

SMART CITIES AND DEVELOPMENT

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ABSTRACT: Large urban centers gather the largest proportion of the population, both globally and nationally. In order to coexist a large number of residents in a city, that city must evolve continuously in order to meet and satisfy their needs. In addition, it is imperative to develop a series of procedures that will make cities more sustainable, resilient and responsive to the new challenges.

During the last years and in order to overcome the problems that have arisen, promising policies have been developed which aim, through the improvement of technology, in helping citizens and upgrading their quality of life. The environment in which these policies will be achieved is the environment of a smart city. According to European Commission, smart cities are cities using mainly technological solutions to improve the management and efficiency of the urban environment. However, creating these is a demanding process because digital transformation is needed on many levels, as the needs of residents and visitors are the main targets of these efforts.

In order to make the concept of smart city more specific, it is defined as the smart combination of the capabilities and activities of determined, independent and sensitized citizens, and must be achieved in the sectors of Smart Environment, Smart Mobility, Smart People, Smart Governance, Smart Living and Smart Economy.

This chapter/article aims to highlight the importance and the contribution of smart cities especially in the promotion of regional and local development.

Initially on a theoretical level the concept of smart city will be analyzed according to international bibliography, what is smart city in practice, the route of smart cities during time, (history and their evolution) as well as description of the three generations of smart cities according to Cohen (2015) [smart cities driven by technology (1997 +), Technologically supported cities (2003 +), Citizen in the role of co – creator (2010 +)].

Then, after approaching the concept of spatial dimension, an attempt will be made to point the contribution of smart cities in regional and local development, and to describe the challenges/questionings of the future for a smart city.

Finally as case study the effort of exploitation of the Eratinos Geothermal Field of the Municipality of Nestos, a medium sized Greek Municipality, will be presented as a means of upgrading in the sector of Smart Environment.

Keywords: *Smart cities, Development, Smart Environment, Municipality of Nestos*

I. INTRODUCTION:

Smart cities are a reality for the most places in planet. The idea of a smart city focuses to the perception that the adoption and use of the continuously developing technologies in everyday life could become the necessary tool for the creation of more improved and effective societies.

In simple terms, smart city is nothing but the effort for the achievement of a local society organized in such a way that innovative technologies of information, communication and data spread could become the base for a more effective improvement of its citizens' life quality (Tsarhopoulos P.,2013).

What really characterizes a city as smart, is its effort to address any public local issues through the use of new information and communication technologies (Delitheou, V., Tsavalias C., 2018). In other words, smart cities seek to create an electronically networked society which will benefit from the smart management of its issues.

Consequently, very cleverly, Arrington G. (2003) points out that in order to achieve the goal of smart management in a smart city, use of technology is necessary in order to develop new infrastructure on the one

hand and to make more efficient use of the existing ones on the other. The result of all these will be to create cities that will support actions such as the creation of compact cities with accessible access to wireless networks for citizens, or even more, that will have replaced all bureaucratic communication processes with digital systems.

Even though there is not a commonly acceptable definition for Smart City, European Commission defines as Smart Cities “Cities using technological solutions to improve the management and efficiency of the urban environment”. Analytically a smart city is a place where traditional networks and services are made more efficient with the use of digital and telecommunication technologies for the benefit of its inhabitants and business.

The research method on which the article is based is bibliographic and qualitative research. The material that was used is books and web pages. Interviews were also considered necessary to enhance the case study research. These were conducted with General Manager of SELECTA HELLAS, and former Mayor of the Municipality of Nestos. By this way are shown the planning, the implementation process, its impact on society and business from the point of view of the Municipality and the business itself.

II. LITERATURE REVIEW

The concept of smart cities has emerged during the last few years to describe how investments in human and social capital and modern ICT infrastructure and e-services fuel sustainable growth and quality of life, enabled by a wise management of natural resources and through participative government (Schaffers, H., Ratti, C., Komninos, N., 2012).

The evolution of the Smart City concept is shaped by a complex mix of technologies, social and economic factors, governance arrangements, and policy and business drivers. The implementation of the Smart City concept, therefore, follows very varied paths depending on each city's specific policies, objectives, funding and scope (European Parliament, 2014).

Komninos N. (2002) in his attempt to delineate the intelligent city, (perhaps the concept most closely related to the smart city), cites four possible meanings. The first, concerns the application of a wide range of electronic and digital applications to communities and cities, which effectively work to conflate the term with ideas about the cyber, digital, wired, informational or knowledgebased city. A second meaning is the use of information technology to transform life and work within a region in significant and fundamental ways. A third meaning of intelligent or smart is as embedded information and communication technologies in the city, and a fourth as spatial territories that bring ICTs and people together to enhance innovation, learning, knowledge and problem solving (the latter being related somewhat to the smart growth agenda - see below). Overall then, Komninos N. (2006) sees intelligent (smart) cities as “...territories with high capacity for learning and innovation, which is built-in the creativity of their population, their institutions of knowledge creation, and their digital infrastructure for communication and knowledge management” (Robert G., Hollands, 2008).

The smart city, which consists - "utilization of networked infrastructures to improve economic and political efficiency and enable socio, cultural and urban development"- has been projected as a panacea to problems related to rapid urbanization and a way to achieve sustainable development (Krishna R., Crutzen, N., 2017).

III. THE NEED FOR THE CREATION OF SMART CITIES

Last decades, it is observed an increasing concentration of population in urban areas. The phenomenon of urbanization is rapidly spreading to all continents. According to United Nations figures, the global urbanization rate in 1950 was 29.8%, in 2000 it grew to 47.2% and is estimated to be 60.2% in 2030, doubling compared to 1950. North America has the highest rates of urbanization from 1950 to 2030, with an expected rate of 84.5% in 2030. In Europe of 1950 the urbanization rate was 52.4% and in 2030 it would reach 80.5%. (O'Sullivan A., 2011).

Given the speed of urban development in the world and the growth of the urban population, it is necessary to use new technologies in the everyday lives of citizens in order to improve quality of life and address the problems that arise in them.

With all the Information and Communication Technologies, it is possible to develop cities in smart cities, provided of course that it is effective and efficient.

Of course, an important factor that pushes a city to become smart is also the intense competition that is now increasingly common among cities to cope and show more attractive, but also competitive in an increasingly globalized economy (Anthopoulos L., 2017).

Thus, every city that seeks to be characterized as smart must adopt such a character and mindset of a city that, with the vehicle of new technologies, designs and supports knowledge intensive actions, provides for sustainable development and protection of its natural resources, gives emphasis on the creation of advanced technology industries, undertakes actions related to the construction of high-tech infrastructure, and all of the

above are based on local prosperity and increased competitiveness (Anthopoulos L., 2017). Throughout this effort, we should not ignore consequences, such as over-accumulation of people in specific areas, a high need for energy demand, and a burden on the local environment.

However during the effort to understand the concept of smart city, it would be very helpful to find answers and solutions to issues that have to do with the necessity of its existence as well as the offer of it itself. The basic issues that triggered the creation of smart cities are the following (Delitheou, V., Tsavalias C., 2018):

- ❖ Issues related with the environment as well as the urbanization phenomenon. In this category we find issues as:
 - Reducing the impact of urbanization,
 - population growth and
 - global warming and climate change.
- ❖ Issues related with the new way of living. In this category we find issues as:
 - people are both consumers and producers at the same time,
 - More opportunities for work / education
 - increased demand for energy and
 - lift of time and space restrictions.
- ❖ Need to strengthen the competitiveness of cities. In this category we find issues as:
 - transport infrastructure,
 - levels and cost of living and
 - attracting resources.

In the context of ranking of the European Medium-sized Cities by the Centre of Regional Science, Vienna University of Technology, it was defined that a smart city, based on the intelligent combination of the capacities and activities of determined, independent and sensitized citizens, should achieve at the following sectors:

- SmartEnvironment
- SmartMobility
- SmartPeople
- SmartGovernance
- SmartLiving
- SmartEconomy.

Each of those sectors is defined by a number of factors, and each factor is described by various indicators.

Smart Economy is described by factors regarding economic competitiveness such as innovation, entrepreneurship, brands, productivity, labor market flexibility as well as integration in national market.

Smart Governance includes aspects of political participation, services for citizens as well the functioning of the administration. Local and international accessibility are important aspects of Smart Mobility, as well as the availability of information and communication technologies and modern sustainable transport systems.

Smart Environment is described by attractive natural conditions (climate, green etc), pollution resource management as well as efforts for environmental protection.

Smart People are not described exclusively by the level of their qualifications or citizens education but also by the quality of social interactions regarding integration and public life and opening up to the “outside” world.

Finally, Smart Living includes several aspects of quality of life such as culture, health, safety, housing and tourism. These characteristics and factors consist the framework for indicators and the assessment of the performance of a city as a "smart city". (Centre of Regional Science, 2007).

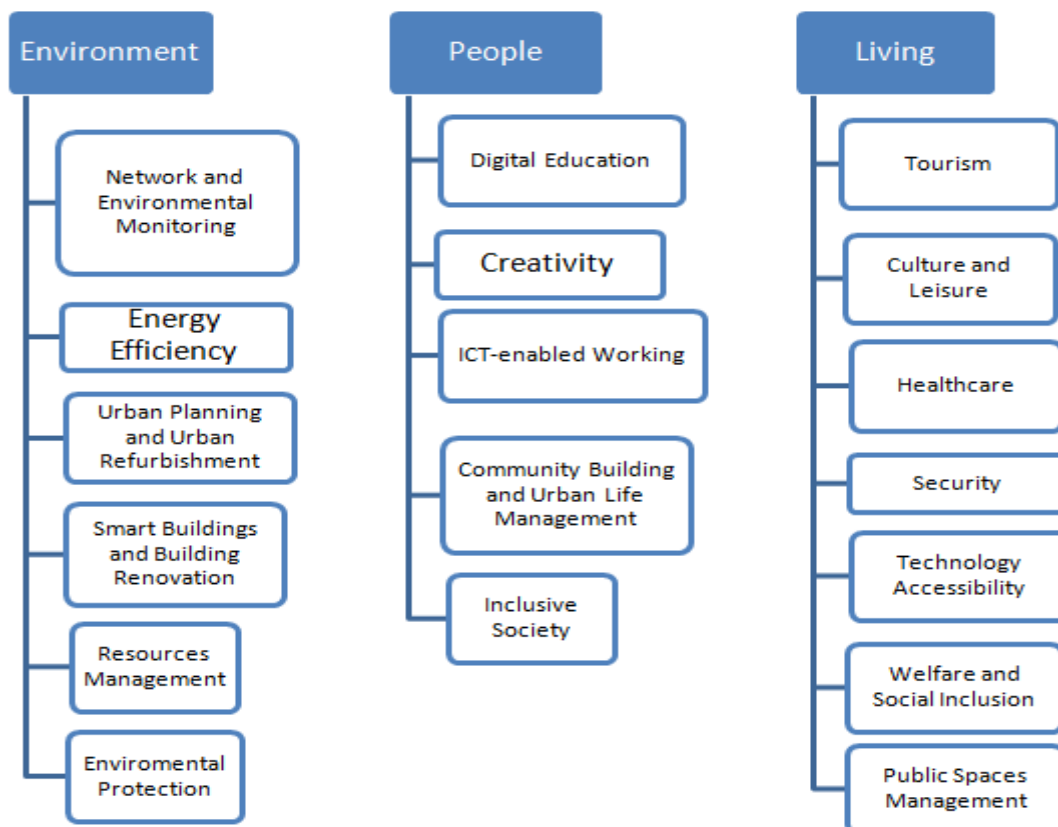
Characteristics and Factors of a Smart City

SMART ECONOMY (Competitiveness)	SMART PEOPLE (Social and Human Capital)
<ul style="list-style-type: none"> ▪ Innovative spirit ▪ Entrepreneurship ▪ Economic image & trademarks ▪ Productivity ▪ Flexibility of labour market ▪ International embeddedness ▪ <i>Ability to transform</i> 	<ul style="list-style-type: none"> ▪ Level of qualification ▪ Affinity to life long learning ▪ Social and ethnic plurality ▪ Flexibility ▪ Creativity ▪ Cosmopolitanism/Open-mindedness ▪ Participation in public life

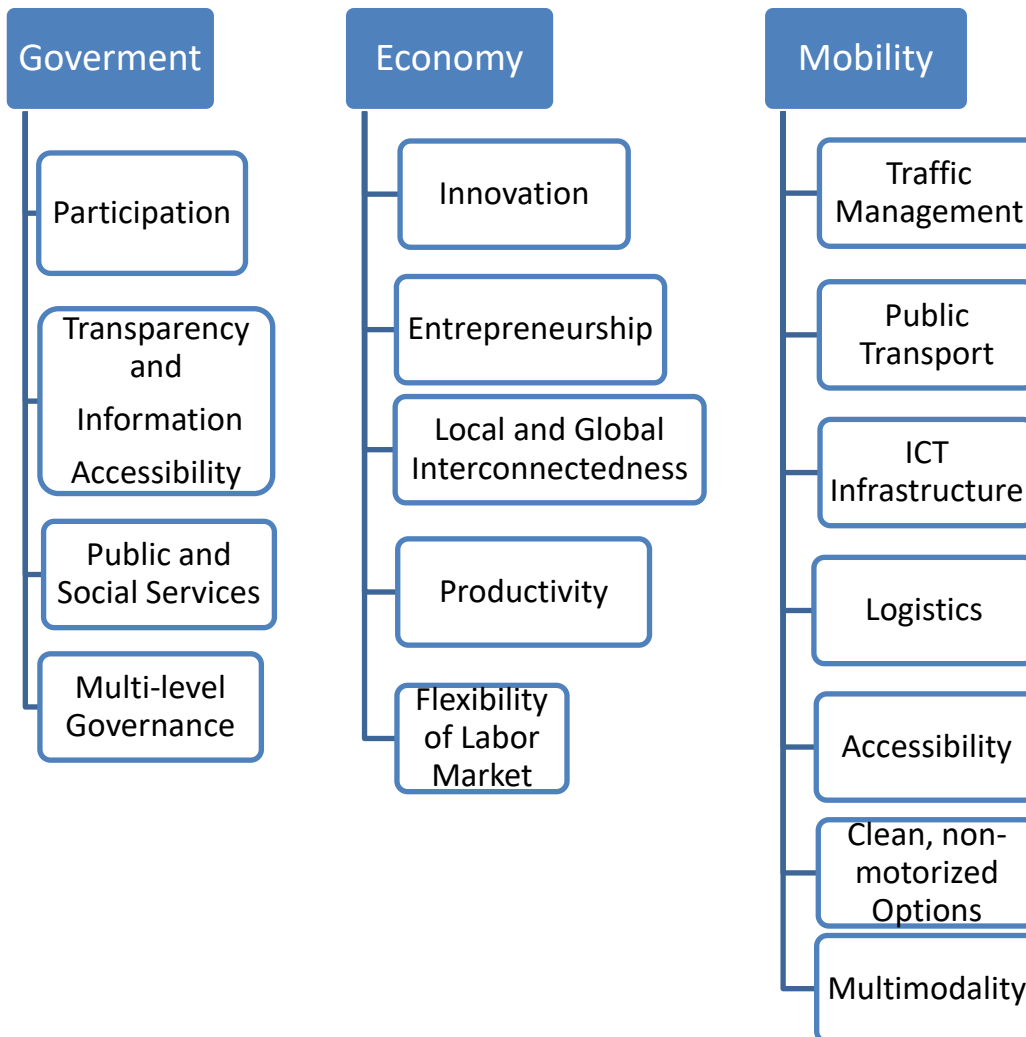
SMART GOVERNANCE (Participation) <ul style="list-style-type: none"> ▪ Participation in decision-making ▪ Public and social services ▪ Transparent governance ▪ <i>Political strategies & perspectives</i> 	SMART MOBILITY (Transport and ICT) <ul style="list-style-type: none"> ▪ Local accessibility ▪ (Inter-)national accessibility ▪ Availability of ICT-infrastructure ▪ Sustainable, innovative and safe transport systems
SMART ENVIRONMENT (Natural resources) <ul style="list-style-type: none"> ▪ Attractivity of natural conditions ▪ Pollution ▪ Environmental protection ▪ Sustainable resource management 	SMART LIVING (Quality of life) <ul style="list-style-type: none"> ▪ Cultural facilities ▪ Health conditions ▪ Individual safety ▪ Housing quality ▪ Education facilities ▪ Touristic attractivity ▪ Social cohesion

Source: Centre of Regional Science (2007), Smart Cities – Ranking of European medium – sized cities.

Characteristics and Factors of a Smart City (Tsarouhis A., 2018)



Source: Institute of Electrical and Electronics Engineers (IEEE)



Source: Institute of Electrical and Electronics Engineers (IEEE)

Future Challenges for a Smart City

Perhaps the most effective pursuit of a smart city is to offer a better quality of life to its inhabitants and at the same time to benefit from it itself. However, we should not omit the fact that in many cases, related efforts do not have the desired results.

A characteristic example of this is the exploitation of the territorial extent of smart cities through solid models where it was observed that it was not accepted by a significant number of people because they still want to live in less densely populated cities. Therefore, it could be argued that perhaps the first challenge currently faced by such cities is the inappropriate promotion of the benefits of this alternative as a better solution for improved quality of living. (Arrington G., 2003).

Additionally, energy needs are also an essential challenge for these cities. The more attractive a smart city becomes, the more its energy needs are raised. This fact combined with the scarcity of available resources, it creates pressure for a smart city to continually find solutions.

According to Arrington G. (2003) smart cities are a place where energy problems are being created but also it is the one where solutions of these problems should be found. One more difficulty that is often found is the way of cooperation between the actors involved. The design and implementation of a smart city strategy implies the involvement and cooperation of all its stakeholders. For this reason, as in almost all cases of cooperation, the most efficient methods should be sought to guarantee the success of the objectives and the satisfaction of all stakeholders.

Finally an important issue for a smart city is related with the exclusion of social groups and entire regions which in turn lead to new forms of social and spatial inequities. (Siolas A., et al, 2015). The result of this situation is unbalanced growth, which is a brake for the creation of a smart city.

But apart from any challenge a smart city ought to face today, the only certainty is that the design and development of a smart city as a continuous and evolutionary process will necessarily be confronted with a

series of challenges and obligations regarding adjustment to the frequently changing needs of modern societies. However, the nature, the character and the mindset of these cities is that which differentiates them from the classic cities. Adaptability, as well as the desire for adaptation of such cities, inevitably make them able to cope with both present and future challenges.

Finally According to Visvizi et al (2018) if we would like to incorporate smart cities research into recent theories of sustainable economic development and applied-technology-qualified innovative projects we should approach in a more integrated way. In other words, this significant subject provides as a starting point in a current discussion about the needed merging between technological policymaking and economic development across and beyond cultures and local boundaries. The eventual perspective is a collective, distributed humanity with bold responses to crucial social and economic development problems that arise (Visvizi et al., 2018). Within this context, people's satisfaction of needs and the improvement of the quality of their everyday life must be integral intentions of any smart approach.

Regional and Local Development through Smart Cities

Nowadays, in the context of interdependent national economies, the exclusive use of traditional national development policies which so far have created results seem now to be insufficient to confront with developmental issues (Ascani A., Crescenzi R., 2012). Indeed, it has been noticed that a significant part of the responsibility for development has in many cases shifted from national to regional and local level¹, with Local Government, taking on a leading role in the process through the search for innovative, smart and sustainable solutions. One of the most credible development tools in the hands of local authorities can be considered as the option to turn cities into smart, a policy that is particularly widespread in recent decades.

However, realizing such a multifaceted (multi-level) process could not be considered as a simple matter. Cities, choosing the smart city's development direction, should initially design processes that are not fragmentary but part of a more general plan, as well as making the most of all the resources at its disposal (Ascani A., Crescenzi R., 2012).

Additionally, everysmart city, in order to serve its intended developmental goals, has to change its previously (non) developmental way of thinking towards a more modern and efficient city. Its main aim is to turn into a major innovation workshop, where the use of new technology and the development of innovative applications will be aimed on the one hand at creating of a more efficient urban area for its inhabitants and on the other at specific development goals.

Spatial Dimension of Development

The phenomenon of globalization that it is noticed more and more intensively in recent decades has changed the previous perception of the concept and function of the development process on a geographic scale (Ascani A., Crescenzi R., 2012).

Additionally, factors such as the emergence of new technologies, which reduce transport costs and increase the volume of available information, in combination with the prevalence of neoliberal policies that promote decisions of limitation of protectionism in international trade, have resulted phenomena such as expanding of international trade and direct foreign investments but also increasing of migratory flows (Crafts N., 2004).

Within this changing and evolving environment, states are called upon to seek effective and sustainable development solutions. Unfortunately, the traditional nation-state no longer seems able to act effectively in order to regulate, control and guarantee the factors that favor and lead to development (Delitheou, V., Tsavalias C., 2018)

Additionally, globalization, technological progress and changes in the way production is organized have significantly altered the importance of space in terms of development, while they have enhanced the role of local socio-cultural actors vis-à-vis the national - central management/ administration in shaping of the developmental path of each region (Ascani A., Crescenzi R., 2012).

Therefore it seems that the concept of space (definition and delimitation) nowadays is a crucial factor in the creation of development programs, since the issues associated with it affect and significantly determine any development efforts.

According to Vliamos (Vliamos S., 2008) the most substantial issues created by the concept of space and affect development policies, may summarized to the following:

- Globalization which is a continuously increasing interdependence between different regions of the planet which results four levels of spatial concentrations. These are:
 - a. large international centres,
 - b. international centres of a wider spatial zone,
 - c. regional centres and

d. local centres.

- The paradox of simultaneous concentration and dispersal of the population and economic activities in the space.
- Incorrect or unreasonable exploitation of natural resources by poor population / space ratio.
- The burden on the environment to the benefit of economic growth.

As it has been mentioned, during last decades, traditional national development models are questioned as ineffective, which has as result the need to redefine the central-local state relationship and to strengthen decentralization of competences and resources towards regional and local institutions (Delitheou, V., Tsavalias C., 2018).

The role of local government in activating and exploiting development factors is considered particularly important. It is noted that this particular trend is not only characteristic of countries with a history of strong local government but also of countries with a tradition of centralized management systems.

The impact of the current situation is to increasingly strengthen the tendency to develop coherent development strategies at local and regional level, which should in general address the following thematic (Crafts N., 2004):

- Improvement of current situation,
- Creation of new activities and
- Redefinition of the already existing activities on the basis of comparative advantages and endogenous local characteristics.

It is noted that this tendency to decentralize responsibilities for benefit of smaller territorial units on the basis of the principle of subsidiarity² is particularly evident at the level of the European Union. The role of local government in European countries has been greatly strengthened and continues to be strengthened through policies such as Regional Policy, Europe of Regions, or at institutional level (European Committee of the Regions).

Additionally, it is important that the EU's attitude towards this issue is not limited to traditional policies of reallocation of resources between rich and poor regions, it also takes advantage of endogenous potential (eg Entrepreneurship Promotion Program, Local Development Initiatives, University Business Associations, etc.) (Vliamos S., 2008)

Smart City as a Lever of Growth in Action

Innovation, enhancement of entrepreneurship and creation of conditions for economic activity are the three axes of a successful development effort. It is taken into account that their assurance is uncertain, they are developing within a series of targeted strategic actions which are: (Delitheou, V., Tsavalias C., 2018).

1) Smart Specialization: When we talk about smart specialization, we are essentially referring to development strategies that have as basic tool the knowledge and they focus on areas where city can gain competitive advantage. More specifically, smart "local" specialization is what we would call an overall suggestion of economic transformation, which is based on the specificities of each city and which (European Commission, 2012):

- Seeks and emphasizes to the strong points and comparative advantages of the city and tries to enhance actions regarding research and innovation,
- Encourages actions related with technological innovation and intend to encourage private investments,
- Aims to priority investments, which create positive externalities and
- Seeks the participation of every stakeholder to the whole procedure and encourages innovation and experiment.

2) City Branding: This is an essential tool for urban development, as the rendering of a brand and a specific identity in a city plays a key role in its development (Delitheou, V., Tsavalias C., 2018). The concept of city branding refers to a set of activities which aim to best transform the offer of urban functions of the city in demand for them from its inhabitants, businesses, tourists and visitors of all kinds (Braun E., Otgaar A. H. J., Berg L. Van Den, 2003).

In order to understand the importance of branding for a city, it is enough to consider the size of the competition that current cities face, both at international and local level. For a city today to be capable of attracting new residents, investors, businesses and visitors, it should be attractive, on the one hand, and it must have communicated in advance the reasons that make it attractive. By branding a smart city creates the image that she wants for itself, boosting its positive points and degrading any negative ones. In general, a strategic

²**Subsidiarity principle**: The principle in which the underlying entity is primarily recognized as having the power to take action if it is able to exercise it effectively, while the supreme unit completes the action of the underlying.

identity management of a city aims to highlight the character it wants to promote (Panagiotopoulou M., Stratigea A., Somarakis G., 2014).

3) Enhancement and Promoting Entrepreneurship: A key feature of a smart city is to take initiatives to promote and strengthen new innovative ideas (projects) that either serve specific economic sectors or groups of entrepreneurs wishing to take action (UCLG, 2017). The main concern should be the creation of conditions and a culture that boost entrepreneurship, based on innovation, in order to achieve the desired growth and make the city attractive to new resources and investments. A relatively new trend of smart cities is to turn themselves into the so-called innovation hubs, where in general lines an attempt is made to connect start-ups with investors, business angels, etc.

4) Promotion of Policies for Research, Development and Innovation:

Local authorities investing in actions to promote science, research and technology is a key priority for a socially and environmentally sustainable development model based on people's high training and on new technologically innovative ideas. According to the General Secretariat for Research and Technology (2013), such actions aimed at strengthening of the activities of research and productive local actors could be (Delitheou, V., Tsavalias C., 2018):

- the creation and promotion of a complete strategy regarding research, technology and innovation,
- the exploitation of qualifications of researchers for the benefit of development and reduction of unemployment,
- the exploitation of the results of the produced research through the transfer and diffusion of innovative technologies to local producers and
- The creation of actions to raise awareness of local society in research and technology.

Main Application of a Smart City aimed to Development

Smart cities are connected and almost identical to the production and use of new innovative technologies. The use of these technologies will create the conditions or, in many cases, will add value to the design and success of the strategic actions mentioned just above. According to the URENIO research team of the Aristotle University of Thessaloniki, as the main technological categories of information and communication, which, if used together in a city, enable the provision of all the services offered by a smart city, can be considered the following (Tsarhopoulos P., 2013):

1. Networking technologies: Networking technologies create the proper conditions for the necessary interconnection of all digital units that are installed in a city, both with each other and with the citizens as well. The purpose of these technologies is to enable the data transfer and, as a result, the exchange of information between digital units.
2. Natural and Digital City Interconnection Technologies: Through this category of technologies, real-time monitoring of what's happening in a city is achieved. In other words, this is what is now widely known as the Internet of Things. In addition, Augmented Reality technologies are also included in this category, which enable understanding of the natural environment of the city through the recording of relevant information when necessary and Location Based Services that offer the ability to provide services that require a specific placement.
3. General Web Supportive Technologies: Technologies of this category aim to enhance quality and the way digital services are provided. These are technologies that are basically used on the web, but using them in a smart city certainly creates added value. The most well-known applications of the category are (Delitheou, V., Tsavalias C., 2018):
 - Cloud Computing,
 - Semantic Web
 - Open Data
 - Open Standards
 - Open Source
4. Technologies of Data Management which create the conditions for applications development: Technologies that belong in this category are usually the ones that have to do with data gathering, analysis and visualization, collaboration to find the best solution, and 2D / 3D imaging.

Below, authors will refer to the degradation of environmental quality and environmental policy as extreme and unpredictable weather events have been observed in recent years. As for temperature, there are areas that are very hot and very cold. At the humidity level, some areas encounter many rainfall and other droughts.

Policy for Limiting the Degradation of the Environment

Changes that have been observed in recent decades in the environment have led to a downgrade of its quality. The environmental problem that has arisen is due to the gradual deterioration of the environment due to

its extensive pollution, use and exhaustion (Bithas C., 2012). Negative impacts do not concern a single spatial level, but the whole planet. Therefore, they cannot avoid the problems caused by these changes as they affect the natural and human environment. However, the most possible necessary efforts should be made to limit the impact of these changes.

With the current effects of climate change on the environment, policy cannot be left unchanged. The European Commission has adopted a number of thematic objectives which are the basis of the development strategy of the Region of East Macedonia and Thrace.

Protection of the environment has an important position among the eligible goals. One of the most important targets set to slow down climate changes is the reduction of carbon dioxide emissions in all sectors of economic activity (Delitheou V., 2018). It is important that available Renewable Energy Sources will be used. This will reduce the need for energy produced from non-renewable sources that cause air pollution. Apart from smart energy management, it is a priority to support the improvement of energy efficiency. The above-mentioned integrated energy saving plan concerns in the first stage public buildings and infrastructure as well as sectors of economic activity in housing.

Particular emphasis is given to adjustment in climate change. That is why it is important to include and manage the risks of these environmental changes (Delitheou V., 2018). At management level, the Region should be able to provide direct help to citizen facing disaster problems. In order to combat them effectively, it is necessary to secure the necessary equipment. The goal of limiting carbon dioxide emissions will help to reduce problems.

Finally, a very important eligible thematic objective is to preserve and protect the environment while at the same time achieve resource efficiency (Delitheou V., 2018). Due to climate changes occurred in Eastern Macedonia and Thrace Region a regional policy should be implied in order for the environment to be protected and at the same time to promote and exploit it as much as possible. The first priority is to invest in the water sector in order to meet the Union's environmental requirements. An environmentally-friendly policy requires the rational management of its resources and not the wastage of it.

Separate discussion should be made regarding climate change that affects the biodiversity and the soil of the area. Protecting and restoring them, as far as possible, is of particular importance. The means to resolve the problem posed by climate change is the promotion of ecosystem services and the development of green infrastructures. The policy to eliminate ecosystem degradation and protect biodiversity is included in European Union's broad guidelines.

Good Practice: Municipality of Nestos

Municipality of Nestos belongs to Regional Unity of Kavala and it is based in Chrisoupoli (Ladias Ch., 2015). Its permanent population is 22,331 inhabitants (Hellenic Statistical Authority 2011).

In the Municipality of Nestos, 51.28% of the employees work in the tertiary sector with 3,620 employees, followed by the primary sector with 29,43% (Hellenic Statistical Authority 2011). The involvement of the tertiary and primary sectors is important for the local economy as it contributes directly or indirectly.

Geothermal Exploitation in the Municipality of Nestos

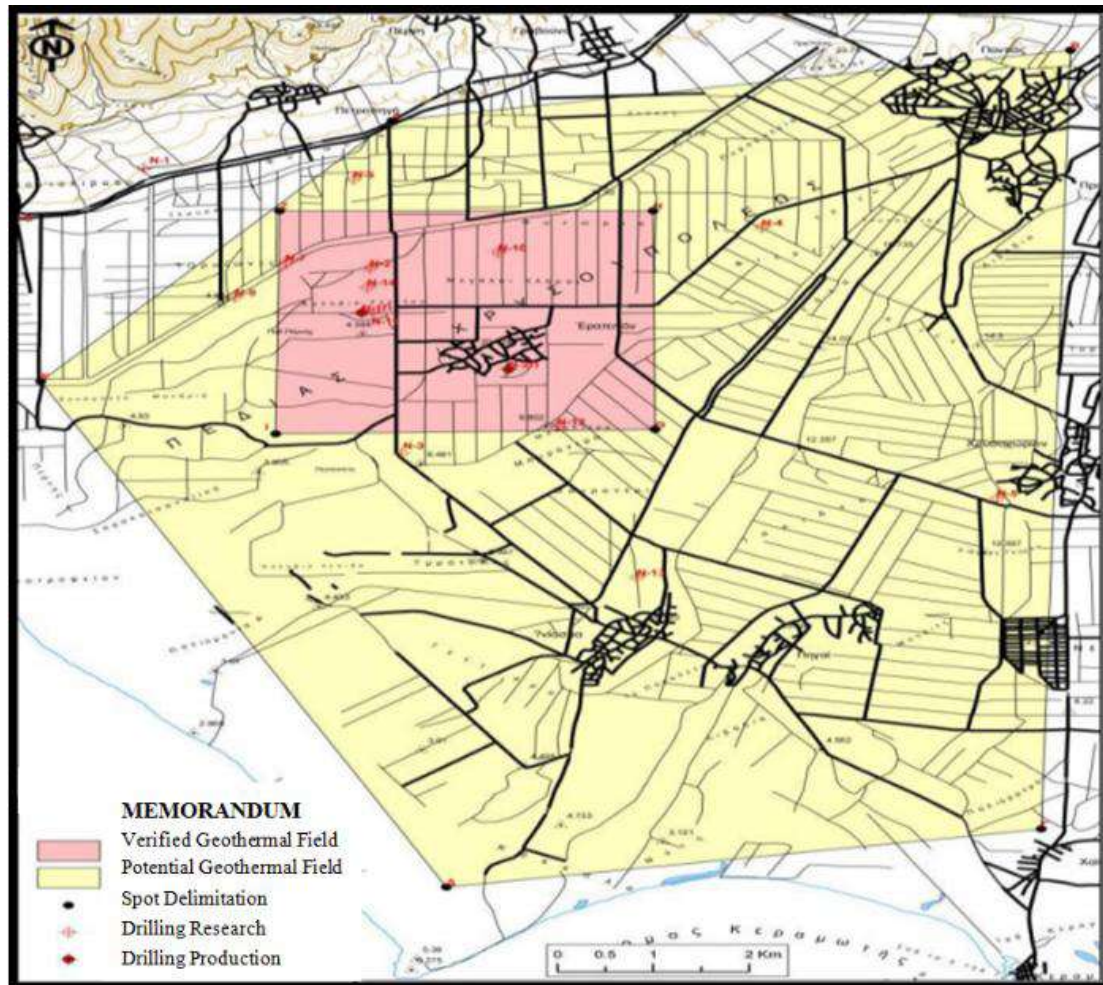
Geothermal energy is inexhaustible, cheap-clean and does not pollute the environment (Chalkos G., 2013). Geothermal fields are fed both by the sea and by the rains, thus continuously renewing the geothermal reservoirs, as well as the heat from underground volcanic magma.

According to Law 3175/2003, National Official Gazette, 1012/B'/19-7-2005 and 161/ B' / 5-2-2008, 25 regions in Greece are characterized as verified or potential geothermal fields. Two of these regions (1 verified and 1 potential geothermal field) are located at Municipality of Nestos).

The verified geothermal field of low enthalp³ of Eratino of Kavala is located in an area of 14 km² with a flow rate of 300 m³ / h of fluid and a reservoir depth of 650 m. While the potential geothermal field of Eratino of Kavala is estimated to have an area of 93 km².

³As enthalpy is defined the sum of the internal energy of a body and the product of the external pressure on the volume occupied by a substance to define the energy required to displace the body in order to take its current position (Chalkos G., 2013).

Geothermal Field of Eratino of Kavala



Source: Regulation for the Operation of the Rural District Heating Network

Exploitation of the Geothermal Field of Eratino Chrysoupoli Kavalas

In order to attract investments within its boundaries, the Municipality of Nestos exploited the Geothermal Field of Chrysoupoli Kavala. The project was funded by the Regional Investment Programme for Macedonia - Thrace 2007-2013 and its total budget was 10,600,000 euros with 23% VAT (Municipality of Nestos 2013). The project was co-funded by the European Regional Development Fund and is part of the Public Investment Program (Municipality of Nestos 2007).

The aid amounts to 97.18% of the total cost of the project, while VAT which amounts € 1,982,113.82 is not an eligible expense, but is part of the Public Investment Program (Municipality of Nestos 2013).

Given that the Ministry of the Environment and Climate Change granted Nestos Municipality the permission to distribute thermal energy, self participation would have to be covered by it. Following a meeting of the Municipal Council of Nestos Municipality, the self participation that was approved was € 243,366.79.

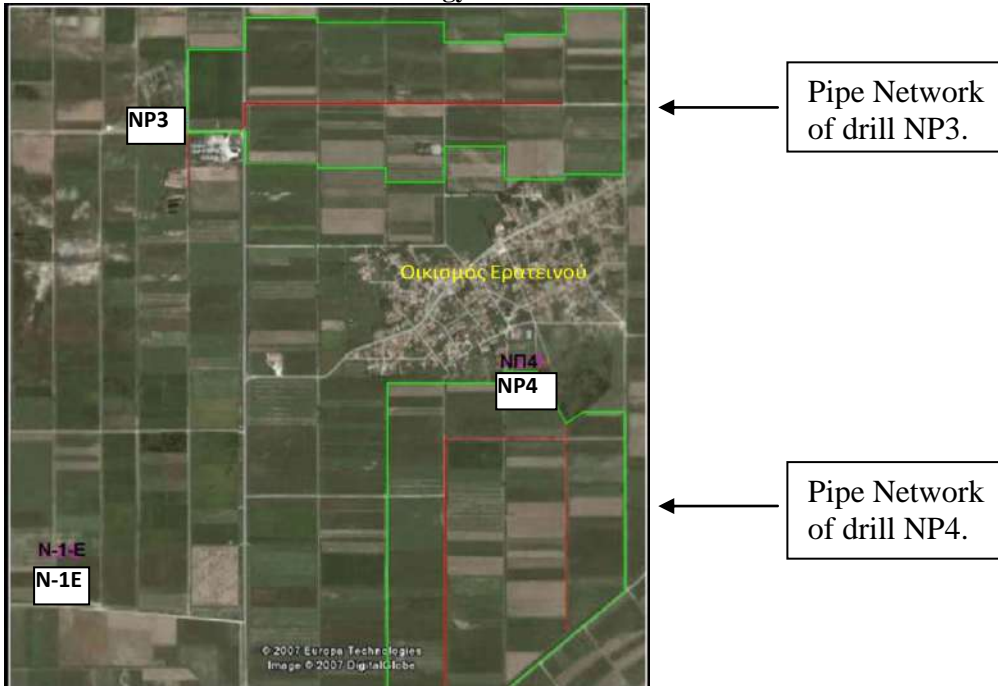
Characteristics of the Specific Project

After studying the feasibility of geothermal energy, the use of geothermal energy for agricultural purposes has been piloted, as its agricultural application offers excellent heat conditions for the direct growth and growth of crops at low cost (Maleviti E., 2012). For this reason, it was considered necessary to create a transportation and distribution system of thermal energy. Thus two new production drills were constructed with their thermal stations, distribution networks and a new re-entry bore for the return of the geothermal fluid to the reservoir (Municipal Water Supply and Sewerage Company of Nestos - Geothermy, 2018).

The first thermal station has depth 750 m, flow of 100 - 120 m³ / h and temperature 77 degrees Celsius. The second thermal station has depth of 750m, flow rate of 120-140 m³ / h and temperature of 69 degrees Celsius. The heat distribution network is distinguished in a primary pipeline network, from the thermal stations to the re-inlet well and a secondary pipe network connecting the thermal stations to the consumers of geothermal energy and vice versa.

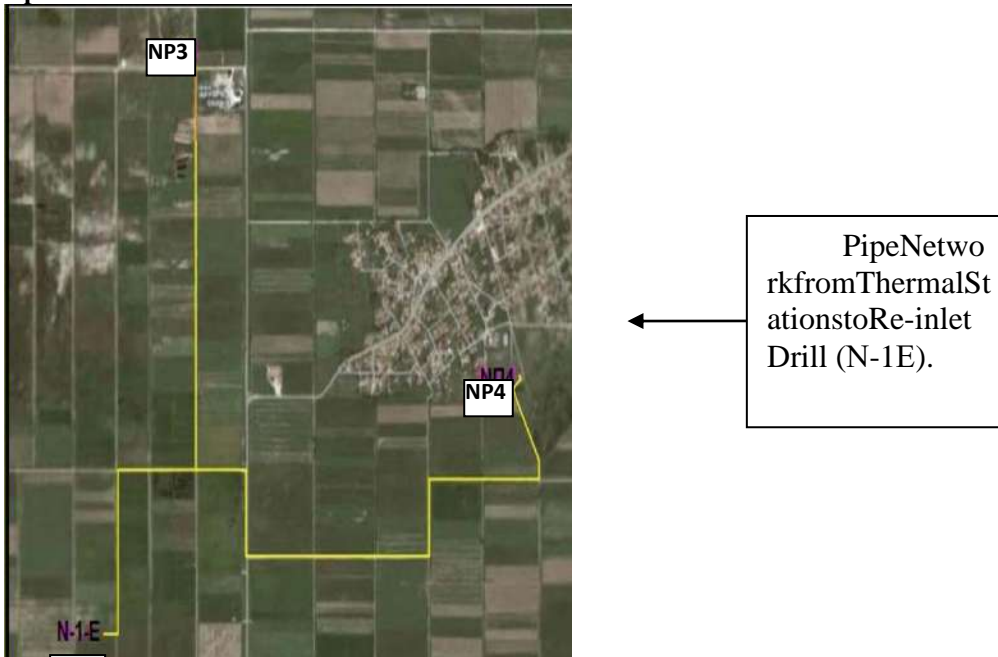
The NP3 drilling network spans at a length of 1.8 km and the NP4 drilling at a length of about 2.8 kilometers and provides consumers on either side of the drilling (Municipality of Nestos 2017).

Distribution Network of Thermal Energy



Source: 6th Smart Cities Conference - “ Geothermal Field of Eratinos and innovative agricultural exploitation ”

Pipe Network from Thermal Stations to Re-inlet Drill



Source: 6th Smart Cities Conference - “ Geothermal Field of Eratinos and innovative agricultural exploitation ”

The pumped geothermal fluid is transferred through a district heating distribution network with two insulated pipes installed directly into the ground into the trench with hot water as a carrier of heat for supplying agricultural crops (Municipal Water Supply and Sewerage Company of Nestos - Geothermy, 2018).

Period after the completion of the Eratinos Chrysoupolis Project in Kavala

Upon completion of the project, the Nestos Municipal Council decided to grant the Nestos Municipal Sewerage Company (DEYAN) the license to operate, manage and exploit the thermal energy distribution for exclusively agricultural exploitation. DEYA.N. had the know-how and the technical and financial infrastructure

in order to be able to meet the additional obligations arising from the operation of the thermal energy distribution network resulting from the utilization of the Eratinos geothermal field (Municipality of Nestos 2016).

At the same time, the Municipality organized conferences and programs to inform the inhabitants and landowners of the wider region in order to make them aware of the advantages of this type of renewable energy and to highlight the benefits that they can obtain if they invest in it and the process they had to follow in order to connect with the district heating networks (Tsompanopoulos E., 2018).

On behalf of the Municipality, invitations of interest were sent in writing to all owners or tenants of the parcels near the distribution network. Unfortunately, the local community did not express interest and the Municipality was addressed to the wider stakeholders (Tsompanopoulos E., 2018).

The subsidiary in Greece of the German Selecta Group filed a request for an association, after securing an area of 60 acres, to be used for the production of ornamental floricultural cuttings (Municipal Water Supply and Sewerage Company of Nestos - Geothermy, 2018). Already, 35 acres have been built with a total investment of 7,000,000 cubic meters. which are running and they are expected to be used another 25 acres. (Selecta Hellas 2018).The total investment is expected to be more than EUR 10 million.

This particular project is an important achievement as it has increased the number of jobs in the municipality. It is estimated that employees can be up to 120 when production reaches the maximum.

Furthermore, the unit which was created operates with zero environmental footprint because the geothermal fluid after its exploitation returns 100% to the geothermal reservoir through the reintroduction drilling.

Moreover, geothermal units do not require large areas of land for their installation or storage areas and thus do not bind large areas - a plot of land in Nestos Municipality, preventing the development of activities in the primary sector.

The successful investment has attracted new interested foreign investors, contributing to local development and acting as a powerful counterweight to the viability of the region. That is why the Municipality of Nestos has designed a study of € 8 million, in order to integrate it into the new invitation of the Region of Eastern Macedonia and Thrace. Future plans for the exploitation of the Eratinos Geothermal Field are the creation of a Geothermal Park (Municipal Water Supply and Sewerage Company of Nestos - Geothermy, 2018).

City Awards

Municipality of Nestos in the "Best City Awards 2017" was awarded with the golden prize in the "Economy and Development" Section and more specifically in the category "Innovative Actions for supporting the development of the primary sector" for the action "Geothermal Field of Eratinos Municipality of Nestos and innovative rural exploitation» (Best City Awards 2017).

For the application of e-Nestos, the Municipality was awarded in the Best Cite Awards 2018 with the award in the "Liveable City" section and the Specialized Projects category, which contribute to the daily service of citizens by offering them public administration services (Best City Awards 2018).

Qualitative research

Interviews were considered necessary to capture the design, implementation and impact to society and business by individuals whose position in the hierarchy is of particular importance. The purpose of the interviews is to record the views and perceptions of the participants and to identify the reasons for certain attitudes

The reasons for the interview were analyzed to the research participants, while the interview plan was a semi-structured discussion. Also, the questions asked to the participants were different.

Interview with the General Manager of SELECTA HELLAS

An interview with the General Manager of SELECTA HELLAS revealed that there were three reasons that led to the choice of the installation of the ornamental nursery grape production unit in the Municipality of Nestos. The first one was his patriotism. As the parent company intends to look for geothermal areas in Bulgaria or Portugal. The second one was the Development Law promised by the SYRIZA government and the third, the existed Geothermal Field implemented by the former Mayor, through DEYAN. He noted that there was another candidate spot in northern Greece, but after studying the Municipality of Nestos he decided to build the unit there for two reasons: Geothermia and Microclimate. It was noted that this choice was ultimately correct.

However, since submitting the application to date, the company has faced problems, such as the rejection of the 2016 development law that would boost private investment for the country's regional and economic development. Consequently, there was no financial support at the beginning of the investment. It was also noted that bureaucratic problems were encountered, there was a loss of time until the decisions were finalized, and officials were unaware of the steps needed to proceed with the procedures. In addition, it was found unjustified rigidity, negativity and suspiciousness by some officials, indifference by others and even

diversification of the application of the directives already known to German investors. In all these cases it should be noted that the company was financially burdened by the imposition of very high contractual fees for import-export and production of the multiplying material. Finally, the new Municipal Administration decided to abolish the auction of land for the exploitation of Geothermia in the 2nd well, located in a nearby area. This decision is an obstacle to the expansion planned by the parent company SELECTA ONE.

Regarding citizens reaction, the General Manager noted that citizens of Nestos welcome the investment since it created many new jobs.

In addition, the General Manager was asked about the areas that receive the decorative floricultural plants coming from the units located in Nestos Municipality. He mentioned that despite the competition coming from the existed companies, the products are already being exported mainly to Italy, Germany, the Netherlands e.tc. A 5-6% remains in Greece. The products are exported by refrigerated trucks to Europe (Balkans & North Central Europe), countries which are particularly demanding. Apart from them the products are already being exported to India, Japan, Nepal, Tunisia, Lebanon, Bahrain, Korea, Serbia, Turkey etc. by air. The next targets are the market of China and Russia.

Finally, it was noted that the cooperation with the administration of the ex Mayor as well as with DEYAN was excellent. While there has been no contact with the new municipal authority yet, it will be in the near future.

IV. INTERVIEW WITH THE EX-MAYOR

Additionally, an interview was conducted with the ex-Mayor of Municipality of Nestos, who hold this position from September 2014 till August 2019, that is from the beginning of the project, since when he took over his duties there was a contractor, but the works had not started. The project was completed at the final delivery date (21/12/2015).

Although since October 2014, the farmers of the Eratino area as well as the rural cooperatives of the Municipality had been informed through open assemblies unfortunately no interest had arisen. However, at the beginning of 2015 there was interest in the greenhouse construction of ornamental plants. Following the concerted actions of the local administration, it was decided the implementation of the investment in this area, when there were alternatives to other areas which were even more economically advantageous.

Concerning the reaction of the citizens, the ex-Mayor said that in the beginning the local community was unaware of the methods of utilization of geothermal energy. Following the information provided by their management, there were reservations, as it was something new and required increased costs. Due to the negative general economic downturn, no one decided to invest. For this reason, they tried to convince the Ministry of Rural Development to legislate on subsidizing the investment costs of farmers for the exploitation of geothermal energy.

On the question of whether it was appropriate to extend the use of geothermal energy to other uses, there was interest in utilizing district heating to heat the homes and public buildings of the settlement, but the project was funded for the uses of the first farming and the construction of greenhouses. Therefore, it was very difficult to change the potential utilization for other uses.

In addition, the ex - Mayor pointed out that efforts were made to reach out other investors as one bridge remains inactive. They had many contacts with prospective investors, both domestic and foreign. However, the problem of finding land remains, although locals are demanding huge sums. The interest is in ecological, horticultural, and pharmaceutical cannabis. There are already registered applications from Greek companies but also from foreign companies.

He acknowledged that working with the company had been flawless and exemplary from the beginning until today. They stood by the company in all installation work, reducing bureaucratic barriers to the minimum. He noted that the investment works were completed much earlier than planned. DEYAN was and remains on the alert in order to avoid operational problems in the company. Against the Municipality, the company remains consistent in its obligations as well as in its payments.

Ex - Mayor believes that "this investment was successful because in addition to the revenue generated for DEYAN (100,000 euros per year), the goodwill for the region, the interest of other investors, the traffic from Greek and foreign universities, and 100 jobs for both scientists and workers in the region, contributing to the increase in family income and the local economy. Interest has already been expressed in additional investment of € 6,000,000. The investment is a pilot project nationwide. "It would be a mistake not to mention that we have received three national awards for this investment."

Finally, he noted that there is a ready study for 2 new boreholes, in the certified geothermal field, with a budget of € 8,000,000 and the Eastern Macedonia - Thrace region is expected to open an invitation. The goal is to create a geothermal park.

V. INSTEAD OF EPILOGUE

Cities are the future of humanity and are constantly being strengthened by the phenomena of urbanization that fuel the process of moving of a large part of the population to large urban centers. This creates strong pressures for redesigning, developing and creating city-centers that are able to meet the needs and demands of their population.

Turning a city into smart is not an easy process as it is dynamic, constantly evolving and requires wider involvement of all the city's stakeholders (Bregiannis A., 2012). That is why there should be representatives of various actors and groups of citizens, because they are those who know the problems of the region, will contribute to the identification of local needs and will help to define the objectives of the smart city.

In addition, research and continual search for innovation are essential determinants of sustainable local development. However, they require close cooperation between actors, namely the private and public sectors, as well as local research entities. Apart from their cooperation, however, particular attention should be paid to the commitment of all parties involved over time. The creation of an in-depth strategic plan with clear objectives and a vision that creates and describes the whole process is considered to be absolutely necessary to achieve the goal of a smart city.

It is also important to develop a centrally designed policy to achieve local and regional development by creating smart cities (Delitheou V., Michalaki E. 2019). This plan should be long term in order to produce the desired results. Otherwise, if a smart city gets lost, it automatically loses its potential but also the benefits it offers.

For the transition of cities into smart cities, municipalities need to be informed about available financial instruments. In addition, the information should be extended to the local authorities and its residents in order to accept the idea and contribute to its transformation into a smart city. Without their contribution, the efforts of the Municipalities will not have the desired results.

Also, considering that smart cities have emerged in Greece in recent years, support for the development of a city in the transfer of know-how from abroad is very important, as is the transfer of ideas.

Regarding the use of Geothermal Energy from the Eratinos Geothermal Field is a pioneering action. The Municipality of Nestos created the conditions for the city's transition into a Smart City. Through the project, it focused on the Smart Environment, because it limited the pollution and protected the environment of the Municipality through the sustainable management of resources. It also emphasized in smart economy by developing an innovative spirit, increasing entrepreneurship and developing the local economy.

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