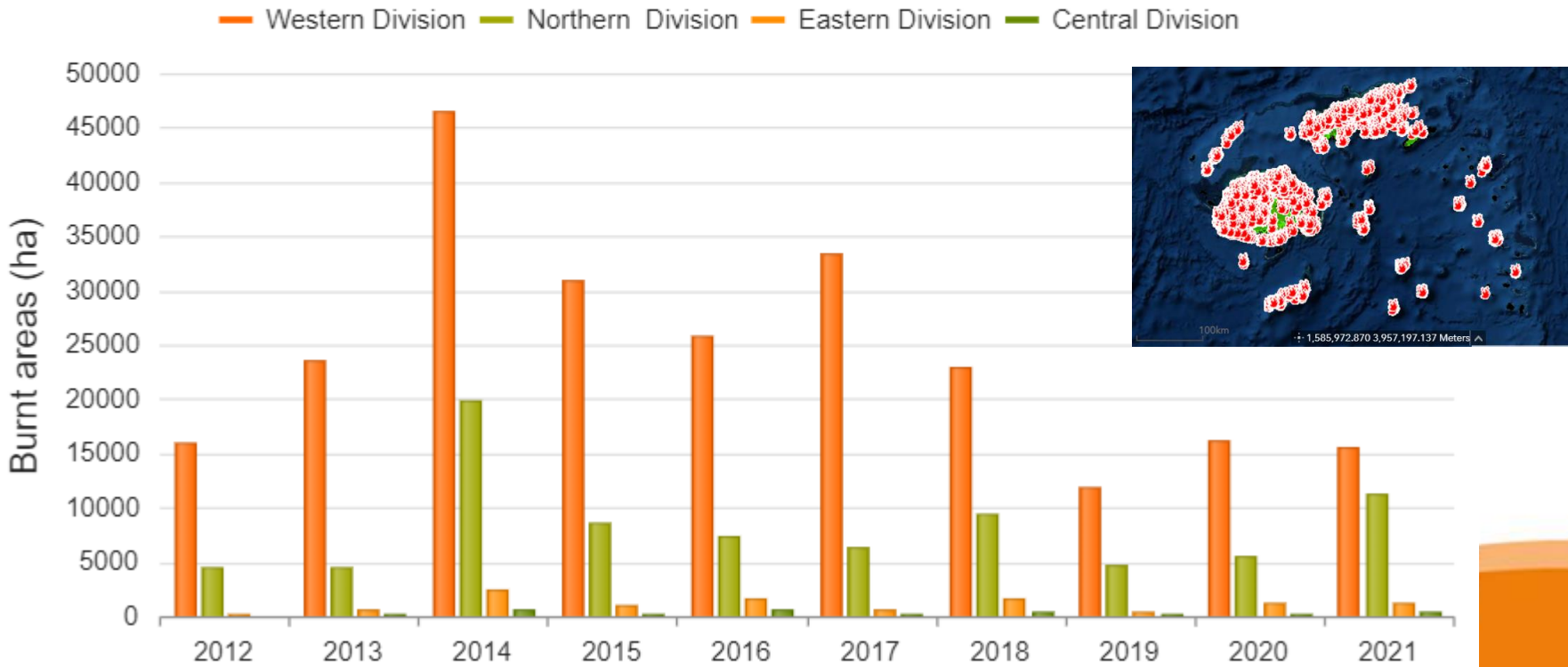
S

Exemple: annual burnt aera per geographical area (VIIRS)

Temporal evolution for : Western Division, Northern Division, Eastern Division, Central Division, fires from 2012 to 2021

Agregation period Day Week Month Year Select data to display : ☐ Number of fires ☒ Burned areas

Burnt area (ha)

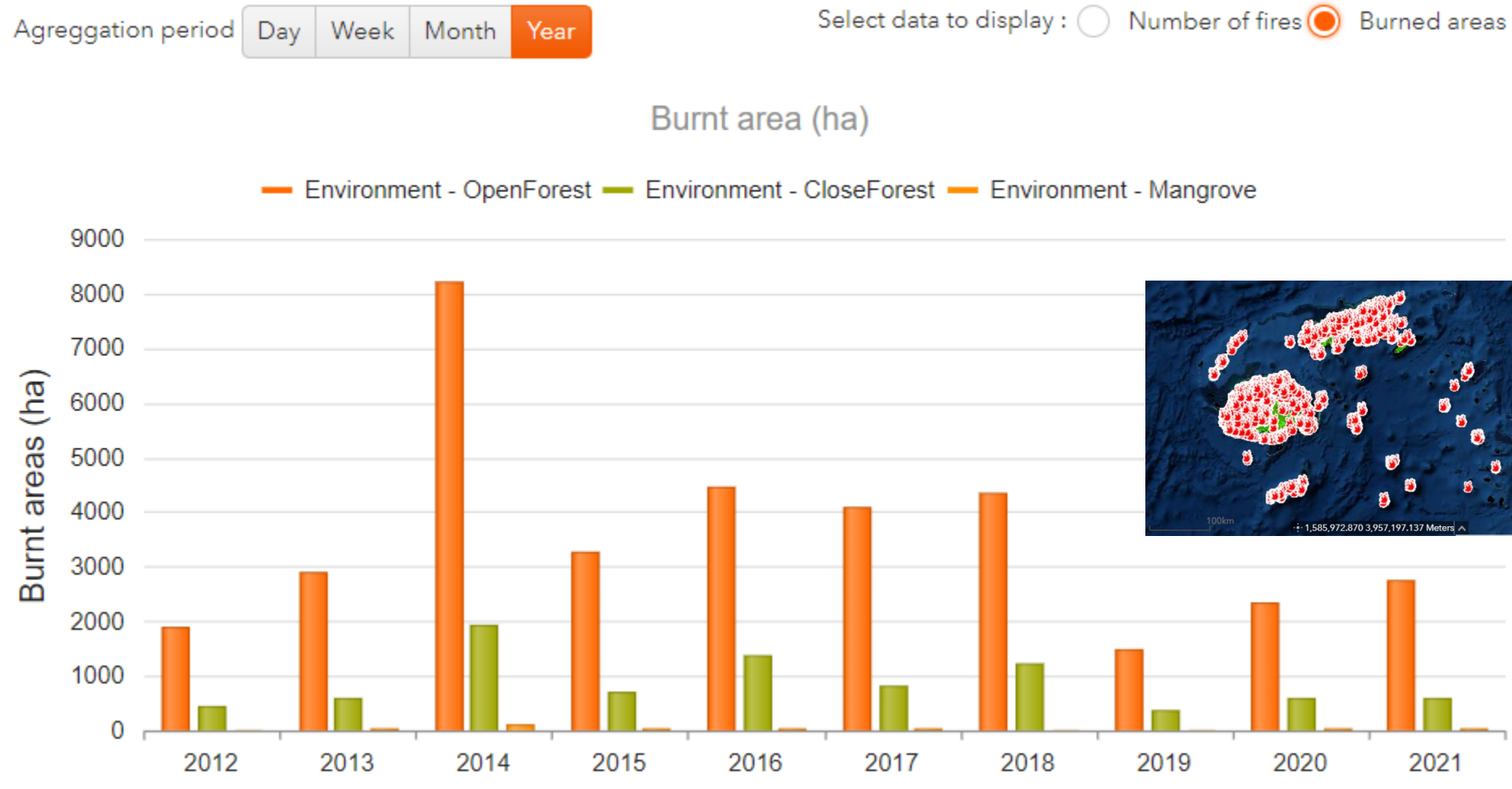


RESULT

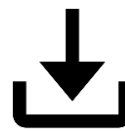
S

Exemple: annual burnt aera per type of vegetation (VIIRS)

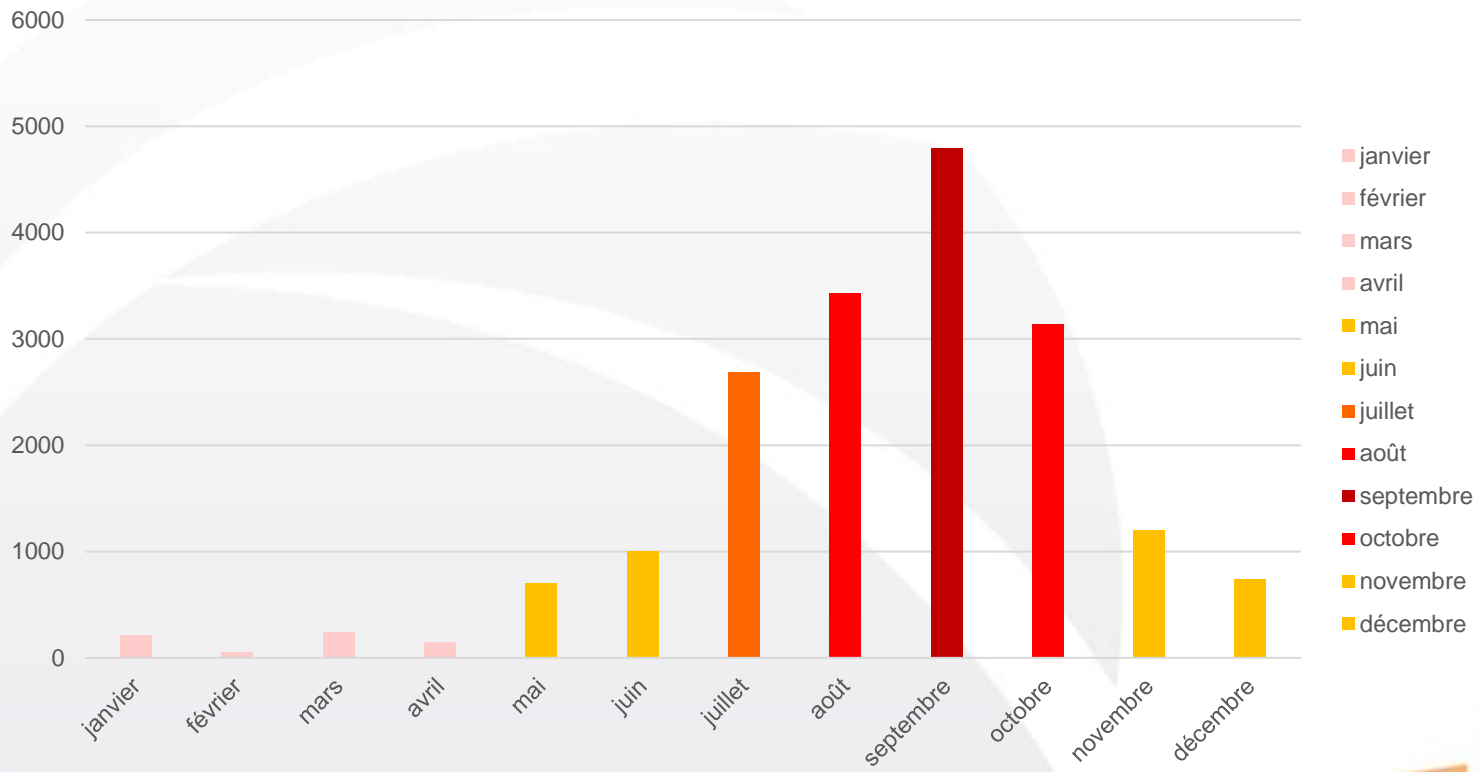
Temporal evolution for : Fiji, fires from 1/01/2012 to 2/12/2021



Seasonal analysis of bushfires in Fiji



Monthly accumulation of fire departures in FIJI
from SUOMI – VIIRS(2012-2017)



Source : OEIL, EOSDIS, NASA, Université Maryland, NOAA

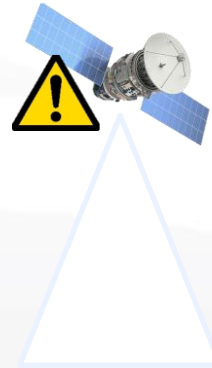


RESULTS



NEXT STEPS

- Improve data treatment related to fijian particularities (e.g. solar exploitation, industries...)



NEXT STEPS

- Improve data treatment related to fijian particularities (e.g. solar exploitation, industries...)
- Organise a proper training to handle the application



Stakeholders:

- **Institution**
- **Local communities**
- **NGOs**
- **Medias**
- **Schools...**



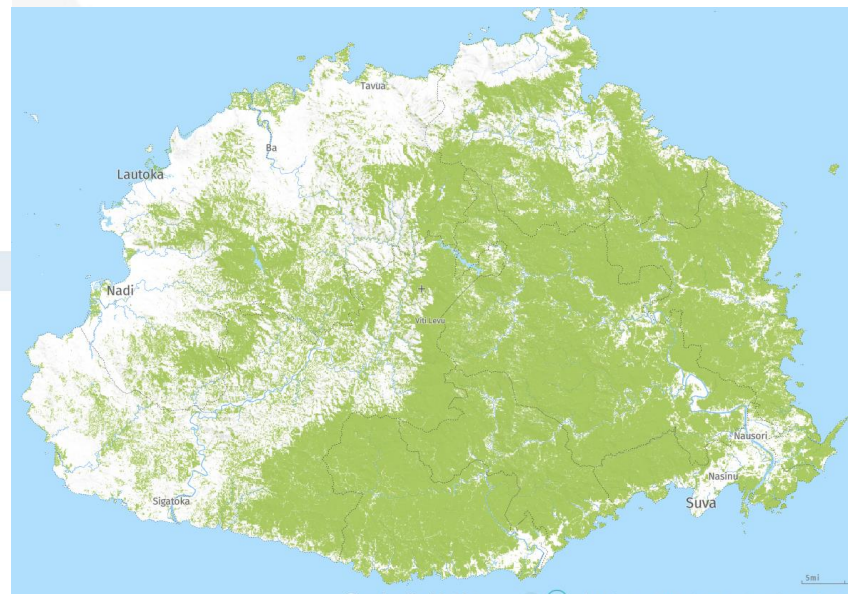
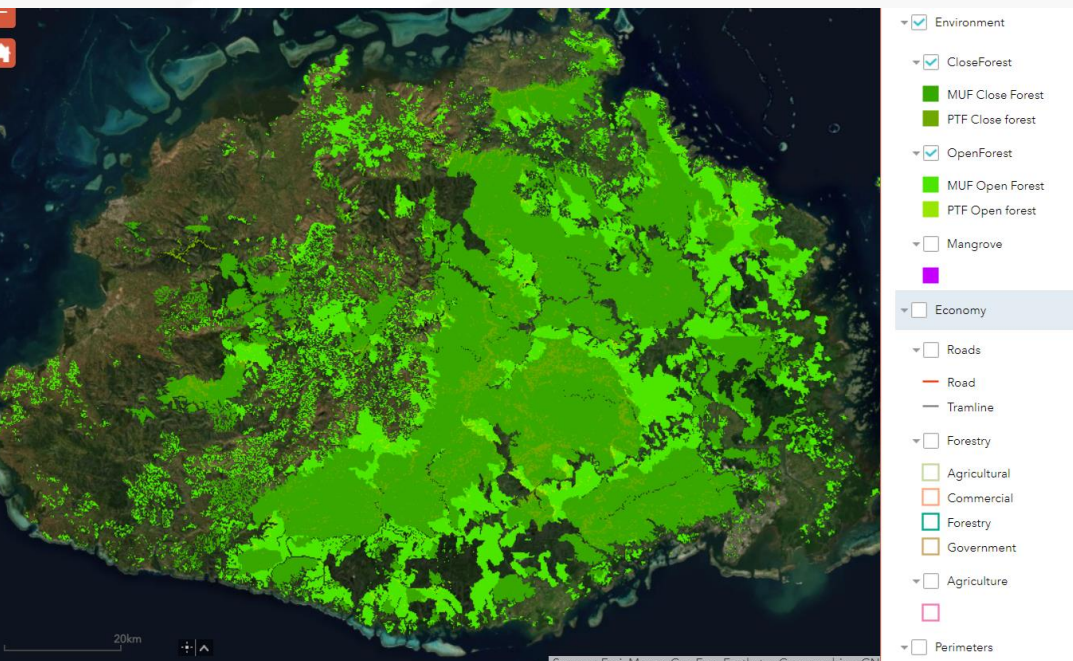
NEXT STEPS

- Improve data treatment related to fijian particularities (e.g. solar exploitation, industries...)
- Organise a proper training to handle the application
- Add new geographical information of interest in the system (ie. Global forest watch...)



NEXT STEPS

- Improve data treatment related to fijian particularities (e.g. solar exploitation, industries...)
- Organise a proper training to handle the application
- Add new geographical information of interest in the system (e.g. Global forest watch...)



NEXT STEPS

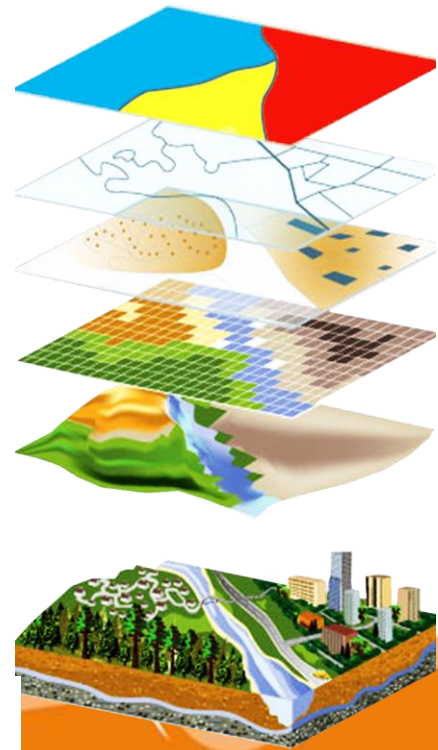
- Improve data treatment related to fijian particularities (e.g. solar exploitation, industries...)
- Organise a proper training to handle the application
- Add new geographical information of interest in the system (e.g. Global forest watch...)

Currently 4 types of specific geographical information:

- Vegetation (close forest, open forest, mangroves)
- Roads
- Forestry
- Administrative / customary perimeters

Other potential layers of interest:

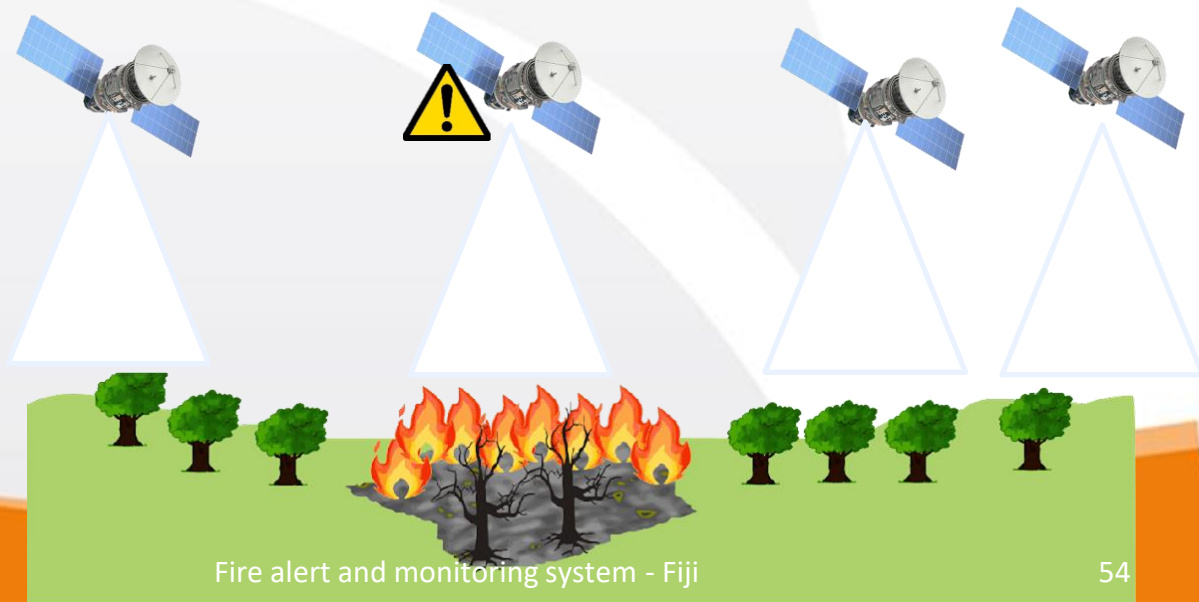
- Protected areas
- Freshwater resource (catchment)
- Buildings
- Threatened species...



More information = More analysis power

NEXT STEPS

- Improve data treatment related to fijian particularities (e.g. solar exploitation, industries...)
- Organise a proper training to handle the application
- Add new geographical information of interest in the system (ie. Global forest watch...)
- Improve the system through the implementation of potential additional satellites data



NEXT STEPS

- Improve data treatment related to fijian particularities (e.g. solar exploitation, industries...)
- Organise a proper training to handle the application
- Add new geographical information of interest in the system (ie. Global forest watch...)
- Improve the system through the implementation of potential additional satellites data

PROJECT SYPAFI

APpropriation of the Fire Alert SYstem by Fijian stakeholders

funded by the french pacific funds with technical support from SPC and CIL

A project that has been delayed and needs to be carried out



Fire alerte :

14 % of fires were known from Fire Alert System first

Early detection is the best natural resource management measure



IUCN : Red list Authority, use burned area to adjust priority indicator of endangered species

Recherche Chronik : comportement des déplacements des métaux suite à des incendies (quand, où, superficie)

Priorisation dans la réhabilitation :

- Forêt de saïlle
- Adaptions des mesures compensatoires

Et les surfaces non brûlées:

- Transplantation d'espèces rares et menacées
- Mesure de protection des patchs de forêts / lisières restantes après un incendie



VINAKA VAKALEVU / MERCI !

OEIL - Observatoire de l'Environnement en Nouvelle-Calédonie

fabien.albouy@oeil.nc

adrien.bernaud@oeil.nc

Tel : (687) 23 00 22 / (+687) 74 03 99

PARTNERS AND DATA PROVIDER



OEIL

Observatoire de
l'environnement
Nouvelle-Calédonie



Pacific
Community
Communauté
du Pacifique



GOUVERNEMENT DE LA
**NOUVELLE
CALÉDONIE**



GOUVERNEMENT

*Liberté
Égalité
Fraternité*



**THE FIJIAN
GOVERNMENT**

