Evaluation of the infrastructure development in Mediterranean Greek typical mountainous dry grassland

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Abstract

In the past few year on account of the one-dimensional economic development activity that destroys thoughtlessly the environment, gains ground, directly or indirectly, the notion that the development whether will be completed, that is to say simultaneously economic, social, technological and cultural, in harmony and with respect in the particular natural and cultural environment, which part of it is the man, or will not exist by no means. The following environmental resources (components) were identified: the fauna, the flora, the water capacity (water resources, water saving), the soil, the disturbance of soil and rocky lands, the landscape-physiognomy and the acoustic environment. However, the construction of a technical work can have negative impacts on the environment. These may be defined as changes of the environmental resources (natural and social), with a temporary or permanent character in respect to the time horizon within which these changes take place. The environment-friendly planning and design of a technical work must consider not only technical or economic parameters but also the effect of the construction (direct or indirect) upon the natural and social environment. This paper deals with the construction of a technical work in dry grassland, the environmental resources were identified, the impacts were evaluated and the criteria of estimating the alternative solutions were set out following the grouping of the environmental resources. The results proves that this method provides a way to evaluate the compatibility of the existing infrastructural works with the natural environment, and offers the possibility to choose the most compatible solutions for the environment in future.

Keywords: Evaluation, infrastructure development, mountainous dry grassland, consequence, alternative solutions.

Introduction

In its narrow sense, "Grasslands" may be defined as ground covered by vegetation dominated by grasses, with little or no tree cover; UNESCO defines grassland as "land covered with herbaceous plants with less than 10 percent tree and shrub cover". According to FAO (2005), grasslands (*sensu lato*) are among the largest habitat type in the world; their area is estimated at 52.5 million km^2, or 40.5% of the Earth landmass. Grasslands are of vital importance for raising livestock for human consumption and for milk and other dairy products. Grassland vegetation remains dominant in a particular area usually due to grazing, cutting, or natural or manmade fires, all discouraging colonization by and survival of tree and shrub seedlings.

The environmental impact assessment (EIA) is assessed the environmental impact of the investment project and proposed actions and interventions required in order to protect the natural environment (Doukas 2004).

The Directives 85/337 EEC and 97/11 EU require a more systematic assessment and evaluation of impacts on all aspects of the environment from almost all the projects and activities (public and private). These Directives provide for the investigation of alternatives during the siting of works, enforcement of environmental conditions in the implementation and operation of works and the as far as possible site restoration by the project.

Aim of this paper is to investigate the impacts of the construction and operation of a Processing Factory of Fisheries Products (PFFP), a Worksite of Aggregates (WA) and a Ski Center (SC) on dry grassland and the choice of the most compatible solution for the environment.

Materials and methods

The research area is the wider region of Prefecture of Florina and especially the area between Pisoderi and Prespes Lakes. For the research assessed the environmental impacts of investment projects using criteria and followed by the choice of the best possible investment for the protection of natural and human environment in complete agreement with the size and return on each investment project. Development works in one location using (negative effect) or enhance (positive effect) some of its environmental benefits (Doukas, Drosos 2012).

The criteria were specified and setting of their weights based on the related Greek and international literature, the Joint Ministerial Decision (JMD) 69269/5387/90 and the opinions of experts (special scientists).

We accepted a situation as maximum (=100%). The percentage of deviation from this maximum situation should be subtracted from 100%. The result will be the grading of the criteria of the positive impacts. As for the negative impacts the percentage of deviation from this maximum situation that will be subtracted from 100% will be and the grading of the criteria.

To grade the criteria, aerial photographs and digital opthophotos of the area were used as well as and the geological map. Also the onsite measurements play a major role.

In order to calculate the coefficient I, for the negative impacts at the construction phase we multiply the grading of each criterion with its weight and in the end; we divide the sum of the products with the total sum of weights. The same applies for the coefficient II for the positive impacts at the construction phase and coefficient I and II for the negative and positive impacts during the operation phase.

The index “return on investment” (ROI) is used to evaluate the return of an investment or to compare the efficiency of different investments. To calculate ROI, the benefit (return) of an investment divided by its cost and the result is expressed as a percentage. In this paper we are going to refer to the financial investment with a roundabout way because if we want to refer in details we need detailed and comprehensive feasibility studies which are not the main goal of this paper.

Results and Discussion

All the possible environmental impacts both at the stage of construction and during the phase of operation are presented in Table 1. In Figure 1 is shown the tendency diagram of impacts of the investment projects. The investment cost for the PFFP roughly calculated to 218,000.00 €, for the SC at 70,840.00 € and last for the WA to 126,240.00 €. If we divide the positive to the negative affects resulting one factor that indicates whether an investment is green or environmentally sound as close as is it to the one.

So the PTTP comes first with 0.1155 and 1.2755 second the SC with 0.0792 and 0.993464 and last the WA with 0.070148 and 0.04657 for the construction phase and operation phase,_respectively. If we subtract the negative from the positive impact the investment that has a positive or the less negative result is preferable than the others. So the PTTP comes first with -44.69 and 10.439 second the SC with -67.85 and -0.35088 and last the WA with -77.32456 and -85.307 for the construction phase and operation phase,_respectively. WA needs heavy type drilling machinery and then need to take measures in order to restore the landscape or the surrounding area.

PTTP needs a coating by spot material and construction with dimensions that are compatible with the surrounding area in order not to change the natural landscape. As for SC need to construct protection works by erosion and there are big problems because of the intense annoyance of noise from the lifts and large hydrological impact in the diet of underground water or not.

Table 1. Possible environmental impacts both at the stage of construction and during the phase of operation

Environmental impacts of the investment projects	Weights	Grade %			Sum		
		PFFP	SC	WA	PFFP	SC	WA
Construction phase							
Negative impacts	Natural environment						
1. Soil	3	60	90	100	180	270	300
2. Relief	2	50	80	90	100	160	180
3. Water	3	70	90	100	210	270	300
4. Atmosphere	2	50	70	90	100	140	180
5. Biosphere	3	80	90	100	240	270	300
6. Microclimate	1	0	10	20	0	10	20
7. Development of the area	2	10	60	70	20	120	140
8. Landscape aesthetics	1	30	40	60	30	40	60
Subtotal I	17				880	1280	1480
Coefficient I %					51.76	75.29	87.06
Positive impacts	Social environment						
9. Health of citizens	3	0	0	0	0	0	0
10. Population	2	10	10	10	20	20	20
11. Economic growth	3	10	10	10	30	30	30
12. Common good	2	10	10	10	20	20	20
13. Cultural heritage	2	0	0	0	0	0	0
Subtotal II	12				70	70	70
Coefficient II %					5.83	5.83	5.83
Operation phase							
Negative impacts	Natural environment						
1. Soil	3	20	40	100	60	120	300

2. Relief	2	0	40	90	0	80	180
3. Water	3	70	40	80	210	120	240
4. Atmosphere	2	50	60	90	100	120	180
5. Biosphere	3	80	90	100	240	270	300
6. Microclimate	1	0	20	20	0	20	20
7. Development of the area	2	20	40	100	40	80	200
8. Landscape aesthetics	1	10	70	100	10	70	100
Subtotal I	17				660	880	1520
Coefficient I %					38.82	51.76	89.41
Positive impacts	Social environment						
9. Health of citizens	3	0	10	0	0	30	0
10. Population	2	90	80	0	180	160	0
11. Economic growth	3	80	70	10	240	210	30
12. Common good	2	80	70	10	160	140	20
13. Cultural heritage	2	0	50	0	0	100	0
Subtotal II	12				580	640	50
Coefficient II %					48.33	53.33	4.17

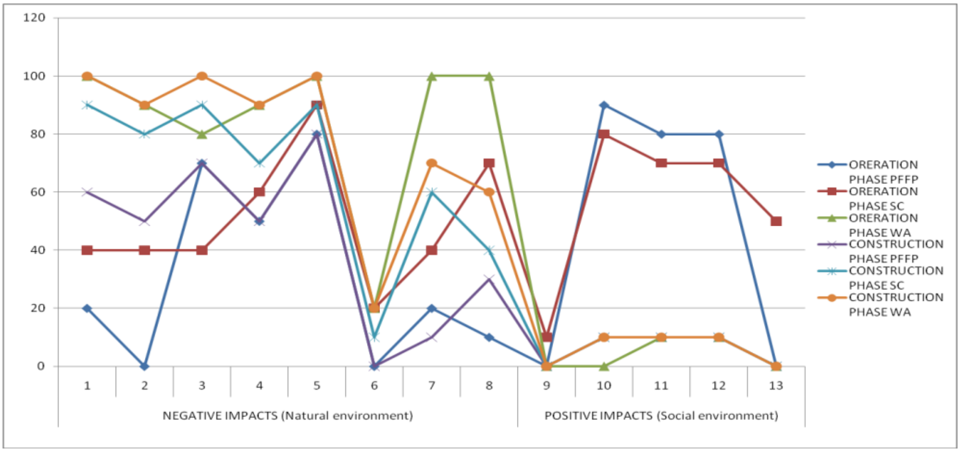

Figure 1. Diagram of impacts trends of the investments

Conclusions

To make the investment the entrepreneur should have net profit i.e. capital costs + amortization of capital + business profit. In this way the PTTP and SC are disadvantaged while the WA is advantaged. Considering the environmental cost of restoration, where the cost of WA is big for a sustainable green growth, so that the PTTP comes first second the SC due to the seasonal nature of the investment and last comes the WA. With this method we try first to ensure the environment and in the other hand to promote other kind of investments like green, viable and sustainable in a region.

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