Regional Innovative Actions: Can they initiate the formation of a regional innovation system?

Abstract

This paper attempts to identify the suitability of centrally designed innovation-related regional actions, examining the case of regions that started innovative activities from a low development level. Using the case of two Greek regions, the paper analyses the legacy left to the regional systems by a series of regional innovation programmes implemented during the 1990s and 2000s, whose main priorities were designed centrally without any regional consultation. The findings suggest that these programmes often provide the means for generating the first steps towards the creation of a Regional Innovation System; however often they create a dependency on publicly funded programmes.

Keywords: Regional Innovation Systems / Strategies; Innovation Policy

INTRODUCTION

The innovation process implies technological changes, changes in organization and behaviour of firms and individuals, circulation and diffusion of information, multiple ways of collaborations, links and interactions among agents, forming a system of innovation (LIU and WHITE, 2001; GALANAKIS, 2006; TÖDTLING and TRIPPL, 2005). Drivers of innovation in an innovation system are the human capital, research institutes and universities, technology transfer organizations and other intermediary organisations, consultants, development agencies, funding and investment organizations, hard and knowledge infrastructures, markets and consumers and, finally, productive firms (LUNDVALL, 1992; COOKE, URANGA and ETXEBARRIA, 1997). According to EDQUIST and HOMMEN, "*...firms almost never innovate in isolation but interact more or less closely with other organizations, through complex relations that are often characterized by reciprocity and feedback mechanisms...*" (EDQUIST and HOMMEN, 1999: page 68).

The approach of the innovation process from a systemic view has been focused on paradigms at national level (CODINHO et. al., 2004), and more recently the regional or even the sub-regional level (CHANG and CHEN, 2004), for example the 'Living Labs' initiative.

The concept of RIS has been gaining much attention from policy makers and academic researchers since the early 1990s (COOKE, 1992). Lundvall, one of the first authors to promote thinking about systems of innovation, mentioned regionalization in relation to globalization and referred to regional networks. However, he did not believe a regional perspective on innovation could be as useful as national systems, even in respect of such geographically contingent processes as tacit knowledge exchange (LUNDVALL, 1992). He suggested that transnational innovation interactions, unlike regional processes, were likely to gain in importance over national ones. When this view was being developed, the European Commission was already developing and implementing, inter alia, Regional Technology Plans and RIS. The reason for this was precisely the inability of national innovation systems in the European Union (EU) to produce rates of innovation comparable to those of the United States of America (CEC, 1995). From a regional point of view, innovation is localized and a locally embedded, not placeless, process (STORPER, 1997; MALMBERG and MASKELL, 1997). Accordingly, the regional science literature deals both with the role of proximity, i.e. the benefits deriving from localization advantages and spatial concentration, and the sets of rules, conventions and norms with territorial prevalence, through which the process of knowledge creation and dissemination occurs (KIRAT and LUNG, 1999). In order words, a RIS is characterized by co-operation in innovation activity between firms and knowledge creating and diffusing organizations, such as universities, training organizations, R&D institutes, technology transfer agencies, and so forth, and the innovation-supportive culture that enables both firms and systems to evolve over time.

The popularity of the concept of RIS is closely related to the emergence of regionally identifiable nodes or clusters of industrial activity as well as to the surge in regional innovation policies where the region is deemed as the most appropriate scale at which to sustain innovation-based learning economies (ASHEIM and ISAKSEN, 1997). However, the focus at regional level is raised by the understanding of the complexity of national systems and the level of variation of the individual regional productive systems (SEFERTZI, 1998). Furthermore, it is often considered that the concept of a distinctive regional system can play a balancing role in the age of growing globalization that shows tendency towards homogenisation of cultures and directions in strategies and solutions

(COOKE et al., 2000). The concept of RIS has no generally accepted definition; it is usually understood as a set of interacting private and public interests, formal institutions and other organizations that function according to organizational and institutional arrangements and relationships conducive to the generation, use and dissemination of knowledge (DOLOREUX, 2003).

Systems oriented theories cover a wider range of issues related to regional competitiveness, focusing on regional differentiation and institutional learning. The Theory of Economic Development, by Schumpeter, highlighted the role of technology-driven economic change, in explaining long-term development (SCHUMPETER, 1934). Schumpeter's inspirational work offered fertile ground for the development of a broad school of thought addressing issues of technological change, economic growth and innovation. As evinced in the neo-Schumpeterian and evolutionary literature, the introduction of radical or incremental innovations, technological structural transformation, institutional change, diffusion of new technologies and knowledge and, finally, formal or informal links between the actors of the system are basic prerequisites for long-term growth (NELSON and WINTER, 1982; LUNDVALL and BORRAS, 2005). As a matter of course, in the late 1980s and through the 1990s the 'systems of innovation' emerged as a new theory. This latter establishes a connection between the policy of innovation players and the ability of firms to innovate, which in turn affects the wealth of a nation (SUNDBO, 1998; EDQUIST, 1997). This new theory further attempts to identify the social and economic impact of the process that creates innovation as well as its impact on the actors and their interrelation across a nation. Therefore, assist the development of specific innovation policies by indicating the way, the type and the fields of public interventions and by emphasising the suitability of alternative strategies for regional context. They can direct interactions between innovative actors, the activities and priorities of supporting agents and the creation of mechanisms for knowledge acquisition and learning (FREEMAN, 1995, 1987; NELSON, 1993; PORTER, 1990; EDQUIST, 1997, MELKAS and HARMAAKORPI, 2008). As a matter of fact, this knowledge interrelation comprises, initially, institutional interaction between the actors of the system such as research institutes, universities, firms, government agents and bodies and their staff. It also includes political support from governments in areas such as legislation, finance and infrastructure development. Lastly, it encompasses market characteristics, for example sophistication and size, and enterprise activities, such as in-house research, investment in new technology, and new product design and development processes (EDQUIST, 1997; OECD, 1997; OECD, 1999; LUNDVALL, 1992; NELSON, 1993).

The prevailing evolutionary theories of economic and technological change in the systems of innovation literature assign to innovation the qualities of an evolutionary and social process (EDQUIST, 2004). As a social process, innovation is naturally inspired and influenced by many actors and factors, both internal and external (DOSI, 1988). The goal of a systems-oriented innovation policy is to offer support and to control both the components and the links which are essential for the functioning of a system (EDQUIST, 2011). This type of policies concentrate on the acceleration of knowledge exploration, diffusion and exploitation and handling embedded institutional and functional barriers (TÖDTLING and TRIPPL, 2005; ASHEIM and GETLER, 2005; TER WAL and BOSCHMA, 2011; BOSCHMA and FRENKEN, 2011). Thorough examination of regional and sectoral systems' thinking has demonstrated that it is necessary for innovation policies to employ mechanisms for adapting a system's existing functions to sectoral specificities (ASHEIM et al., 2011; TÖDTLING and TRIPPL, 2005). A direct impact of such prioritisation is palpable in the knowledge generation sub-system, which

includes universities, public and private research organisations, and knowledge transfer and research funding institutions (COOKE, 2001; ASHEIM and COENEN, 2005). It is manifestly obvious that the knowledge generation process is strengthened by factors such as intra-national (e.g. the European Union Framework Programmes), national and regional science and innovation policies; general knowledge infrastructures (soft infrastructure); the financing of basic and applied research activities, and innovation-supporting institutions, such as technology and knowledge networks and science and technology parks. However, the impact of the knowledge generation sub-system heavily relies on the ability of the system to apply and exploit these results, producing innovative products and services or business models, i.e. firms that generate appropriate value chains and trading relations (AUTIO, 1998). Evidently, this part of the system is under the influence of the way firms are organized, cooperate and interact.

The objective of this paper is to observe the evolution of two regional systems, which have received significant investment over the last three decades, but still are considered as underdeveloped in terms of innovation activity. The question which is raised is whether centrally designed actions can influence such an evolutionary and social process.

In the next section we present the theoretical framework of innovation systems. Section 3 presents the methodology that we followed to develop our research. Section 4 applies the theoretical framework to analyse the two cases. Finally we conclude with a discussion on the influence of these actions and reflection for the related policies.

SYSTEMIC COMPONENTS AND KNOWLEDGE PATTERNS FOR DEVELOPING A RIS

In principle, innovation systems strategies involve a set of initiatives aiming to enhance the capacity of companies to introduce knowledge assets and produce new products or services, usually by encouraging collaboration between knowledge users and producers (NAUWELAERS et al., 2008). These policy initiatives may be codified to five important subsystems (LUNDVALL, 1992), affecting the performance of innovation activity: the public sector as policy designer and regulator; the knowledge generation sub-system; the knowledge exploitation sub-system; the physical set-up of supporting mechanisms and institutions, and the institutional set-up of the financial sector. A systems-oriented innovation policy, however, attempts to support and often to control both the components and the links which are crucial for the functioning of a system (EDQUIST, 2011). Such policies aim to tackle embedded institutional and functional barriers and to accelerate knowledge exploration, diffusion and exploitation (TÖDTLING AND TRIPPL, 2005; ASHEIM and GETLER, 2005; TER WAL and BOSCHMA, 2011; BOSCHMA and FRENKEN, 2011).

Systemic Components

Universities, public and private research organizations, as well as research funding institutions that promote knowledge transfer constitute the knowledge generation sub-system (COOKE, 2001; ASHEIM and COENEN, 2005). Knowledge sharing is encouraged through intra-national, such as the European Union Framework Programmes, national and regional science and supported by soft infrastructure, the funding of activities relevant to basic and applied research and institutions that promote innovation (e.g. science and technology parks, technology and knowledge networks, etc). The effects of the above sub-system are highly related to the successful implementation and exploitation of these issues. Thus, significant changes in the production of innovative

products and services and business model are presented in order to guarantee the development of more effective value chains and commercial relations (AUTIO, 1998). Over the years, new alternative, regarding their value adding process and sustainability, business models (e.g. 'technology platforms' and cluster generation) have emerged mainly due to the large-volume research, the high investment requirements and the complexity of the production process (CASPER, 2007; IRELAND and HINE, 2007). The appearance of innovation-supporting institutions and innovative systems is highly substantial in high-cost and complex fields, such as biotechnology, materials, energy, etc., where knowledge flow is vital in order to eliminate complexity and uncertainty. Hence, the role of these institutions in supporting innovation, in order to assure sector's growth, is to provide common infrastructure regarding research, testing and prototyping labs to promote customized knowledge flow and networking mechanisms (PISANO, 2006b).

Finally, in spite of the fact that most companies finance their R&D programs mainly out of cash flow and secondarily using external funding, the institutional framework of the financial sector is essential concerning the sustainability of the system (HALL, 2002; HALL, 2005). As far as it concerns external R&D investments, they have a greater impact when they are bank-based (e.g. venture capitalists or investment banks) rather than market-based (e.g. stock market capitalization) (KARJALAINEN, 2008), mainly because of the information asymmetry between the company and its potential investors. The banking system is mature enough to comprehend the specific conditions in each sector and competent to extend the potentials of future long-term investments. Moreover, national systems provide tax reductions on firms which are willing to invest in R&D, by matching funds or public guarantees given on private R&D programs or internal investment, in order to enhance firm operation and efficiency (CHRISTENSEN, 2010). The above intervention is divided in three major categories: grants, loans and government contracts; incentives and tax law provisions; and organizational research collaboration on a national or international level (RAHM et al., 2000).

Knowledge flow patterns

The growth of the Biotech sector, as a science intensive one, is affected by the knowledge creation and diffusion patterns. Knowledge has been seen as an object and as action (knowing), in which progress is made through active engagement with the world (NAHAPIET and GHOSHAL, 1998). This view extends the distinction of knowledge between tacit and explicit (POLANYI, 1967; WINTER, 1987) to the importance of Social Capital[1], or network ties (OH, et al., 2004) that provide access to resources. Knowledge generation and diffusion however tends to be highly localised (HIPPEL, 1994; JEFFE, et al., 1993; AUTANT-BERNARD, et al., 2013; MIGUÉLEZ AND MORENO, 2015) especially for sectors such as biotechnology, pharmacheuticals and cemicals, in contrast to electronics and information and communication technologies (ADAMS, 2002). BOTTAZZI and PERI (2003) for example demonstrate the locality of knowledge generation measuring the effect of doubling R&D investment in a region comparing to a neighbouring one. Their results – 80-90% increase of new ideas generation on the region where the investment took place in comparison to 2-3% in the neighbouring one – demonstrates the spatial effect, although others have found an

[1] Social Capital is defined by ARREGLE, et al. (2007) as the relationships between individuals and organisations that facilitate action and create value.

existing but much lower importance (e.g. AUTANT-BERNARD and LESAGE, 2011). The institutional factor and relevant incentives has been found to be determining factors for both on generating and diffusing knowledge (AUTANT-BERNARD, 2001; AUTANT-BERNARD et al., 2005) and thus the important role of innovation policies and priorities. Furthermore, diffusion is highly related to skilled employees mobility (BOSCHMA et al., 2009; SINGH and AGRAWAL, 2011; AUTANT-BERNARD et al., 2013), the ability of a region or a firm to 'anchor' the mobile skilled staff (LOWE and GERTLER, 2009; CREVOISIER and JEANNERAT, 2009) and cross-pollination through networks (KATZ and MARTIN, 1997) especially the relation between knowledge creators and the industry (AUTANT-BERNARD et al., 2013).

Universities with their specificities and distinctive characteristics, occupy a central point in the generation of knowledge. However, they are not naturally connected with industry and its priorities (AUTANT-BERNARD et al., 2013). This connection though – keeping the identity of each side (DOSI et al., 2006) – is considered as very important for a knowledge-based economies (FORAY and MAIRESSE, 2002). ZUCKER and DARBY (2007) investigated, for example, the benefits for both sides in the biotechnology sector demonstrating a 'virtuous' circle of interactions benefiting researchers, institutions and private sector. Additionally, ANTONELLI (2002) observed that inter-industry contacts and networks stimulate further the exchange of knowledge as he observed that knowledge generation is a collective activity of a variety of agents. BURT (1992) suggests that social relations and channels provide benefits in the forms of access, timing and referrals. Network ties provide the channels – or their absence create a barrier – for information transmission, compensating for the absence of geographical proximity (CRISCUOLO and VERSPAGEN, 2008; FREEMAN, 1991; GUAN, et al., 2015). The ties' configuration – density, connectivity, stability over time, openness and hierarchy – impact the development of intellectual capital (NAHAPIET and GHOSHAL, 1998).

Thus the challenge is to initiate and sustain the collaboration between all the different agents and to implement a variety of mechanisms capturing and absorbing[2] local and external knowledge (AUTANT-BERNARD, et al., 2013). Finally, the intensity of knowledge flows and commitment to innovation enhancing interactions from internationalised enterprises into domestic firms depends on the perceived advantage from both sides. Furthermore, the absorptive capacity of the domestic firms and the technology/productivity gap may be the drivers of knowledge adoption and flow as a result of FDI (FU, 2008; CRESCENZI, et al., 2015). Internationalised domestic firms have a lower potential to learn from MNEs or to perceive collaborations to their benefits as they usually tend to have higher productivity rates already and are more likely to be direct competitors in international markets (CRESCENZI, et al., 2015).

METHODOLOGY

[2] The ability is measured overall by the absorptive capacity of a region. Absorptive capacity refers to the "ability of a firm to recognize the value of new, external information, assimilate it, and apply it to commercial ends" (COHEN and LEVINTHAL, 1990). This concept has been applied to regional level (e.g. VON TUNZELMANN, 2009; ROPER and LORE, 2006; MUKHERJI and SILBERMAN, 2013), connecting the capacity of individual firms, the level of interactions and their inter-relations (ABREU, 2011). The absorptive capacity of regions increases when significant R&D activity is present, providing a multiplier factor and a point of attraction. In parallel these regions are more able to translate external knowledge to commercial applications and become more efficient with higher productivity levels, demonstrating a double role for R&D (GRIFFITH, et at., 2003).

The literature review and the conceptual framework from AUTIO (1998) were used to identify and analyze the relevant regional innovation frameworks and regional innovation strategies/policies. The research focused on the material generated from the relevant programmes implemented in the regions of Western Macedonia and Thessaly[3], namely, RIS, RIS+, Innovative Actions and Innovation Poles. Partly financed by the European Commission, these actions constituted a basic tool for designing regional strategies and initiatives, upgrading the competitiveness and the viability of both SMEs and large firms. In the case of Greece they were the basic and often the only financial instrument for the transfer of modern technology and know-how to regional actors and firms. The method used for conducting the data collection and analysis was the grounded theory and its techniques, i.e. extant text analysis and coding.

The writers have participated in the implementation of innovation related activities in the region of Western Macedonia, on behalf of the University of Western Macedonia. At the same time, we have closely collaborated with the relevant actors in the regions of both Western Macedonia and Thessaly. Therefore, an in-depth observation analysis of the related actions was conducted as a first step of this research.

Furthermore, we reviewed all the actions developed by the programmes under study, we codified them to nine areas of activities: training, education and diffusion effects; environment, energy and transport; culture, civilization and tourism; research, development and innovation management tools; entrepreneurship and adaptation in new technologies; academia-industry relationships; funding of innovation; cluster development and networking; creation and development of infrastructures for supporting innovation.

Following the desk research, fieldwork was carried out for the two regions. Semi-structured interviews with key stakeholders were conducted, broadly based on pre-identified themes and concepts (15 for the region of Western Macedonia and 6 for the region of Thessaly during autumn 2012). The survey studied the extent to which the programmes covered the needs of the region and the extent to which their objectives were fulfilled by the projects executed under these programmes. Purposive and availability sampling was used to select (i) departments of organisations covered by public law, (ii) local businesses-suppliers and (iii) research institutes consultancies and regional development agencies (RDAs). The responding institutions are listed in Table A.1. For

[3] Greece consists of 13 regions forming devolved units of state administration. Until 2010, the regional authorities were appointed by the central government with limited actual power and responsibilities. The policies that were implemented at each region were designed with limited local consultation by the relevant government secretaries, codified under the multi-annual Regional Operational Programmes (ROP). The ROPs are designed taking into account the traditional perception of regional development, which dictates the construction of public infrastructure in sectors like transport, energy, irrigation, schools, and hospitals. However, after directions from the EU Commission and national competent authorities, ROPs started providing support to innovation-related measures. These measures were defined as related actions aiming to enhance the understanding and the implementation of the innovation process at each region. These actions, which are to a significant extent similar across European countries, were Regional Technology Plans (RTP, mid 1990s- this actions did not implemented in the two regins), Regional Innovation Strategy (RIS, 1997-1999), RIS+,1999-2002, Regional Innovation & Technology Transfer Strategy (RITTS, 1999-2002), Innovative Actions (2002-2008) and Innovation Poles (2007-2008). Table A. 3 in the appendix illustrates the main aims and objectives of each programme and how these were used in the two regions under study.

All regions show low levels of R&D financing, with an average GERD/GDP lower than one percent. Seven of the 13 Greek regions however, are among the top in regional productivity growth rates, as they start from a relative low level. Crete, due to the local universities and a very low population density, shows the highest GERD/GDP ratio, 1.04 %, Thessaly comes second, with a 0.85%, while the islands of South Aegean, with an economy based largely on tourism, 0.17 % (Eurostat, 2011).

the region of Thessaly we had no response from the local businesses. The fieldwork study was performed in two stages. In the first stage, the questionnaires were submitted electronically while, in the second, face-to-face interviews took place for further commentary on the answers and for any other comments on the innovation actions. In this way, the fieldwork study provided empirical evidence on the status of implementation of innovative actions at the regional level as well as perceptions of impact for each one of these actions. A qualitative data analysis approach was followed both for fieldwork interview material and notes and documentary resources.

THE FORMATION OF RIS IN WESTERN MACEDONIA AND THESSALY

Western Macedonia is a small region, regarding its economy, as it represents just 2.3% of the Greek GDP. In terms of GDP per capita, the Region was positioned 4th among the 13 Greek regions but below the EU27 average (80%). The region's economic activity is based heavily on the secondary sector (Table 1) mainly due to mining activities (lignite feeding the Public Power Company), the production of electric power (70% of the country's total electric power is produced in the region) and the fur-leather sector (SAMARA et al., 2010). Overall, the unemployment rate in the region peaked at 32.9% in 2013 (Table 2), thus placing the region in the first position, as the country with the highest unemployment rate between the Greek regions. The general perception from the interviews is that this is a result of the lack of business agility, the rigidity of the workforce and the general low level of entrepreneurial culture. Firms and agricultural activities are on small scale, family based, lacking the competencies to respond to contemporary challenges and survive wider competition.

Table 1. *Share of employment and Gross Value Added (GVA) in the two regions by sector (2008)*

	Primary		**Secondary**		**Tertiary**	
	Employment*	**GVA** **	**Employment**	**GVA**	**Employment**	**GVA**
Western Macedonia	16.2%	5.2%	28.1%	33.0%	55.1%	61.8%
Thessaly	22.3%	7.4%	18.4%	22.3%	58.6%	70.3%

* EUROSTAT database, 03/2012
** Hellenic Statistical Authority, 2011

Thessaly accounted for 4.8% of the national GDP in 2010, while in terms of GDP per capita it ranked 11th among the 13 Greek regions, 65% of EU27 average. The economic crisis, in full swing during the second quarter of 2013, caused the unemployment rate to triple comparing to 2008 (Table 2). In 2011, there was a decrease of 9.7 % in the number of commercial enterprises compared to the rates in 2010 with a general very pessimistic expectation for the future. The agricultural sector is facing further problems caused by increasing production costs and the lack of a strategic plan and funds for sector modernization.

Table 2. *Western Macedonia and Thessaly unemployment rates*

Western Macedonia						
	2008	**2009**	**2010**	**2011**	**2012**	**2013**
General unemployment rate	12.5	12.5	15.5	23.2	29.9	31.8
Long term unemployment rate	7.2	5.8	7.9	11.7	18.0	20.7

Female unemployment rates	19.3	17.0	19.8	29.2	36.8	38.2
Thessaly						
	2008	**2009**	**2010**	**2011**	**2012**	**2013**
General unemployment rate	8.4	9.2	12.1	16.8	22.6	25.4
Long term unemployment rate	4.0	3.5	5.1	7.8	13.1	16.9
Female unemployment rates	12.1	13.1	16.9	22.9	30.5	31.8

Source: Eurostat

Knowledge application and exploitation subsystem

The primary sector in Western Macedonia, although it employs close to a sixth of the workforce it is significantly underperforming regarding productivity. Lately it has developed new directions through niche markets, for example organic production and high end wine production, but these are still in small scale. The tertiary sector develops important areas of tourism-related activities and supporting services for the main manufacturing activities. However, it underperforms compared to the secondary.

Most firms in the region show little or none technological innovation, a situation which contradicts the findings from CIS (1998-2000) that show a significantly high innovation activity. The Public Power Company (PPC) and its related activities often directing the industry's priorities and status quo dictating relevant regulation and policies. Employment of young people heavily rely on PPC and its mining activities lowering further the entrepreneurial culture. Other manufacturing activities, while growing in importance, is concentrated in sectors facing either strong international competition, such as the fur industry, or rigid public regulations such as the energy industry. This large scale carbon-intensive electricity production based on lignite coupled by equally pollusive fur related production activities have a great environmental impact on the region. Consequently, environmental and health concerns have led to the creation of a 'Green Entrepreneurial' culture. This culture is directing all new economic activities towards sustainable development, especially in agriculture and tourism (European Commission, Europa,)[4]. Together with the unique and unspoilt natural heritage is increasingly viewed as offering scope for expansion of sustainable tourism activities.

Thessaly is one of the major agricultural areas of Greece with about a fifth of the workforce employed in the sector, producing though only 7.4% of GVA. This fact explains partly the very low GDP per capita average and provides an indication of an urgent need for modernization and professionalization of the sector. The tertiary sector which dominates the regional economy (Table 1) improves the average image, however doesn't overcome the general perception that Thessaly is an agricultural based region. The most important segments of the services economy gravitate around tourism, retail and wholesale trade and transportation services. In the manufacturing sector, the larger firms are located mainly along the axis formed by the cities of Volos and Larissa and are active in medium to low technology sectors, for example, food and beverages, textiles and wearing apparel, basic metals and metallic structures.

The Knowledge Generation and Diffusion subsystem in Western Macedonia

[4]Regional Innovation Monitor Plus, region of Western Macedonia, https://webgate.acceptance.ec.europa.eu/ENTR/rim_cp/base-profile/region-western-macedonia

The Western Macedonia Higher Education and Research Institutions (Table A.2) are relatively young and not fully formed and equipped. From mid 2000s though through the innovative actions investment they have sufficient facilities to transform ideas to operational product concepts. This is a result of the formation of intermediary organisations and other research facilities (formed during RIS and RIS+ programmes), which from early stage engaged to create strong links both across the region and with the neighbouring Region of Central Macedonia. The formation of the University of West Macedonia often is seen as a destruction of resources, which weakens the ability of the tertiary sector to mature and play a stronger role in the region. However, the University brought a stronger collaborative and more ambitious culture in the region with researchers and staff well connected in the national and international innovation landscape. However, reluctance on the part of researchers to move to the region permanently has deteriorated their research capacity in terms of human resources. During the last decade all the researchers and students have followed entrepreneurship related training programmes, an initiative driven by central government policies. This has enhanced the level of awareness of the importance of spin-offs, entrepreneurial activities and new venture creation related needs.

The concept of innovation policy is fairly new to the Region of Western Macedonia. The RIS programme was the first attempt towards the development of innovation strategies and policies in the region. The regional report that was conducted through consultation of the local actors in 1998 identified five major innovation-related strategic priorities/needs[5]. These rather broad priorities aimed to support innovation in regional SMEs and the organisations of technology supply, transfer and demand. However in practice they were just starting to create a general understanding and awareness of the established industrial base and economic structure.

The next step was the RIS+ programme attempting to put flesh on the bones of the theoretical analysis of RIS, and as an applied programme it developed pilot in areas that had been identified during RIS (Table A.4). A large amount of money was spent in the category of R&D and innovation management tools (Category D, table 3) related to technology audit, transfer and policy design. These highlighted the importance of understanding regional competencies for the first time in the region. Furthermore, the concept of producing specialised niche products in the agro-sector and relating them to tourism was introduced. Furthermore, for the first time, the concept of networking and clustering was initiated in the region.

T*able* 3. *Budget of the regional programmes, by category, for Western Macedonia*

CATEGORIES	Number of actions		Budget €		Percentage of total budget	
	RIS/RIS+ (1990s)	Inn. Actions/ Innovation Poles (2000s)	RIS/RIS+ (1990s)	Inn. Actions/ Innovation Poles (2000s)	1990s	2000s
A. Training, education & diffusion effects	0	0	0	0	0,00%	0,00%
B. Environment, energy &	0	8	0	3.197.834	1,89%	41,05%

[5] Priority 1-Increase the technological capacity of firms; Priority 2-Reinforce innovation financing; Priority 3-Increase the endogenous technology supply; Priority 4-Increase the technology transfer capability; Priority 5-Support the system of technological information.

transports						
C. Culture, civilization & tourism	2	0	164.314	0	0,22%	0,00%
D. Research, development & innovation management tools	7	3	1.202.000	502.982	15,43%	6,46%
E. Entrepreneurship & adaptation in new technologies	4	4	673.437	1.283.550	8,65%	16,48%
F. Academic – Industry relationship	2	2	32.422	34.006	0,42%	0,44%
G. Funding of innovation	1	0	33.936	0	0,44%	0,00%
H. Cluster development and networking	3	1	15.727	6.782	0,20%	0,09%
I. Creation & development of infrastructures for supporting innovation	3	1	427.520	214.794	5,49%	2,76%
Total	**22**	**19**	**2.549.356**	**5.239.948**	**32,73%**	**67,27%**
	41		**7.789.304**		**100%**	

An issue, however, was raised from the implementation of all these actions and their ability to make an impact, because of fragmentation and the lack of clear connection with the productive base of the region (e.g. the finance of the Woods institute). The energy sector, for example, was involved only marginally in those actions. The idea for example of turning the negative impact of the considerable pollution generated by the energy industry into positive started through the entrepreneurship and adaptation of new technologies theme with a relative small contribution. The level of disconnect of the design of the two first programmes reflected on the survey (Fig. 1).

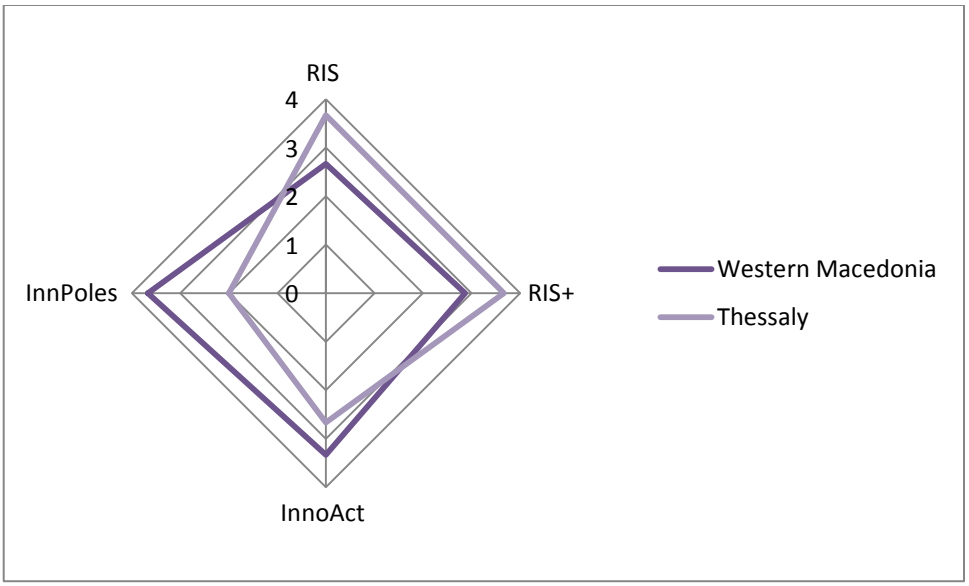

Fig. 1. Perception of the level of coverage of the needs of each region by the designed programmes.
Source: Writers own illustration.

The latter observation made an influence on the design of the next programmes, the Innovative Actions and Innovation Poles. The priorities were directed towards the main

industrial activities in the region. The main objective which materialised through the K-clusters actions was to identify concrete cases of best practices on new product development and, then, transfer them to the larger possible number of regional firms. This however, directed once more from the proposition of the European Commission, DG Regional Policy (2002) rather than the regional realisation of the need. The clustering activities resulted in the development of four clusters in the sectors of wood, fur, marble and residue handling, whose operation ended with the completion of the Innovative Actions programme. Some other parallel actions though focusing on the promotion of innovation management, the development of a virtual technopolis, a regional innovation observatory and a regional enterprise benchmarking (Table A.4) achieved a continuation of relevant discussions around innovation policy generating further awareness.

The creation of the Regional Pole of Innovation for Western Macedonia (RPIWM) is considered a significant change in the level of understanding in the Region. The creation of the University of Western Macedonia, which did not exist during the previous programmes, attracting research staff with international experience, came to contribute to the ongoing discussion, helping to deal with weaknesses in the design of the programme that were evident in the earlier programmes. For example, the new design explicitly raised the issue of multiple split, the generic nature and the complexity of previous programmes, the weakness of identification of strategic collaborations between institutions of the region, particularly in the sector of energy, as well as the detachment of strategy from the implemental action. Thus, the three research actors in the region promoted the focus of effort for innovation and technological growth through the energy sector that clearly dominates the region's output. Therefore, the RPIWM's main goal was to assist the growth and maintenance of infrastructure in order to support R&D activities, international research collaborations and entrepreneurial culture in the production, disposal and saving of energy, in environmental protection, and in innovative actions in the wider sector of energy. This justifies the really high amount of expenditure attributed to category B (Table 3) during the last period.

Furthermore, the relationship between academia/research community, regional policy actors and the business community materialised in action for the first time. Despite the fact that it is a small region in terms of surface and population and one could expect a level of understanding and a spirit of solidarity among the different actors, this did not occur until these actions came into the picture. The needs of firms for the first time emerged as priorities for research and policy design, leading to new partnerships under several national or European schemes (SAMARA et. al, 2010).

The Knowledge Generation and Diffusion subsystem in Thessaly

Thessaly's Higher Education and Research Institutions (Table A.3) are operating in five cities in the Region of Thessaly. They include a large variety of science and engineering disciplines, for example, agricultural sciences, mechanical engineering, health sciences. They are older than the ones in Western Macedonia, yet very young from an international perspective. The sites in Larissa and Volos accommodate adequate facilities to offer a research base for the region aiming, simultaneously, at enhancing the European dimension in the academic and research activities.

The intermediary organizations have developed through the RIS and RIS+ programmes and not through local initiatives. The Region of Thessaly has a more advanced network of such agents than Western Macedonia although the innovation concept is relatively new in Thessaly, too (SKAYANNIS, 2002). These agents, however, tend to act at a very local level (city-community) rather than at regional level.

Furthermore, their objectives often overlap, creating unnecessary frictions and fragmentation of funding. Furthermore, there is no finance institution in the two regions that has an innovation related investment approach, only branches of national banks are present.

The private sector, apart from a small number of consultancy firms and some minor R&D departments in larger industries, serving mainly quality assurance purposes, does not have any significant presence in research and technology development in either region (Country Review of Greece's Innovation Policy, MoD/GSRT, 2007). Therefore, any inspiration for high technology and innovative actions cannot be met because of issues having to do with the structure of the regional innovation system. (Country Review of Greece's Innovation Policy, MoD/GSRT, 2007).

Thessaly has followed a similar pattern of participation to innovation-related programmes. Regional research and technological development as well as innovation policy were at low levels before the development of these programmes. Although some component actors existed in the region, their financial support, in terms of permanent and project funding, came either from the national government or from the E.U framework programmes for research and technological development. Originally, there were no bridges among research institutions and firms, with few individually promoted exceptions, and virtually no contacts between the research community and central administration.

However, the presence of the academic and research institutions in the region developed an awareness of innovation as a substantial factor for economic growth. This allowed actors to take a more focused approach in the design of the RIS and RIS+ programmes taking into account the region's industrial base, both food and drinks and textile, thus attracting a significant amount of funds, almost double than those raised for Western Macedonia for this period (Table 4).

The RIS of Thessaly's medium term objective (Table A.4) was to enhance the research capacity of the existing institutions and to promote them as collaborative partners for the private sector. Such measures needed to take account of the lack of in-house capacities to undertake product or process innovation of the vast majority of firms. As a result, some new projects were considered and proposed within the Regional Operational Programme. However, the regional actors' main aim was to strengthen the medium to long term strategic orientation of economic and social development through innovation and cooperation. Therefore, they focused to:

- understand the factors influencing technology development and innovation in local firms, and identify the strengths and weakness of the RIS;
- ensure a consensus between the public administration, the enterprises, the labour organisations and the universities on the priorities for technology development and innovation support in the region;
- select specific actions, stimulated by a bottom-up consultation process of the regional actors and entrepreneurs, aimed at responding to actual needs and methods for their implementation within the framework of an Innovation Strategy for the region.

The RIS+ programme has been the direct extension of the previous RIS aiming at the embedment of an innovation culture, as well as the coordination of existing SME's support structure. Its objective was to establish a coherent and demand-driven framework of innovation in the region. To this end, the RIS+ focused on three main actions (Table A.5), namely, training, education and diffusion effects (category A of table 4);

strengthening the innovative capacity of businesses by adapting to new technologies and organisation structures (category I); and, innovation management tools (category D).

Table 4. Budget of the regional programmes, by category, for Thessaly

CATEGORIES	Number of actions		Budget €		Percentage of total budget	
	RIS/RIS+ (1990s)	Inn. Actions/ Innovation Poles (2000s)	RIS/RIS+ (1990s)	Inn. Actions/ Innovation Poles (2000s)	1990s	2000s
A. Training, education & diffusion effects	5	2	1.769.900	1.237.600	19,80%	13,85%
B. Environment, energy & transports	0	0	0	0	0,00%	0,00%
C. Culture, civilization & tourism	0	1	0	450.000	0,00%	5,03%
D. Research, development & innovation management tools	1	0	178.500	0	2,00%	0,00%
E. Entrepreneurship & adapting to new technologies	1	1	105.700	193.400	1,18%	2,16%
F. Academia – Industry relationship	2	1	117.648	62.352	1,32%	0,70%
G. Funding of innovation	2	1	506.500	423.500	5,67%	4,74%
H. Cluster development and networking	1	0	30.000	0	0,34%	0,00%
I. Creation & development of infrastructures for supporting innovation	4	3	1.739.079	2.123.421	19,46%	23,76%
Total	**16**	**9**	**4.447.327**	**4.490.273**	**49,76%**	**50,24%**
	25		**8.937.600**		**100%**	

The Innovative Actions programme intended on providing the Region of Thessaly with a coherent regional strategy and a portfolio of actions that reflected the strengths of the region, following the previous actions. In this programme, all major players in the RIS were actively involved with the responsibility to contribute an innovative vision for Thessaly. However the specified actions dominated by the needs of the academic institutions and focused on the establishment of an entrepreneurship support centre and of the Mechatronics Research Centre, dominating the budget allocation. This however, created a discontinuation on activities that promoted academic-industry collaboration, neglected existing relations and creating a perception of separation between the stakeholders of the system (Fig. 1). The Innovation Pole of Thessaly attempted to re-establish these relationships through the creation of industry-based technology platforms. This programme was designed to contribute to the association of knowledge production bodies (University, Technological Educational Institute, Research Institutes) with the organizations of Thessaly and industry intermediaries (Technology Park of Thessaly, industry associations and chambers) for the development of research, innovation and competitiveness. The focus was on areas directly related to the primary and secondary sectors of the economy in Thessaly, including: the agro-materials with emphasis on textiles, cotton and furniture; food and beverages; and biofuels (Table A.5). Tourism related activities appear only during the Innovation Actions programme although the sector has a high significance for the region. The activities of these platforms though have been to a large extend discontinued after the completion of the project. The

perception of the level of fulfilment of their objective (Fig. 2) is indicative of the disappointment of the different stakeholders from the latter two programmes.

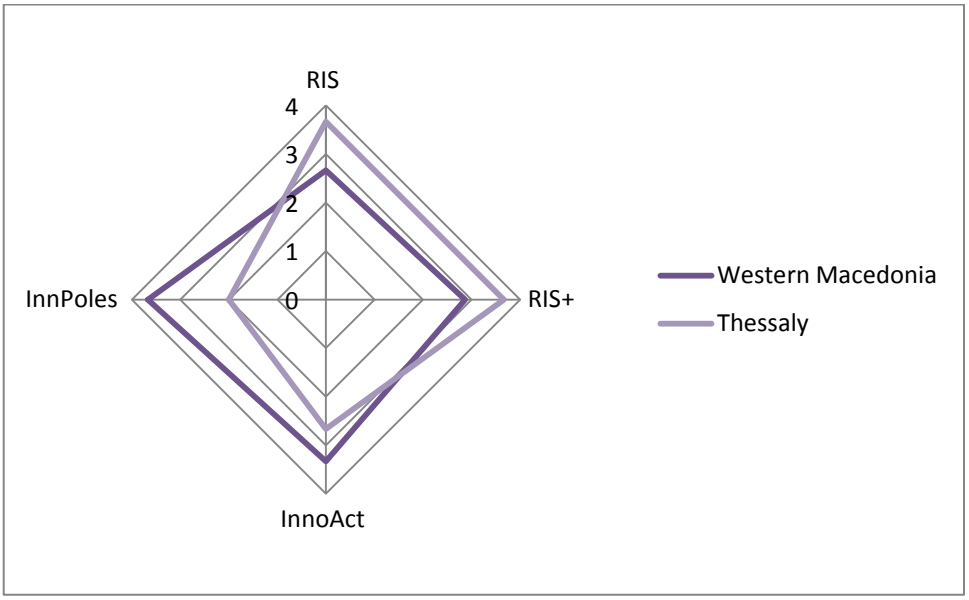

Fig. 2. Perception of fulfilment of the programmes' objectives for each region. Source: Writers own illustration.

DISCUSSION AND CONCLUSIONS ON THE IMPACT OF THE REGIONAL ACTIONS

During the first half of the 2000, the two regions' innovation capacity grew significantly comparing to the 1990s, by the establishment of several research and development and mediation actors. The University of Western Macedonia has become a central point of reference in the region as its establishment was one of the main demands made during the implementation of the Innovative Actions programme. In the Region of Thessaly, three centres for research, entrepreneurship and development have been established, which partnered with the academic institutions and the regional development agencies. As a result of such actions the Innovation System in the two regions started to take a more complete form during the 2000s (Fig 3).

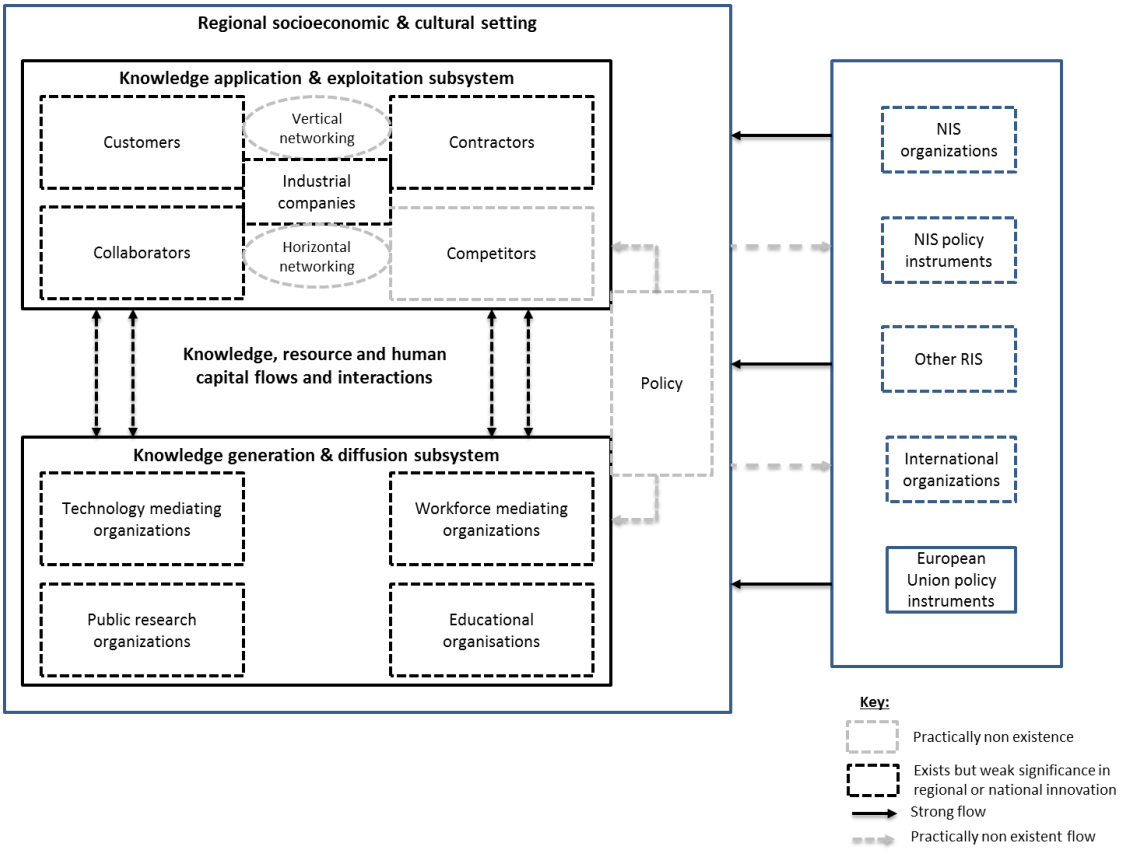

Fig. 3. The Regional Systems of Western Macedonia and Thessaly after the implementation of the programmes

Source: Own modification of Autio, (1998) as found in Tödtling and Trippl, (2005), p. 1206.

The implementation of the actions over time though revealed a very difference perception between the two regions. More precisely, the RIS and RIS+ programmes were considered quite successful in the Region of Thessaly but inadequate in the region of Western Macedonia. This is completely reversed for the programmes during the latter programmes in the 2000s. As commented in the survey, Western Macedonia during the 1990s and Thessaly during the 2000s adopted a flawed approach of identifying their real needs in innovation. More specifically, each region selected their course of action failing to foresee the dangers of the existing dissociation of local and national politics while designing their research and innovation plans that define objectives, strategies and funds. In the case of Western Macedonia, originally, there was no local actor able to supervise such design. For the case of Thessaly the problem arose during the 2000s as the relationship between the academia/research actors and the regional industrial base showed signs of discontent instead of the necessary unanimity of purpose. As a result the designed plans, for the Innovation Actions and the Innovation Pole, lost the connection with the real R&D and innovation needs and activities of the productive sectors of the region, focusing instead on covering needs of the immediate financial survival of specific actors. The big difference in the success rate concerning meeting the regional needs of the latter two programmes can be also attributed to the fact that the Western Macedonia region spent on these two programmes almost three times more R&D funds compared with the programmes of the 1990s, while Thessaly's funding amounts were the same as in the 1990s programmes. However, the local actors had a relative freedom in designing the specific activities, especially in the Innovation Pole programme, mainly through consultation at the local level. Our conclusion is that this flaw of design derives from the

lack of a professional Policy Design Actor, which will be able to oversee the system and design short-medium-long term policies and strategies of implementation.

The design at the moment is made on the basis of the generic priorities that the central authorities (usually the European Commission) set for each programme. The local actors adapt their proposals to these priorities instead of their local identified needs, generating a 'subsidies' culture under of which the local structures are financed. The two regions actually had to use the follow up Innovation Actions programme to further finance the operation of some of the actors as no other funds existed. In any case, though, the developed actions often focused on activities with low continuity or coherence over time on the regional actual needs. Most of the actions were 'one-off' ones with no follow up plan to become self-sustained. The objectives and outcomes of the actions were not connected to a coherent long term plan for sustainable innovation strategy. The actors in the regions introduced activities and structures to cover immediate needs which often led to conflicts and discontent in their relationships. Furthermore, their priorities repeatedly followed general trends on the field rather than analysing regional/market needs. The structures created under those programmes, which frequently were replaced or renamed every time a programme was completed; face serious survival problems as there were no significant funding mechanisms following these programmes. They have not managed to develop a sustainable source of funding that could be generated either by collaboration with the private sector or the faster commercial exploitation of their achievements. This leads to the conclusion that these regions are still dependent on publicly funded initiatives. The moment that such funding terminates, all the efforts are threatened to reach an end. The focus for the future could have been on influencing the activities and culture of the main local industrial players. The energy company in Western Macedonia and the food, metal or tourism sector in Thessaly could be the poles to generate a sustainable networking effect and invest in relevant long term applied research.

The programmes had a positive effect on raising awareness of how innovation relates to regional development. Moreover, these programmes created an awareness of collaboration between the actors some of which, such as the Technology Mediation Organisations, were created for the first time. The target was to initiate discussion for action planning suitable for regions with appropriate local characteristics and capacity. This led to the creation of the first horizontal and vertical networks, which proved though temporary and weren't sustained after the completion of the programmes. This however requires demonstrating direct benefits for the private sector rather than only academic or generic benefits.

In conclusion, our research has demonstrated that the benefits of these programmes were numerous, with most important the raising of awareness and understanding of the importance of innovation through dissemination events and networking activities. An equally important benefit is the creation of networks between the different stakeholders, through training and pilot collaborative activities of technology transfer. Furthermore, these programmes supported the creation of institutions and mechanisms of exploitation and growth such as the mediating organizations, in order to support entrepreneurship and intellectual property rights exploitation from the research centers.

One key finding regarding the influence of the programmes during the second period is that their policy dimension appeared for the first time. This led to the design and development of institutional and administrative structures related to innovation at local level. However, the regional policy priorities still cannot have any significant influence at the national level design, and the structures have not been designed as permanent and independent stakeholders of industrial or development policy for the central government.

From the above illustrations this study argues that the RIS in these two Greek regions have been actually initiated under the programmes that EU Commission has promoted over the last two decades. In the 1990s and 2000s innovation related actions in the two regions were financed only through these programmes. Notwithstanding the setbacks, the programmes have contributed to raise awareness and have broadened the scope of the innovation concept into a strategic priority for growth in both regions. Even though the disconnection of industrial policy, academic priorities and the fragmentation of the structural development failed to align knowledge capacity and needs through a coherent strategy. This lesson, however, could be addressed by the wider design of relevant programmes (national or EU level). Reflecting for example the level of synchronisation and continuation through the selection criteria – for example, the vague and often easily manipulated 'impact' criteria could be replaced by a 'synchronisation' and 'continuation' criterion – on all the regional programmes, e.g. Regional Operation Programmes, Structural Funds etc. Finally, these programmes may phase their objectives accordingly to the development level of the region, instead of assuming the same level of understanding.

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APPENDIX

Table A.1. Respondents of the case studies

	Western Macedonia	Thessaly
Procuring entities	• Regional Authority of Western Macedonia • Kozani municipality • Eordaia municipality • University of Western Macedonia • Technological Education Institute of Western Macedonia	• Regional Authority of Thessaly • University of Thessaly • Technological Educational Institute of Larissa
Local businesses - contractors	• Public Power Corporation (PPC) • Diadyma S.A. • Helbio S.A • I. Perivolaris & AL. O.E. • Kikis SA	**Not responded**
Research institutes, consultancies & RDAs	• Anko S.A. • Mellon Ltd • Institute for Solid Fuels Technology and Applications • Balkan Business Centre of West Macedonia • Technological research centre	• Technological Research Centre of Thessaly • Centre of Entrepreneurial & Technological Development • Centre for Research and Technology - Thessaly (CE.RE.TE.TH)

Table A.2. Knowledge Capacity at the Region of Western Macedonia

Western Macedonia			
Institution	**Year of establishment**	**Departments/Main activities**	**Comments/Achievements**
Technological Education Institute (T.E.I.) of Western Macedonia	1983	a) The Applied Technology Department (Mechanical; Electrical; Industrial Design; Geotechnology and Environment Antipollution Department); b) Management and Economics (Logistics; Economics and Business Management); c) Agricultural Technology; d) Health Services (Obstetrics)	The mission statement underlines the practical and applied side of its courses and research undertaken, highlighting the spin-off development opportunities for the regional economy. Applied research is carried out through 15 projects of which the majority is connected directly to firms. The TEI of Western Macedonia, in part due to have been in existence for relatively longer than the University, and the applied nature of activities has created stronger links with local and national industries
Institute of Solid Fuels Technologies and Applications (ISFTA)	1987	ISFTA acts as consultant to the Greek Government, the Public Power Corporation (PPC), the Institute of Geological and Mineral Exploration (IGME) and to any other company or organization involved in the energy sector that is actively involved in the Governmental planning for power production and industrial development.	ISFTA is the main Greek organisation for the promotion of research and technological development aiming at the improved and integrated exploitation of solid fuels and their by-products with several research projects funded by national and European frameworks. In 2005, ISFTA has been awarded the title of Excellence in Research and Technology. It ranked 6th among more than 40 Greek Research and Technology Organisations supervised by the General Secretary of Research and Technology.
University of Macedonia (U.o.W.M.)	2004	a) Faculty of Education i) Elementary Education ii) Nursery Education b) Faculty of Engineering i) Mechanical Engineering ii)Engineering Informatics & Telecommunications c) Other Departments i) Balkan Studies ii) Applied and Visual Arts	The Department of Mechanical Engineering was already operational as part of Aristotle University of Thessaloniki (A.U.Th.), the larger University in Northern Greece and one of the major Universities in Greece. Through this connection the members of staff have long and high level of experience in research, innovation strategies and knowledge management. The U.o.W.M. is strongly linked to the University of Thessaly, with long experience in managing RIS projects.

Table A.3. Knowledge Capacity at the Region of Thessaly

Thessaly			
Institution	**Year of establishment**	**Departments/Main activities**	**Comments/Achievements**
Technological Educational Institute of Larissa	1983	a) School of technological applications b) School of business and economics c) School of health professions d) School of agricultural technology e) Centre of foreign languages and physical education	• Today it has 10,000 students and buildings that extent over 1,152 acres, with an annex in Karditsa.
University of Thessaly	1984	a) School of Humanities • Department of Primary Education (DPE)	• The members of academic staff and the new researchers participate in European research networks and numerous innovative research

		• Department of Pre-School Education (DPSE) • Department of Special Education (DSE) • Department of History, Archaeology and Social Anthropology (DHASA) b) School of Agricultural Sciences • Department of Agriculture Crop Production and Rural Environment (DACPRE) • Department of Ichthyology and Aquatic Environment (DIAE) c) School of Engineering • Department of Planning and Regional Development (DPRD) • Department of Mechanical Engineering (DME) • Department of Civil Engineering (DCE) • Department of Architecture (DA) • Department of Computer and Communications Engineering (DCCE) d) School of Health Sciences • School of Medicine (SM) • Faculty of Veterinary Science (FVS) • Department of Biochemistry and Biotechnology (DBB) e) Independent Departments • Department of Physical Education and Sport Science (DPESS) • Department of Economics (DE)	programmes co-funded by EU, which constitute a significant source of income. • The Liaison Office holds the results of research conducted at the University and organises awareness-raising activities and public lectures on various social issues. • Emphasis is also placed on the bond between the University of Thessaly and the local society. This bond is further supported by the University Hospital of Larissa which covers the needs all over Thessaly. • The Career Office brings students, mainly from the School of Engineering and the School of Agricultural Sciences, in contact with the labour market, providing services to them. • Since May 2009 there has been cooperation between the University and the Greek Radio of Volos for the organization of radio broadcasts concerning the University activities that have a main impact in the local and wider society, as well as the discussion of important current issues in the presence of qualified professors.
Karditsa Energy Centre	1994	Serves as Regional Energy Centre dealing with: • improvement of energy infrastructures energy management and energy saving • promotion of alternative energy sources	
Technological Research Centre of Thessaly	2001	The fundamental goal of TRC of Thessaly is the technological research development in order to solve specific problems of the productive procedure and the social and economic development of Thessaly. The technological research development will result in the improvement of the existing methods and the productive processes, which serve the needs of the Thessaly prefecture and consequently the country's needs. TRC's main target is the development of applications & products, the provision of services, as well as the support of industrial-manufacturing units. The collaboration between TRC & the local productive units will upgrade the relationship between research & labor market, granted	• It holds a major research-scientific staff, Professors of the TEI of Larissa and cooperating leading scientists. • Plays a significant role in the production of technological research, quality and competitiveness of the economy of Larissa and the wider area of Thessaly. • It offers specialization for students and graduates on modern areas of new technologies. • It is the only research centre which with its Annexes in the four counties will grow geographically across Thessaly. • Thus, it can help decisively to the uniform development of the region and to the alleviation of disparities in development and

		that the majority of the founding members are professors of higher education.	living standards among different regions.
Centre of Entrepreneurial & Technological Development	2003	Its services are decentralized in the entire region of Thessaly and its provision is supported by the four Chambers and Development Agencies in the region.	
Institute for Research and Technology Thessaly (IRETETH) / Centre for Research and Technology - Thessaly (CE.RE.TE.TH)	2006	Originally established as a non-for-profit legal entity organized under the auspices of the General Secretariat for Research and Technology (GSRT). The Centre's main mission was to conduct basic, applied, and technological research that leads to new products and services with industrial, economic and social impact.	The **Institute for Research and Technology Thessaly (IRETETH)**, a non-profit research and technological development organization headquartered in Volos-Thessaly, is the result of merging of the four Institutes of the Centre for Research and Technology Thessaly (**CERETETH**), which was established in January 2006. IRETETH/CERETETH became a member of the Center for Research and Technology – Hellas (**CERTH**) established in Thessaloniki and administered by the Ministry of Education, Religions Affairs and Long Life Learning. IRETETH, in its present structure, continues to support the research areas of CERETETH: **i) Mechatronics, ii) Agrotechnology, iii) Biomedicine and iv) Kinesiology**
Development Agencies	1. 1997 2. 1997 3. 1997	1.Development agency of the prefecture of Larissa 2.Development agency of Magnesia S.A. 3.Development agency of Karditsa S.A.	• It provides services concerning business and information to the investors, it makes suggestions to the regional and national authorities, it supports and promotes European projects protecting the environment. These are some of its tasks. It also participates in the European network REACTE dealing with SMEs. • It formulated its development strategy on the basis of the productive and social character of the region of Magnesia and the prospects of the region's economic factors within a rapidly changing and strongly competitive economic environment. • The development concept of AN.KA S.A. focuses on helping build capacity and empowering local people, especially the disadvantaged groups, as well as preventing social exclusion. Programmes and projects are planned and implemented in order to serve a coherent and integrated vision for local development. Each one covers a specific need, meets a specific goal of this vision, which is constantly updated and enriched through social open debate.

Table A.4. Innovative actions implemented in the regions

Programme	Aims & Objectives (as designed from the central authorities)	Aims & Objectives (defined to be applied at regional level for each programme)
Regional Technology Plans (RTP, mid 1990s)	To support R&D activities in a number of strategic technological fields such as biotechnology, information technology, material sciences and telecommunications	-
Regional Innovation Strategy (RIS, 1997-1999)	To promote territorial cohesion by balancing spatial discrepancies across countries and regions.	Western Macedonia • Creating a new culture for innovation among the people who influence the economic development of the region • Creating innovation-industry links and technology networks • SWOT analysis of the region • Providing an action plan that will focus on the available and future financial resources and development programmes in relation to the identified needs and opportunities aiming at updating the region's technological profile • Creating a sustainable mechanism to monitor and assist innovation activities and to assist S.M.E.'s on technology transfer and R&D linking Thessaly • Understand the factors influencing technology development and innovation in Thessalian firms • Ensure a consensus between the public administration, the enterprises, the labor or organizations and the universities, • Select specific actions, stimulated by a bottom-up consultation process of the regional actors and entrepreneurs
Regional Innovation Strategy + (RIS+,1999-2002)	To strengthen regional competiveness and to devolve and de-concentrate the regional policy responsibilities	Western Macedonia • Implementation of Pilot Actions and Feasibility Studies of the RIS Strategic Plan for Innovation, in order to strengthen the Innovation capacity of the Regional Economy and maintain the local consensus among all regional actors involved • Need of a strong interaction with the Structural Funds Thessaly • Utilization of special knowledge and experiences • Stressing regional specificities and needs • Utilization and mobilization of existing human resources

Regional Innovation & Technology Transfer Strategy (RITTS, 1999-2002)	To promote innovation, building on intangibles vs traditional regional policies focusing on physical infrastructures	-
Innovative Actions (2002-2008)	To help regions of several member states with additional funding and support the localized clusters that are formed from the close co-operation between public institutions.	Western Macedonia (Knowledge clusters in West Macedonia" /K- clusters) The main objective of "k–clusters" was to provide added-value services for the formulation of innovative actions based on : • Thematic knowledge building and creation of technology poles • Exploration of innovation issues within the thematic areas • Support collective entrepreneurship effort in the regional public – private collaboration providing horizontal support in the innovation process • Initiate pilot actions that will be the "quick-wins" for enhancing the innovation spirit in Western Macedonia. Thessaly (Innovative Ventures/Invent) • Application of innovative practices for product development • Creation of regional support structures promoting product innovation and development, • Building of regional awareness with demonstration and dissemination of new product models and practices aims to increase regional awareness for new product development practices.
Innovation Poles (2007-2008)	To reinforce of co-operation networks/clusters between local business and research centres and universities financial institutions or specialist consultants etc. for the development of new products/ services	Western Macedonia The **Regional Innovation Pole of Western Macedonia (**RPIWM) will assist the growth and maintenance of appreciable infrastructure, which will support the multi-sector technological R&D and the activities of growth that will promote technological and scientific discoveries and international inquiring collaborations, so Western Macedonia becomes the cradle of creation of next generation most optimal and viable practices in the production and disposal of energy, in the saving of energy, in the protection of environment, as well as in innovative actions in the wider sector of energy. Thessaly The main objective of the **Regional Innovation Pole of Thessaly (RIPT),** is to support a development strategy in three main areas, which will explore and will take advantage of the region in the primary agricultural production, by supporting three industrial sectors a) Food Processing b) Agro Materials c) The Cultivation of energy crops for the production of biofuels

Table A.5. Actions undertaken in Western Macedonia under the RIS, RIS+, Innovative Actions and Innovation Poles

Categories of actions	RIS	RIS+	Innovative Actions	Innovation Poles
Training, education & diffusion effects				
Environment, energy & transports			1. Energy sector innovation development-development of innovation in the sub-constructing supply chains of the public power corporation. 2. New products based on brown coal ash residue-development of new products with the use of lignite-consumption residue 'tefra'. 3. Development of innovation, in terms of new services & entrepreneurship, in the field of recycling specific hazardous materials.	1. Environmental management and support of PPC's operational decisions system for the region of Kozani/Ptolemaida/Amyntaio/Florina 2. Advanced measures for the improvement of operation of lignite-based power plants and for reduction of CO2 emissions 3. Co-combustion of secondary fuels (biomass) with lignite in a Power Plant 4. AIOLOS: Promotion of Exploitation of Wind Energy in the Region of Western Macedonia 5. Development and manufacture of solar air conditioning devices with small power consumption
Culture, civilization & tourism		1. Potential for promoting agro tourism 2. Integrated thematic tourism programme		
Research, development & innovation management tools	1. A study of the production system of the Western Macedonia Region, 2. A study of the technology trends in principal branches of the primary, industrial and tertiary sectors, 3. technological surveys in 52 selected industrial enterprises, 4. A study of the requirements of the	3. Development of technology audit –transfer of relevant know how 4. Woods institute	4. E-cluster knowledge tools (virtual technopolis, regional innovation observatory and regional enterprise benchmarking)	6. Study for energy savings and the optimal use of energy at SMEs (Small Medium Enterprises) 7. Development and evaluation of innovative catalytic systems for hydrogen production from biogas (bio2hydro)

	Region's enterprises in technology and innovation services 5. A survey of technology supply and transfer from Regional bodies.			
Entrepreneurship & adaptation in new technologies	6. Support for traditional eponymous local products	5. Pilot plantation of aromatic plants 6. Promotion of the use of solid ash residue in the construction sector 7. Industrial automation	5. Mar.in.-development of innovation in the sector of marble 6. Development of new products &/or methods of manufacturing &/or development processes in the fur & leather sector 7. Innovation in the wood sector-development of new products &/or manufacturing processes &/or methods in the wood sector	1. Pilot application of use of cube blocks with high content in flying ash
Academic – Industry relationship	7. Support and improvement of university- SMEs links	8. Transfer of know-how in the field of recycling & exploitation of waste disposal special		9. Technological platform of the Regional Pole of Innovation in Western Macedonia 10. Development and Consolidation of the Regional Innovation Pole in Western Macedonia
Funding of innovation		11. Improvement of national & regional funding in the sector of agriculture		
Cluster development and networking		12. Promotion of sub-contracting with the public power corporation 13. Marble firm co-operation network & related actions 14. Farmers networks & local co-operation groups	8. Four clusters in the sectors of wood, fur, marble and residue handling	
Creation & development of infrastructures for supporting innovation		9. Regional innovation office 10. Information & sub-contracting promotion agency 11. Enterprise modernisation on the basis of an information bureau	2. Innovative knowledge management	

Table A.6. Actions undertaken in Thessaly under RIS, RIS+, Innovative Actions and Innovation Poles

Categories of actions	RIS	RIS+	Innovative Actions	Innovation Poles
Training, education & diffusion effects	1. Promoting quality & certification in the food industry 2. Increasing publicity concerning the supply of services for research & technology transfer	1. Innovation week 2. Seminars & business missions 3. Promotion of HACCP (hazard analysis- critical control points)	1. Learning networks & innovation management	1. Training Activities in priority sectors
Environment, energy & transports				
Culture, civilization & tourism			2. Innovative products in tourism	
Research, development & innovation management tools		4. Innovation measurement system		
Entrepreneurship & adaptation in new technologies		5. Integrated production & distribution agreement		2. Creation of five Spin Off Companies.
Academic – Industry relationship	3. Enhancing access to technology transfer	6. Participation of firms to national & European RTD programmes		3. Technological Platforms (TP) - Food, Textile Industry, Biofuels. 4. Horizontal Activities
Funding of innovation	4. Developing of new form of financing for innovation & modernisation of companies 5. Renewing the machinery of the wood-furniture industry			5. Research and Development Consortia
Cluster development and networking	6. Establishing co-operation networks among the entrepreneurs of the primary sector			
Creation &	7. Upgrading the laboratory equipment of the	7. Accreditation of	3. Mechatronics prototyping	6. Infrastructure Development

development of infrastructures for supporting innovation	technological educational institute of Thessaly 8. Establishment of a fashion centre for the textile sector 9. Development of the RIS Thessaly web site allowing access to detailed information on issues relating to innovation & the future development of the region	laboratories	centre 4. Regional innovative entrepreneurship support centre	