

# Cross Forest

INEA/CEF/ICT/A2017/1566738

FRAME: Forest fiRes Advanced ModElization

*Felipe Aguirre Briones, Víctor Gonzalvo Morales.*

[www.crossforest.eu](http://www.crossforest.eu)

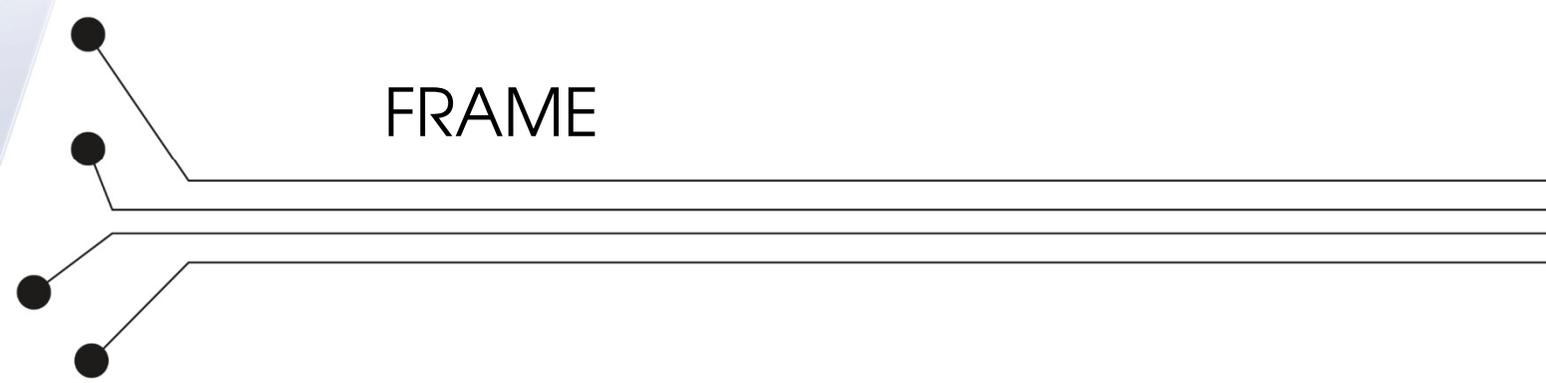


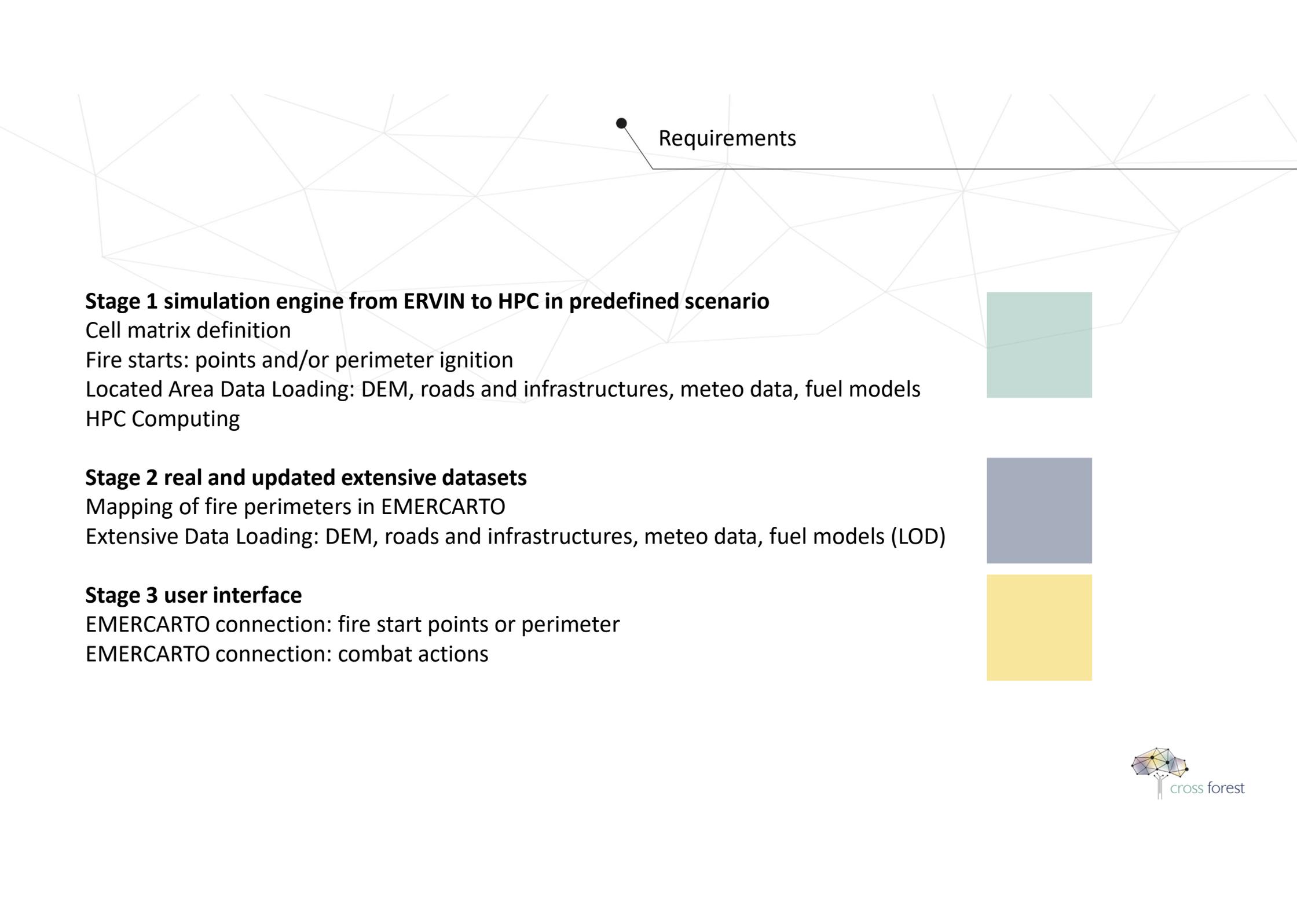
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FRAME





Requirements

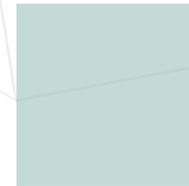
**Stage 1 simulation engine from ERVIN to HPC in predefined scenario**

Cell matrix definition

Fire starts: points and/or perimeter ignition

Located Area Data Loading: DEM, roads and infrastructures, meteo data, fuel models

HPC Computing



**Stage 2 real and updated extensive datasets**

Mapping of fire perimeters in EMERCARTO

Extensive Data Loading: DEM, roads and infrastructures, meteo data, fuel models (LOD)



**Stage 3 user interface**

EMERCARTO connection: fire start points or perimeter

EMERCARTO connection: combat actions



## Requirements

What will be fire perimeter at the hour "x"?

Will fire reach a specific point? At which hour?

What will be flame length or fire intensity at a specific point and hour?

What will be rate of spread at a specific point and hour?

Will fire exceed track or barrier, "x" meters wide, in his predicted progress?

Such a municipality will be affected? Such a natural space? In which proportion?

Which roads or paths will intersect the predicted progress of fire?

What will be the affected surface at a specific moment?

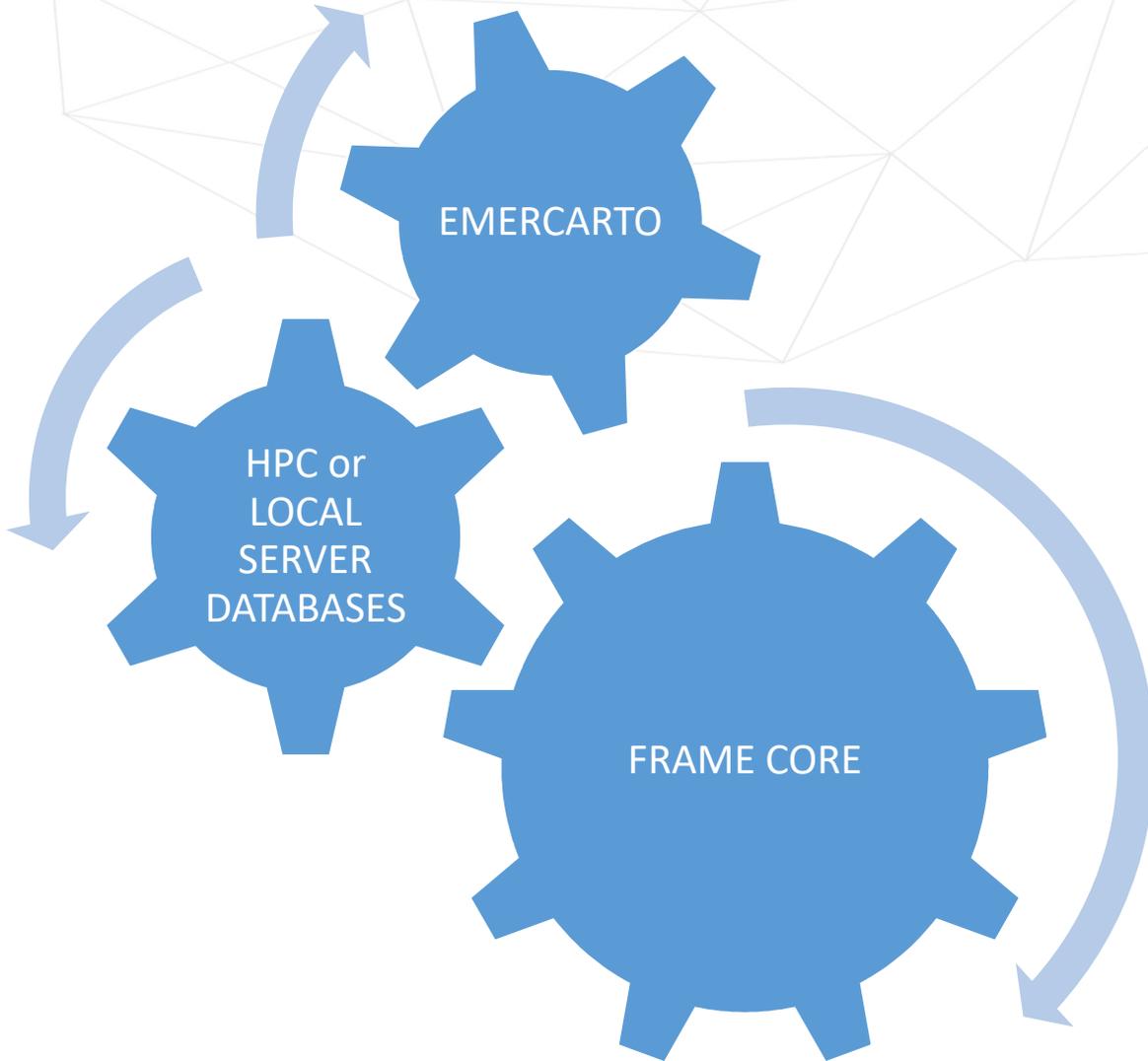
What will be maximum registered fire intensity and rate of spread? At what points?

Wind direction or slope at a certain place and at any given time?

What is the type of vegetation at a certain place and at any given time? What percentage of burned area, according to the type of vegetation, will be affected in each case?

Within an active perimeter at a given time, which is the most active point, that is, with higher rate of spread or fire intensity?

## Data flow



```
{
  "id": -1,
  "date": "08/06/2021 12:00:00",
  "enddate": "08/06/2021 13:00:00",
  "interval": [
    15,
    15,
    15,
    15
  ],
  "extension": [
    -6.4,
    40.35,
    -6.36,
    40.38
  ],
  "focus": {
    "type": "FeatureCollection",
    "features": [
      {
        "type": "Feature",
        "geometry": {
          "type": "Point",
          "coordinates": [
            -6.398796920776366,
            40.37896582116329
          ]
        },
        "properties": null
      },
      {
        "type": "Feature",
        "geometry": {
          "type": "Point",
          "coordinates": [
            -6.398797,
            40.378966
          ]
        },
        "properties": null
      }
    ]
  },
  "weather": [
    {
      "humidity": 75,
      "temperature": 35,
      "windSpeed": 15,
      "windAngle": 270,
      "date": "08/06/2021 12:00:00"
    },
  ]
}
```

Input datasets



Fuel layer:  
Spanish Forestry Map (MFE)  
Portuguese Forestry Map (COS2018)



Topo layer:  
DEM (digital elevation model)  
Spain 5x5 meters  
Portugal 25x25 meters



Meteo layer:  
Spanish AEMET  
Portuguese IPMA



Roads and infrastructures layer

Fuel data transformation

LOD  
MFE50

- TIPESTR
- TFCCARB
- TFCCTOT

MFE25

- TIPESTR / FCCARB /
- FCCMAT / FCCHER / FCCTOT
- FORARB / FORMAT / FORMAT2 / HMMAT
- ETES

COS

- COS2018\_n4

I  
W  
H  
Vp

## User interface on EMERCARTO

The screenshot displays the EMERCARTO web application interface. At the top, a blue navigation bar contains the EMERCARTO logo and menu items: Map viewer, Management, Reports, Administration, and Simulation. On the right side of the navigation bar, there are user profile icons for 'aguirre' and notification counts (7 and 10). The main area is a satellite map of a forested region with a network of roads and rivers. A vertical scale bar on the left shows a value of 15. A small inset map in the bottom-left corner provides a broader geographical context. A scale bar at the bottom right of the map indicates 500 meters. On the right side, a sidebar contains several panels: 'Tools' with options like Raster, IGN Grid, Search, Spot information, Filter for incidents, Query by date, Tracking, Print, Coordinate format, Reassigner IMEI a medio, and Simulation; 'Measure Tools'; 'Layers' with a list of map layers including Mobile Media, Incidents, Multimedia, Indidence Area, Notations, POI, Water Resources, Bases, Tower, Infrastructure, and Zones; and 'Tracks'. The URL at the bottom left is <https://emercarto2pre.tragsatec.es/Test/Herramientas/Simulacion>.

# User interface on EMERCARTO

The screenshot displays the EMERCARTO web application interface. At the top, a navigation bar includes the EMERCARTO logo and menu items: Map viewer, Management, Reports, Administration, and Simulation. The Simulation menu is active, showing a notification icon with '7' and a user profile icon for 'aguirre'.

The main content area is titled 'Simulación' and contains several input fields:
 

- Description:** A large text area for simulation details.
- Simulation interval (minutes):** A dropdown menu set to '15.00'.
- start date simulation:** A date and time picker set to '06/22/2021 15:50:19'.
- end date simulation:** A date and time picker set to '06/22/2021 16:50:19'.

Below these fields is a map interface with a topographic map showing terrain contours and elevation. The map includes several control buttons: '+ Add box', '+ Focus', '+ Front', 'Delete focus', 'Delete front', and 'Info. MFE cal'. An 'Info MFE' popup window is open over the map, displaying the following information:

**Informacion MFE**

**TipoEstructura**  
 AFM (RIBERAS): Tienen cabida en esta clase las teselas que presentan arbolado fuera del monte, es decir, rodeado de otras teselas no forestales y que se encuentra junto a los cauces de los rios

**FormArborea**  
 Pinares de Pinus pinaster en la región biogeográfica mediterránea

**FormArbustiva**  
 Brezales de mesófilos a xerófilos y hiercolares, puros o mixtos (incluyendo matorrales mixtos de Ericáceas)

**FormHerbacea**  
 Sin datos

ETES	FCCARB	FCCMAT	FCCHER
2	15	75	10
FCCTOT	HMMAT		
100	10		

At the bottom left, there are two manual input sections: 'Foco manual' with 'Focus X' and 'Focus Y' fields, and 'Caja manual' with 'Initial X' and 'Final X' fields. Both sections have an 'Add box' button. Additionally, there are buttons for 'Send simulation' and 'Json Simulación'.

# User interface on EMERCARTO

**EMERCARTO** Map viewer Management Reports Administration Simulation 10 aguirre

### Simulación

Simulation interval (minutes): 15.00 start date simulation: 06/22/2021 17:49:31 end date simulation: 06/22/2021 18:49:31

Provincia: CACERES Municipio: Pínofranqueado

Datos meteorológicos + Nueva condición

Humedad	Temperatura	Velocidad ...	Angulo Viento	Fecha	
60	25	15	180	06/22/2021 17:49:33	

Send simulation Json Simulación

**Foco manual**

Focus X:

Focus Y:

Add focus

**Caja manual**

Initial X:  Initial Y:

Final X:  Final Y:

Add box

**Map Controls:** + Add box + Focus + Front Delete focus Delete front Info. MFE cal Info MFE

**Map:** Topographic map showing a simulation area outlined in red. The map includes various geographical features and labels.

>>> USER CASE

SCAYLE connection, massive iterations

Fuel model (type)	Temperature (°C)	Relative humidity (%)	Wind speed (Km/hour)	Wind direction (degrees)
1.- Pasto	1.- 0	1.- 10	1.- 0	1.- 0
2.- Pasto alto	2.- 10	2.- 30	2.- 10	2.- 90
3.- Matorral	3.- 20	3.- 50	3.- 20	3.- 180
	4.- 30	4.- 70	4.- 30	4.- 270
	5.- 40		5.- 40	

aguirre

end date simulation  
6/21/2021 4:39:05 PM

Total perimetros: 47

Info. MFE cal Info MFE

Caja manual

Initial X	Initial Y
-6.39453259749159	40.3516669323338
Final X	Final Y
-6.3527330522035	40.3801797754227

# Cross-border exercises



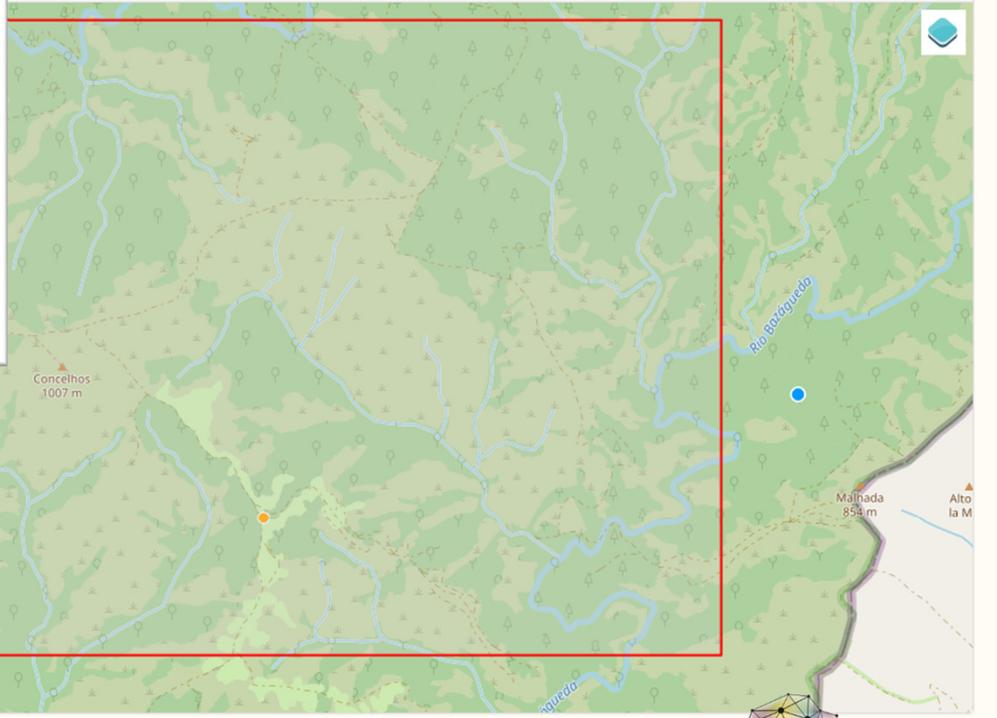
COS2018_Makata_clip	COS2018_Makata_clip	COS2018_Makata_clip	COS2018_Makata_clip	COS2018_Makata_clip	COS2018_Makata_clip	COS2018_Makata_clip	COS2018_Makata_clip	COS2018_Makata_clip	COS2018_Makata_clip
AREA	M	W	Vg	Geom					
1 Pastagens	3.1.1.1	3.1.1.1	Pastagens melhoradas	6.721361	18840	0.29	0.005	50	
2 Pastagens	3.1.1.1	3.1.1.1	Pastagens melhoradas	20.100397	18840	0.29	0.005	50	
3 Florestas	5.1.1.2	5.1.1.2	Florestas de azobinha	409.66230	18840	0.35	0.012	20	
4 Florestas	5.1.1.2	5.1.1.2	Florestas de azobinha	225.71354	18840	0.35	0.012	20	
5 Florestas	5.1.1.2	5.1.1.2	Florestas de azobinha	258.09424	18840	0.35	0.012	20	
6 Florestas	5.1.1.2	5.1.1.2	Florestas de azobinha	536.97022	18840	0.35	0.012	20	
7 Florestas	5.1.1.2	5.1.1.2	Florestas de azobinha	523.689486	18840	0.35	0.012	20	
8 Florestas	5.1.1.6	5.1.1.6	Florestas de eucalipto	6.347442	20000	1.2	0.033	25	
9 Florestas	5.1.1.7	5.1.1.7	Florestas de outras folhosas	9.15317	15000	1.2	0.01	100	
10 Florestas	5.1.1.7	5.1.1.7	Florestas de outras folhosas	4.82035	15000	1.2	0.01	100	
11 Florestas	5.1.1.7	5.1.1.7	Florestas de outras folhosas	14.57312	15000	1.2	0.01	100	
12 Florestas	5.1.2.1	5.1.2.1	Florestas de pinheiro bravo	4.532738	20000	1.2	0.033	25	
13 Florestas	5.1.2.1	5.1.2.1	Florestas de pinheiro bravo	13.47802	20000	1.2	0.033	25	
14 Florestas	5.1.2.1	5.1.2.1	Florestas de pinheiro bravo	20.85222	20000	1.2	0.033	25	
15 Florestas	5.1.2.1	5.1.2.1	Florestas de pinheiro bravo	9.063916	20000	1.2	0.033	25	
16 Florestas	5.1.2.1	5.1.2.1	Florestas de pinheiro bravo	9.696796	20000	1.2	0.033	25	
17 Florestas	5.1.2.1	5.1.2.1	Florestas de pinheiro bravo	12.157962	20000	1.2	0.033	25	
18 Florestas	5.1.2.1	5.1.2.1	Florestas de pinheiro bravo	26.48166	20000	1.2	0.033	25	
19 Florestas	5.1.2.1	5.1.2.1	Florestas de pinheiro bravo	2.376121	20000	1.2	0.033	25	
20 Florestas	5.1.2.1	5.1.2.1	Florestas de pinheiro bravo	51.55661	20000	1.2	0.033	25	
21 Florestas	5.1.2.1	5.1.2.1	Florestas de pinheiro bravo	1.96949	20000	1.2	0.033	25	
22 Florestas	5.1.2.1	5.1.2.1	Florestas de pinheiro bravo	5.992304	20000	1.2	0.033	25	
23 Florestas	5.1.2.1	5.1.2.1	Florestas de pinheiro bravo	1.237347	20000	1.2	0.033	25	
24 Florestas	5.1.2.1	5.1.2.1	Florestas de pinheiro bravo	13.093346	20000	1.2	0.033	25	
25 Florestas	5.1.2.1	5.1.2.1	Florestas de pinheiro bravo	193.349059	20000	1.2	0.033	25	
26 Florestas	5.1.2.1	5.1.2.1	Florestas de pinheiro bravo	2.117391	20000	1.2	0.033	25	
27 Florestas	5.1.2.1	5.1.2.1	Florestas de pinheiro bravo	266.33222	20000	1.2	0.033	25	
28 Florestas	5.1.2.1	5.1.2.1	Florestas de pinheiro bravo	3463.30972	20000	1.2	0.033	25	
29 Matos	6.1.1.1	6.1.1.1	Matos	73.861587	20000	1	0.05	20	
30 Matos	6.1.1.1	6.1.1.1	Matos	6.50239	20000	1	0.05	20	
31 Matos	6.1.1.1	6.1.1.1	Matos	426.607871	20000	1	0.05	20	
32 Matos	6.1.1.1	6.1.1.1	Matos	3.878878	20000	1	0.05	20	
33 Matos	6.1.1.1	6.1.1.1	Matos	2.762979	20000	1	0.05	20	
34 Matos	6.1.1.1	6.1.1.1	Matos	3.244969	20000	1	0.05	20	
35 Matos	6.1.1.1	6.1.1.1	Matos	3.32534	20000	1	0.05	20	
36 Matos	6.1.1.1	6.1.1.1	Matos	22.944944	20000	1	0.05	20	
37 Matos	6.1.1.1	6.1.1.1	Matos	3.47727	20000	1	0.05	20	
38 Matos	6.1.1.1	6.1.1.1	Matos	14.24496	20000	1	0.05	20	
39 Matos	6.1.1.1	6.1.1.1	Matos	26.183389	20000	1	0.05	20	
40 Matos	6.1.1.1	6.1.1.1	Matos	6.418321	20000	1	0.05	20	
41 Matos	6.1.1.1	6.1.1.1	Matos	2.474165	20000	1	0.05	20	
42 Matos	6.1.1.1	6.1.1.1	Matos	91.29794	20000	1	0.05	20	
43 Matos	6.1.1.1	6.1.1.1	Matos	3.855429	20000	1	0.05	20	
44 Matos	6.1.1.1	6.1.1.1	Matos	6.821024	20000	1	0.05	20	
45 Matos	6.1.1.1	6.1.1.1	Matos	1.743391	20000	1	0.05	20	
46 Matos	6.1.1.1	6.1.1.1	Matos	6.283839	20000	1	0.05	20	
47 Matos	6.1.1.1	6.1.1.1	Matos	693.44376	20000	1	0.05	20	
48 Matos	6.1.1.1	6.1.1.1	Matos	28.10572	20000	1	0.05	20	
49 Matos	6.1.1.1	6.1.1.1	Matos	6.57649	20000	1	0.05	20	
50 Matos	6.1.1.1	6.1.1.1	Matos	2.178977	20000	1	0.05	20	
51 Matos	6.1.1.1	6.1.1.1	Matos	110.750887	20000	1	0.05	20	
52 Matos	6.1.1.1	6.1.1.1	Matos	630.34645	20000	1	0.05	20	



start date simulation: 06/22/2021 19:09:32

end date simulation: 06/22/2021 20:09:32

+ Focus + Front Delete focus Delete front Info. MFE cal



Send simulation

Json Simulación

Foco manual

Focus X: 0

Focus Y: 0

Add focus

Caja manual

Initial X: -7,07790551042663€

Initial Y: 40,21659478296811

Final X: -7,02245888567077€

Final Y: 40,25178120747222

Add box





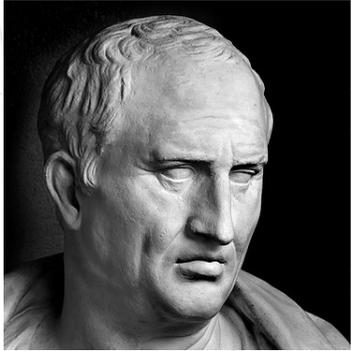
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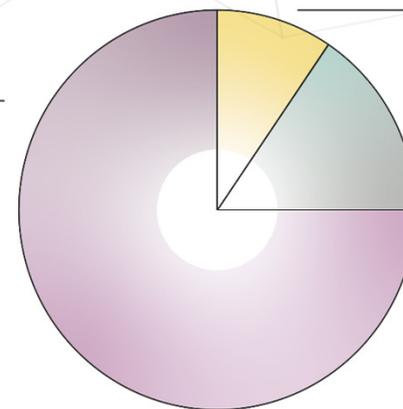
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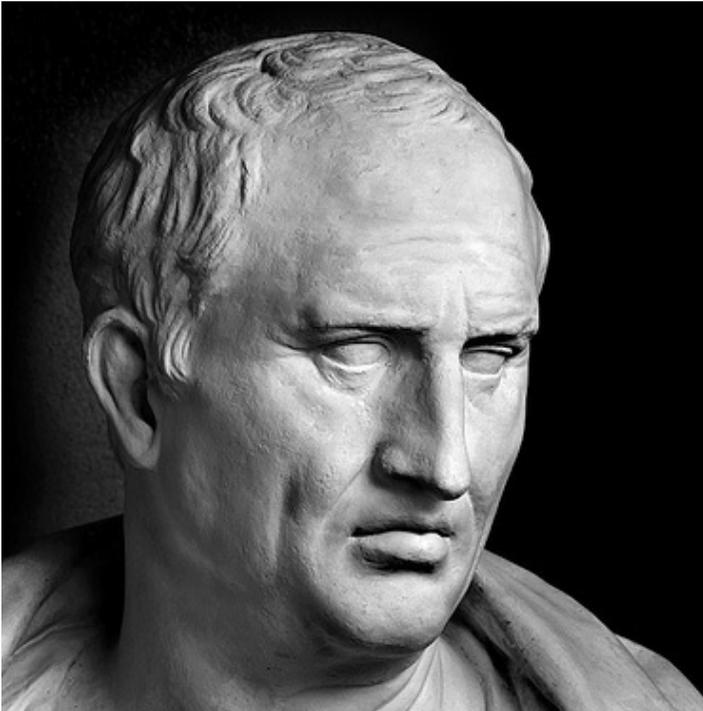
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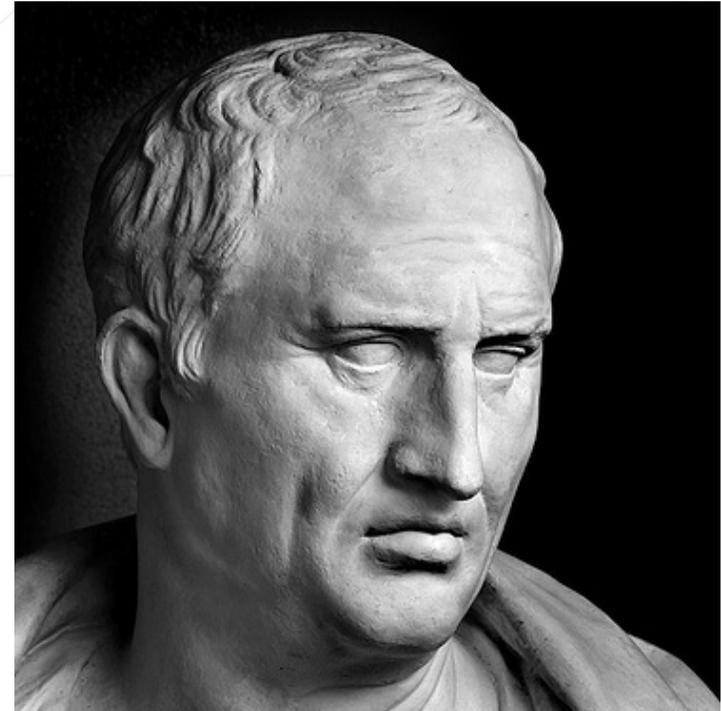
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## Índice

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