Promotion of sustainable development in Asopos River Basin

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Abstract

This project is concerned with the pollution in the Asopos River. The pollution mainly caused by human activities. Specifically, for more than 40 years, the widely region of Asopos has been converted to an industrial zone. Hexavalent chromium, Cr (VI) is the main pollutant in groundwater. This project tries to promote a sustainable plan which includes environmental connection and social similarities concerning the pollution, perception and resistance. Social, government and business cooperate to find the best solution for the problem. An extend research which was basically include a questionnaire and a risk assessment in combination with the gathering information from old research was enough to complete the research. To sum up the project focus on the environmental, economic and social functions of Asopos. Moreover, identify the main social, economic and environmental impacts of degradation to promote sustainability in the area. The results of the research and the evidences suggest that different household profiles show different willingness to pay, depending on attitudes against the environmental damage, population age and place of residence. Finally, as it was expected the findings show a mistrust between different parts of the society (municipality, residents, local activists etc).
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1 Introduction

To start with, the general topic is the promotion of sustainability in Asopos River Basin. Sustainable development is the development that meets the needs of the present, without compromising the ability of future generations to meet their own needs (World Commission on Environment and Development, 1987) and it is based on the two opposed concepts of “needs” and of “limits” (Sands, 2003). Also, Sustainable development has been defined as “socially responsible economic development” that protects “the resource base and the environment for the benefit of future generations. (UN conference on environment and development)(1992).

Furthermore, in order to achieve sustainable development, environmental protection shall constitute an integral part of the development process and cannot be considered in isolation from it. (Principle 4 of Rio Declaration, UN, 1992) Moreover, the “interdependent and mutually reinforcing pillars of sustainable development, namely “economic development, social development and environmental protection”, must be collectively promoted and advanced “at the local, national, regional and global levels” (UN, 2002).

However there are more definitions like the Australia’s National Strategy for Ecologically Sustainable Development (1992) which defines the sustainable development as: “using, conserving and enhancing the community’s resources so that ecological processes, on which life depends, are maintained, and the total quality of life, now and in the future, can be increased. In a business context it is necessary to find how sustainability can serve the core challenges of a business. Accordingly, the sustainability has four components:

- The environmental protection
- Cultural concerns
- Social responsibility
- Have economic sustainability
Those components together form a sustainability plan. A company that uses those four pieces to drive its business strategy is steadily becoming sustainable. Furthermore, it is important to use transparency to share the challenges to make clear what the business challenges are. Afterwards engage the employees and make sure that everyone is aware about the effects of sustainability both upon them and in the core business challenges. Finally, the use of networks used in order to find experts from the business or from a non-profit organization (NGO) to help you run a better business.

This project promote the sustainability in wider region of Asopos River. As it is mentioned above sustainable development is the key to leave a better planet to next generation. Accordingly, the environmental protection, the social welfare and the economic prosperity are necessary. The wider region of Asopos is an industrial zone. As a result the river of Asopos face pollution problems. Many health issues have appear to the residents of the wider region, industries do not implement to environmental friendly regulations and the environment is really in risk. Accordingly, this project could be really helpful to the industries, to the people who are live in the region, to employees and to all of us. Below is presented how the problem begin in order to identify what the problem is.

1.1 Background history

In 1969 Asopos was a river which faces any environmental problems. The water was clean available for swimming and fishery. However the same year after a Presidential Decree offered, given incentives to industries to relocate their facilities from Attica to Oinofyta-Schimatari as it is referred to a governmental newspaper of that age(20 of March, 1969). The incentive which was given by the government was enough to motivate many industries to move and set up their industrial activities to that area. The problem was that there were not precise rules for the operation of firms; there were not the proper infrastructures or any other land-planning to support that relocation. In the same year, the Association for the Protection of Asopos River was founded in order to ensure that Asopos would not face any environmental problems
which usually caused by industrial activities. However, this Association did not work properly and as result the Asopos was unprotected.

In 1979, the first negative signs about the environmental situation of Asopos were noticed. In accordance with the governmental newspaper (27 of December, 1979) with a Prefectural Decision, industries were allowed to discharge their pre-treat wastes into Asopos. However, the majority of the firms were not willing to apply a bio-treatment or to take any other measurements for the environmental protection as they want to keep production cost low. So, they continue to discharge their waster to the river, directly or indirectly.

One year later, the condition of Asopos River was tragic. The pollution in the area was extended with a result the elimination of some birds and other organisms. (Stergiopoulos, 1984), since 10.000 tons of wastes were discarded daily into the river (I Augi, 1980). As the environment was degraded, both the industrial activities and their economic prosperity of the industries which was located at Oinofyta increased (To Vima, 1998). Furthermore, in 1980 estimated that there were three hundred industries with up to sixty thousand employees in total. With the passing of the time, the number of enterprises in the region steadily increased. As a result new jobs created to the widely region of Asopos and the value of the land increased. This is a critical point as the industrial activities were in a way balanced with the human and environment prosperity.

In the end of 1980, the political concern for the environmental issues increased. One of the main reasons that the politics pushed to care for the environment was the apparent effects of Chernobyl. In the same period of time, the concept of “sustainability” emerged not only in national level but in European level as well. Moreover, as it is mentioned by Botetzagias and Boudourides(2004) in Greece “green movements” started to rise in that period. Important to be noticed is that Greek green parties start to be active in political life and some of them take part in elections since 1989. As a result the “environment” has been a part of the agenda of different political parties.

Since 1990, the water of Asopos river was that polluted which proclaimed as “unsuitable for swimming” (Dasenaki, 1992). Furthermore, noticed health issues, especially skin diseases to people who used to swim in the river. In 1996 recognized
by YPEXODE (Ministry of Environment, Physical Planning and Public Works) that Asopos was facing pollution due to uncontrolled industrial activities. Two years later noticed that the industries did not use and bio-treatment procedures which lead to an increase in the pollution (Louzidou, 1998). Is 1998 also proposed the creation of a pipeline to a treatment plant in Avlona. However, in order to avoid the exploitation of this propose the firms should pre-treat their wastes (Louzidou, 1998). From 1996 to 1999 had been taken measurements to Asopos by a EU program namely “European Programme for Control of Surface Water” as it was expected the results were particularly alarming (Perperas, Giannarou 2007).

In period 1998 to 2000 was noticed a mobilization of the residents who lived in industrial zones. Those people used to observe the effects of the pollution to environment. Brown noticed that, the larger amount of information which was gathered and available about toxic hazards in workplaces and communities was a result of lay observation (1992). Although the citizens were aware about the pollution of Asopos, they were late to act against the polluters. The participation in an intervention in the administrative processes of decision making can be expressed only through individual actions of citizens (Fiorino, 1996). Additionally, the bond that individuals have developed with the region is an important factor (Skanavis et al., 2005). Specifically, as the most of the people was economically depended to the industries was not easy to conflict against them. Finally, the first Union which start a social mobilization was the “Federation of Unions of Oropos”, which in 1999 took legal action against the industries of the wider region.

1.2 Related legislation
Legislation is a very important factor in evolution of an industrial zone. More specific, the institutional framework since 1969 could be considered responsible for the current situation of Asopos River Basin. Analytically, in 1969 as already referred above with a Presidential Decree was allowed companies to set up their industrial activities to Oinofita. Actually, although there was incentives for the industries to transfer their activities across to Asopos there was not the proper legal framework to secure their proper operation. Moreover, as there was lack of planning and monitoring system industries start to discharge their waste in the Asopos. Thus, it was caused an
extended pollution of surface and underground water of the river with a variety of different environmental, social and economic impacts.

Regarding the implications of the related legislation the following are emphasized:

1. According to the Public Health Act/Regulation E1b/221/65 the disposal of the treated waste water and industrial wastes is allowed either in surface water bodies after asking for Permission by the Prefect or underground (after asking Permission from the Planning Service of Northern Attica). This Regulation is rather general and as long as the underground disposal of the treated industrial wastes are concerned, it is not referred particularly, to dangerous and toxic substances and it does not set limits for the disposal of dangerous substances.

2. The legislation for the management/disposal of the toxic-dangerous industrial wastes according to the law L. 1650/86 includes a plethora of provisions which most of them concern harmonization of the national Law with successive EU Directives. However, these provisions do not face with a single and concise way the whole issue since there are gaps, discontinuities and overlapping. Hence, although there is adequate environmental legislation relevant to the management/disposal of dangerous industrial wastes, these issues are still regulated by the Public Health Act/Regulation E1b/221/65.

3. The non-application of the provisions on hazardous/toxic industrial waste and due to the lack of understanding among relevant ministries (Environmental and Public Works, H & SS and Ministry of Development) for which provisions shall prevail and be applied.

4. The problem highlighted by measurements in Asopos - Oinofita regard to pollution of ground and groundwater horizon of the dangerous substance hexavalent chromium [Cr (VI)] such as emerged from the autopsies of Inspectors Inspectorate found very high concentrations of Cr (VI) in absorbent pits some industries are using Chrome or Chromium compounds in their production process and were performing subsurface disposal of their waste on units are allowed to operate without applying the provisions of CMD 26857/553/88, but with incomplete implementation of the provisions of the MA E1v/221/65.
5. The lack of direct cooperation between the competent services, in combined with the uncontrolled activity of some enterprises have resulting in non-implementation of existing environmental legislation and relevant EU Directives and therefore the emergence of a highly worrying problem of environmental pollution and, by extension, create risks to public health. There are serious concerns that the problem not just the companies examined, but other than those active in Asopos - Oinofita since these have licensed under the same principles, the same logic.

This research tries to identify which are the main problems in order to find and promote a sustainable solution in the region. The people of the wider area of Asopos, employees, employers others are directly interested in this project. Generally this project concern all the people who want to leave a better and cleaner planet to their children. As it is mentioned above, this project focuses in balance between the social and economy in order to help the environment. In social section included the local community and the social mobilizes. In economy section will be examined how the industries could approach the environmental pollution and implement to regulations without compromise their economic viability. Government is one of the main regulators and could be balance the social and the economic differences. In the next chapters will be examined the community, the government and the industries in order to identify the different ways which they approach the pollution of the Asopos river. Qualitative researches were performed in order to support the project.
2. Literature review last

2.1 Asopos literature

2.11 Pressures and impacts of pollution in Asopos River Basin

Asopos area is the largest industrial zone in Greece with up to 1300 industrial facilities settled in the region. The industrial activity in the area started at the end of 1970. At Oinofita the industrial activity is considerable and keeps increasing. In the table below are shown the different types of industries which exist in the area and their average daily flow of wastewater.

<table>
<thead>
<tr>
<th>Industrial Sector</th>
<th>Number of industrial units</th>
<th>Average daily flow of wastewater (m3/day)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Livestock farms</td>
<td>11</td>
<td>539</td>
</tr>
<tr>
<td>Food and drink industries</td>
<td>41</td>
<td>2198</td>
</tr>
<tr>
<td>Textile and leather industries</td>
<td>20</td>
<td>1925</td>
</tr>
<tr>
<td>Woodworking industries</td>
<td>15</td>
<td>2</td>
</tr>
<tr>
<td>Pulp and paper industries</td>
<td>17</td>
<td>8</td>
</tr>
<tr>
<td>Chemical industries</td>
<td>77</td>
<td>154</td>
</tr>
<tr>
<td>Non metallic mineral industries</td>
<td>20</td>
<td>908</td>
</tr>
<tr>
<td>Metallurgy related industries</td>
<td>96</td>
<td>1615</td>
</tr>
<tr>
<td>Commercial industries</td>
<td>9</td>
<td>-</td>
</tr>
<tr>
<td>Warehouses</td>
<td>26</td>
<td>-</td>
</tr>
<tr>
<td>Other industries</td>
<td>46</td>
<td>256</td>
</tr>
<tr>
<td>Total</td>
<td>378</td>
<td></td>
</tr>
<tr>
<td>Closed</td>
<td>28</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>350</td>
<td>7605</td>
</tr>
<tr>
<td>New/Under construction</td>
<td>5</td>
<td>-</td>
</tr>
</tbody>
</table>

Figure 1 Industrial unit distribution and average daily flow of waste water for each industrial activity (m3/day) (Loizidou 2009)

Two out of five industries in the region produce wastewaters during their production function. The total daily produced quantity of waste waters reaches the 9.044 m$^3$/day of which 84% corresponds to the industrial waste waters.
Specifically, the total quantity of wastewater which produced by the different industrial sectors is 7605 m\(^3\)/day; and the rest 16% (1,438 m\(^3\)/day) is sewage. According to the table 1 can be noticed that the main polluters are the “Textile and leather industries” (25%), “Metallurgy related industries” (21%) and “Industries of Foods and Drinks” (30%)

<table>
<thead>
<tr>
<th>Industrial Activity</th>
<th>Current</th>
<th>10 years</th>
<th>20 years</th>
<th>20 years +15%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Livestock farms</td>
<td>539</td>
<td>807,9</td>
<td>1091</td>
<td>1254</td>
</tr>
<tr>
<td>Food and drink industries</td>
<td>2198</td>
<td>3298</td>
<td>4451</td>
<td>5119</td>
</tr>
<tr>
<td>Textile and leather industries</td>
<td>1925</td>
<td>1925</td>
<td>1925</td>
<td>2214</td>
</tr>
</tbody>
</table>

*Table 1: Estimation of average flow of wastewater for the 3 main polluters for the next 20 years (m\(^3\)/day)*

One out of six artisanal units that produce waste waters, have a treatment facility for their produced waste waters. Generally, from the total quantity of produced waste waters the 97% is subject to a treatment.

In the table below are shown the different ways of disposal in respect with the quantity of wastewater (m\(^3\)/day) in Asopos.

Finally, some of the industrial units not having an alternative option collect temporally their wastes which are then managed by an authorized body.
In addition, considering the study of the Agricultural University of Athens which recorded the industrial and artisanal units in the area it was concluded (Masoura, 2008: cited in Technical Champsers, 2009) that the North East of the Asopos’ river bed in a stretch of 7 km there is a big number of industrial and artisanal units (407) which produce a daily volume of waste waters ranging from 0.3 m$^3$/d to 3000 m$^3$/d depending on the production procedure that is followed and the size of each industry.

An additional pressure in the area is also put by the agricultural activity (arable, tree crops etc). As stated in the Report of the Technical Champsers (2009): “there are 351,400 str. which are cultivated from which the 45% are irrigated and the 55% non-irrigated. In general, in the area an intense agricultural activity is observed in the upstream of Asopos.”

Therefore, the pollution of Asopos surface water from agricultural run offs is expected to aggravate the problem. Moreover, it is noted that there are also natural sources of pollution apart from the industrial, urban and agricultural activities.

Except for the environmental impacts there are also human health impacts due to the presence of high concentration of highly toxic heavy metal hexavalent chromium (CrVI) in some cases up to 330 ppbs, in both surface and groundwater in the Asopos.
River. The presence of CrVI in the water is linked to industrial pollution of soils and waters from hazardous waste and sludge. The CrVI harms human not only by drinking but also by skin contact or the consumption of fruits and vegetables. Different scientific evidence has shown that CrVI is absorbed through the gastrointestinal tract and can reach many organs causing serious damages and cancer. Even the inhalation of CrVI can cause mainly lung cancer.

2.2 River and Industrial pollution

It is generally agreed that rivers are most effectively managed on a river basin level and that many issues cannot be dealt with within territorial, physical, or political boundaries (Rees et al. 1998). Therefore, it is necessary for the central government to authorize an agency to manage and protect freshwater on a river basin scale. Another aspect that could be examined is the micro-communities or eco systems (Riggs 1995) or has been policy orientated.

Afterwards, two of the most common recommendations in the water resources literature of the last decade are:

1. Integrated water resources management (IWRM)
2. Organizing water resource primarily at the river basin level (World Bank 1993).

Additionally, water management in a basin is frequently connected with the concept of decentralization, so the managing of the water resources at the “lowest appropriate level”. (Mody 2001)

2.3 Environment and economic growth

The World Bank Development Report (1992) reports indicate the relationship between the environmental quality and the level of national GDP. Specifically, the environmental degradation and income have an inverted U-shaped relationship. The pollution increase at lower income levels and pollution decreases at higher income levels. Moreover, as Kuznets notice “at lower levels of economic development, both the quantity and the intensity of environmental degradation are limited to the impacts
of subsistence economic activity on the resource base and to limited quantities of biodegradable wastes as shown in the figure below.” (Kuznets, 1955)

Growing economic activity generated larger quantities of waste by-products as it required larger inputs of materials and energy. (Georgescu-Roegen and Meadows) Over exploitation of natural resources, accumulation of waste and concentration of pollutants will therefore overwhelm the carrying capacity of the biosphere and result in the degradation of environmental quality and a decline in human welfare, despite rising incomes. Moreover, it is argued that degradation of the resource base will eventually put economic activity itself at risk. Furthermore, a steady-state sustainable economy is the key to save the environment and secure the long term viable economy. Finally, as Beckerman report “The better way to improve the environmental quality in long term is to become rich”. That is a result of the strong correlation between incomes in combination with the extent correlation to which environmental protection measures are adopted. Also, there are people who claim that the environmental regulations could reduce quality of environment in case that those regulations reduce the economic growth.
2.4 Economic growth and society

The current standard national accounts do not reflect sustainability objectives and in fact obscure the reality that sustainability is not being achieved despite positive increases in economic growth.

Hamilton (1998) argues there are four main reasons for these results:

1. The levels of foreign debt are unsustainable;
2. The costs of unemployment and overwork increase;
3. Environmental issues;
4. Inability to maintain the investments in capital stock.

As Beck supports, an industrial area is a risk society and people of this society are equally affected by the pollution independently of their:

- income,
- education,
- occupation
- living habits (Beck, 1992).

As it is expected in a risk society social movement will appear in order to protect social or the environment. So the appearance of NGO and other activists was expected. Activist is someone who has the training to identify a problem, find the most suitable solutions, allocate responsibilities, devise strategies, raise public awareness, and develop a ‘group sense’ (Brown, 1992:269).

2.5 Governmental and eco-social perspective

The most common tools which a government uses to press the industries to implement to an environmental regulation are the environmental taxes. “Environmental tax” is a tax and used market-based instrument on polluting products and production process. (Tietenberg, 2006) In this point is good to be noticed that a company either will try to avoid the tax for instance by introducing new technologies to reduce polluting emissions or will prefer to pay taxes. That is usually happens in case that the cost to adapt the pollution is lower than the tax. The aim of the environmental tax is to “internalize” environmental and social external cost. However, to evaluate a social cost is extremely difficult for the regulator who set the tax because the market does
not provide it a price for it. So, different evaluation methods of environmental and social costs leads to an equivocal results (Kolstad, 2000) Also important is that, governments can share an amount of the tax (environmental tax) revenues to support innovations and R&D in the environment friendly technologies and that is called Earmark (O’Riordan, 1997). That could be useful for promoting the environmental taxes.

In this direction is also the “deposit-refund system” which is a way to combine taxes and subsidies (Callan and Thomas, 1996). This system is recommended in order to encourage the use of recycling wastes methods. According to this system when a product is sold a deposit is keeping by a regulatory agency. This deposit is given back (whole or a part of it) if the producer or the buyer shows that they are able to recycle it.

Another suggested method in order to strengthen partnership between business communities and environmental regulators is the “voluntary environmental agreements” (Segerson, 2006). This is considered as a way to respond to high costs of CAC type of environmental regulation. Accordingly, the polluters voluntarily undertaking control measures instead of undertaking them mandatory because of the existence of a regulation. The role of consumers is very important and especially their willingness to pay for environmental friendly products.

To conclude, the environment is not an abstraction, but represents the living space, the quality of life and the very health of human beings, including generations unborn and according to International Court of Justice, 1996 this is the environmental challenge. In this direction is also the UN conference on the Human Environment which tries to inspire the people of the world in the preservation and enhancement of the human conditions. (UN, 1972)
2.6 Social Movements

As a “social movement” Tilly(1994) describe a “series of interactions between power-holders and persons successfully claiming to speak on behalf of a on stridency lacking formal representation, in the course of which those persons make publicly visible demands for change in the distribution or exercise of power, and back those demands with public demonstrations of support”. Also, according to Tilly (1994) three populations are needed to operate a social movement: The power-holders who are the object of claims, the activists who take action and contribute to the solution of an issue concern the society or the environment and the “population” on whose behalf activists will make and support their claims”.

Furthermore, the Value-added Theory which actually proposes six factors that encourage the development of social movements: (Neil Smelser, 1962)

- a perceived problem,
- a belief that the responsible authorities are not doing what they supposed to do,
- a spread of the belief,
- a precipitating or dramatic event,
- mobilization
- a lack of social control.

This theory has been criticized for not being able to explain why some people who experience discontent fail to join a social movement (Kendall, 2008).

Afterwards, local environmental groups, which constitute the majority of environmental movements in Greece, depend mainly on volunteer participants, while their action usually takes place in rural areas, outside the urban centers (Daut, 2009). (NEED) However, the community-based environmental movements argue that they fight against major environmental, public health, social and economic impacts (Kousis et al., 2001). Additionally, most of the community-based mobilizations are independent initiative with no connection or dependency relations with political parties (Kousis et al., 2008).
Also, they are usually concerned about health and economic impacts on the family, as well as environmental impact at the community level (Kousis, 1997). Furthermore, the state plays an important and complex role in local environmental mobilizations. The role of state is complex because the two of its main functions, that is facilitator of economic development and capital accumulation are responsible for maintaining the harmony of its citizenry socio-economic structure (Schnaiberg, 1994), usually come into conflict when issues of local environmental degradation are raised.

2.7 Questionnaire

The questionnaire is a research tool that used to gather information by an individual and it is widely used in social research. The questionnaire invented by Sir Francis Galton. The advantages of the use of questionnaires instead of other evaluation methods is that this way is cost efficient, and because of the questions are standard it helps in gathering and further analysis of information. Actually, there are two types of questionnaire:

- The questionnaire which filled directly by the respondent
- The questionnaire which filled indirectly by the respondent, that is mean that the researcher fills the questionnaire on behalf of respondent.

The different ways which is possible to fill a questionnaire are basically three:

1. Via mail or email. (direct)
2. By direct interviews. In this case the researcher fills the questionnaire on behalf of respondent. (indirect)
3. By telephone interview, provided that the questionnaire is short.

The research via telephonic interview significantly evolved is1970-1980 and in combination with the informatics and statistical progress offer greater possibilities to researchers in gathering and processing larger volumes of data.

According to Javeau (1996) there are some general principles that should be followed to edit the research questions:

- To examine an issue should be asked people who are involved with it directly or indirectly.
- Could be gathered important information from the research in case which the proper question asked.
• In is not necessary to ask every single individual; just ask a representative part which is called “sample”.
• After the proper processing, the data could offer a good sense of what the situation of a problem is.

The stages of a questionnaire survey are:
1. Identification of subject of the survey
2. Selection of material resources for research
3. Gathering information from previous researches
4. Determination of the scope of the research
5. Find the sample and research field
6. Organization of the sample
7. Edit a draft questionnaire
8. Test the questionnaire to working groups
9. Edit the final questionnaire
10. Training of the researchers
11. Implementation of the research
12. Coding of the questionnaire
13. Detection survey
14. Verification of sample and data analysis
3 Community

3.1 Methodology

The emergence and operation of the community-based movement in Asopos River is obvious. The question is how these movements can operate, what are the main constraints hindering their mobilization, what their main weaknesses are and how their effectiveness and success can be evaluated. A qualitative study was considered most adequate since the best way to understand the processes surrounding a social environmental movement is to capture the various opinions, views and experiences of those enforcing, witnessing or recording the operation of a community-based movement.

Additionally, the protest-case analysis method that proposed by Kousis (1998) suggests the examination of six sources of data:

- national media
- local movement archives,
- archives of local or non-local agencies,
- documents,
- reports,
- In-depth interviews with local or non-local key actors.

Conducting qualitative research involves a series of steps and the validity of the findings depends on various processes such as:

1. Research methodology,
2. Selection of the sample of potential respondents
3. Analysis of the data (Valentine, 1997).

Moreover, all the participants were guaranteed confidentiality and anonymity in order to ensure their participation in the project and encourage honest responses (Hoggart et al., 2002).
Local and national newspapers, as well as different ecology magazines, have proved to be a very important data source. However, it has been acknowledged that issues of content bias may be raised when media is used for analyzing social movements’ action, since news articles, or journalists’ comments on TV may reflect personal opinions or political ideologies (Carmin, 1999).

The pollution problem in Asopos River first revealed as a result of the concern locals. The increase cancer incident rates alert and push the local people to organize coalitions and associations with the aim to press the government for the implementation of environmental regulations.

![Figure 5](source www.amen.gr)
3.3 Questionnaire

3.3.1 Introduction

This questionnaire had used in another thesis in 2010 for the National Technical University of Athens by Dimaras Aggelos and Mastrogiannis Filipos. The main reason that this questionnaire re-used is to see how the situation in the region changed the last three years. Moreover, it is an opportunity to examine if the financial crisis in Greece the last three years affects the different factors of the questionnaire. The first three questions examine is the people of the region are aware about the issue and the situation of Asopos River. From the fourth to the seventh question examined if the respondents use or for which uses do they use the water of the region. Until the question twenty three examined the ways which the people are informed about the situation how aware they are and if this situation was affect their daily life. Finally, the last six question examine if the people would voluntary contribute to find a solution for the environmental degradation of the region.

The questionnaire filled via telephone calls. The telephone numbers was found by a directory of the region. The people who reply to the calls was in total two-hundred fourteen and just the one hundred of them was accepted to reply in the questionnaire. The anonymity was kept in order to make them feel comfortable and answer to the questions. The average time which spent a respondent was 5 minutes and this research has been done from 10 of October till 5 of December in 2013.
### The questionnaire

<table>
<thead>
<tr>
<th>No</th>
<th>Question</th>
<th>Answer</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>What is the environmental condition in Asopos?</td>
<td>a) Very bad</td>
</tr>
<tr>
<td></td>
<td></td>
<td>b) Bad</td>
</tr>
<tr>
<td></td>
<td></td>
<td>c) Medium</td>
</tr>
<tr>
<td></td>
<td></td>
<td>d) Good</td>
</tr>
<tr>
<td>2</td>
<td>Which is the most important Environmental issue in Asopos?</td>
<td>a) Pollution</td>
</tr>
<tr>
<td></td>
<td></td>
<td>b) Underground water pollution</td>
</tr>
<tr>
<td></td>
<td></td>
<td>c) Sea pollution</td>
</tr>
<tr>
<td></td>
<td></td>
<td>d) Urban wastewater</td>
</tr>
<tr>
<td></td>
<td></td>
<td>e) Air pollution</td>
</tr>
<tr>
<td></td>
<td></td>
<td>f) Other</td>
</tr>
<tr>
<td>3</td>
<td>Which is the groundwater condition in Asopos?</td>
<td>a) Very bad</td>
</tr>
<tr>
<td></td>
<td></td>
<td>b) Bad</td>
</tr>
<tr>
<td></td>
<td></td>
<td>c) Medium</td>
</tr>
<tr>
<td>4</td>
<td>Do you use water by water well (drinking-cooking) now</td>
<td>a) Yes</td>
</tr>
<tr>
<td></td>
<td></td>
<td>b) No</td>
</tr>
<tr>
<td>5</td>
<td>Do you use water by water well (drinking-cooking) earlier</td>
<td>a) Yes</td>
</tr>
<tr>
<td></td>
<td></td>
<td>b) No</td>
</tr>
<tr>
<td>6</td>
<td>Do you use water by water well (other use) now</td>
<td>a) Yes</td>
</tr>
<tr>
<td></td>
<td></td>
<td>b) No</td>
</tr>
<tr>
<td>7</td>
<td>Do you use water by water well (other use) earlier</td>
<td>a) Yes</td>
</tr>
<tr>
<td></td>
<td></td>
<td>b) No</td>
</tr>
<tr>
<td></td>
<td>Question</td>
<td>Options</td>
</tr>
<tr>
<td>---</td>
<td>--------------------------------------------------------------------------</td>
<td>-------------------------------------------------------------------------</td>
</tr>
<tr>
<td>8</td>
<td>Which is the main source of information about the situation in Asopos?</td>
<td>a) Television&lt;br&gt;b) Newspaper or magazines&lt;br&gt;c) Friends&lt;br&gt;d) Information sessions&lt;br&gt;e) Internet&lt;br&gt;f) Municipal or other</td>
</tr>
<tr>
<td>9</td>
<td>Which is the aspect of the problem that you are aware?</td>
<td>a) Appearance of CrVI and heavy metal in the water&lt;br&gt;b) Water pollution&lt;br&gt;c) Discharge of wastewater by industries&lt;br&gt;d) Cancer symptoms due to water pollution</td>
</tr>
<tr>
<td>10</td>
<td>Which is the importance of the problem?</td>
<td>a) Huge problem&lt;br&gt;b) Big problem&lt;br&gt;c) Not a problem</td>
</tr>
<tr>
<td>11</td>
<td>Which is the main environmental issue in the region?</td>
<td>a) Health issue&lt;br&gt;b) Underground water pollution&lt;br&gt;c) Pollution of Asopos&lt;br&gt;d) Coastal pollution</td>
</tr>
<tr>
<td>12</td>
<td>Which is the main source of pollution?</td>
<td>a) Industry&lt;br&gt;b) Agriculture&lt;br&gt;c) Urban wastewater&lt;br&gt;d) Litter&lt;br&gt;e) Other</td>
</tr>
<tr>
<td>13</td>
<td>Does the pollution cause health issues?</td>
<td>a) Yes&lt;br&gt;b) N/A</td>
</tr>
<tr>
<td>14</td>
<td>Does the pollution cause impact on resident’s</td>
<td>a) Yes</td>
</tr>
<tr>
<td>Question</td>
<td>Option</td>
<td>Option</td>
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<tr>
<td>-------------------------------------------------------------------------</td>
<td>--------</td>
<td>--------</td>
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<tr>
<td>15. Does the pollution cause impact in the local economy?</td>
<td>a) Yes</td>
<td>b) No</td>
</tr>
<tr>
<td>16. Does the pollution cause impact on the quality of agricultural products?</td>
<td>a) Yes</td>
<td>b) No</td>
</tr>
<tr>
<td>17. Does the pollution cause impact on the quality of industrial products?</td>
<td>a) Yes</td>
<td>b) No</td>
</tr>
<tr>
<td>18. Do you know anyone who had face any health issue due to pollution?</td>
<td>a) Yes</td>
<td>b) No</td>
</tr>
<tr>
<td>19. Do you change your habits because of the pollution?</td>
<td>a) Yes</td>
<td>b) No</td>
</tr>
<tr>
<td>20. Which is the main impact in habits because of the pollution?</td>
<td>a) Increase of health problems</td>
<td>b) Anxiety</td>
</tr>
<tr>
<td></td>
<td></td>
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</tr>
<tr>
<td>21. Which is your drinking water source?</td>
<td>a) Bottled water</td>
<td>b) Network</td>
</tr>
<tr>
<td>22. Which is your water source for other uses?</td>
<td>a) Bottled water</td>
<td></td>
</tr>
<tr>
<td>Question</td>
<td>Options</td>
<td></td>
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<tr>
<td>-------------------------------------------------------------------------</td>
<td>----------------------------------------------</td>
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<tr>
<td>Do you take any protection measurements?</td>
<td>a) Water filters</td>
<td></td>
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<tr>
<td></td>
<td>b) No measures</td>
<td></td>
</tr>
<tr>
<td></td>
<td>c) Network</td>
<td></td>
</tr>
<tr>
<td></td>
<td>d) Boreholes</td>
<td></td>
</tr>
<tr>
<td></td>
<td>e) Other source</td>
<td></td>
</tr>
<tr>
<td>Do you think that is necessary to prevent measures for the underground water protection?</td>
<td>a) Quite necessary</td>
<td></td>
</tr>
<tr>
<td></td>
<td>b) Absolutely necessary</td>
<td></td>
</tr>
<tr>
<td>Are you satisfied with the actions was taken by the state?</td>
<td>a) Enough</td>
<td></td>
</tr>
<tr>
<td></td>
<td>b) Slightly</td>
<td></td>
</tr>
<tr>
<td></td>
<td>c) Not at all</td>
<td></td>
</tr>
<tr>
<td>Do you think that social movements could help the situation?</td>
<td>a) Very much</td>
<td></td>
</tr>
<tr>
<td></td>
<td>b) Not that much</td>
<td></td>
</tr>
<tr>
<td></td>
<td>c) Not at all</td>
<td></td>
</tr>
<tr>
<td>Would you like to have a voluntary contribution?</td>
<td>a) Positive</td>
<td></td>
</tr>
<tr>
<td></td>
<td>b) Negative</td>
<td></td>
</tr>
<tr>
<td>Which amount of money would you willing to pay?</td>
<td>a) 15</td>
<td></td>
</tr>
<tr>
<td></td>
<td>b) 20</td>
<td></td>
</tr>
<tr>
<td></td>
<td>c) 25</td>
<td></td>
</tr>
<tr>
<td></td>
<td>d) 30</td>
<td></td>
</tr>
<tr>
<td></td>
<td>e) 35</td>
<td></td>
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<td></td>
<td>f) 40</td>
<td></td>
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<td></td>
<td>g) 45</td>
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<td></td>
<td>h) 50</td>
<td></td>
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<tr>
<td></td>
<td>i) 60</td>
<td></td>
</tr>
<tr>
<td></td>
<td>j) 100</td>
<td></td>
</tr>
<tr>
<td>Which is the reason for you to not contribute?</td>
<td>a) Not enough money</td>
<td></td>
</tr>
<tr>
<td></td>
<td>b) It is not a priority issue</td>
<td></td>
</tr>
<tr>
<td></td>
<td>c) I do not use the underground water</td>
<td></td>
</tr>
</tbody>
</table>

Table 1 Questionnaire
**Personal details which was asked:**

Gender:

Age:

Marital status:

Income:

Education level:

To conclude as the interviews done via telephone the question had to be short and small in number. Moreover, the sample of the people was randomly chosen. It is important to be noticed that the most of the people who deny answering the questions were suspicious about the nature of the research. Furthermore, as it is mentioned in the beginning because of the interviews was via telephone there was a lack of any kind of critiques about the pollution and other aspects which concern the public.
4 Government

4.1 Introduction

In the beginning, it is important to identify the critical problems and set priorities in terms of political, human, and financial resources. Accordingly, it created a correlation between the greatest impact and the cause of the most important problems. Afterwards, a government should support the enterprises with incentives. Taxes are another factor that governments examine. Environmental taxes considered in some case as more important than environmental regulations. In addition government should not neglect the pollution charges. Furthermore the Ministry of finance should face the taxes as a way to change the behavior of enterprises and not as a way to generate revenues. Moreover the different ministries should take their consistent policies. In addition, important for the government is realistic draw up environmental regulations in a manner way that the enterprises will implement the regulation in a non coercion way. Also, the negotiation of the targets with the industries in order to check if there are common targets as the time which the companies need in order to comply in a regulation. Finally, government should support the strengthening of environmental agencies in order to help them to develop their technical and monitoring capabilities. Important also is the decentralization the responsibilities to regional authorities wherever possible.

4.2 Political and Economic interaction

Many studies suggest that changes in political opportunities and constraints structure affect the emergence and evolution of a mobilization (Kriesi et al., 1995; Tilly, 2004; Rootes, 2006). Politics is closely connected to environmental protest, and local mobilizations are highly affected by the political conditions, strategies and alliances structures (van der Heijden, 1999). The close examination of the Asopos river movement proves Kousis’ (1999) argument that local mobilization is more likely to emerge in tourist areas. Accordingly, the residents of Oinofyta, where the majority of industries are located, are highly economically dependent on industrial activity. On the other hand, Oropos is mainly dependent on tourist activities. People in Oropos were more willing to engage in a local conflict with the polluters and the state, since the economic viability of the
area is depending on a clean environment. Therefore, economic dependence on environmental-destructive activities along with the lack of other resources to tackle the environmental problem is closely related to limited social demand for environmental preservation (Kousis, 2004).

The local environmental conflict over Asopos River is rooted in the government’s regulation and decision-making processes. In the modern world, especially in rural settings, the central state usually assumes the role of the major antagonist of community based environmental movements. In case of Asopos, the state has also the role of the producer since the Hellenic Aerospace Industry (EAB) is located in this area.

As Kousis (1997) states, “the administrative state [in Greece] is highly constrained in its responses to [local environmental] problems given severe difficulties in policy implementation, the inability to deal with complex problems due to the non-neutrality of expertise, and its obstruction of the free transmission of information”. Although, contemporary environmental regulations require producers to apply some qualitative controls over their production systems, governments often fail to impose quantitative limits on the volume of the production and its financial gains (Schnaiberg, 2009). This is the case also in the Asopos River. Although there are legislation tools available for imposing limits to the damaging industrial activity, the state appear unwilling to enforce them, by conducting regular quality assurance controls and impose fines to those producers who do not comply with the regulations.
5 Industries

5.1 Management of Industrial Pollution:

To start with, good environmental practice is just a good management; environmental problems are often a symptom of inefficiency and waste of resources. Furthermore, involve your staff and workers. Environmental problems are often occupational health problems. Define clear goals, provide training, and monitor performance. Finally, focus on those environmental investments that can be financed out of cash flow. This ensures that environmental management is seen as part of the overall operating costs of the enterprise.

5.2 Plan and Priorities

In order to solve an issue a proper way to face it is to find the reason which caused it. Accordingly, a Program for the management of the environmental crisis in Asopos could cover:

1. Ways to ensure safe and clean water
2. Institutional safeguard of the broader area
3. Monitoring the pollution
4. Intensification of the controls
5. Ways against the environmental degradation
6. Definition of environmental policies in terms of goals rather than inputs
7. An effective environmental strategy with clear priorities
8. Greater decentralization, with respect to the implementation of policies
9. Instead of the use of control measures could promoted of improved performance and management strategies
10. A plan for adoption of cost-effective strategies instead of specifying extra control measures.
Figure 6 The draft strategy has been developed around this structure.

Figure 7 Implementation plan.
5.21 Use yardstick competition to improve environmental performance over time.

The relationship between environmental agencies and those regulated may mean that the best approach is a combination of minimum requirements and market incentives. In such cases, it is critical that the minimum requirements be adjusted regularly to reflect the average performance of enterprises, rather than being determined by technical criteria. The goal would be a system of regulation based on yardstick competition, which has the desirable property of encouraging a continuous search for cost-effective improvements while penalizing laggards, perhaps heavily.

5.3 Promote Good Management

To start with, it is very important to internalize the environmental management. Significant and lasting environmental improvements will not come until the objectives and requirements of environmental protection are internalized in the behavior of polluters, whether these are enterprises, organizations, or individuals.

Also important is to rely on incentives (financial and social). Pollution control policies have relied heavily on technological standards. Even where these standards are effective, they tend to be an expensive way of meeting environmental goals. Market incentives that reward good environmental management offer an alternative strategy, but they may be resisted on grounds of fairness and because of uncertainty about the level of reduction of total emissions. In practice, any differences between policies based on standards and those based on incentives are not large for particular industries or sources. The real advantage of relying on incentives lies in their flexibility and cost savings when emissions from many industries and sources have to be reduced. Incentives need not be financial; the provision of information and public participation can have a significant impact on the behavior of some polluters.

The adoption of “win-win” options such as cleaner production techniques, waste minimization, and energy efficiency seems to offer the prospect of environmental improvement at little or no cost. Yet diffusion of such practices is often frustratingly
slow, and the resulting benefits are modest. The problem, once again, is one of management capacity. The enterprises best placed to adopt and benefit from many “win-win” opportunities are likely to be among those that already have the best environmental performance. The same management constraints and weaknesses that lead to poor performance mean that the costs of innovation are likely to be relatively high and the benefits low for laggards.

In the region of Asopos there are large, medium and small enterprises. The basic separations between them are the:

- Differentiated products
- Management
- Technical skills
- Market target
- Time horizon for their business decision

Also large companies care about their reputation so their managers focus on the good housekeeping aspects of production and the good environmental performance of the continuous process of implementing efficiency and quality improvements that is required to compete on quality of output as well as on price. Usually, for medium and small enterprises the budgets for which are available for innovation departments are low. Furthermore, the prices of the products are usually a vital criterion for the consumers to buy a product. Notice that, many small enterprises do not want to be the first who will try new managements of technologies.

5.4 Ambient and Emissions Standards

Ambient standards considered the maximum allowable levels of a pollutant in the air, water, or soil. Ambient standards can be used as a simple method in order to set priorities. That is happen because the areas that ambient standards comply are considered to require no further intervention.

Afterwards, the technology-based standards are based on knowledge of what can be achieved with current equipment and practices. The principles which are usually used include:

- best available technology (BAT),
- best practicable technology (BPT),
- best available technology not entailing excessive cost (BATNEEC)

All these approaches are open to interpretation and are related to establishing the highest levels of equipment and performance that can reasonably be demanded from industrial plants.

Moreover, there are the New Source Performance Standards (NSPSs) which are specific emissions standards which are applied only to new plants. In case those NSPSs are much stricter than standards imposed on old plants and are therefore costly, they could effect of prolonging the economic life of existing plants. Also, it is easier for new plants to adopt cleaner processes and to incorporate treatment requirements in the initial design. Therefore, the costs of well designed NSPSs should not be excessive.

5.6 Comparative Risk Assessment

Comparative risk assessment provides a general framework for evaluating environmental problems that affect human health. Risk assessment does not have to be cumbersome or costly to provide useful insights. Rapid, inexpensive approaches can be considered risk assessment as long as certain basic concepts are included. There are four generally recognized steps in assessing human health risks, as described by the U.S. National Research Council:

- Hazard identification
- Exposure assessment
- Dose-response assessment relates the probability of a health effect to the dose of pollutant.
- Risk characterization which combines the exposure and dose-response assessments to calculate the health risk estimates.

5.7 Issues in the Use of Risk Assessment

5.7.1 Defining the Scope of the Analysis

An effective risk assessment must have a well defined scope. The appropriate scope depends on the purpose of the analysis. The purpose of most comparative risk assessments is to identify the most important health risks from the point of view of the
people affected. Although the options for mitigating risks may be evaluated on a sectoral basis, the initial analysis should consider all types and sources of environmental risk in making the ranking. The analyst must choose the types of risks and populations to assess. These may include:

- Type and duration of health end point (acute or chronic, cancer or noncancer, occupational disease)
- Special target populations such as children, pregnant women, and asthmatics
- Ecological effects (for example, on populations, unique habitats, or biodiversity).

An assessment of a particular industrial project or sector typically begins with a description of the source of pollution. Models of the transport and potential transformation of the pollutants in the environment are used to estimate the concentration of contaminants in air, water, or soil. Concentrations in these media are used to estimate the human dose, which, combined with dose-response information, predicts the occurrence of disease.

For some pollutants, monitored data on concentrations in air or water may be available, obviating the need for modeling the transport and fate of the pollutant. In other cases, data on measures of pollutants in the human body, such as blood lead levels, or measures of characteristic clinical responses to exposures, such as elevations in blood enzyme levels, may be available. These may be used as a direct measure of exposure in the dose-response functions, rather than using estimated exposure rates.
5.72 Quality of Data Required

The quality and quantity of data needed to produce a meaningful analysis will depend on how much uncertainty the analyst is willing to accept.

Ideally, high-quality local data for all parts of the analysis, including locally based epidemiology for the dose-response functions, would be available. The ideal will rarely, if ever, be the case. However, limited good data can be supplemented through techniques that fill data gaps with reasonable assumptions and extrapolations. For example, data on ambient concentrations of many chemicals are often unavailable, since monitoring is expensive and is likely to be directed at only a few constituents. In its place, emissions data can be used in conjunction with environmental modeling systems to estimate concentrations in the environment.

<table>
<thead>
<tr>
<th>Area of concern</th>
<th>Hazards identified</th>
<th>Persons at risk</th>
<th>Current Risk Factor (3,2,1)</th>
<th>Actions to be taken to minimize the risk</th>
<th>New risk factor (3,2,1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asopos River and the wider area</td>
<td>Water pollution</td>
<td>Residents of the wider region, employee, employers</td>
<td>3</td>
<td>Operation to EMS, monitoring pollution loads, share information and technology</td>
<td>2</td>
</tr>
<tr>
<td>Air pollution</td>
<td></td>
<td></td>
<td>3</td>
<td>Operation to EMS, monitoring pollution loads, share information and technology</td>
<td>2</td>
</tr>
<tr>
<td>Underground water pollution</td>
<td></td>
<td></td>
<td>3</td>
<td>Operation to EMS, monitoring pollution loads, share information and technology</td>
<td>2</td>
</tr>
<tr>
<td>Sea water pollution</td>
<td></td>
<td></td>
<td>2</td>
<td>Operation to EMS, monitoring pollution loads, share information and technology</td>
<td>1</td>
</tr>
<tr>
<td>Litter and other wastes</td>
<td></td>
<td></td>
<td>2</td>
<td>Operation to EMS, monitoring pollution loads, share information and technology</td>
<td>1</td>
</tr>
</tbody>
</table>

Table 2 Risk Assessment- example

High risk=3 Medium risk=2 Low risk=1
To conclude, the effective environmental strategies which are developed and implemented require cooperation between:

- Enterprises and other polluters,
- Regional and local authorities
- National agencies.

Furthermore, the key to success is to keep the solutions as simple as possible, and to ensure transparency and accountability on the part of all those involved. The links between emissions, ambient levels, and impacts need to be well understood when a monitoring system is being designed because an error in the assumed relationships can lead to wasteful or counterproductive policies and actions. In some cases where a highly polluting industry is also one of the major local employers, noticed that the “jobs versus pollution” debate is one of the main public concerns.
6 Data Analysis and Discussion

Introduction

6.1 Data collected

Question 1: The environmental condition of Asopos River is critical. However it is very important to know if the people are aware about this situation. So, in the first question, the respondent is asked to describe the environmental condition of the Asopos. As the problem exist, a solution is necessary. That is why the promotion of Sustainable Development in the region is so important. According to the figure below, the 69% of the respondent answer that the condition of Asopos is very bad, the 18% bad, the 12% medium and just 1% said that the condition in the region is good.

![Environmental Condition of the region](image)

Question 2: This question considers the environmental issues in the region. Specifically, the respondent asked to answer which are the three most important environmental problems in the region. Their first answer was count for 3 points the second for 2 points and the third for 1 point. The percentages in the graph below are a result of the points was gathered for each issue. As it is shown in the figure below, the main environmental problem is the pollution of Asopos (44%). In the second and the third place is the underground water (30%) and sea pollution (12%). Another problem which seems that concern the people are the urban wastewater (9%).
Question 3: In this question examined the condition of underground water in the region. As it is shown by the graph below, the people are aware about the underground water pollution as the 73% of the respondent agrees that the underground water condition is very bad and the 12% agrees that the condition in the region is bad.

Question 4: This question examine if the people use the water from boreholes for drinking or cooking. The graph below shows that, the majority of the people avoid drinking the water which coming from boreholes. In contrast one out of five of the respondents are still drinking the water.
Figure 11 Use of water by boreholes (drinking-cooking) recent

Question 5: This question examines if the people used to use the water by boreholes for drinking or cooking. This graph shows that almost one out of five people used to drink the water by water well in the region. It is the exactly opposite that it is happening now (see figure 11).

Figure 12 Use the water by boreholes (drinking-cooking) earlier

Question 6: The sixth question examines if the people are using the water by boreholes for house cleaning or garden watering. The results indicate that, one out of three people use it.
Question 7: This question examines if the people used to use the water by boreholes for house cleaning or garden watering. The results indicate that, the 92% of the respondents used to use it.

Question 8: This question focuses on the main sources of information about the Asopos case. The question help us to check what kind of information Accordingly, the main sources of information about the Asopos case seems to be the the Municipal(29%) and the television(22%).
Question 9: The ninth question focuses on the aspects of the problem which displayed by the different sources of information (see figure 15). The graph below shows that, the residents are aware about the different aspects of the problem but the main issue is the existence of CrVI and heavy metals in the water (52%). After that, the water pollution with a 28%, the cancer symptoms with a 12% and the discharge of wastewater by industries with 8% are the aspects of the problem which the respondent was aware.

Question 10: All of the people who believe in existence of the problem agree that the problem is huge with 92% and just an 8% agree that the problem is big.
Importance of the problem

![Importance of the problem](image)

**Figure 17 Importance of the problem for the region**

Question 11: The main impacts caused by the pollution are actually the factors that show why the problem of Asopos is so important (figure 17). As it is obvious from the graph below almost the half of the residents believe that the main impacts which are cause by environmental pollution are the health issues (48%). However, one out of three (34%) believes that the groundwater pollution is more important than the health issues.

Main Impacts caused by the pollution

![Main Impacts caused by the pollution](image)

**Figure 18 Main impacts caused by the pollution**

Question 12: This question shows the main sources of pollution in the region. The 55% of the respondents answer that the industrial activities are responsible for the pollution. However one out three people agreed that the agriculture is the main source of pollution. The litter and the urban wastewater with 5% and 1% respectively considered as sources of the pollution as well.
Question 13: The graph below indicates that the people strongly believe that the pollution is responsible for the health issues in the region.

Figure 19 The main sources of pollution

Figure 20 Does the pollution cause health issues?
Question 14: According to the graph below the people agree that the pollution effect the economic situation of the residents.

![Are there impacts on residents' economic situation?](image)

Figure 21 Are the impacts on residents' economic situation?

Question 15: People also agree that the pollution has impact in the local economy. Specifically, this question focuses on impacts which probably had the environmental degradation of the region in the local economy. It could be also noticed that the answers of people in this questions was based in their location. Actually, the 82% of the people who answer this question live in touristic region and the 12% live in industrial region.

![Are there any impacts in the local economy?](image)

Figure 22 Are there impacts in the local economy?
Question 16: People also agree that the pollution has impact on the quality of agricultural products.

![Are there any impacts on the quality of agricultural products?](image1)

Figure 23 Are there any impacts on the quality of agricultural products?

Question 17: In the question “are there impacts on the quality of industrial products?” the most of the people agreed (42%) a big number of people was not aware about the issue (38%) and one out of five supported that the pollution impact the quality of industrial products.

![Are there any impacts on the quality of industrial products?](image2)

Figure 24 Are there any impacts on the quality on industrial products?
Question 18: In this question the respondent was asked to answer if they know any people who have face health problems due to environmental pollution. In this case it seems that the 49% of the respondent suspects that the pollution was responsible for the health issues of the people in the area. The 35% of the people was sure that the pollution was the main cause of the health issues. Just the 16% of the people said that they did not know anyone who has face in the past, or currently facing health issues.

![People who had face health problems](image)

**Figure 25 People who had face health problems**

Question 19: Graph below indicates that the people have changed their habits because of the pollution of Asopos. The 87% states that they change their habits and the 13% declare that they did not change their habits. This change may be a result of the economic and health impacts of the pollution.

![Change in habits because of the pollution](image)

**Figure 26 Change in habits because of the pollution**
Question 20: This question identifies the impacts in habits due to the environmental pollution in the region. The most important of the impacts in their habits was that they spend more money as they have to buy bottled water (57%). A 16% of the people state that they are more anxious. A 14% of the total said that cleanliness consider the most important impact on their habits.

![Impacts in habits because of the pollution](image)

**Figure 27 Impacts in habits because of the pollution**

Question 21: This question concerns the drinking water sources. The majority of the people (90%) buy bottled water. A 9% of them drink water from the network and just the 1% drink the water by water well.

![Drinking water source](image)

**Figure 28 Drinking water source**
Question 22: This question indicates which sources of water the people are using for house cleaning purposes. So, for the house cleaning and other uses the 82% use water from the network. On the other hand the 17% of the people use bottled water.

![House cleaning water source](image)

Figure 29 House cleaning water source

Question 23: The main protection measure which the people could take is the water filters. So in this question the people were asked if they use or not filter in their houses. It is important to notice that the most of the people do not use any protection measures (63%). As a 37% of them uses water filters.

![Protection measures](image)

Figure 30 Protection measures
Question 24: The majority of the people support that it is absolutely necessary to prevent measures for the underground water protection.

**Figure 31 Prevention measures for the groundwater protection**

Question 25: The graph below indicates that 9 out of 10 people are not satisfied by the actions was taken by the state.

**Figure 32 Satisfaction for the actions was taken by the State**

Question 26: It is remarkable that the majority of the people believe that social movements can change the situation. However it was expected as the action of social movements in the region especially the last two decades was noticeable.
Question 27: The respondent was asked if they were willing to voluntary contribute in the creation of an organization which would be responsible to solve the problem of environmental pollution in the region. For the voluntary contribution the 72% of the people was positive and the 28% negative.

Question 28: The people who were positive in the voluntary contribution (see figure 34) was asked if there was willing to pay in order to change the situation and what amount they should offer for this purpose. The graph below indicates exactly the results.
Question 29: The respondent who was negative in voluntary contribution (see figure 34) was asked to tell the reasons for their negative stance. The 21% of the people it is willing to voluntary contribute but the income is not enough. The 18% believes that the government should pay. The 7% of the people believe that the polluters should pay.
6.2 Demographic Data

The graph below indicates the age of the respondents.

![Number of people by age](image1)

**Figure 37 Number of people by age**

Marital status shows if the people are single or married.

![Marital status](image2)

**Figure 38 Marital status**
Gender of the respondents shows how many males and females participate in this research.

**Figure 39 Gender of participants**

The classification of education shows the educational level of the participants.

**Figure 40 Classification of education**
Income per person is the amount of money which each of the participant receives in a year.

Figure 41 Income per person
6.3 Analysis and discussion

To start with, the people are aware about the critical situation in region. The environmental degradation as a result of the industrial pollution in Asopos River is an issue that concerns the residents of the wider region. Generally, the people of the region avoid using the water by boreholes or the local network for drinking. However, they use it for home use only. Noticeable is that the number of people who used to use the water for house cleaning purposes decreased in present. All the respondents are from the region of Asopos and that was because as Reed had noticed the most effective manage of a river is on its basin level. (Reed et al. 1998). However, respondent was from the wider region of Asopos. Although the income, education, and living habits are factors that do not protect individuals by the pollution in an industrial area (Beck, 1992) was asked to examine their interaction with the voluntary contribution of the residents in environmental movements. Especially, it seems that the habits of the people has changed due to the water pollution of Asopos. One of the most important factors that they change their habits is that they were forced to buy bottled water. It is economically unaffordable. Furthermore some of the questions in the questionnaire were based on the perceived problem of the industrial pollution of Asopos and on the belief that responsible authorities are not doing what they supposed to do. (Neil Smelser, 1962) As it is obvious by the answer of the respondents in the relative questions the people are not satisfied by the actions was taken by the state to the case. However, people seem to believe that social movements have result and help the situation. Based on the statement of Daut the environmental movements in Greece, depend mainly on volunteer participants (Daut, 2009) that is why a relative question asked to respondents. So, according to the result of questionnaire it is seems that three out of four respondents were willing to voluntary contribute in organized environmental movements. Additionally, issues that concern health and economic impacts at the community level examined. The 97 out of 100 respondents were agreed that the pollution cause health problems. However, almost the half of them replied that they knew people who get sick because of the pollution. The most of the people who asked was from Oinofyta which is the area that the majority of industries are located and many others from Oropos which is a touristic region. However, the result on questions 14 and 15 could not be explained. As the
most of the people are from Oinofyta the results should show that the local economy or the economy of each of them individually should not have any impact. Probably the financial crisis was responsible for the salary reduction of the people who work on the industries. From the people who live in Oropos their answer was expected as the environmental pollution caused them impact in their touristic activities.
7 Conclusion and Recommendation

According to protest-case analysis method that proposed by Kousis (1998) suggests the examination of six sources of data:

- national media
- local movement archives,
- archives of local or non-local agencies,
- documents,
- reports,
- In-depth interviews with local or non-local key actors.

In this thesis all the above factors examined in order to have a better understanding of the issue. Moreover, this project was focus on the promotion of sustainability in Asopos River. Investigated the different ways in which sustainability could be promoted in the region. As the problem is existing and concern everyone was considered to be good to examined by different angle. Accordingly, examined how the community reacts or could react in order to reduce the pollution of the river. Also, in this project examined different stances of the government in order to balance the society and economy concerns. Afterwards, the industry as a typical sample of economy examined in order to find how the enterprises face the pollution which actually they occur. The most of the information gathered by books, internet sources, newspapers, magazines and previous works on the theme. However, in case of community a questionnaire used a qualitative method in order to gather extra information. On the other hand in case of industries by method of gathering information and observation filled an environmental risk assessment. As the questionnaire filled by the researcher and the interview was via telephone it was difficult to ask many and in depth question. On the other hand there was a plenty of information available on the internet and past works for the specific issue was really helpful. This research was focus to show how the community, government and the industries could act in common in order to solve the problem. As many researcher in the past had focus on the community based movements in Asopos River, it could be suggested to new researchers to focus on how the industries could organizes, form and follow a sustainable plan with respect to society and environment.
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