Summer School on Education Sustainable Development in biosphere reserves and other designated areas

Amfissa, Greece, 6-19 July 2014

Topic:

The fire risks in the area of Parnassos National Park. Review of existing fire risk measures and campaigns and interventions to reduce fire risk in the protected area and proposal for their further development in the National Park and the surrounding region.

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Figure 1: Map or Parnassos National Park core zone and surrounding area. Source www.projectplanet.net

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1 Introduction

In this introduction we outline the definition of fire risk, the causes of fire, the role of fire in the ecology of forests especially in the Mediterranean region and why fire has become a major danger for Mediterranean ecosystems like the National Park of Parnassos and the biodiversity they harbour.

1a Forest fires in Mediterranean Ecosystems, causes and consequences

The dictionary definition of fire risk is something which is likely to cause a fire or make a fire worse.

Anthropologists identify the capture and control of fire as equal in importance, for humans, to the evolution of language. Fire moved from an entirely natural phenomenon to a largely anthropocentric one when indigenous peoples gained control of naturally occurring fire. In Greek mythology it was Prometheus who stole fire from Zeus and gave it to humans, an act for which he was punished.

Historic and contemporary wild-land fire is not a random event, natural, social, and cultural conditions cause it. How and when wild-land fire occurs, outside of naturally caused fires due to lightening, volcanic eruptions or spontaneous combustion of accumulating forest biomass, requires an analysis of such conditions and practices. The control of wild-land fires has become increasingly important, as the incidence of catastrophic fires has risen in recent years, especially in the Mediterranean region. In a world concerned with the greenhouse effect the preservation of the forests becomes paramount.

Fire is an integral part of many ecosystems particularly the Mediterranean ecosystem. Natural fire is part of the cycle of forest regeneration. It helps to clear forests from over-accumulation of organic matter which in the dry season can become very flammable. Fire helps create conditions for new seeds to germinate and grow. In the Mediterranean forests, vegetation is adapted for periodic fire (every 30-50 years), with features such as underground buds and seeds or heat resistant seed coats. No species of plant can be considered entirely or generally fire-adapted; plant species are adapted to a particular fire regime.

In recent decades the Mediterranean forests are under serious threat, with forest fires, in most cases deliberately or accidentally set by humans. The current frequency of fire exceeds the capacity of the forest ecosystem to cope with fire. Besides social and environmental impacts, forest fires produce considerable economic damages due to:

i) the large amount of resources spent in fire suppression and prevention; ii) the loss of commercial value of damaged wood products; iii) the costs related to loss of public non-market services (*i.e.*, biodiversity protection, water cycle regulation, supply of recreational areas, soil protection, carbon sequestration).

The Mediterranean has been identified by WWF and IUCN as one of the most important regions in the world for its outstanding biodiversity. We hence became interested in the fire risk management strategy of a Mediterranean national park, Parnassos in mainland Greece. Mediterranean forests are one of the planet's centres of plant and animal diversity.

An IUCN-WWF document on Mediterranean forest points out that:

- 25,000 floral species, 30,000 if sub-species are included.
- This represents 10% of the world's flowering plants on just over 1.6% of the Earth's surface.
- 13,000 endemic plants: the second richest area in endemic flowering plants in the world, just after the tropical Andes.
- Only 17% of the original 82% forest cover still exists.

In EU Mediterranean countries such as Spain, Portugal, Italy and Greece the average total burnt area has quadrupled since the 60's. The need for an effective policy of prevention to address the root causes of increasing fire damage to Mediterranean forests acquired a higher public profile following the devastating fires of 2007 in the Mediterranean region.

Greece has a typically Mediterranean climate of warm and dry summers, with the majority of fires in the country not due to natural causes. Since humans are a large part of the problem of forest fires the question of an education for sustainable development (ESD) addressing fire risk, becomes how to make those very humans a part of the solution.

Greece was ravaged by forest fires throughout the summer of 2007 that killed 84 people and burned 670,000 acres of forest and farmland. Arson and negligence are thought to have been the main causes and the phenomenon was repeated only two years later in 2009 with a further 21,000 hectares of pine forest, olive groves, shrub land and farmland near Athens burning. Aircraft were drafted-in to help from Italy, France and Cyprus at a cost estimated at 30 million euro's.

Table 1: Forest fires in Greece in the years 2000-2008

Data from the Ministry of the Environment Energy and Climate change

Year	No of fires	Hectares burnt	Forest hectares burnt	Mixed areas burnt	Human causes	Natural causes	Unknown causes
2000	2.581	145.034,0	69.579,0	75.455,0	336,00	129,00	2.116,00
2001	2.658	18.342,0	8.423,0	9.929,0	405,00	177,00	1.953,00
2002	1.400	4.337,0	887,0	3.450,0	140,00	154,00	1.106,00
2003	1.425	3.263,0	960,0	2.303,0	157,00	241,00	1.026,00
2004	1.755	10.722,1	2.586,0	8.136,1			
2005	1.544	6.437,4	2.180,2	4.257,2			
2006	1.417	12.661,4	6.513,1	6.148,3			
2007	1.992	222.894,0	85.970,6	136.923,4			
2008	1.486	29.172,0	13.397,0	15.775,0			
M.O.	1.806,4	50.318,1	21.166,2	29.153,0	259,5	175,3	1.550,3

1b The management of fire risk in Greece

Originating in the 1920s, Greek forest management and policies were modelled on methods of fire management and total fire suppression better suited to the cool and moist northern European ecosystems rather than the fire susceptible ecosystem of Greece. For around 50 years, until 1998, the Greek Forest Service of the Ministry of Agriculture was exclusively responsible by law for holistic forest management and protection, including fire prevention, total fire suppression and post-fire rehabilitation activities. In May 1998, fire suppression duties transferred to the Greek Fire Corps (fireservice.gr) which until then was responsible only for structural fires. It contributed to forest fire-fighting, just as the Greek army does, only when necessary. The Greek Fire Corps is under the Ministry of Public Order and Citizen protection (http://www.mopocp.gov.gr/main.php).
Most aspects of fire prevention, for example the patrolling of forests, remain with the Forest Service and/or the Ministry of the Environment, Energy and Climate change (www.ypeka.gr) and various regional-local authorities. The Forest service itself, was reorganized into regional structures without effective and consistent central coordination of activities across the country. As a result a fragmented and multifaceted fire management and policy seems to be in place in Greece.

The boundaries of state forests and the forests registry are incomplete (as is the land registry for the whole country) and construction within forests is still permitted, although, not in core zones of National Parks. National park management services are permanently understaffed. It is notable that Greece spends about ten times more on fire suppression relative to fire prevention.

1c The Parnassos National Park (PNP), Greece

Mount Parnassus (Greek: Παρνασσός), is a mountain of limestone in central Greece that towers above the ancient site of Delphi, north of the Gulf of Corinth. According to Greek mythology, this mountain was sacred to the God Apollo and the Corycian nymphs, and the home of the Muses.

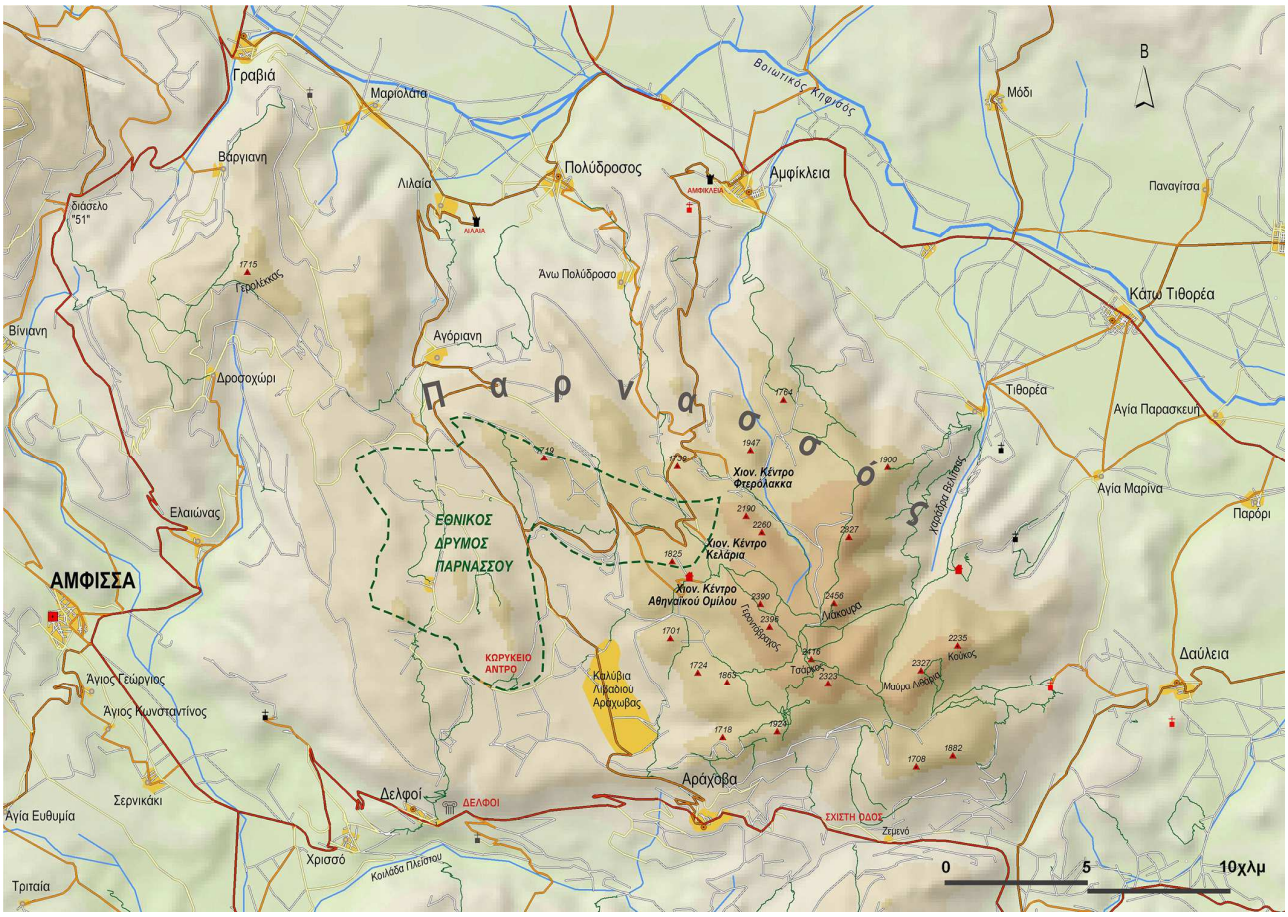

Figure 2: Parnassos national park (in green) and surrounding area. Source: google images

Parnassos National Park, founded in 1938 is one of the oldest National Parks in Greece. It was founded together with that of mount Olympus. It includes the SPA "Oros Parnassos" (GR 2410002), the largest part of which is supervised and protected by the Parnassos National Park's

Management Body (PNPMB). In addition, the Network "Natura 2000" subjects it to the EU Habitats Directive 92/43/EEC (for their integration and protection) and so the maintenance or restoration of habitats should be ensured, according to the principles of sustainability. The SAC "Notioanatolikos Parnassos – Ethnikos Drymos Parnassou - Dasos Tithoreas" (GR 2450005) has been institutionalized on Mt. Parnassos, and is the largest part of the responsibility area of (PNPMB). Finally, the Archaeological Site of Delphi and the wider landscape of Delphi were institutionalized under GG. 147/A/2012 .

National Parks in Greece are meant to be reserves for flora and fauna with minimal tourist facilities such as basic campsites and refuges and many walking trails. Management of the parks usually consists of a buffer zone protecting an inner core zone. The idea behind a core zone is that it provides for an area where the ecosystem is minimally disturbed and only low impact research and use can be permitted, to secure the biological diversity of the area. Only walking should be allowed within the core zone, whereas more activities including habitation and on certain occassions hunting, are possible in the buffer zone. Settlements on Parnassos Mt. go back in history long before it became a protected area to 1500 BC. From the foot of the mountain at around 350 metres above sea level up to an altitude of 1.200m 18 villages with populations ranging from 300 to a few thousand exist. Inhabitants are engaged in agriculture, livestock, manufacturing, mining and tourism. The peak of the mountain is at 2,457 metres.

The Parnassos National Park Management Body (PNPMB) was established for the protection, conservation, management and enhancement, of both nature and landscape of the mountain, as natural heritage and valuable natural resource and for ensuring that human activities within the PNP meet this goal. It is a Private Legal Entity supervised by the Ministry of the Environment, Energy, and Climate Change, governed by an 11-member Board, composed of representatives from ministries, services, local authorities, NGOs and scientists. The main objectives of the Management Body are:

- The conservation of natural resources, biodiversity and protection of the entire region.
- Promoting and implementing of information and awareness campaigns for the local community.
- Attracting visitors and promoting the values of the protected area.
- Sustainability of the protected area‘s ecosystems.
- Developing partnerships with research centres, universities and NGOs.

We examined the practices for fire risk management of the area under the PNPMB. It seems however obvious that a comprehensive fire risk management and education policy should address the needs of the entire region.

2 Methodology

We attempted to evaluate the extent to which the PNPMB is successful in the fulfilment of its main objectives (outlined in the previous paragraph) in relation to fire risk management. Our aim was to propose how they can be improved-enhanced especially with regard to ESD for fire risk.

Why we chose this topic?

- Trees are important carbon dioxide sinks and reduce the greenhouse effect so their protection from fire is important

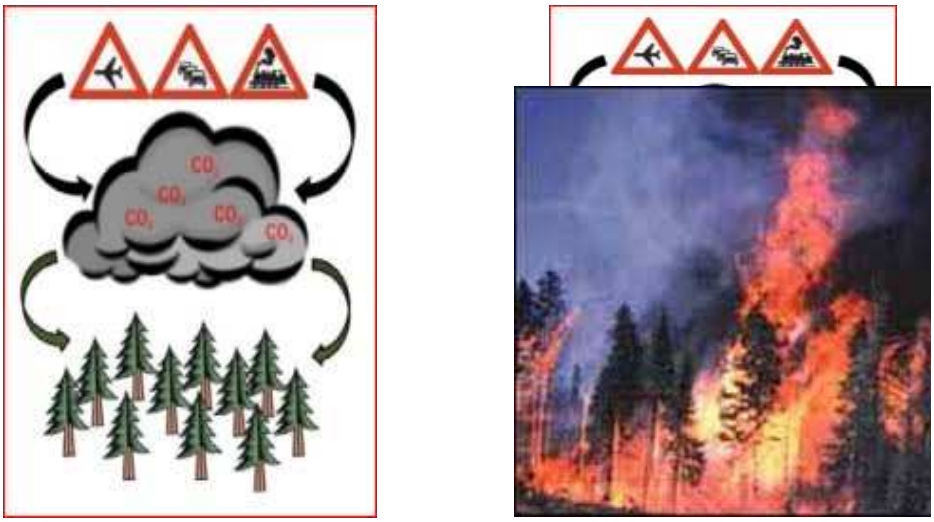

Figure 3; Trees acts as greenhouse gas sinks, burning them would eliminate this

Source; google images and TES.co.uk lesson on trees

- Fire seemed interesting because it is not only a risk and danger for human life and natural ecosystems but also part of their regeneration cycle.
- None of us had studied fire risks before and so this was a novel topic, not well covered in the ESD in Biosphere reserves and other designated areas resource book we were given for the summer school.
- Fire seems a good topic for teaching children and young people about personal responsibility towards the forest ecosystem, since most fires in recent decades are due to human causes

Our methodology can be summarized by the above diagram.

Following our initial brain storming session on what constitutes fire risk, initial internet search related to PNP (mostly on their official website and a search for maps and fire ecology literature), a reading of the fire management plan for the Samaria Gorge that Maria Dimopoulou provided and a visit to a part of PNP, we decided to consult with Dr Tuncay about fire risk management in National Parks. We then used SWOT analysis to reflect on our somewhat limited perceptions of what is in place at the PNP regarding fire risk management and organise our data and the information we had collected to date. Establishing where the authority for fire risk management and suppression in Parnassos lies and the legal-legislative framework that governs fire risk management in Greece was difficult online, and so we contacted directly some authorities, for example people who work on the PNPMB and the Chief Forester of Amfissa, and our colleague Savvas Vasileiadis, who is employed at Mount Olymbos, and the fire brigade for the area. We were not always successful in finding people or information given limited time, and were often referred to 'other' authorities or people with 'more' responsibility. This is why we do not present data on frequency of fire in the area and budgets for the various fire and forest management authorities. After completing a SWOT analysis on fire risk management at the PNP, we contacted authorities again with more detailed questions about what measures for fire risk management information dissemination and education are in place and how they engage stakeholders. We also did some research on existing educational games for fire management or suppression.

3 Results

3a Existing fire risk measures and campaigns and interventions to reduce fire risk in the Parnassos National Park

Taking the PNPMB objectives and reviewing them from the point of view of fire risk and fire management we established the following practices and problems in the Park.

1. For the protection of the area from fire only five permanent staff and four non-permanent summer staff patrol the area (mostly in the core zone). They have access to water tanks for immediate response to fire, and are in constant contact with the Forestry authorities and the fire brigades of the region, for example in the nearby cities of Lamia-Amfissa and Livadia. This is a woefully inadequate force for an area of 3,513 hectares

Figure 4; Entry to the PNP sign and fire risk warning sign in the background. Source; google images

2. They try to promote the value of the PNP as a protected area of rich biodiversity through visits to schools as well as open to the public information days, including limited education on fire related topics.

3. They encourage the audience of such events to participate in tree planting and they always send representatives to educational and information activities organized by others in the surrounding area to inform them about PNP

4. They plan to initiate species recording and monitoring and related ecological studies

5. With regard to control of entry to the PNP there is no information for visitors at park entry points or anywhere else. The fact that the boundaries of the area of responsibility of the PNPMB and of the entire National park beyond the core zone are not well defined complicates matters. Voting of legislation better defining the PNP zones and boundaries is awaited eagerly. The ski resort is within the core zone presently, due to be excluded when

the new legislation will come into effect. It belongs to the ministry of Tourism, as does the archeological site at Delphi, and the former will likely be sold to private investors. None of its profits return to the PNP. Traffic in and out of the ski resort, within the core zone, is not in accordance with the principle of zonation in National parks and other protected areas.

6. No information or educational material for distribution to visitors and inhabitants currently exists, although it has been commissioned and its production has gone out to tender. We didn't manage to get information on the nature of such material.

The completion of the process of bringing legislation to better define the zones in the PNP into effect and define the boundaries of the PNP, will also facilitate the implementation and/or further development of legislation on fire-proof (so far as possible) construction within the buffer zone of the PNP. The staff of the PNPMB told us that they believe fire protection measures worked better when both the prevention and suppression of fire belonged to one ministry-authority. The fragmentation of responsibility for fire risk management and suppression may not serve the needs of the PNP best. Limitations of funding and staff shortages are a major issue hindering the implementation of their strategies for fire risk and overall biodiversity management, protection and education in the PNP and emphasize the need for engagement of the public in such practices through ESD for fire risk.

3b SWOT analysis of fire risk management in PNP

Our SWOT analysis for fire risk management in the Parnassos National Park identified the strengths and weaknesses of the existing plans, the threat sources and the opportunity that educating for fire risk management, humans, who are the main threat to the PNP, represents**.**

Table 2 SWOT analysis for fire risk management at Parnassos National Park (PNP)

Strengths	**Weaknesses**
Patrolling of the park by foresters Maintainance of fire corridors Water tanks Organizing public information –education days	Only 5 (9 in summer) patrol 3,513 hectares Rubbish in PNP Water tanks plastic Few fire sings Imprecise boundaries-zonation in PNP Lack of maps of PNP with fire risk and biodiversity information about PNP Lack fire risk specific educational activities Residential communities within PNP
Opportunity	**Threat**
Inhabitants& Visitors to PNP Fire risk ESD & for best practice in at point of arrival Disseminated to all of local communities and targeting visitors&children	Inhabitants& Visitors to PNP Natural causes, man made causes like arson &waste, Fragmented fire services

4 Recommendations & Conclusion

4a Recommendation for further development of fire risk management practices and related ESD education in the PNP and the surrounding region.

Figure 5 An ESD proposal for fire risk in Parnassos National Park targeting visitors and all children (both of visitors and inhabitants)

Three key words come to mind when reflecting on effective management to control fire risk. Prevention, Education and Coordination (of efforts)

Regarding prevention and education we propose a two fold approach:

1) To develop and distribute good information and detailed maps on the PNP, detailing its paths, trails and roads, its natural and cultural heritage and the fire risks in the area. This information ought to be distributed to all local communities, in houses, schools, local bussinesses such as hotels and restaurants, local authorities, the ski resort, Delphi

archeological site and at stop and rest visitor centres that we propose should be constructed, at all road and walking path entrances to the park. This would be as a first step in making people aware of the area they visit, its wealth of biodiversity and the fire risks in the area. At least two of the above proposed visitor centres at a couple of important-busy entry points to the park, could be made into environmental education outposts specific for the PNP. There, a more in depth exploration of the area and its biodiversity-resources would be facilitated for all visitors, including fire risk management education. The role of fire in forest ecology should be part of the educational materials on fire. Tourist information for the area can and should be linked to any information regarding the biodiversity and fire risk in PNP. The detailed map of the area we propose, can be further developed into an educational board game for school children (and adults). Moving around the map with good fire risk and sustainability practices, would allow the players to reach their destination and win, poor practices would penalize them, in the process knowledge about the area and local sustainability issues could be supplied via questions, with correct answers earning players steps forward toward the destination.

2) To engage the local young people and visiting children, through engagement of their teachers and parents in experiential learning through activities about fire risk management within the PNP. Examples include rubbish collection within the PNP and biomass clearance in high season. The degree of interest-participation for and in such activities, before and after distribution of the information materials proposed above, would be a measure of the success of the information campaign and provide direct feedback to the PNPMB on how to improve the former. Putting all the information proposed above and upcoming educational and other activities, on the PNP website (parnassosnp.gr) but also on online education portals nationwide and social media websites like facebook and twitter, should facilitate the work of PNPMB on fire prevention but also advertised the protected area of Parnassos nationwide and beyond.

Concerning coordination of fire risk efforts, while we don't feel sufficiently informed regarding the legislative constrains on the issue we agree with the PNPMB employees we spoke to that it maybe more effective for fire risk management if management and budget structures where in place to facilitate easier communication and exchange of ideas, expertise and management plans between forestry and fire experts and people on the ground who try to implement relevant to fire risk policies.

4b Conclusion

The concept map below illustrates how all stakeholders, not just visitors to the park, should be engaged in education for fire risk management. According to FAO's 'International Handbook on Forest fire protection', people have to be convinced that forest protection from fire is essential and informed on how to participate in fire protection, for any fire management plan to be effective. This principle should underlie the development of any ESD for fire risk management and the approach should be bottom up. The aim is always to engage as many inhabitants and other stakeholders in ESD so that they become informed ambassadors of good practice and of current science relating to forestmanagement including fire management. People should eventually become active aware participating in their community citizens motivated to safeguard their environment through ESD for fire prevention. Hopefully an active interest in local environmental protection and sustainability makes one interested in global environmental protection and sustainability for fire risk management (but also any other ESD issue).

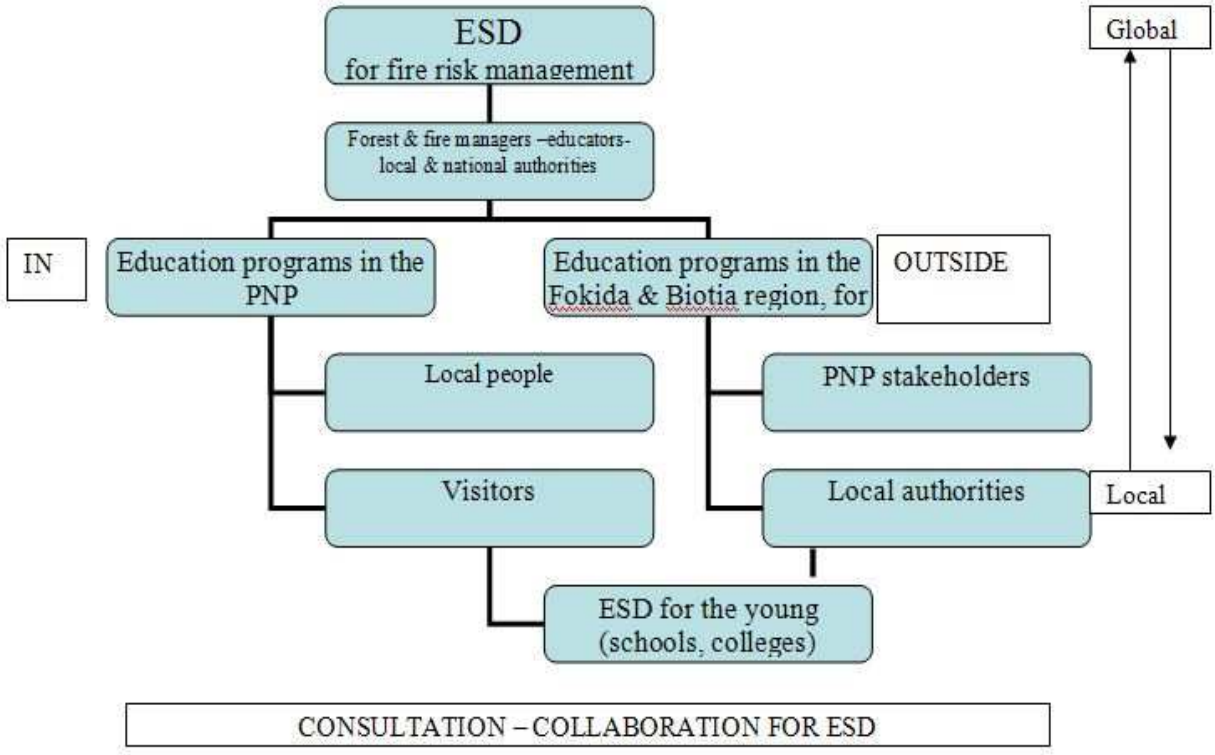

Figure 6 Concept map of how ESD for fire risk should proceed from a consultation collaboration at local level and progress nation-wide

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