

# Wildfires vs. Sustainable Forest Partitioning

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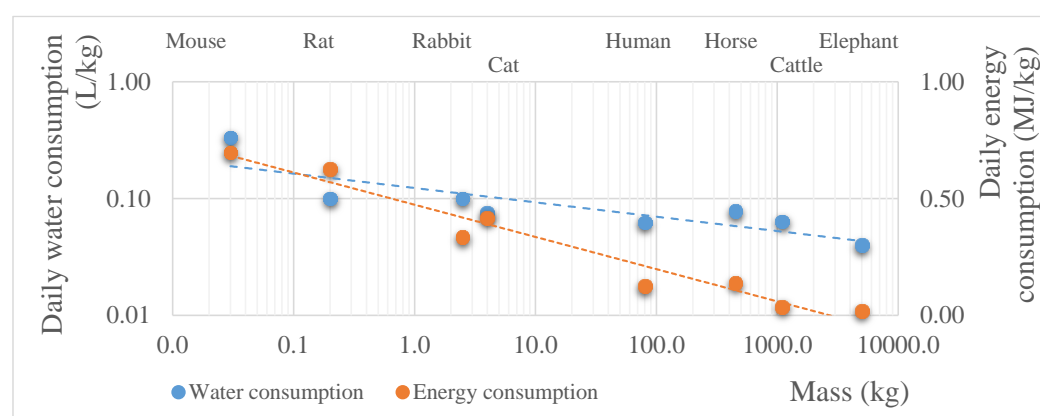
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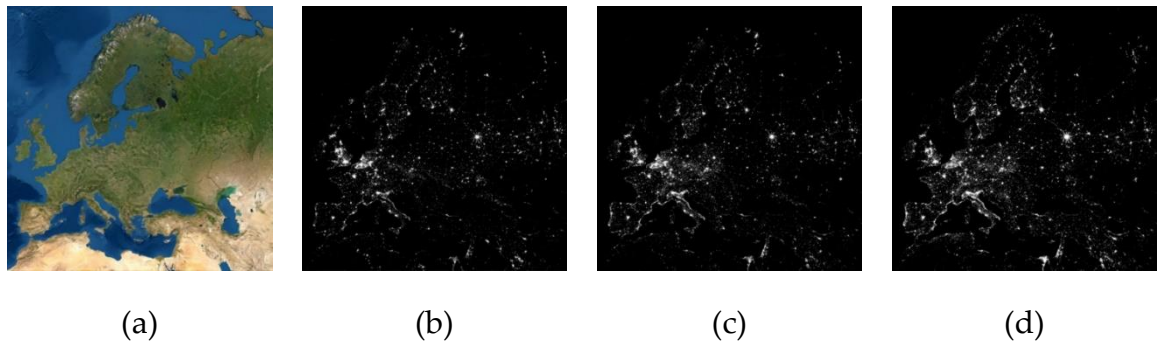
## S1. Clustering as a Growth Process

Clustering is a natural process which makes the organisms to use more efficient the natural resources [1]. Figure S1 shows that elephants, requires about 10,000 times less energy per mass than a mouse. Larger scales also increase the efficiency for mammals in terms of water consumption for survival.

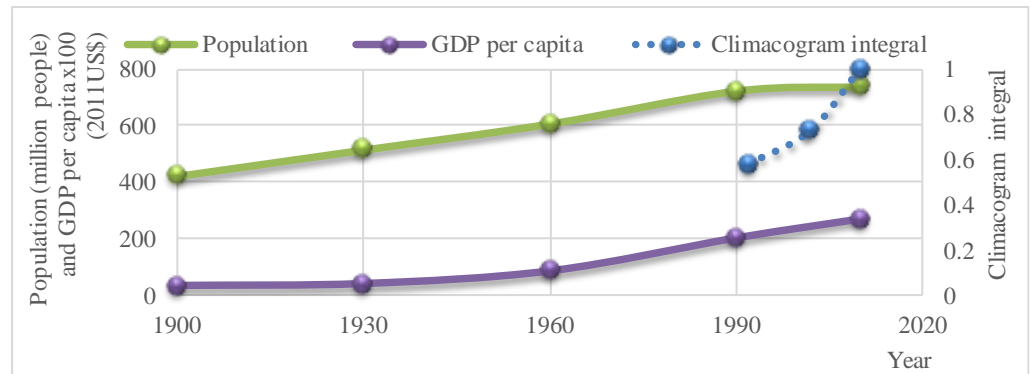


**Figure S1.** Daily energy and water consumption of mammals [2–4]

Clustering is also useful in human societies as clustering of humans created what we now know as civilization. In order to support the modern way of living, growth is based on economies of scale [5]. We can notice this in infrastructures, in cities, in production of goods, even in natural resources. As was argued by Sargentis et al. [6], economies of scale require clustering and societies are interconnected with the evolution of clustering. An example of the clustering of Europe cities and the relation to growth is given in Figures S2, 10 evaluating the clustering of night lights which have been widely used as an index several social issues. The example depicts that even the population in Europe was almost stable in the period 1990–2020, the increasing of clustering of the cities of Europe, meant also the increasing of Gross Domestic Product (GDP) per capita (Figure S3).



**Figure S2.** (a) Europe and its night lights in: (b) 1992; (c) 2002; (d) 2012.

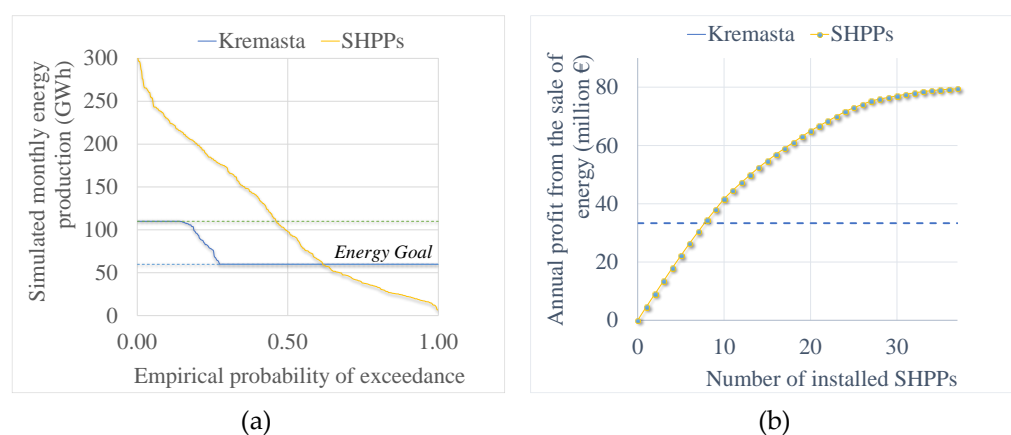


**Figure S3.** Europe: population; GDP per capita; and climacogram integral of Europe's night lights.

An example of clustering effect is the development of the large-scale infrastructures for the exploitation of natural resources [7]. A special case are hydroelectric projects which have a completely different way of construction and operating philosophy, depending on their size. In order to compare the advantages and disadvantages of small hydroelectric projects in relation to large ones, Bairaktaris [8] examined the wider area of the Achelous River basin, where the largest hydroelectric plant of Greece, Kremasta dam, is being "replaced" with as many Small Hydroelectric Plants (SHPPs) as needed in order to achieve an equivalent installed capacity.

Due to the large number of required stations, a standard design method was developed for their design, aiming to produce the most accurate energy and economic results possible for each of the installation sites. Through this and in the context of the proposed delustering of the region, 37 small stations are planned on the bed of the Achelous River, and its tributaries Agrafiotis and Tavropos. Thus, it becomes possible to compare the energy and the techno-economic current status of Kremasta with the hypothetical scheme of the 37 SHPPs.

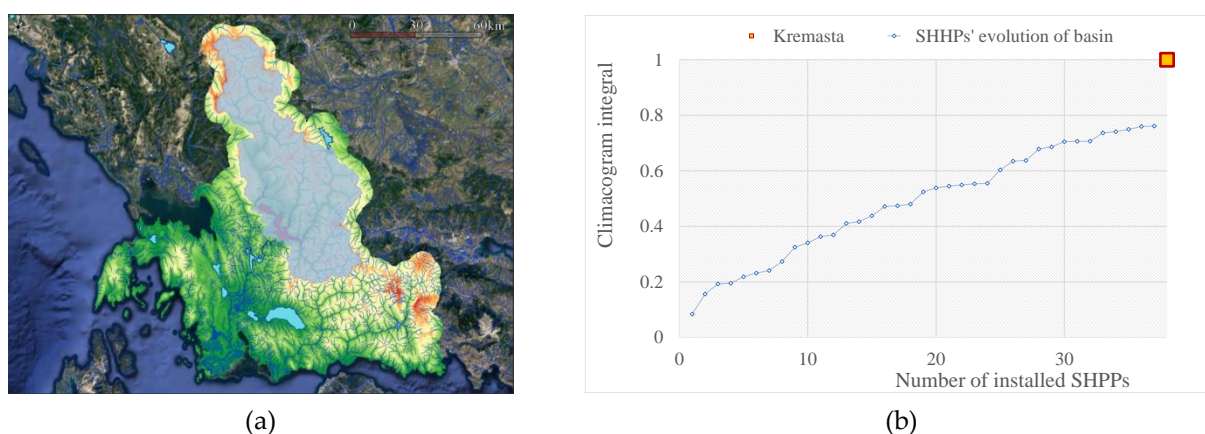
Kremasta's construction cost, has been reported by the construction company [9] 84,781,000 US1974\$ (381,937,825 € after adaption in current prices). The total cost of 37 SHPPs is estimated 446 995 079 €. With the same installed power, theoretically SHPP project can produce 60% more energy (Figure 8 a). However, Figure 8 b shows that the system of SHPPs does not provide guaranteed amount of energy, in contrast to Kremasta that catches the target of 59.9 GWh/month at 100% of the time. Also, through the large-capacity of reservoir's Kremasta, production of energy is delayed from the physical inputs and covers the power peaks of interconnected electrical networks. Evaluating the clustering of natural resources (in this case the water basins) of Figure 9 with stochastic method [1], in Figure 10 we note the increase of clustering.



**Figure S4.** (a) Comparative diagram of annual profit from the sale of energy; (b) Monthly energy-probability curve of Kremasta compared to the SHPPs.



**Figure S5.** Addition of SHPPs and the evolution of water basin.

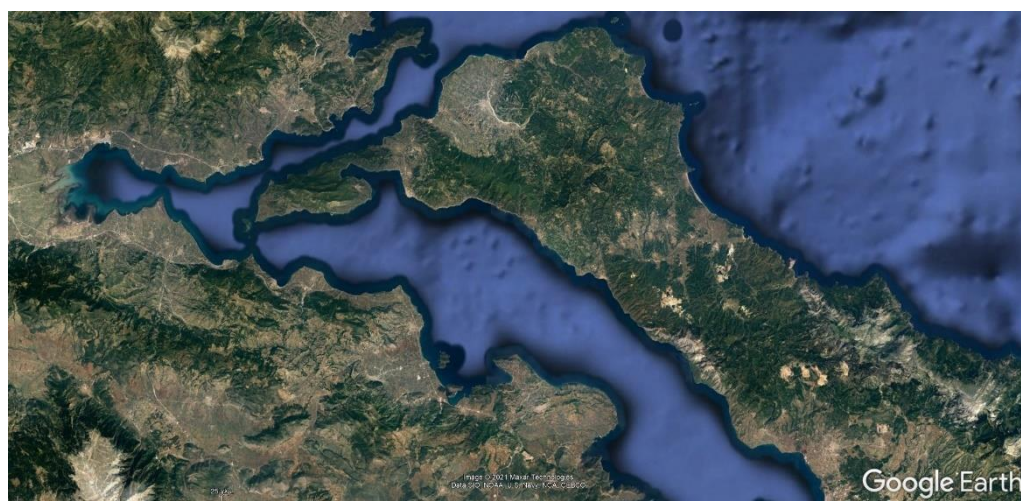


**Figure S6.** (a) The water basin of Kremasta; (b) Rate of the evolution of clustering of the basins with the addition of SHPPs, water basin clustering of Kremasta (blue dashed).

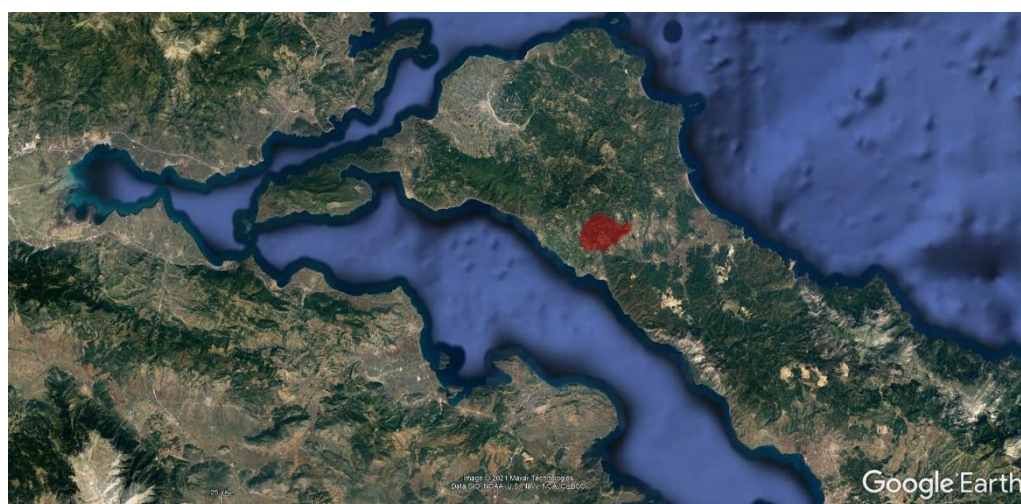
## S2. The Evolution Burnt Areas in Google Earth

The total area of the fire [10,11]. The evolution of the fire, was adapted graphically in Google Earth [12] by satellite imaginary [13,14], calibrated by the reports of: 112 Emergency Communications Service [15].

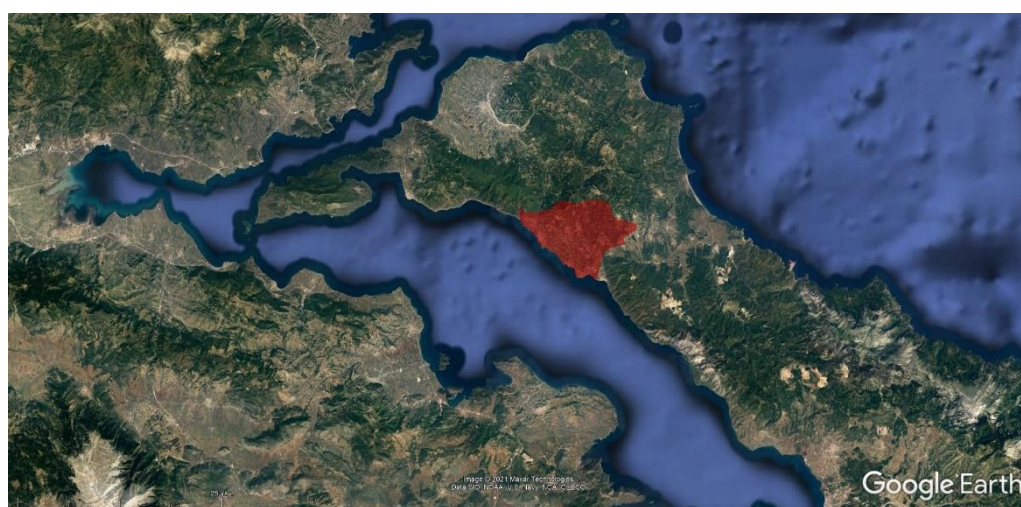




**Figure S7.** The area of North Evia.

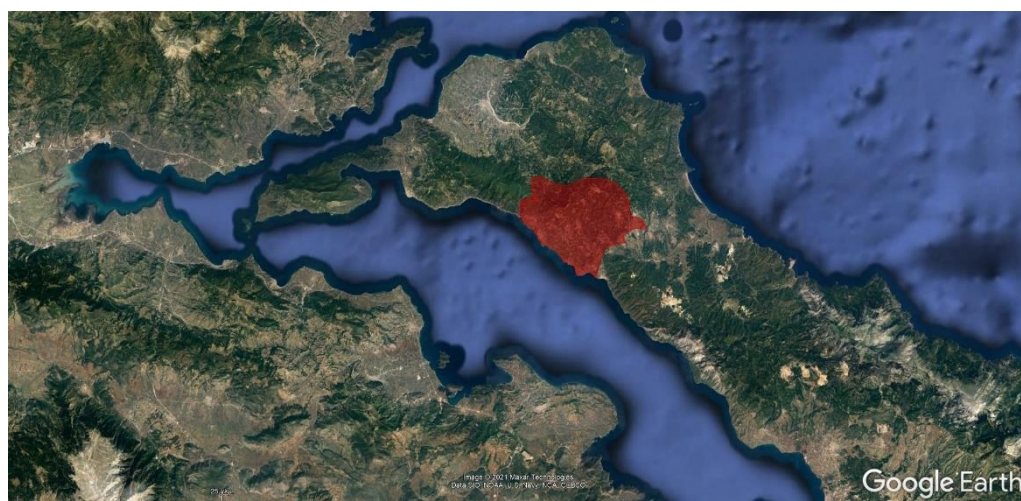


**Figure S8.** North Evia. With red shadow is indicated the area of the fire in 2021-08-03.

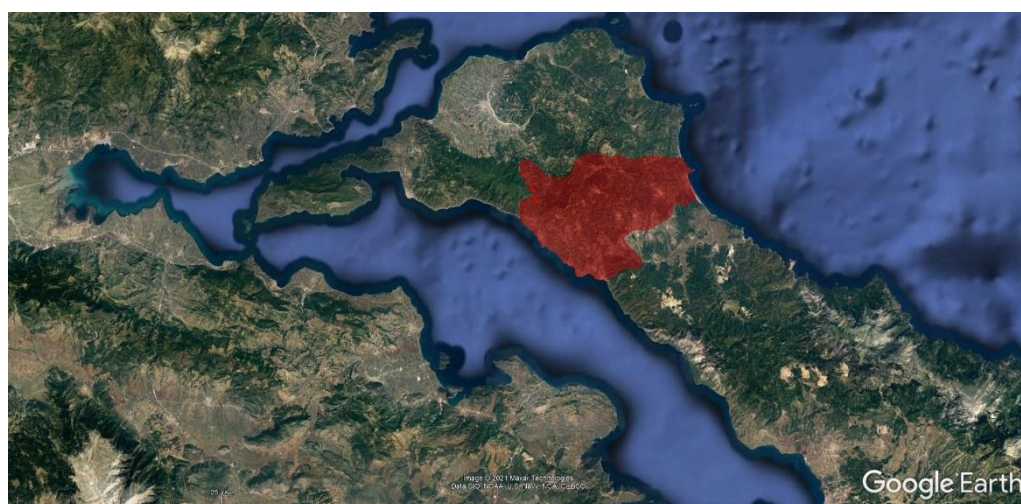


**Figure S9.** North Evia. With red shadow is indicated the area of the fire in 2021-08-04.

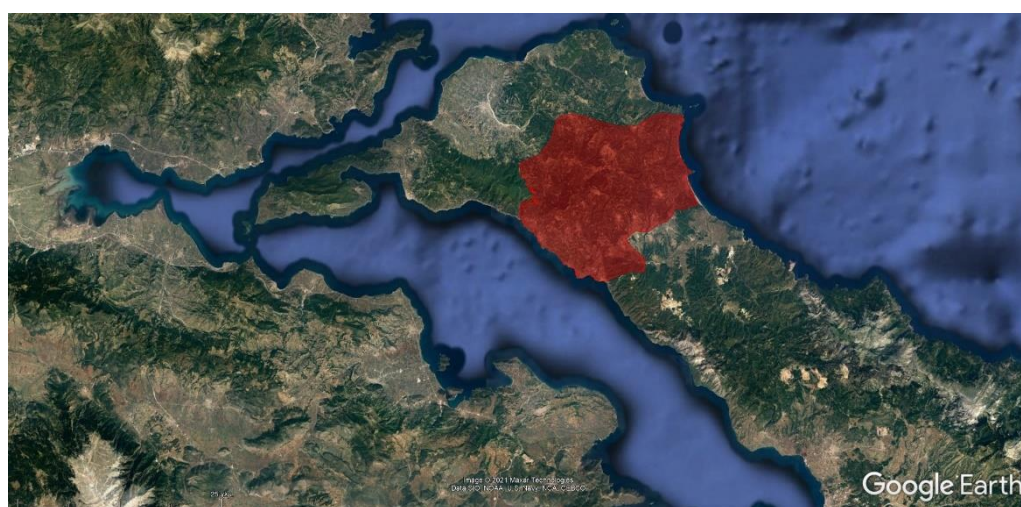




**Figure S10.** North Evia. With red shadow is indicated the area of the fire in 2021-08-05.



**Figure S11.** North Evia. With red shadow is indicated the area of the fire in 2021-08-06.



**Figure S12.** North Evia. With red shadow is indicated the area of the fire in 2021-08-07.

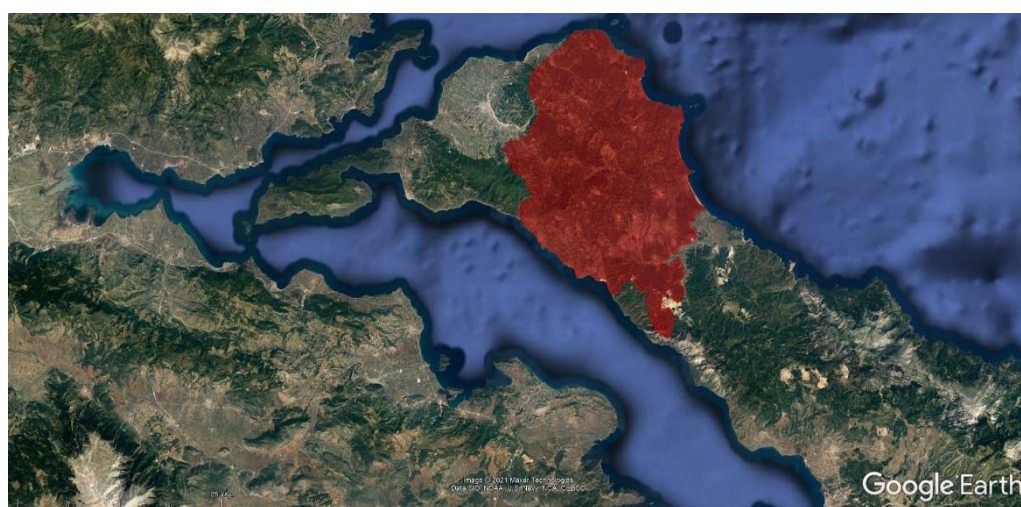




**Figure S13.** North Evia. With red shadow is indicated the area of the fire in 2021-08-08.



**Figure S14.** North Evia. With red shadow is indicated the area of the fire in 2021-08-09.



**Figure S15.** North Evia. With red shadow is indicated the area of the fire in 2021-08-10.



**Figure S16.** North Evia. With red shadow is indicated the area of the fire in 2021-08-11.



### S3. The Evolution of Fire by Satellite Views



**Figure S17.** The evolution of fire, snapshots by the satellite views of: <https://zoom.earth/>.





**Figure S18.** The evolution of fire, snapshots by the satellite views of: <https://worldview.earthdata.nasa.gov/>.



## S4. Additional Documentary Information



Figure S19 Frontpages of big international newspapers in 9 August 2021 had the theme of the Euboea's fire including the photo by Konstantinos Tsakalidis with 81 old women escaping from her burnt house in the area Gouves Euboea [16].



Figure S20. Frontpage of the newspaper «TA NEA», (a) 26.8.1977, (b) 27.8.2007, (c) 7.8.2021 [17].



(a)



(b)

Figure S21. The village of Limni; (a) Before the fire; Photo courtesy of Georgios Tsantes; (b) During the fire; Photo courtesy of Michael Pappas/AP photos.





(a)

(b)

(c)

Figure S22. Fire in Euboea: 2021-08-06.

(a)

(b)

(a)

(b)

Figure S23. Property documents dated from 1957, referred to the law 5151/1931 which redistribute the land to the immigrants from the Asia Minor catastrophe.

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