



MIRIAD

Managing and Infusing Research Investment and Development

Central, East Macedonia and Thrace Knowledge Investment Strategy



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1. Introduction

This document presents the strategic recommendations and the key findings from which these recommendations have been formulated as part of a EU-funded project entitled 'Managing and Infusing Research Investment and Development (MIRIAD). MIRIAD (www.miriad.org) is a two-year project principally operating between 2006 and 2007 funded under the European Commission's Regions of Knowledge 2 initiatives (a programme of Framework Programme 6). The key aim of MIRIAD is to stimulate policy intervention focused on raising levels of R&D investment in four regions across Europe.

The four regions consist of Yorkshire and the Humber in the UK, the Western Turkish region from Istanbul (inclusive) to the Greece and Bulgarian borders of Turkey, East Macedonia and Thrace (including Thessaloniki) in Greece, and the South Eastern Bulgarian region from Sofia (inclusive) to the border with Greece and Turkey, including also the Bulgarian Black Sea region. The choice of regions represents an opportunity to build upon inter-regional cooperation and linkages that already exist between the regions and the proposed project partners.

In the past, knowledge and R&D investment policies and strategies have focused either on stimulating transfers/spillovers or facilitating knowledge absorption. However, it is clear that successful strategy building must take account of both simultaneously. The aim of MIRIAD is to integrate both these aspects, so as to remove both the supply and demand-side barriers associated with knowledge and R&D transfer, absorption, and investment. In essence, knowledge and R&D investment is a function of a region's ability to transfer, spillover and absorb knowledge. MIRIAD focuses on the inter-connectivity of these three factors as a catalyst and stimulator of enhanced knowledge and R&D investment.

The key objectives of MIRIAD are:

- To formalise policies with regional and national government aimed at improving levels of R&D investment by businesses, government and higher education.
- To establish tools by which SMEs are able to identify and measure their knowledge assets through developing a range of benchmarking and scorecard instruments tailored to the regions in which they are operationalised.
- To establish a regional mutual learning platform for promoting the trans-national exchange of practices for enhancing regional R&D investment.
- Facilitate the transfer of good practices in terms of participation to EU funded research, links and co-operation between SMEs and research performers, methodologies and models for the creation and development of research oriented businesses.
- Establish and launch an R&D Investment Strategy for each of the regions, that is complementary to the existing policy initiatives and activities already being undertaken, but also has a real and positive impact on future R&D investment

performance. The processes underlying the development of these strategies can then be applied in other regions across Europe.

This document constitutes the Investment Strategy established for the Yorkshire and Humber region, and we refer to it as a ‘Knowledge Investment Strategy’ – see note below.

A summary of the activities undertaken in each of the four MIRIAD regions is shown below:

- Scoping and Analysis of R&D Performance.
- Foresight and Scenario Workshops.
- Benchmarking Regional Knowledge Demand and Absorption.
- Benchmarking Regional Knowledge Supply and Transfer.
- Regional Policy Roundtables.
- Trans-National Regional Learning Platform.
- Regional R&D (Knowledge) Investment Strategies.

As a means of achieving the objectives of the project, the key analytical components of the project included the following:

- To examine the current and potential knowledge capability of SMEs and the scope for improving their competitiveness through the development of knowledge transfer and business alliances strategies within supply chains and across industries and markets.
- To understand the current role played by SMEs in each region and some of the barriers and opportunities for their expansion.
- To draw out the specific knowledge deficits and/or surpluses within SMEs.
- To identify and understand the likely intermediaries and institutions (particularly universities) required to be involved in establishing knowledge transfer platforms.
- To understand the processes best suited to stimulating engagement from SMEs in each region.

This report presents the strategic recommendations formulated by the MIRIAD project team set within the context of the key findings established during the undertaking of the activities listed above.

Innovation or R&D?

It is important to note that whilst the focus of the MIRIAD process at the outset concerned R&D and R&D investment, during the consultation process undertaken in Yorkshire and Humber, it became abundantly clear that the narrowness of investment in R&D would miss much of the opportunities to invest and exploit in service sector innovation, as well as innovation and changes that do not necessarily derive from R&D in the strictest sense. There, as a result, the MIRIAD study in Yorkshire and Humber evolved to consider wider investment in knowledge that facilitates innovation, rather than just R&D investment. However, the obligations of the project to the European Commission (as well as the available metrics) meant that much of the early work of the project – some of which is summarised below – focused on the concept of R&D.

2. Competitiveness

The competitiveness of the economies of the regions of Central Macedonia (CM) and East Macedonia and Thrace (EMTH) lags behind the national average, as shown by Table 2.1, and more so compared to the EU. The high unemployment rates are a key issue that at least for the region of EMTH are related to the low productivity and the same applies for most parts of CM, if Thessaloniki was to be excluded. The weak economic structure, linked to traditional sectors with low knowledge intensity and less efficient human and physical capital deployment are the key factors.

Regarding the region of CM both Gross Domestic Product (GDP) per capita and Gross Monthly Earnings are close to the national average while EMTH and also most prefectures of CM lag behind by about 20-30%. An interesting point is that the economic activity rate at national level is very much below the EU average due to the high unemployment and the low rate of participation in the workforce. The latter is related to lower participation rates for women and early retirement. Economic activity rates at regional level are probably lower (no recent data available), given that regional unemployment rates are higher than the national average and the region has a larger agrarian sector that usually implies a lower rate of women's' participation in the labour force.

Table 2.1: Key Competitiveness Indicators

Indicator	Central Macedonia	East Macedonia & Thrace	GREECE	EU-25 Regional Mean Average
European Competitiveness Index (2004, Index Score)	N/A	N/A	43,5	100.0 (EU-15)
Gross Domestic Product per Capita (2002, Euros)	16,710	12,522	16,425	20,685
Labour Productivity (2002, Euros)	48	35,7	45,9	45,5
Unemployment Rate (2004, %)	10,1	11,9	10,3	9.0
Economic Activity Rates (2004, %)	N/A	N/A	51.9	57.5
Mean Gross Monthly Earnings (2002, Euros)	1,238	1,103	1,278	1,887

Source: Eurostat databanks on General and Regional Statistics

A SWOT summary of regional competitiveness for CM and EMTH, table 2.2, highlights improvement in regional infrastructure; moreover, positive trends in economic indicators over recent years indicate the potential for progress. Improvements in sectoral allocation coupled with gains in leaving standards and economic recovery in the broader region of SEE provide significant opportunities for regional synergies and amelioration of risks arising from regional antagonism and the

pressures from a restrictive CAP. The role of Thessaloniki as a growth hub for the region as a whole could be vital.

Table 2.2: Competitiveness SWOT Summary

Strengths	Improving regional infrastructure and prospects for further gains in this area. Positive trends in various socio-economic indicators over the last decade indicate the presence of catch-up potential. Thessaloniki could act as a leader to boost growth for the region as a whole.
Weaknesses	Low productivity at prefecture level especially in EMTH and a weak economic structure reflected in stagnant employment rates.
Opportunities	Should the region improve its sectoral allocation combined with improving infrastructure and as the neighbouring countries are raising their leaving standards then there is significant upside potential. This could be more so if synergies are cemented between EMTH and CM as well as the broader SEE region
Threats	The neighbouring Balkan economies have placed pressure on traditional manufacturing sectors employment. Growing economic pressure is expected through CAP for the primary sectors.

The key competitiveness policies, as they are summarised in table 2.3, impacting on the regions of CM and EMTH, are mainly derived from The National Government, although it has over the past decade promoted the decentralisation process in line with EU objectives. A growing share of national funding has been shifting to regional level and there are efforts to strengthen regional policymaking mechanisms through devolved decision-making to Authorities at both Regional and Prefectures levels. The key competitiveness policy tool for CM and EMTH are the Regional Operating Plans (ROP), implemented via the respective regional authorities. The newly developed role for R&D is expected to play a vital role in the overall national research capacity.

Table 2.3: Summary of Key Competitiveness Policies

Policy	Objectives
Devolving decision making: - Meeting the regional economic challenge:	The gradual decentralisation of decision-making and particularly implementation of public investment strategies and projects have been a key development over the past decade. More and more policies that were only understood at national level are currently requiring implementation at both prefecture and regional level. This has led to the creation of new institutions like Regional Development Companies and other intermediaries and increasing collaboration with existing stakeholders like Regional Authorities, Chambers of Commerce and Industry etc.
CM and EMTH Regional Operating Plans	The Regional Operating Plans are the tools for regional economic planning that lay out the strategies and for each region over a six- year period. Currently the ROPs for 2007-2013 are under preparation but the 2 regions together are reported to receive about 12% of the national funding.
New legislation for the development of science and technology	It operates at national level, although most of the articles apply to the regions of CM and EMTH. It provides means for the creation of R&D institutes, university spin-offs and science parks. It also establishes the National Council for Science and Technology.

The profound weaknesses of the traditional sectors in Northern Greece, imposes the need to investigate areas in between these sectors in which innovation can flourish.

3. Innovation and R&D

The area of Northern Greece shows a low share of the private sector as a financier of RTD and a very low share of financing that flows from the private sector to public RTD performers (less than 7% of private funds) and vice-versa. On the other hand, the public sector predominates with almost 60% of financing if higher education and public companies are included. Private companies also receive only 3,8% of their RTD financing from the public sector.

Hence both public and private sectors seem self-contained in terms of spending and usage of resources. Another characteristic is the significant role of EU financing through the structural funds and Framework Programs close to 24% of total financing, although the decision making for the structural funds (13,6% of total RTD) is a domestic responsibility.

The breakdown of Framework Program funds (10,2% of total RTD) is spread across all sectors but public research centers and HEIs receive over 70%. Charity funding institutions from abroad have a minimal role; not-for-profit institutions receive almost 80% of their financing from the public budget and the Framework Program.

The more recent data (2003) that we have referred to, which are however not sufficient to form a matrix similar to the one of 1999, show that the major change has been the rise of the private sector as a financier of RTD which has increased to 30,7% (20% in 1999) with the government sector at 47,4%, financing from abroad (predominantly EU) at 18,1% and other 3,8%. Regarding the shares as % of GDP, corporate spending is at 0,20%, government at 0,14% and all other (mostly higher education and EU) at 0,32%.

The major observation derived about the self-contained nature of the private and public sector RTD is still maintained. This is reflected in the fact that 88,8% of corporate RTD financing is from within the corporate sector, 7,7% from abroad and 3,8% from the government and other national sources.

A comparison with the EU-15 shows that while in the latter the corporate sector finances 65% of total RTD and the government 34% in Greece, the situation is the reverse with shares of 30% and 69% respectively (an analysis at national level with most recent data has not been published).

Finally, at national level according to the 1999 dataset of the GSRT regarding business RTD spending by sector of the economy, about 65% is spent in the manufacturing sector and 32% in services. The sectors of computing, engineering and consulting feature high with 27% of total corporate RTD spending.

However, again the international linkages of the domestic corporate RTD appear limited with the share of FDI in total manufacturing RTD spending amounting to only 5,5% (in 2000) compared to 25% amongst the core EU-4 countries. The tables below provide a broad idea about the RTD outlook at regional level through some key indicators regarding spending and employment in RTD as it is presented in table 3.1.

Table 3.1 RTD personnel per 1000 inhabitants

RTD personnel (Full time) per 1000 inhabitants and RTD expenditure per person (2003)	RTD Employment - Business (/1000)	RTD Employment- Government (/1000)	RTD Employment- Higher Education (/1000)	RTD Expenditure - Business (Euro per person)	RTD Expenditure- Government (Euro per person)	RTD Expenditure- Higher Education (Euro per person)	Patents per million inhabitants
Greece	1,1	0,5	1,4	32	22	52	6
Voreia Ellada	0,5	0,2	1,3	19	10	45	3
EMTH	0,2	0,2	0,9	18	6	38	na
CM	0,3	0,3	1,6	24	14	56	5
Kentriki Ellada	0,2	0,1	1,1	5	5	41	3
Attiki	2,3	0,8	1,5	70	39	63	12
Nisia Aigaiou, Kriti	0,1	0,7	1,3	2	41	56	3
Voreia Ellada/Greece (%)	51	49	98	59	44	87	49

Source: Eurostat Databanks: General and Regional statistics

Overall, RTD expenditure in Greece has been growing at an average rate of 9,8% per annum over 1997-2003 as opposed to almost 12% for the EU15. The fastest rate of growth has been registered by the corporate sector that has increased its share in total RTD spending from 20% to 30% over this period.

Table 3.2 RTD expenditure

RTD Spending	1997	%Share	1999	%Share	2003	%Share	%ch97-03
Total							
Greece	663,8	100,0	976,6	100,0	1182,6	100,0	78,1
Voreia Ellada	167,9	25,3	218,5	22,4	262,5	22,2	56,4
EMTH	24,0	3,6	34,0	3,5	38,7	3,3	61,5
CM	117,8	17,8	154,8	15,8	181,0	15,3	53,6
Attiki	327,1	49,3	514,1	52,6	683,8	57,8	109,1

Sources: Eurostat databanks, Millions of PPP Euros. Corporate figures for CM,EMTH are estimates

It should be noted that the corporate figures for 2003 for CM and EMTH are estimates on the assumption that the two regions have maintained the same share in total corporate spending for Voreia Ellada that they had in 1997. Hence, also the figures for the regional totals are estimates. The regions under examination have followed national trends but have registered smaller increases than the national average with the exception of the corporate sector particularly in EMTH. Overall, the share of both EMTH and CM in total RTD spending has registered a small decline over 1997-2003 while Attiki has increased significantly its share.

The region of Attiki absorbs almost 60% of total RTD spending and 77% of total corporate RTD spending compared to 18,6% and 16,2% respectively for EMTH and CM taken together. The latter regions are also lagging behind in their proportion of regional RTD spending to regional GDP. Further, looking at the share of each component in regional RTD spending both regions rely heavily on higher education RTD spending which accounts for around 57% of the total compared to 48,1% which is the national average.

Looking at the financial breakdown regarding the fashion in which expenditure is allocated from those financing RTD and the funds allocated by recipient the situation appears as follows:

Table 3.3 RTD percentage breakdown

Financier of RTD. Allocation of funds in % by financier (1999)	Recipient of RTD funds					Total (% share by financier)
	Public Research centers	Higher Education Insts	Public Companies	Private Companies	Non-Profit Insts.	
Public finances	48,86	46,82	0,28	3,61	0,41	25,87
Higher Education Institutes	0,00	100,00	0,00	0,00	0,00	21,23
EU-Funds	21,26	56,91	1,55	20,19	0,10	13,61
Retained earnings of insts.	42,36	56,25	0,00	0,00	1,39	3,79
Public companies	4,39	26,02	69,28	0,31	0,00	4,20
Private companies	0,40	6,92	0,33	92,35	0,01	19,96
Non-profit private Insts.	3,18	95,45	0,00	0,00	0,00	0,29
EU-FP	40,77	30,32	4,26	23,35	1,29	10,19
Other Abroad	15,38	52,31	16,92	15,38	0,31	0,86
Total						100

Regarding RTD personnel, there has been progress with total personnel increasing by 32,4% over 1997-2003 (by head count) with FT personnel registering a 58% increase and raising its share to 55,6% from 46,6% in 1997. At regional level we find that the region of EMTH has registered a retreat in both absolute and relative terms. It should be noted, that again corporate sector figures for CM, EMTH are estimates based on the assumption that both regions have retained their 1997 share in RTD personnel within Voreia Ellada.

Table 3.4. Distribution of RTD personnel

RTD Personnel	1997	2003	%ch 97-2003	1997	2003	%ch 97-2003	1997	2003	%Tot.Employees 2003	
	by Head Count			Full Time Equivalent			FTE/HC	FTE/HC	by HC	by FTE
Greece	43252	57257	32,4	20158	31822	58	46,6	55,6	1,46	0,81
Voreia Ellada	13287	15446	16,2	5785	7454	29	43,5	48,3	1,28	0,62
EMTH	1937	1932	-0,3	778	819	5	40,1	42,4	0,91	0,39
CM	9061	10147	12,0	4100	4968	21	45,2	49,0	1,54	0,75
Attica	17671	28943	63,8	9157	18495	102	51,8	63,9	1,93	1,23

Source: Eurostat Databanks. Corporate figures for EMTH, CM estimates

The following summary tables will allow for a more selected representation of the situation at national and regional levels. The most interesting observation which is in accordance with developments in RTD spending is the fast rising role of the corporate sector which has increased its intake of RTD personnel by 187% over the last decade compared to 87,5% for the total RTD personnel increase. This has occurred at the backdrop of a gradually declining share in the role of the government's intake.

Table 3.5. Evolution of RTD personnel

GREECE: Evolution of RTD personnel and researchers (1993-2003) (head count)									
RTD Personnel	1993	%in total	1995	1997	1999	2001	2003	% in total	%ch 93-03
Total	30545	100,0	36385	43252	57108	55626	57257	100,0	87,5
Business Sector	4462	14,6	5285	5739	8611	13099	12808	22,4	187,0
Res. Centres (Govt.)	7145	23,4	10259	9773	7911	8819	9148	16,0	28,0
Higher Education	18811	61,6	20658	27572	40414	33507	35088	61,3	86,5
Non-Prof. Insts.	127	0,4	183	168	172	201	213	0,4	67,7

As in the national case, the most striking feature is that higher institutions provide around 71-78% of both the total as well as the core research RTD personnel. Similarly on a full time basis the figures are still high with higher education providing 63-73% of RTD personnel. However, it is interesting to note that in the corporate sector the ratio of full time (FT) to head count (HC) personnel is quite high at 72,6% although it declines to 57,7% when considering core research staff. Regarding RTD qualifications of employees, as a percent of the total population there has been a significant improvement reflected in the following figures:

Table 3.6: RTD related qualifications of employees as a % of the population (2004)

2004	Education	Occupation	Core RTD	Total
Greece	20,6	15,3	12,0	23,9
Voreia Ellada	18,7	13,4	10,9	21,2
EMTH	14,5	9,9	7,3	17,1
CM	21,0	15,1	12,4	23,7
Attiki	26,3	19,8	15,1	31,0

Looking at the regional level, despite the overall gains registered over the period 1997-2004, the region of EMTH remains quite behind despite the presence of a regional university and a number of technological institutes.

Innovative firms in Greece have increased substantially over the period 1994-2000 particularly in the services sector. In the services sector there are 3,2 RTD employees per 100 while in manufacturing only 1,5 making the latter responsible for the country's lower ranking. What is quite encouraging however is the fact that there has been a sharp increase of innovative companies amongst firms with size between 10-19 employees in the manufacturing sector. About 80% of private sector RTD employment is equally divided between firms with 10-49 and 250-499 employees another 15% by firms with over 500 employees and the remaining 5% by firms with 10-49 employees. Regarding RTD spending, 74% of total spending is almost equally divided amongst firms with over 500 and 250-499 employees while firms with size 10-49 account for 18% and firms with 50-249 for 7%.

Table 3.7. Innovative firms in Greece

INNOVATIVE FIRMS in Greece	%Innovative Firms (1994-96)	%Innovative Firms (1996-98)	%Innovative Firms (1998-00)	%Change 1994-2000
Firms-Total	15,2	17,5	27,3	80,1
Manufacturing	16,9	18,4	26,4	56,2
10-19 employees	3,6	2,1	22	511,1
over 20 employees	26,5	30,3	29,2	10,2
Services	11,1	15,5	31,9	187,4
10-19 employees	na	na	30,1	na
over 20 employees	na	na	41,2	na
RTD engaging Firms	15,2	18,9	29,1	91,4
IEXP/RTD*	24,3	31,2	33,1	36,2

*Innovation expenditure as a share of total RTD spending

Sources: National Innovation Surveys, 1994-2000, Logotech

Regarding the sectoral breakdown of innovative companies the ICT (70%), electrical appliances and instruments (45%), chemicals (53%) and metallurgy (40%) are the

sectors where most innovative companies are concentrated while the least concentration of innovative companies is in food-beverages-tobacco (23%), textile and leather (17%), furniture (25,5%) and transport-equipment (21%). It is the latter sectors that tend to dominate economic activity for most Prefectures of CM and EMTH.

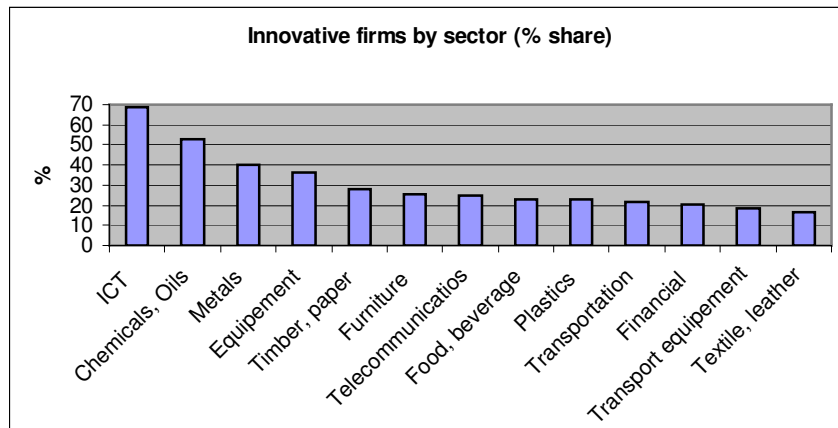


Diagram 3.1, Source: National Innovation Survey 1998-2000, GSRT, 2004

The above observation is reflected in the regional breakdown of innovative companies:

Table 3.8 Regional distribution of Innovative firms

Regions	%Innovative Firms (1998-200)	%Innovative Manufacturing Firms	% Innovative Services Firms
East Macedonia & Thrace	15,1	14,7	23,2
Central Macedonia	23	22,1	30,8
Western Macedonia	25,5	27,1	—
Ipeiros	27,5	28,7	7,9
Thessalia	4,2	4,4	—
Ionian Islands	5,2	—	—
Western Greece	25,1	19,2	58,4
Stereia Ellada	36,0	35,2	100
Peloponnisos	21,3	23,9	0
Attiki	30,9	30,3	33,3
Northern Aegean	17,8	18	20
Southern Aegean	14,7	11,9	34,1
Kriti	23,1	28,4	2,6
Total (Greece)	27,3	26,4	31,9
<i>EMTH/Greece</i>	<i>55,3</i>	<i>55,7</i>	<i>72,7</i>
<i>CM/Greece</i>	<i>84,2</i>	<i>83,7</i>	<i>96,6</i>

Source: National Innovation Survey 1998-2000, GSRT, 2004

Regarding innovation in the corporate sector in both regions, according to the National Innovation Reports (1994-1998 and 1998-2000), the innovative manufacturing companies in CM account for 22,1% of the total standing at 84% of the national average but having declined in national ranking from 5th to 7th position between the two periods. In the manufacturing sector of EMTH the ratio of innovative companies is 14,7% almost 55% of the national average. In the services sector the

innovative companies account for 30,8% of the total in CM close to the national average and 23,2% in EMTH around 84% of the national average. The Prefectures of CM would no doubt conform closer to the average of EMTH if we were to exclude Thessaloniki.

Regarding sources of innovation at national level, the major one for manufacturing companies are the providers of inputs particularly equipment (37% and rising to 43% for large companies) while in the services sector clients also have a significant contribution (28%). The contribution of universities and research centers is very low at 8,3% and 15,1% in the manufacturing and services sectors respectively. Co-operation with other companies from the same sector is also very low at 12% for manufacturing and 8,5% for services. According to the RTP for CM and the RITTS for EMTH the situation conforms to the national trends with the major source of knowledge infusion for manufacturing corporations being the importers of capital assets and co-operation and links between corporations and research institutes is very weak and from the lowest in the country particularly in EMTH.

New products and new processes take up over 50% of innovative activity in the manufacturing sector (National Innovation surveys for 1994-96, 1997-98, 1998-2000). Companies in the region (as well as nationally) overwhelmingly believe that the cost of innovation is the major barrier to RTD followed by lack of specialised personnel and rigid regulations. This is more so for companies in traditional sectors particularly in agriculture and industry. In conjunction, limited access to financing rather than subsidies is sited as more important. Currently, venture capital stands at 0,08% of GDP compared with 0,19% for the EU15 average while the banking system is seen as less willing to finance SMEs; furthermore, state aid to private business over the period 1996-2002 has declined from 0,65% to 0,35% of GDP and 95% of policy measures and directed funds have shifted towards horizontal at the expense of sectoral actions (Benchmarking European Enterprises, 2004).

Most of the strengths and opportunities seem to lie in the increasing awareness for the need to open up the system in terms of global and regional-SEE networking, synergies between public and private RTD etc. The weaknesses and threats lie in the slow domestic response in reforming the education system and commercializing the innovation process as well as in factors related to innovation culture and the structure of the economy. Our interpretation of the regional innovation system with a similar SWOT type analysis as follows:

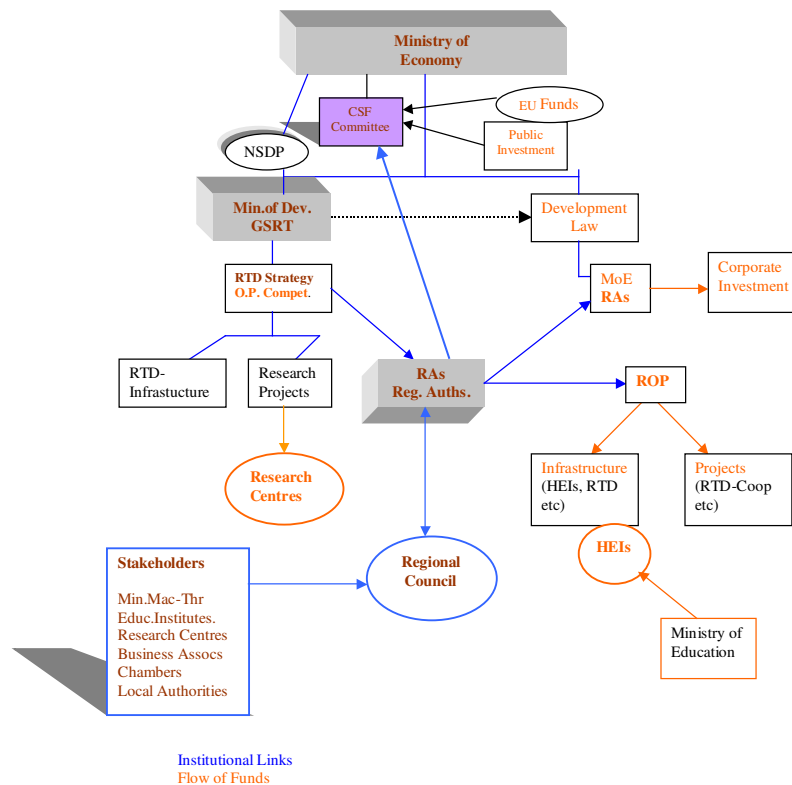
Table 3.9 SWOT analysis of the R&D capacity

STRENGTHS	WEAKENESSES
<p>Common to CM and EMTH</p> <ul style="list-style-type: none"> • One of the highest ratios of higher education graduates per capita in the world • Changing public attitude towards favouring entrepreneurship • Favourable environment and weather • A network of newly build roads linking the area with the rest of Greece, the SEE and EU countries • Proximity to SEE countries 	<p>Common to CM and EMTH</p> <ul style="list-style-type: none"> • Low correspondence between the educational system and the market needs • The economy of both regions is still highly depended on old sector, labor intensive industries and traditional agriculture • Very small average size of enterprises, resulting to inability to adapt to new developments in management, technology, market trends • A very weak and ineffective vocational education system • A very risk-prone behavior from both the business and the financial communities, resulting in limited high

	<ul style="list-style-type: none"> risk/ high tech investments High unemployment among the higher education graduates Low adaptation of new technologies by the public sector (i.e. the shortcomings of the OP Information Society)
CM <ul style="list-style-type: none"> Concentration of a significant number of education, research and innovation related institutes in and around Thessaloniki Thessaloniki a major economic development node for the country and South East Europe The Thessaloniki Port 	CM <ul style="list-style-type: none"> Highest unemployment ratio in the country
EMTH <ul style="list-style-type: none"> The Demokritus university being a major development driver for the region Multiplying effects from the university (i.e. the existence of medical school in Alexandroupoli, has led to the development of conference tourism). 	EMTH <ul style="list-style-type: none"> Distance from the main economic, political and social centers of the country A history of manufacturing investments going bust in Thrace during the past 2 decades. Brain – drain of highly qualified people towards the 2 big centers (Athens, Thessaloniki) and abroad
OPPORTUNITIES	THREATS
Common to CM and EMTH <ul style="list-style-type: none"> New structural funds 2007-1013 focusing more on innovation and the Lisbon agenda New law for PPP (public private partnerships) projects Entrance of Bulgaria and Romania (at a first stage) and possible entrance of Turkey and FYROM (at a second stage) to the EU, creating new internal market opportunities High renewable energy potential Both regions lie at the path of Pan-European Transport corridors Demand for ecologically produced agricultural products rising world –wide 	Common to CM and EMTH <ul style="list-style-type: none"> Decline of traditional manufacturing sectors Dominance of Thessaloniki threatens the rest of the CM and the EMTH regions with brain –drain and underdevelopment
CM <ul style="list-style-type: none"> The new Thessaloniki Innovation Zone A rising service sector 	CM <ul style="list-style-type: none"> The region is not an Objective 1 region for the programming period 2007- 2013 Rising unemployment due to the decline of traditional manufacturing sectors
EMTH <ul style="list-style-type: none"> The region remains an Objective 1 region for the programming period 2007- 2013, allowing it to benefit more from the Structural Funds The construction of the Burgas – Alexandroupoli oil pipeline Development of alternative tourism in areas such as Xanthi, and Drama that are not affected by the energy transportation. 	EMTH <ul style="list-style-type: none"> Revision of the Common Agricultural Policy, might result in higher unemployment in the agricultural sector The energy highways might impose danger to development of agrotourism in the energy transport areas.

The dominant question in our engagement with various experts and the analysis of the regional institutional figure (3.1) and institutions was the following: Does the critical-mass present in terms of physical and human resources and infrastructure include entrepreneurial acumen/culture and financial resources to drive the RTD outlook to a higher level? Hence, the priority issue seems to be the creation of a critical-mass for RTD (stock of know-how) in terms of infrastructure, engagement of capable skills, entrepreneurial spirit and imaginative policy leadership that will put into use the combined resources effectively making innovation a self-sustaining process that allows for its faster evolution.

Figure 3.1 The regional R&D institutional model



A hypothetical strategy, that has been mentioned by a number of interviewees could be in favour of diversification of primary production towards greater specialization combined with the merging of agro/biotechnologies and synergies with other sectors like life-sciences and environmental technologies towards the promotion of pharmaceuticals, specialised foodstuff, health and different types of tourism as a clustered composite product/service. Most interviewees also believe that present resources are sufficient in terms of spending, human skills and infrastructure in order to create this critical-mass. There is a dilemma regarding the strategy, in that the above mentioned hypothetical strategy might constitute wishful thinking and that creation of a critical-mass might not necessarily require such complex sector focused strategies but could arise as a result of horizontal strategies like the triple-helix interaction, the play-out of market forces and state-of-the-art scientific practices. What seem to be the major barriers are the institutional and cultural bottlenecks that could greatly be ameliorated with decisive policy actions.

On the pessimistic side, even leaving aside any policy making constraints, any chosen strategy will have significant requirements in specialised personnel, links with the scientific community and innovative entrepreneurship that does not correspond to the ageing country-side of small land holdings in traditional crops often relying on subsidies. It would further be constrained by the predominance of the small merchant class, self-employed (32% of the workforce in industry and services compared to 12% for EU15) and civil servants that dominate the employment make-up of the population at regional level coupled with entrepreneurial quality limitations on the side of the business community. The transition from this environment has been slow and new dynamic businesses are not appearing fast enough to take-up the slack.

Finally, the regional definition for RTD policy might also prove important for achieving the required size that will secure economies of scale and the critical-mass. In this respect the policy planning space for RTD could be taken to be the region of CM and EMTH, with Thessaloniki at the core, or even the whole of the NUTS I region of Voreia Ellada taken together in order to achieve economies of scale and economy in the allocation of resources rather. An obstacle, according to some research performers, could be a perceived limited lack of complementarities between the economy of Thessaloniki and the other Prefectures even though all could gain in the future. Synergies in the future with neighboring countries would be useful although such a discussion might be premature at this time. Nevertheless, a broader RTD market could resolve many of the issues through market forces that could see an opportunity in the gains arising from agglomeration.

Despite the problems, the main fact and encouraging aspect is that Greek companies including SMEs are increasingly willing to develop technological capacity and product quality and that Greek RTD performers are increasingly aiming to engage with the real economy. Many of the sited problems are due to the fact that the process of developing and infusing R&D as well as the transition of the corporate sector towards modern methods are at a relatively early stage. Other research performers particularly the Universities and TEIs although growing more aware regarding their impact on the economy are still at an early stage in the transition process. Similarly, policy makers have been engaged with RTD policies relatively recently and in addition face problems arising from the overall mediocre state of Greek public administration. The newly published European Innovation Scoreboard for the European Regions presents the gap among Greek regions and EU average especially

Table 3.10: Regional Innovation performance for the year 2006.

Index	Knowledge workers	Life Long Learning	Med/High tech manufacturing	High tech services	Public R&D	Business R&D	Patents
EU average	93	89	96	87	82	69	86
Greece	89	13	32	53	73	16	7
Voreia Ellada	78	11	24	34	61	7	4
Anatoliki Makedonia, Thraki	62	14	13	28	65	9	2
Kentriki Makedonia	85	14	31	45	77	8	7
Attiki	111	19	51	79	95	27	13

Source: Trendchart 2006 Innovation Scoreboard, <http://trendchart.cordis.lu>

in the areas of life long learning, business R&D and patents. Within Greece, the two regions and especially the region of EMTH seem to lag behind national averages.

The following policy recommendations arise for improving the weak points' performance of the regions and enhancing and capitalizing on the strengths of the local R&D performance.

Recommendation 1	Rationale
Identify new areas in between traditional sectors where innovation can flourish, capitalizing in new technologies and shifting to new activities. Raising the interest of traditional sectors would be a challenge though, since it also relates to RTD and innovation awareness and culture	The low productivity and performance of traditional sectors of the region prompt for identification of areas that traditional sectors could expand their activities, capitalizing on new technological advancements. For example, traditional sectors such as construction could cooperate with the automation high tech sector to produce “smart house” products.

The need for equalizing inequalities in R&D infrastructures necessitates the following recommendation within the region.

Recommendation 2	Rationale
This recommendation applies mainly to the region of EMTH. Capitalize on the Science and Technology Legislature to improve R&D infrastructure by creating a science and technology park and relative institutes related to the R&D locally advanced areas where the region presents high scientific skills, e.g. Biotechnology. The regional policy should be directed in creating a critical mass of R&D resources in selected research areas.	The region of Northern Greece, although it is not high rated in R&D performance, it presents a high concentration of R&D infrastructures around the metropolitan area of Thessaloniki. The region of EMTH must also follow in infrastructures to equalize inequalities within the area of Northern Greece and also capitalize on the excellences that it presents, such as the research results of the Biotechnology Department of The University Hospital of Alexandroupoli.

Recommendation 3	Rationale
Create an interregional R&D investment committee for Northern Greece, including R&D actors from Institutes, Universities, and Public and Private organizations. This committee should be linked to the National Committee for Research and Technology. It must highlight the importance to also include representatives from the private organizations and intermediaries than just academics and researchers.	The strengths of the regions, favourable environment, adequate supply of scientific personnel, existence of regional funds, increasing attitude toward R&D investment by the private sector must be coordinated and organized from a widely participating body of R&D actors and business organizations, aiming to minimize the gap between R&D and the business world.

Recommendation 4	Rationale
<p>Promote cultural changes toward innovation and entrepreneurship, especially in the community of young generation of scientists and the future R&D human capital including high school students. This culture enhancement should be directed toward entrepreneurship and innovation.</p>	<p>The high level of unemployment among young scientists indicates the low level of utilization of human scientific resources within the regional innovation system. The uncertainty of the financial environment directs them to seek secure employment in the public sector. Young scientists must capitalize on the benefits and the hospitable environment of the region to create innovative start-ups. Also younger generations, such as high school students must be infused with the benefits of entrepreneurial skills.</p>

Recommendation 5	Rationale
<p>Interlink the R&D capacities of the area with business initiatives toward new products and services following extended methodologies and best practises from the past (such as the Technogenesis process for R&D start up creation). Emphasis should be put in raising the interest of the Research Community for business exploitation of research results, so that RTD and innovation performance is strengthened in the long run. There is availability of regional consultants in providing corresponding support services needed.</p>	<p>The low level of cooperation among R&D organizations and the business environment requires cooperative policies seeking mutual benefits. Learning from the example of Technogenesis, which has presented fruitful results for new products and services, this cooperative process must be supported by specialised consultants that will guide all cooperative processes with added value services.</p>

4. The Knowledge Economy

Table 4.1 presents some of the key measurable and available indicators of knowledge supply and creation. The main weakness of the region lies in the very low level of R&D employment by the corporate sector, which is very small both in relation to the national average and the EU average.

The same applies for patents, which are minimal at both regional and national level compared to the EU average. The marked exception is R&D employment in the higher education sector, which for the case of CM is even above the EU average. When these indicators are combined with those regarding R&D spending, the conclusion that the higher education sector and its reform are the key to the evolution of R&D activity at both national and regional levels is inevitable.

This is more so, given, that policy action regarding the R&D outlook of the corporate sector can not be as effective since the latter is primarily market determined. However, the potential impact of synergies between higher education and the

corporate sector is also a policy variable that can be influenced to a significant degree and allow for strong gains.

Table 4.1: Key Knowledge Supply and Creation Indicators

Indicator	Central Macedonia	East Macedonia & Thrace	GR	EU-25 Regional Mean Average
Patents (2003, Patent Applications per Million Inhabitants)	3	N/A	6	58.0
R&D Employment by Business (2003, Employees per 1,000 Inhabitants)	0,3	0,2	1,1	2.2
R&D Employment by Government (2003, Employees per 1,000 Inhabitants)	0,3	0,2	0,5	0.7
R&D Employment by Higher Education (2003, Employees per 1,000 Inhabitants)	1,6	0,9	1,4	1.4

Table 4.2 presents a SWOT summary of knowledge supply and creation in the CM and EMTH region. The ability and willingness of the higher education sector to focus on its ability to evolve its R&D capacity to a higher level is the key issue. Commercialisation and spin-offs will play an important role. The creation of synergies with the corporate sector and the latter's ability to add a greater degree of sophistication to its entrepreneurship and R&D outlook will prove vital to allow for this process to culminate into an overall improved outcome.

Table 4.2: Knowledge Supply and Creation SWOT Summary

Strengths	A strong potential for knowledge creation and enhanced supply capacity by the higher education sector.
Weaknesses	Markedly low levels of R&D employment and activity by the corporate sector.
Opportunities	Promoting synergies for the transfer of knowledge from higher education to the business community.
Threats	Difficulties to effectively and swiftly reform the higher education sector. The possibility that the national government will not be able to implement decisive policies to impact the R&D system as a whole.

Within the CM and EMTH regions, the key stakeholders responsible for knowledge supply and creation are within the region's higher education sectors. In particular, a group of regional universities – Aristotle, Democritus and Macedonia and a number of Technological Education Institutes across the region – appear to be the key drivers

of knowledge creation, accounting for the bulk of the sector’s research. A promising development has been the establishment of the Technological Park of Thessaloniki, which acts as an intermediary, and the National Centre for Research and Technological Development (CERTH) within it.

Table 4.3: Role of Key Knowledge Supply and Creation Stakeholders

Stakeholder	Role
Higher Education Institutions	The region is home to 3 Universities and 4 Higher Technological Institutes. The 2 major universities are conducting significant research with around 20% of the research budget relating to corporate projects. The future potential is great if HEIs engage in cooperation between them and other stakeholders (especially the corporate sector) and engage in commercialisation.
Research Centres and Intermediaries	The most important is the Technology Park (and CERTH), although only a minimal share of its research relates to corporate applications. Intermediaries are generally a recent creation and resources/experience has not yet accumulated to an efficient level.

As shown by Table 4.4, the key policies relating to knowledge supply are primarily relating to the region’s higher education sector. Hence, the strategic plans adopted by regional universities (Research Committees and Liaison Offices) and the ability to implement them will be vital in shaping the future R&D outlook for the region. Furthermore, the role of intermediaries and regionally based research centres will need to forge synergies with the higher education sector and other stakeholders including the Regional Authorities which could play a key role in promoting this process. Cooperation between institutions within the higher education sector could lead to agglomeration effects and fill knowledge gaps across regions. This process needs to be set-up via institutional links with the cooperation of regional policy makers and communication at the national level.

Table 4.4: Summary of Key Knowledge Supply and Creation Policies

Policy	Objectives
National Government level- GSRT	Restructure R&D supply system: GSRT supervised research performers to engage with corporations (private and public), promote academic research to support academic training and produce new R&D personnel, differentiate role of HEIs from GSRT research performers, promote critical-mass though concentration of R&D spending and improve operational efficiency of research institutions.
CM and EMTH Research Performers and intermediaries	To facilitate the development and delivery of collaborative policies and projects. To develop strategic partnerships with the capability to raise the profile of the research community as a whole and other key stakeholders.
Priorities from the Regional Operational Plans (ROP)	Promotion of cooperation between the regional authorities-corporate representative organisations-higher education institutes-intermediaries mostly through specific project focus. The planned Innovation Zone as a key R&D infrastructure facility is of special importance for the region of CM and hopefully also for EMTH.

Knowledge demand and absorption is necessarily a difficult area of analysis and measurement. At a regional level, the best available indicators relate to industrial structure and the human capital capacity of the existing workforce.

Industrial structure analysed in terms of the knowledge intensity of the region's businesses is a useful indicator of the potential demand for knowledge, while human capital capacity indicators are able to monitor the likely ability to absorb appropriate knowledge.

As shown by Table 4.5, the proportion of innovative businesses in CM and EMTH is overall below the national average, particularly in the case of EMTH, which lags by 30-50% with respect to the national average. Hence the weak knowledge demand that applies for the country as a whole is more pronounced at the regional level.

Finally, the lower workforce skills on offer observed for EMTH and most likely for some prefectures of CM also highlight problems of skill shortages at this level. The problems of vocational training, on-the-job training as well as life-long learning are issues of special importance that need to be addressed by both the national and regional policy makers.

Table 4.5: Key Knowledge Demand and Absorption Indicators

Indicator	Central Macedonia	East Macedonia & Thrace	GR	EU-25 Regional Mean Average
Proportion of Knowledge-Based Businesses (2000, %)	23	15,1	27,3	N/A
Proportion of Knowledge-Based Businesses in Manufacturing (2000, %)	22,1	14,7	26,4	N/A
Proportion of Knowledge-Based Businesses in Services (2000, %)	30,8	23,2	31,9	N/A
Proportion of Workforce Educated to Degree Level (2003, % of population)	23,7	17,1	23,9	N/A

Table 4.6 presents a SWOT summary of knowledge demand and absorption of the CM and EMTH region. The lack of sophisticated demand for knowledge due to the weak economic structure is a major weak link on the R&D demand side which poses a constraint for the evolution of the system as a whole. However, the weak links between the higher education and the corporate sectors are intensifying problems. The degree of relevance of the skills produced by the higher education system is an issue for consideration. Overall, the degree to which R&D demand and supply meet is not entirely clear.

Generally, there is little substantive information of the complexities and specificities relating to these issues. It is the aim of the forthcoming work-packages of the MIRIAD initiative to provide and gather more detailed evidence in this area, so as to fully inform regional R&D investment strategy making.

Table 4.6: Knowledge Demand and Absorption SWOT Summary

Strengths	Workforce-skills are the least lagging factor although this is less so at individual prefecture level. The relevance of skills produced by the educational system might be an issue.
Weaknesses	The share of innovative firms in both the manufacturing and services sectors is relatively small, reflecting the weak economic structure of the region. This implies a knowledge demand of limited sophistication that constrains the development of supply. Limited vocational training at national and regional levels.
Opportunities	Building information networks and enhancing the knowledge base of SMEs in the region would raise demand for more sophisticated know-how. Creating/enhancing communication links between corporations and HEIs.
Threats	A continuing inability of many firms to be aware of the need for knowledge to stimulate their innovation capability and overall competitiveness. A limited response by HEIs to open themselves to the needs of the real economy.

Knowledge demand and absorption largely lies with the strategies pursued by the region's business community. This community is represented at the regional level by a number of 'umbrella' institutions, the most important of which are the Chambers of Commerce, the Federation of industrialists, and various business Associations at sector level.

Table 4.7: Role of Key Knowledge Demand and Absorption Stakeholders

Stakeholder	Role
Chambers of Commerce	Representative organisation for the region's business community at prefecture level
Federation of Industrialists of Northern Greece	Representative organisation for the region's key businesses and organisations in the broader region
Business Associations	Representative organisation for the region's businesses at sectoral level.

In most regions of Greece including CM and EMTH, policies relating to knowledge demand and absorption tend to be an implicit feature of other policies targeted at the private sector, rather than explicit policies in themselves. At a national level, R&D policies primarily in the form of subsidisation of innovative companies and investment projects is the major policy measure that is implicitly aimed at stimulating knowledge demand. Indirectly, the Development Law that places special incentives, mostly subsidy of initial investment, for disadvantaged regions is the major policy tool in place, which however applies for all business. In addition there are regional projects that aid the creation of clusters, intermediaries and co-operative schemes between knowledge performers and business at regional level supported through EU policies.

Diagram 4.1 The knowledge demand and supply model

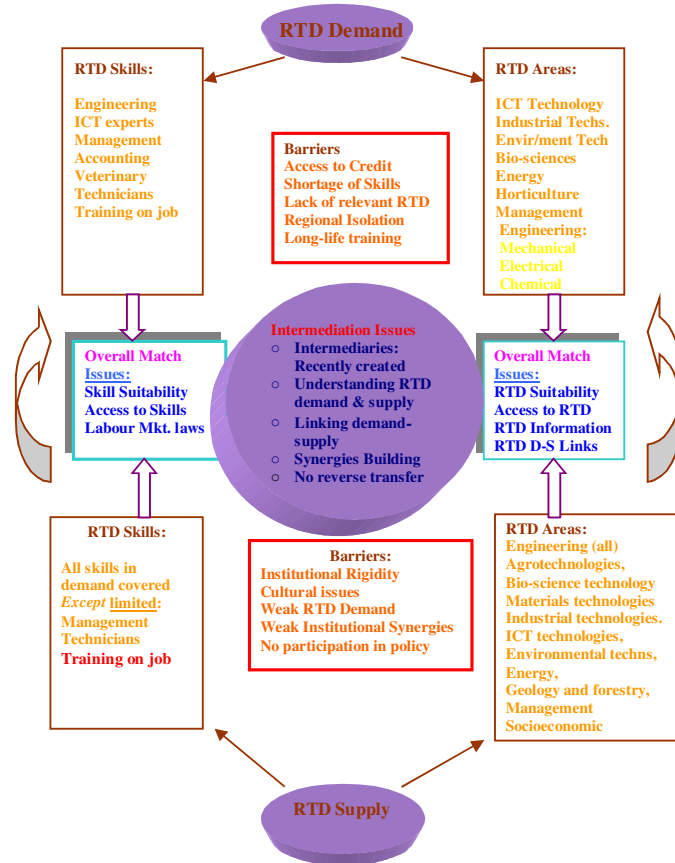


Table 4.8: Summary of Key Knowledge Demand and Absorption Policies

Policy	Objectives
National R&D Policies	Increase R&D demand: invest in knowledge intensive sectors and attract R&D personnel in these areas, increase corporate R&D employment, attract R&D intensive FDI, incentives for new R&D intensive entrepreneurship, cooperation between research and corporations. Promote <u>sector/thematic priorities</u> with cross-sector synergies (see section 3.3). Main <u>policy tools</u> are primarily subsidy schemes for innovative business investments while the Development Law provides subsidies for disadvantaged regions (all business eligible).
Regional Authorities CM: Regional Projects	In the 1990s the RTP, RIS+ and Technology Foresight for CM were the main projects. “Excellence for CM” aims to develop high tech clusters, technology foresight and technology clinics applied to key industries of the region. The Innovation Pole for ICT clustering is the other key project.
Regional Authorities EMTH: Regional Projects	In the 1990s the RISS for EMTH was the major project. Currently, “Technogenesis for EMTH” focuses on developing a regional network of all major players in the area of RTD and the various segments of the regional production system through forums (including venture capital), technology clinics and new product ideas.

Recommendation 6	Rationale
<p>Increase R&D investment by private organizations outside the higher education system, by building infrastructures and providing incentives so that large scale business organizations move their R&D activities into the region. The region must implement investment policies, marketing techniques, human capital and infrastructure availability, including financial incentives so large scale corporations will benefit from relocating their R&D departments in the region.</p>	<p>The low performance of the region in private R&D spending and patent creation indicates the inefficiency of the higher education driven R&D system. Furthermore, the creation of the area of critical mass of private sector R&D activities imposes the potential for regional growth and increase in the investment basis of the local economy.</p>

Recommendation 7	Rationale
<p>Capitalize on the fluent scientific resources of the higher education system by promoting synergies in transfer of know-how with private organizations. Regional incentives should be created for the transfer of R&D personnel from the universities to industry and vice versa.</p>	<p>The high level of scientific knowledge and human resources concentrated within the limits of higher education system must flow outside the borders of the universities enriching the start-up repository for new business ideas and technological innovation in the area.</p>

Recommendation 8	Rationale
<p>Develop new regional metrics that incorporate a holistic means of measuring investment in knowledge. These indicators should measure the qualitative, “fact finding”, aspects of the regional R&D performance using a survey inside the regional organizations than a statistical approach.</p>	<p>Whilst R&D expenditure continues to be an important measure of innovation and the basis for the achievement of a knowledge-based economy, it is limited due to its relative inapplicability to growing service-based sectors.</p>

Recommendation 9	Rationale
<p>Enhance knowledge economy by building science parks where higher education R&D might find applications and meet business demand for knowledge</p>	<p>The isolated higher education R&D system and the unfavourable environment for innovation commercialisation within the universities must find a hospitable environment to experiment the application of these results to the market needs.</p>

5. Knowledge Transfer and Flow

Specific indicators and measures of knowledge transfer and flow within the regions of CM and EMTH as well as amongst them and other regions are non-existent. However, the opinions of organisations engaged as well as some national data, presented by Table 5.1, point towards the conclusion that in general knowledge transfer and flow must be quite low as this is the case also at national level. Hence only 20,4% of innovative companies in manufacturing and 39,7% in services have been in some form of cooperation. Although no exact figures are available, there is a general belief that there is very significant transfer of know-how from abroad primarily by suppliers in the form of imported machinery and licences. The figures for cooperation arrangements between innovative corporations and HEIs are much lower.

Table 5.1: Key Knowledge Transfer and Flow Indicators

Indicator	CM & EMTH	GR	EU-25 Regional Mean Average
Cooperation arrangements for innovation in Manufacturing (% of innovative manufacturing enterprises, 2000)	N/A-- Expected at less than national average	20,4	N/A
Cooperation arrangements for innovation in Services (% of innovative services enterprises, 2000)	N/A-- Expected at less than national average	39,7	N/A
Cooperation with HEIs in manufacturing (% of innovative manufacturing enterprises, 2000)	N/A-- Expected at less than national average	9,1	N/A
Cooperation with HEIs in Services (% of innovative services enterprises, 2000)	N/A-- Expected at less than national average	17,5	N/A

Table 5.2 presents a SWOT summary of knowledge transfer and flow for the regions of CM and EMTH. Overall, there is currently an evidence gap of the type of transferring occurring, its density and frequency, as well the flow directions. It is this evidence gap that MIRIAD aims to go some way to narrowing.

Table 5.2: Knowledge Transfer and Flow SWOT Summary

Strengths	Growing cooperation amongst innovative businesses.
Weaknesses	Overwhelming knowledge transfer from abroad with limited value added at domestic level.
Opportunities	Growing public sector investment in knowledge transfer policies including the recent growth of intermediaries.
Threats	A weak response by stakeholders to promote triple-helix interaction. Matching knowledge supplied with that being demanded.

As shown by Table 5.3, there is a relative plethora of stakeholders with some form of responsibility for knowledge transfer and flow within the regions of CM and EMTH. We have mentioned that most of these organisations are relatively new and as a result it is relatively early to evaluate their overall performance, other than stating that the regions are still at the stage of developing the critical-mass for R&D.

Table 5.3: Role of Key Knowledge Transfer and Flow Stakeholders

Stakeholder	Role
The national innovation network of Greece (RINO) and the Hellenic RITTS/RIS network	The RINO (Regional Innovation Network) was set up to support the exchange of experience and diffusion of best practices across all regions within the country but also other regions within the EU. The RISS/RIS network was set-up in 1998 to share cross regional information from these projects.
Centers of Business and Technological Development. Central Support Agency (KEDY)	These organizations were established by the Operational Program Competitiveness (OPC) and form a network of 13 organizations (one for each region). The network is based and coordinated from Athens. The regional counterparts are the Centre of Business and Technological Development in CM and EMTH
Innovation Pole for CM & Thessaloniki Technopolis	The Innovation Pole is at an early stage aiming to achieve ICT agglomeration in research and business with the participation of all R&D players in the region. The Technopolis is an initiative of the Association of Information Technology Companies of Northern Greece to establish a high tech industrial area that would “cluster” ICT companies.
Technology Park of Thessaloniki (TPTh)	Established by CERTH in co-operation with FING and a number of industrial and consulting companies of Thessaloniki, TPTh operates an Incubator and acts as an intermediary between supply (mainly CERTH) and demand for R&D (GSRT supervised)
SME Development Intermediary Bodies	Established by business representing organizations. For CM the Business Development Center (KEPA) and for EMTH: SME Development Intermediary Body – DESMOS. They have been important in facilitating access of SMEs to programs funded by the Structural Funds by the Community Support Frameworks
The URENIO laboratory in Thessaloniki	This is a laboratory established by the Engineering School of Aristotle University. It is being addressed separately, because of the important role it plays in the development of policies for innovation in the region
Regional Development Agencies (RDAs)	These agencies are being established by public bodies (most often Municipalities and Prefectures but also by Chambers or Regional Authorities) and their role is to promote entrepreneurial and social development in the region with focus on the primary sector.
Clusters- an initiative by the Ministry of Development	These are: Organic Products Cluster – an initiative of FING and Wine cluster (Wine roads of N. Greece)
Incubators- (Technology Park incubator, i4G, Thermi)	The 3 high-tech/knowledge based incubators operating in the area of Thessaloniki. Another 3 incubators are in the planning stage, again to be situated in the area of Thessaloniki.

It can be seen that most of the infrastructure and organisations relating to knowledge flow and transfer are based in Thessaloniki (CM) while the region of EMTH is endowed with relatively limited resources. The issue of cooperation between the two regions regarding the use of such infrastructure might provide mutual benefits.

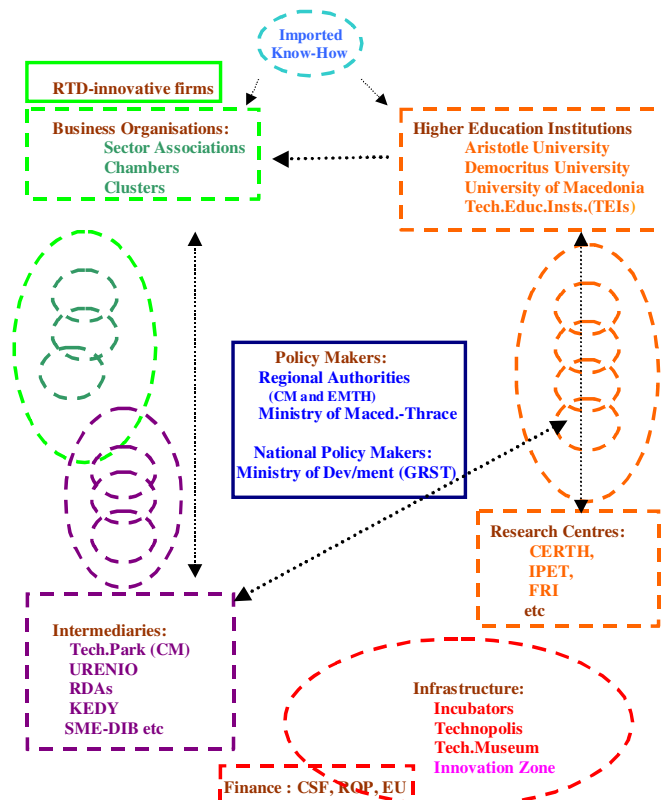
Table 5.4: Summary of Key Knowledge Transfer and Flow Policies

Policy	Objectives
National initiatives from the GSRT	<u>Developing infrastructure</u> : incubators-technology parks-research centres with corporate sector participation, dissemination of practices, infrastructure for R&D commercialisation, spin-offs, standardisation etc. <u>International exposure</u> : Promoting the participation of Greece in the EU's framework program, opening the R&D system to global networks: cooperation with international actors, Greek presence in global forums.
Regional initiatives for CM	In addition to Excellence for CM, there are 2 major projects in the planning stage: the Innovation Zone (R&D infrastructure) and the Thessaloniki Technopolis (high tech industrial cluster for ICT companies). The latter will achieve synergies with the Innovation Pole for CM (initiation stage) regarding ICT clustering.
Regional initiatives for EMTH	In addition to Technogenesis, the Regional Authority is currently discussing with the Ministry of Technology specific actions at sector level with focus on the primary sector and related industries.

A broad conceptualisation of knowledge creation, demand, transfer and flow based on the evidence collected to date. In summary, it highlights the following:

- The higher education institutes, particularly Aristotle and Democritus are the main knowledge creators within the region. The Thessaloniki Technology Park also plays an important role.
- These universities are not engaged in considerable knowledge transfer with organisations external to the region. Although Aristotle university has been active in providing a significant share of its research services outside the region of CM.

Figure 5.1. The regional knowledge flow model



- There is a notable low level of knowledge commercialisation and utilisation by firms as well as higher education institutes within the region.
- There is little evidence of significant direct knowledge transfer between the higher education and business communities.
- There is little evidence of business sector engagement with organisations external to the region outside their head-offices or imported know-how in the form of equipment and licences to sell products.
- There is a range of public sector funded intermediaries, few of which are linked to the region's higher education sector.
- At both the national and regional level there is limited investment in university knowledge transfer functions.
- There are limited business support mechanisms with effective facilitation of knowledge transfer.
- There is little evidence of knowledge transfer from (potential) commercialisers to knowledge creators in the region.
- There is little evidence of regional knowledge spillovers.

Figure 5.1 presents a further representation of knowledge flow within the region based on conceptualisation set within the framework of the Triple Helix model. A key finding is that the triple-helix interaction is reliant on a group of intermediaries that are not very well connected or interfaced. From the whole conceptualisation the following is evident for the regions of CM and EMTH taken together:

- **Government** – key policymakers are the Ministry of Development-GSRT at national level and the Regional Authorities of CM and EMTH at regional.
- **Business** – SME dominated regional economy with low levels of R&D investment and knowledge commercialisation.
- **Higher Education** – large-scale knowledge creation appears mainly restricted to a small number of higher education institutions. The cases of the Thessaloniki Technology Park/CERTH and URENIO show that there is significant potential for intermediation in synergy with Higher Education, should the proper institutional arrangements were in place.
- **Government-Higher Education Interface** - key linkages between higher education and government either lack coordination and decisive initiative or are limited at both national and regional level.

- **Higher Education-Business Interaction**– little evidence of direct knowledge transfer and even less of reverse transfer. Intermediaries act as key facilitators, with the government being the key funder. Although, there has been a rapid increase in the number of knowledge transfer intermediaries the process is at a relatively early stage. There is a lack of intermediaries facing higher education institutes with the main focus being instead on the corporate sector.
- **Government-Business Interaction** - connections between government and the business community with regard to R&D are limited at either national and regional levels or lack decisive initiative.

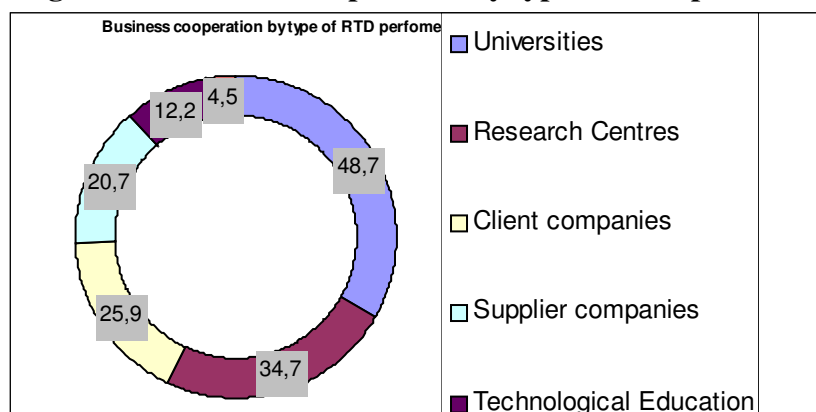
The share of innovative companies cooperating with other companies is significant and particularly so in the services sector while cooperation between innovative firms and research performers, although having registered a significant increase, it is still relatively low. This result is derived both through surveys as well as the macro data on RTD expenditure that have been analysed already. Finally, the use of higher education institutes and research centers as sources of know-how is limited and according to the surveys it might even be declining.

Although 75% of overall RTD cooperation is directly related to the core activity of the company, the impact on commercialization has been small at 28% (data year 1999) but the encouraging aspect is that in 70% of the cases there is the expectation of future commercialization while in 66% of cases firms are participants in the research effort.

The above mentioned issues are reflected in the overall low patent creation. There are 2,5 patents per 100,000 inhabitants (111,1 for EU15) with approximately 250 patents registered each year and over 60% registered in Athens. In CM patents mostly focus on the areas of living necessities and industrial techniques while EMTH does not make a significant contribution to patent production.

Looking at a more detailed breakdown of business cooperation by type of research performing institution, we conclude that amongst the firms that have cooperated with RTD performers the breakdown shows that universities rank high followed by research centers. The next group is cooperation with client and supplier companies. In this area, companies in the services sector cooperate more with clients while manufacturing firms with suppliers. Finally cooperation with Technological Education Institutes and competing firms is quite limited.

Diagram 5.1 Business cooperation by type of RTD performer



Regarding sources of innovation at national level, the major one for manufacturing companies are the providers of inputs particularly equipment (37% and rising to 43% for large companies) while in the services sector clients also have a significant contribution (28%). The contribution of universities and research centers is very low at 8,3% and 15,1% in the manufacturing and services sectors respectively. Cooperation with other companies from the same sector is also very low at 12% for manufacturing and 8,5% for services.

At regional level, companies to a significant degree especially in traditional sectors, claim that research performers do not conduct research relevant to their needs. However, there is differentiation between innovative companies where 50% believe that research performers are adequate compared with only 30% for traditional companies (average total of 35%). Amongst innovative companies, 20% found that regional policy and incentives were adequate while only 10% of traditional companies agreed. The above results are only from CM and one would expect a more negative response in EMTH due to the presence of more traditional sectors and relative isolation. From the surveys on innovative companies, it can be inferred that the major barriers to transfer are financial: particularly access to credit, relative isolation in certain areas in terms of infrastructure and skill availability networks in vocational training.

Turning to regional level for RTD performers, although 77% of laboratories in CM claim to provide applied technology services, less than a third of laboratories believe to be making a contribution to the economy while 70% believe to have a minor or no impact at all. The major problem in their opinion (50%) is the companies themselves, which are not innovative enough to show interest. This issue has also been raised by both academic and non-academic research centers, incubators and intermediaries. Next in the list are the limited infrastructure and personnel and then the rigid institutional framework surrounding research carried out by public institutions. Finally, the findings indicate that policy makers are not well-equipped to address innovation per se and an overall weak leadership by the public administration.

Given the central role of Universities as research performers, a major barrier to their further evolution is their institutional structure.

The overall outdated administrative structures of universities and TEIs are reflected in weak administrative powers and a generally improper environment for research which is not geared significantly towards the real economy with further reflection on the suitability of skills offered.

A major weakness in the ability to reform the system, other than the entrenched mentality of many members of the staff (e.g. unwilling to accept formal evaluation of their work), is that the students' participation in university affairs is overwhelming.

Regarding the institutional links of HEIs to the policy makers and the corporate sector although there is participation in the Regional Council of the Regional Authority, the representatives of HEIs claim that this is hardly sufficient. Hence universities complain that while they produce the bulk of research they do not participate in decision making while in addition they do not receive research designated funds from the ministry of education.

Similarly, the corporate sector has not established institutional links particularly with research performers while again the Regional Council link with policy-making structures is considered insufficient. According to the opinions of the organizations interviewed, the regional councils that include the participation of stakeholders from HEIs and business associations are not in practice fulfilling their role in policy shaping, especially when it comes to RTD.

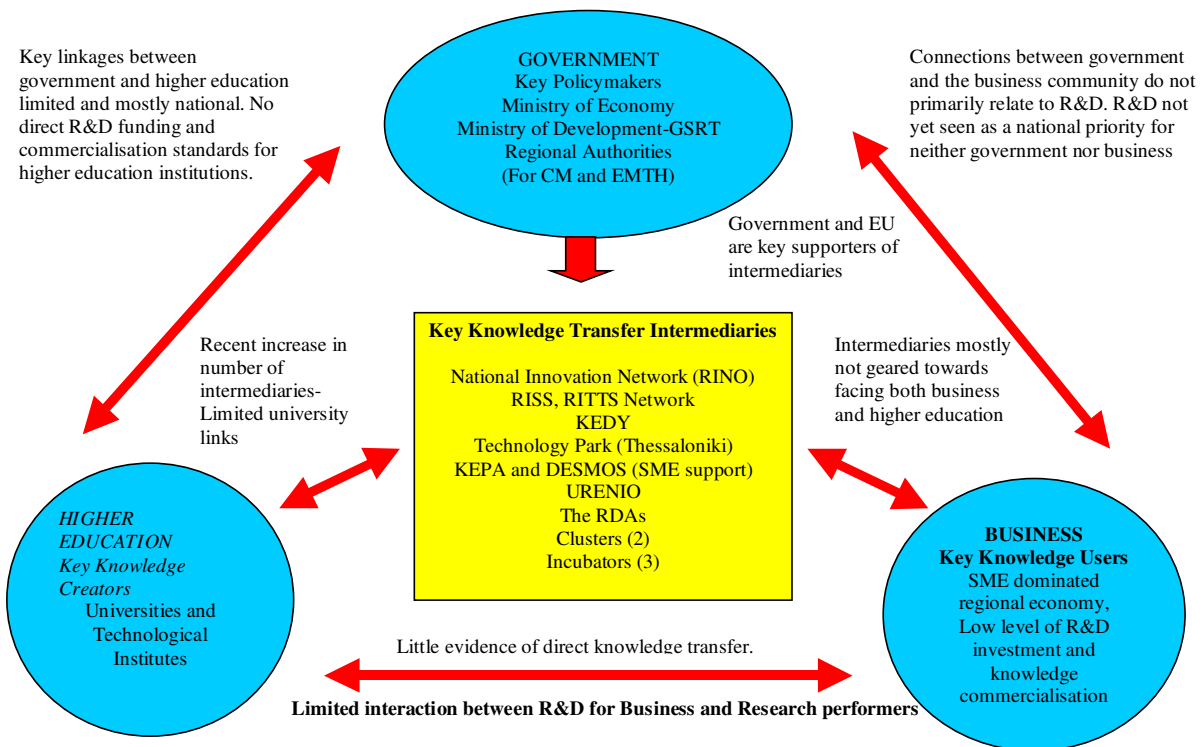
Regarding intermediaries, their history is relatively recent hence the development of their intermediation role and their impact on the economy are limited. Nevertheless their presence has helped alleviate some of the institutional bottlenecks that hinder the contribution of HEIs and the broader public sector research performers in playing a more significant intermediation role.

Their role is expected to gain significance in the future although institutional issues regarding their links to the universities remain to be resolved and further agglomeration of their capacities and stronger links with the private sector could have significant multiplier effects. In this respect, the creation of agglomeration infrastructure projects like the planned Technology Zone in CM should play a significant role.

Policy makers are often passive, believing that they are not politically-institutionally equipped to take leadership but also tend to criticize businesses and research performers as being either too demanding of the government without being significant providers of RTD spending or divorced from the real economy respectively.

Another fact, however, is that on the one hand inefficiency/bureaucracy is considered to be the key barrier to the development of entrepreneurship in Greece and on the other hand the public administration is not sufficiently independent from the political power structure.

Figure 5.2: Triple Helix model for the regions of CM and EMTH



The latter is quite significant particularly when it comes to issues like RTD, which require solid policies, persistence, credibility and trust. Policy makers at higher and often medium level are quite frequently appointed by the party in power and often change on the appointment of a new minister. Hence, they see their appointment as temporary and are further subject to party politics and objectives, which outweigh the political cost of policy action and do not necessarily encourage long-term planning and swift or radical measures. The questionable credibility of the public

administration, which also significantly affects public sector research performers including the HEIs is an important barrier to policy action and the promotion of cooperation within the triple helix model.

A special regional characteristic is the history of the centralization of power and policy making in Athens while brain-drain from the regions to Athens is still prevalent. Regional leaders and policy makers are still not aware of the new reality that the EU has brought forward regarding regional policy and the new opportunities at EU level with many regions now able to formulate their own regional development program independent or complementary to the national one and to promote their own agenda directly to Brussels. The fact that people and policy makers in most of Northern Greece complain about the centralized Greek state and the monopoly of the Attiki region, over funding is not reflected in significant independent initiatives or even noble ideas originating from the regions.

Regarding regional innovation policies, the lack of prior experience and the weak expertise of regional administrations are notable and have resulted in delays in the preparation of measures and funding schemes. The fact that the regional general secretaries were replaced in 2004 marked further delays resulting in reallocation of budgeted funds. According to the trendchart report (2005), the choice of policy actions has often been dictated by funds already earmarked at national level and ease of implementation rather than regional needs. The diagrams below depict a representation of a regional Knowledge-Flow Model in the triple-helix fashion.

Recommendation 10	Rationale
Enhance life long learning activities with regional social structures, upgrading therefore the human capacity of the region. Existing quality of training curricula and services and structures should be adopted to serve long term learning action plans instead of partial vocational programmes.	The high level of unemployment among non skilled workers requires immediate actions, enriching the human capacity skills of the region.

Recommendation 11	Rationale
Enhance clustering support policies related to R&D activities among R&D researchers and targeted business sectors, strengthening the role of intermediaries in the cluster building process.	The clustering efforts in the region and generally in the country were not adequately supported by a methodological approach that will bring together different sectors and activities into joined R&D activities. The support policies and the role of intermediaries are elements missing from these unsuccessful clustering measures.

6. SME Competitiveness, Innovation, and Knowledge Networks

This section presents the results for the Central Macedonia and East Macedonia-Thrace region in Greece. A survey of 20 Universities, Research Laboratories and Research Centres was conducted in the region, gathering data on knowledge assets, knowledge flows and interaction with relevant organisations and regional business. The surveyed organisations were primarily from the exact sciences and business-economics.

The data analysis is divided into three sections. The first section examines data on knowledge stock within the organisations and their competitiveness in order to benchmark the importance and effectiveness of various factors. The second section analyses data on knowledge transfer in order to assess how knowledge is transferred by the research organisations to the regional economy. The third section examines the barriers faced by the organisations in terms of transferring knowledge to firms in the region and their perceptions of barriers faced by firms with respect to acquiring or creating knowledge. Finally, their opinion about what should form the core policy for the development of R&D in the region is examined and final conclusions are drawn.

In terms of Knowledge Type, Table 6.1 shows that not all of knowledge types are supplied with similar degrees of frequency by most organisations. ‘Training’ is most frequent supplied with 45% followed by ‘IT development/support’ with 40% and ‘New Technology’ with 35%. However, General business support (40%), ‘New Product development’ (35%) and ‘Recruitment or Skilled Labour’ (30%) are also important knowledge types since they are quite often supplied. It is worth noting that knowledge types, which are more market oriented like ‘Finance accounting’, ‘Employment law’, ‘Market development’ and others are amongst the least frequently supplied.

Table 6.1: Knowledge Type

Knowledge Type	Very often supplied	Quite often supplied	Not often supplied	Never supplied
Employment law	5%	5%	35%	55%
Health and safety advice	10%	15%	35%	40%
Finance, accounting and auditing	0	30%	30%	40%
New Market development	0	20%	40%	40%
New Product development	10%	35%	30%	25%
New Process development	25%	15%	40%	20%
New Service development	15%	25%	40%	20%
New Technology	35%	40%	20%	5%
Recruitment or Skilled Labour	5%	30%	15%	50%
Training	45%	30%	15%	10%
Procurement of inputs	0	10%	35%	55%
IT development/support	40%	15%	10%	35%
General business support	5%	40%	30%	25%

Table 6.2 presents data on the organisations’ intellectual assets in relation to competitiveness. ‘Website’, ‘IT facilities’, ‘Market knowledge’ and ‘Training programmes’ are rated as the most important, scoring between 6.6 and 7.2. Further, organisations rely quite significantly on ‘Website’ and ‘IT facilities’ to generate competitive advantages and seem to be relatively effective in implementing these strategies, particularly regarding their ‘Website’. Interestingly, typical intellectual

assets such as patents and copyrights rank lowest in terms of importance, reflecting the limited orientation of research performers to market needs and knowledge commercialisation, a fact that has also been confirmed by national data and consultations that took place under deliverable 2.2.

Table 6.2: Intellectual Assets

Intellectual Assets	Importance	Effectiveness	Percentage Difference
Patents filed	5,1	3,15	38.23%
Copyrights held	5,7	4,35	26.68%
Market knowledge	6,65	5,55	16.54%
Process manuals	6,05	5,25	13.2%
Training programmes	6,6	5,95	9.84%
Website	7,2	6,55	9.02%
IT facilities	7,05	6,35	9.29%

Table 6.3 highlights the fact that in terms of knowledge created ‘Computer science and information systems’, ‘Business and administrative’ and ‘Engineering technology’ are rated as the most important.

As expected, all other disciplines scored quite low given their more specialised nature. It should be noted that regional higher education institutes do provide all the above mentioned types of knowledge.

Table 6.3: Importance of knowledge created by discipline

Disciplines	Significance
Biological sciences	4,35
Medicine and dentistry	4,1
Computer science and information systems	7,55
Engineering technology	5,7
Mathematical sciences	4,7
Business and administrative (e.g. logistics)	5,75
Physical sciences	3,95
Agriculture	3,95
Architecture, building & planning	3,5
Other (please state)	<ul style="list-style-type: none"> • Tourism • Transport • Employment, Health and Safety • Psychology

Table 6.4 shows that the most important sources of knowledge for research performers in Central Macedonia & East Macedonia/Thrace are located both inside and outside the region. However, the key sources of knowledge seem to reside within the community of research performers especially universities or other higher education institutes both within and outside the region.

This is followed by ‘International Organisations’ and ‘Public sector organisations’ while the corporate sector ranks quite low. As far as the locations of knowledge sources from outside the region, the capital city of Athens is dominant together with EU countries and to a lesser extent the USA and the broader Balkan region.

Table 6.4: Sources of Knowledge

	Within the Region	Outside the Region
Small private sector firms (1-49 employees)	4,2	3,21
Medium sized private sector firms (50-249 employees)	3,85	3,43
Large private sector firms (250+ employees)	3,65	3,78
Public sector organisations, such as government business support agencies	5,05	4,5
Private sector organisations, such as private training or research providers, and consultants	4,95	3,69
Universities or other higher education institutes	6,55	7,21
Professional networks (e.g. chambers of commerce, trade or business associations, business clubs or other professional networks).	4,4	4,23
International Organisations/Donors	5,7	5,31
Other (please state)		

In terms of Human Resources, table 6.5 shows that all human resource factors are of great importance for competitiveness. However, ‘Staff/employee skills’, ‘Competencies’, ‘Problem Solving Capacity’, ‘Management Skills and Commitment’ were found to have the highest rating in terms of importance all scoring above 7. Staff/employee Strategic and Consulting Skills ranked the lowest.

The general rating on factor “effectiveness” is lower compared to factor ‘importance’ with a percentage difference range of 10.07%-21.97%. Hence, although the importance of human resource factors might be very high, organisations do not seem to be able to utilise them to an equal degree of effectiveness.

This is particularly so for the case of ‘Staff/employee leadership skills’ and ‘Staff/employee knowledge of specific markets’. These results are consistent with those derived on other aspects of the knowledge stock and reflect the limited

orientation of research performers to the real economy and the corporate sector as well as the low degree of knowledge commercialisation.

Table 6.5: Human Resources and Competitiveness

Human Resources	Importance	Effectiveness	Percentage Difference
Staff/Employee skills	7,7	6,75	12.33%
Staff/Employee competences	7,45	6,45	13.42%
Staff/employee experience	6,95	6,05	12.95%
Staff/Employee problem solving capacity	7,55	6,4	15.23%
Staff/employee teaching skills	6,95	6,25	10.07%
Staff/employee knowledge of specific markets	7	5,55	20.71%
Staff/employee consulting skills	6,45	5,5	14.73%
Staff/employee strategic skills	6,4	5,1	20.31%
Staff/employee leadership skills	6,6	5,15	21.97%
Staff/employee development skills	7	5,78	17.43%
Staff/employee project management skills	7,4	5,8	21.62%
Staff/employee mentoring skills	7,0	5,85	17.02%
Management commitment	7,25	6,35	12.41%

The fact that the more market oriented knowledge types are the ones that are least supplied is characteristic of the limited focus of research performers on market needs. This is also displayed by the limited importance of patents/copyrights as key intellectual assets reflecting further the limited degree of knowledge commercialisation.

These findings are further highlighted in the fact that the corporate sector ranks quite low as a knowledge source for research performers. Further, the self-contained nature of the community of research performers is confirmed by the fact that the predominant knowledge source lies within their own community both at home and abroad. Finally, the fact that the importance of human resources ranks consistently higher than their effectiveness displays their overall under-utilisation.

This section analyses knowledge transfer by presetting data on 'Practices and routines', 'Importance of knowledge transfer by discipline', 'External relations', 'Knowledge transfer beneficiaries' and 'Membership networks'.

Table 6.6 shows that 'e-library subscription' and 'Library' are the most important Practices/Routines followed by 'Communication with other service providers'. 'Customer project materials' and 'Process manuals' rank the lowest in terms of importance. The high ranking of 'Communication with other service providers' combined with the low rank of 'Customer project materials' underline the inward looking nature of the research performers community possibly at the expense of engaging with the external business environment. Finally, the relatively high importance of 'Forums for solving problems' could display the realisation, by research performers of the need to engage more intensively with the real economy,

however, this practice remains the least effectively used (Percentage Difference 15.25%).

Table 6.6:Practices and Routines

Practices and Routines	Importance	Effectiveness	Percentage Difference
Process manuals	5,7	4,9	14.03%
Training materials	6,1	5,55	9.92%
Customer project materials	5,18	4,42	14.67%
Library	6,55	5,6	14.50%
e-library subscription	6,75	6,1	9.62%
Forums for solving problems	5,9	5	15.25%
Communication with beneficiaries	5,9	5,2	11.86%
Communication with other service providers	6,35	6,15	3.14%

Again all “practices and routines” factors, with the exception of communication with other service providers, rank with higher importance than effectiveness, i.e. the research performers are not able to use them as efficiently as it is necessary to boost competitiveness.

Table 6.7 shows that ‘Responsiveness to beneficiary demands’ and ‘Reputation of your organisation’ are the most important external relations followed by ‘Collaboration with other providers to innovate’. ‘Relationships with your beneficiaries’ and ‘Presentation of your services’ rank the lowest in terms of importance. Again all ‘external relations’ factors rank with higher importance than effectiveness, i.e. the research performers are not able to use them as efficiently as they would like to. These results seem to reinforce the conclusions derived under practices and routines as research performers are less interested in building long-term relations with beneficiaries and promoting their services in an organised fashion.

Table 6.7: External Relations

External Relations	Importance	Effectiveness	Percentage Difference
Reputation if your organisation	7,15	6,7	6,29
Presentation of your services	6,65	5,8	12,78
Knowledge of your organisation’s role(s)	7,2	6,2	13,9
Satisfaction of client/customer/partner	6,75	6,05	10,37
Responsiveness to beneficiary demands	7,25	5,95	17,93
Relationships with your beneficiaries	6,5	5,9	9,23
Relationships with other providers	6,9	6,45	6,52
Collaborations with business to innovate	6,75	5,7	15,55
Collaboration with other providers to innovate	7	5,9	15,71

Recommendation 12	Rationale
Implement awareness raising policies and support mechanisms for the organizations in the private and public sector on the importance of IPR's in securing financial stability and future prospective, strengthening their R&D orientation, focusing on universities and R&D centres.	The extremely low performance of the region regarding IPR management indicates the low level of R&D activities. Enhancing the value of IPRs by raising awareness and providing supporting mechanisms for IPRs, is an effective policy to increase the R&D capacity of the region.

Recommendation 13	Rationale
Implement policies to increase the inwards information flows from regional researchers and R&D institutes to local innovation actors.	Although innovation actors have a profound need for knowledge creation, they rely mostly on external sources to the region. This fact weakens the opportunity to transform knowledge into regional R&D activities.

7. The Knowledge Networks of Universities

Table 7.1 highlights the fact that in terms of knowledge transfer 'Computer science and information systems', 'Business and administration' and 'Engineering technology' are rated as the most important. This is in line with the fact that these are also knowledge types that bear high significance. As expected, all other disciplines scored quite low given their more specialised nature. It should be noted that regional higher education institutes do provide all the above-mentioned types of knowledge.

Table 7.1: Importance of knowledge transferred by discipline

Disciplines	Significance
Biological sciences	3,8
Medicine and dentistry	3,85
Computer science and information systems	7,8
Engineering technology	5,85
Mathematical sciences	4,35
Business and administrative (e.g. logistics)	5,85
Physical sciences	3,65
Agriculture	3,7
Architecture, building & planning	3
Other (please state)	<ul style="list-style-type: none"> • Tourism • Transport • Employment • Health and Safety • Psychology

Table 7.2 shows that the most important beneficiaries of knowledge transferred from research performers in Central Macedonia & East Macedonia/Thrace are significantly located both inside and outside the region. The key beneficiaries of knowledge transfer by regional research performers are universities and other higher education institutes both within and outside the region followed by public sector organisations within the region and private sector research providers. The role of the corporate sector, especially SMEs, ranks much lower as a beneficiary of knowledge transfer. As far as the locations of knowledge sources from outside the region are concerned, the capital city of Athens is dominant together with EU countries and to a lesser extend the USA and the broader Balkan region.

The high importance of international organisations and higher educational institutes from outside the region reflects the participation of regional research performers in international projects like the Framework Programme while the regional public sector organizations seem to be the most important clients/beneficiaries within the region. In all instances, the corporate sector ranks significantly lower as a client/beneficiary.

Table 7.2: Transfer of Knowledge

	Within the Region	Outside the Region
Small private sector firms (1-49 employees)	4,21	3,23
Medium sized private sector firms (50-249 employees)	4,5	3,5
Large private sector firms (250+ employees)	4,05	3,86
Public sector organisations, such as government business support agencies	5,5	4,86
Private sector organisations, such as private training or research providers, and consultants	5,25	3,69
Universities or other higher education institutes	5,5	6,43
Professional networks (e.g. chambers of commerce, trade or business associations, business clubs or other professional networks).	4,8	4,78
International Organisations/Donors	3,6	5,07
Other (please state)		

Regarding external relations (Table 7.3), it is observed that generally research performers do appear to be highly connected especially with ‘International research organisations’ as well as ‘Subject focused organisations’, ‘Funding organisations’, and ‘Professional organisations’. On the other hand, ‘Chambers of Commerce’, ‘Trade or business associations’ and ‘Business Clubs’ rank less importantly. The predominance of ‘International research organisations’ in external relations displays the great benefit for regional research performers in terms of international exposure through their participation in European Projects (mostly Framework Programme).

Table 7.3: Interaction with other organisations

	Yes	No
Chamber of Commerce	55%	45%
Trade or Business Association	50%	50%
Business Club	25%	75%
International research organisations	100%	0%
Professional organisations	80%	20%
Subject focused organisations	85%	15%
Funding organisations	80%	20%

Table 7.4 shows that all outcomes of interaction with other organisations are highly significant. The highest importance is attached to ‘Improving university-business relations’ and ‘Sharing knowledge with other members’ followed by ‘Developing trust between research providers and companies’. These results show that at least over the recent past regional research performers have been making significant strides in engaging with the real economy and the corporate sector by utilising the interaction with other organisations particularly as a result of their involvement in international research projects.

Table 7.4: Outcomes of interaction with other organizations

	Importance
Developing contacts with firms	7,45
Developing other service provider contacts	7,5
Improving university-business relations	8,2
Sharing knowledge with other members	8,05
Developing trust between research providers and companies	8

The less efficient use of ‘practices and routines’ and the predominance of other research performers and public sector organisations as beneficiaries of ‘knowledge transfer’, contrasted with the limited amount of knowledge transfers to the corporate sector, reflect the limited degree of knowledge commercialisation and the high dependence of research performers on public sector projects. However, increasing networking relationships primarily achieved through cooperation with international organisations and research performers outside the region have significantly increased the international exposure of regional research organisations.

Furthermore, the high importance attached to ‘university-business relations’ shows that regional research performers are conscious of the need to improve knowledge commercialisation and address more effectively the needs of the real economy. The increasing participation of regional research performers in European projects especially in the Framework Programme has proved vital in improving the overall outlook.

Table 7.5 suggests that the most important barrier faced by research performers in the process of transferring knowledge is the ‘Lack of contacts in the business world’ (9,3). This is followed by the ‘Lack of finance/budget to reach many firms’ (7,6). The least importance is attached to the ‘Lack of time to contribute to such activities’ (6,05) as well as the ‘Lack of management acumen and skills’ (5,95). It is important to note that the ‘Lack of demand from local firms’, which also ranks significantly might on

the one hand suggest the low degree of sophistication of the regional business sector and on the other the limited efforts of regional research performers to engage with regional businesses and possibly the limited relevance of their skills.

Table 7.5: Barriers to knowledge transfer

Barriers	Importance
Lack of demand from local firms	6,8
Lack of time to contribute to such activities	6,0
Lack of finance/budget to reach many firms	7,6
Lack of management acumen and skills	5,9
Lack of support from the public sector (based on your experiences)	6,8
Difficulties in undertaking market research to identify opportunities for collaboration	6,4
Lack of contacts in the business world	9,3
Other (please state)	Legal Framework

Finally, an important aspect often cited by research organisations (under other barriers) is the legal framework. This reflects the inappropriateness of the legal framework surrounding the community of research performers and especially higher education institutes, particularly as regards their ability to commercialise knowledge and acquire funds that are explicitly earmarked for research purposes or furthermore for the creation of company spin-offs. These issues have been highlighted by research performers during earlier consultations and analysis undertaken under deliverable 2.2. Table 7.6 looks at the perception of research performers regarding the most important barriers faced by firms in the region with respect to acquiring or creating knowledge. In this respect the most important barrier is the ‘Access to suitable finance’ (7.5) followed by the ‘Inapplicability of knowledge created by others in the region (e.g. universities, other companies or existing networks)’ (6.8). Another factor of importance is ‘Access to skilled labour’ (6.3) which relates to the applicability and quality of the overall education and training system as has been highlighted by our analysis under deliverable 2.1. This factor also ranked high in the answers of SMEs regarding barriers to knowledge under deliverable 4.2. Finally, the least important factor is the ‘Access to suitable equipment or plant’ (5.5).

It is interesting to note that overall the same results were obtained by the answers of regional SMEs regarding their barriers to knowledge creation in our survey that was reported under deliverable 4.2. Further, of particular significance is the fact that research performers clearly recognise the relative inapplicability of knowledge that they create for regional SMEs, even though this might be partly due to the limited sophistication of regional SMEs that might also contribute in explaining the low demand for R&D services.

Table 7.6: Barriers to knowledge acquisition or creation

Barriers	Importance
Access to relevant networks	6
Access to relevant collaborators	6,25
Inapplicability of knowledge created by others in region (e.g. universities, other companies or existing networks)	6,8
Quality or applicability of available business support or advice	6,1

Access to suitable finance	7,5
Access to skilled labour	6,3
Access to suitable training	5,9
Access to suitable equipment or plant	5,55

Recommendation 14	Rationale
Implement policies to engage private organizations into the 7 th Framework Programme and the relative national initiatives, by providing incentives for networking with other European organizations and establishing R&D links and interconnections for them.	The participation of the regional actors into the Framework Programmes derives mainly from public organizations, and mainly from the higher education area. The participation of the private sector into these activities requires high level of networking with other European organizations, participation in conferences, forums and business clubs.

Recommendation 15	Rationale
Increase and highlight regional R&D corporate demand bringing together private organizations and the R&D actors. Policies must include proactive measures, inside the business organizations to identify and match R&D demand to the regional supply. Such policies could include post-doctoral internships and incentives for building internal R&D departments.	The low level of interaction among R&D organizations and the business world requires the fulfilment of demand driven R&D processes. The demand stimulates R&D performers to target their activities into applicable and commercial areas.

Recommendation 16	Rationale
Improve commercialisation of R&D results setting marketing support mechanisms and consulting services to R&D performers. The support for start-up creation for the commercialisation of RTD results is considered the most efficient method. The involvement of business incubators in this process is crucial.	The effort to commercialisation of R&D results is a long-term attitude changing process and is problematic within the region and countrywide. This attitude is not assisted by the current environment and commercialisation structures of the higher education systems, which fosters most of the R&D activities. Synergies must be achieved with capable marketing support organizations to promote R&D commercialisation.

Recommendation 17	Rationale
Initiate a dialogue for IPRs ownership within the region clarifying the question of “who is	A major obstacle in the R&D collaboration efforts is the unclear status of IPR ownership within the higher education system. Private

the proprietor?" in case of collaborative projects between Universities and the private sector.

organizations are reluctant to engage in collaborative R&D projects and invest in a not well-defined and complex IPR management status.

8. Financing the Knowledge Economy

The key R&D investment indicators for CM and EMTH are summarised in Table 8.1. The regions lag behind the national average on most indicators with EMTH being quite behind. The gap with respect to the EU average is quite overwhelming. The gap is most evident when looking at corporate R&D expenditure, which reflects the relatively unfavourable economic structure of the region and also the fact that many of the major regional companies are based in Southern Greece. The situation is more positive with respect to higher education expenditure, thanks to the presence of regional universities, particularly in Thessaloniki. The small government expenditure for EMTH is quite notable. Hence the challenge for the region regarding R&D is very significant and explicit policy intervention is required.

Table 8.1: Key R&D Investment Indicators

Indicator	Central Macedonia	East Macedonia & Thrace	GR	EU-25 Regional Mean Average
R&D Expenditure by Business (2003, Euros per inhabitant)	24	14	32	230.5
R&D Expenditure by Government (2003, Euros per inhabitant)	18	6	22	48.0
R&D Expenditure by Higher Education (2003, Euros per inhabitant)	56	38	52	87.7

The key stakeholders involved in policies relating to R&D investment are the National Government, the Regional Authorities of CM and EMTH as well as the Ministry of Macedonia-Thrace. The Regional Authorities have been gaining in significance regarding their policy impact on regional economic development. However, it must be noted that R&D policy is not addressed as such at regional level but is impacted indirectly via broader policy channels, particularly via the Regional Operational Plan (ROP) for CM and EMTH amounting to Eur1290mn and Eur1116mn respectively as well as the various national Operational Programs:

- OP Competitiveness (RTD support, incentives for investment)
- OP Information Society (ICT public and private infrastructure)
- OP Railways, Airports and Urban Transport (large scale public infrastructure)

- OP Road Axes, Ports and Urban Development (large public infrastructure)
- OP Human Resources relating to the upgrading of human capital

The policies for R&D arising from the OPC and implemented at national level (via the Ministry of Development-GSRT) can be divided into 6 main chapters as follows:

- Increasing Demand for R&D
- Restructuring the system for R&D Supply
- Opening Greece to international R&D
- Developing R&D Infrastructure
- Setting sector/thematic priorities
- Quantification of goals

In general, policy makers, in addition to specific policy targets regarding R&D spending, are aiming to stimulate demand for RTD from the corporate sector of the economy by improving its sectoral allocation, stimulating supply of RTD through the reorganization of the tertiary education and research system, opening up to global research networks and building domestic R&D capacity infrastructure. Finally, the sectoral focus is on renewable energies, tourism-sports-culture, transport, food and agriculture, environment, health, modes of work organisation, e-learning and e-business. These priorities coexist with the second pillar of the policy relating to private investment incentives for innovation propagated either directly through the Ministries of Development and Finance or through regional development incentives.

A key criticism of the policy framework has been the perceived lack of co-ordination on the one hand between the aforementioned ministries and on the other amongst public policies at sector level to maximize the efficiency of policy measures.

A major contributor to the innovation and R&D framework are the financial organizations and more specifically organizations that are specializing on financing high-tech investments, start-ups and high-risk such as Venture Capitals. In this respect, it is worth noting the following:

- There is no Venture Capital with its headquarters based in neither of the two regions.
- The two incubators established in Thessaloniki (i4G and Thermi) are providing some limited start-up funds, acting, in a sense, like venture capitals.
- There is also currently no commercial bank based in Thessaloniki or any other city in the 2 regions. Seven to eight years ago there were two banks with their headquarters in Thessaloniki, but since then, one was bought by an Athens-based bank and the other decided to move its headquarters in Athens.

Although the above does not necessarily mean that the region's SMEs are totally excluded from funding (after all there are numerous Athens-based Banks operating in the region and the Athens-based VCs can, in theory, invest anywhere in Greece and abroad), it does demonstrate a lack of interest for the region on the part of the financiers that is striking, given the regions' contribution to the national GDP and the overall educational and R&D infrastructure of the region (especially that concentrated around Thessaloniki).

Recommendation 18	Rationale
Identify the main corporate actors with R&D potentials and involve	Since the business environment of the region is dominated by small and medium size

them into cooperative activities to increase the regional level of R&D spending

businesses, the few corporate leaders must be utilised to raise R&D capacity. Smaller businesses could cluster around these corporate leaders.

9. Analysis of Key Findings

The question that has dominated in our engagement with various experts and institutions was the following: Is the critical-mass present in terms of physical and human resources and infrastructure including entrepreneurial acumen/culture and financial resources to drive the RTD outlook to a higher level? Hence, the priority issue seems to be the creation of a critical-mass for RTD (stock of know-how) in terms of infrastructure, engagement of capable skills, entrepreneurial spirit and imaginative policy leadership that will put into use the combined resources effectively making innovation a self-sustaining process and allow for its faster evolution.

A hypothetical strategy, that has been mentioned by a number of interviewees, could be in favour of diversification of primary production towards greater specialization combined with the introduction of agro/biotechnologies and synergies with other sectors like life-sciences and environmental technologies towards the combined promotion of pharmaceuticals, specialised foodstuff, health and different types of tourism as a clustered composite product/service. Most interviewees also believe that present resources are sufficient in terms of spending, human skills and infrastructure in order to create this critical-mass. A dilemma is posed regarding the strategy, in that the above mentioned hypothetical strategy might constitute wishful thinking and that creation of a critical-mass might not necessarily require such complex sectorally focused strategies but could arise as a result of horizontal strategies like the triple-helix interaction, the play-out of market forces and state-of-the-art scientific practices. What seem to be the major barriers are the institutional and cultural bottlenecks that could greatly be ameliorated with decisive policy actions.

On the pessimistic side, even leaving aside any policy making constraints, any chosen strategy will have significant requirements in specialised personnel, links with the scientific community and innovative entrepreneurship that does not correspond to the ageing country-side of small land holdings in traditional crops often relying on subsidies. It would further be constrained by the predominance of the small merchant class, self-employed (32% of the workforce in industry and services compared to 12% for EU15) and civil servants that dominate the employment make-up of the population at regional level coupled with entrepreneurial quality limitations on the side of the business community. The transition from this environment has been slow and new dynamic businesses are not appearing fast enough to take-up the slack.

Finally, the regional definition for RTD policy might also prove important for achieving the required size that will secure economies of scale and the critical-mass. In this respect the policy planning space for RTD could be taken to be the region of CM and EMTH, with Thessaloniki at the core, or even the whole of the NUTS1 region of Voreia Ellada taken together in order to achieve economies of scale and economy in the allocation of resources. An obstacle, according to some research performers, could be a perceived limited lack of complementarities between the economy of Thessaloniki and the other Prefectures, even though all could gain in the future. Synergies in the future with neighboring countries would be useful, although such a

discussion might be premature at this time. Nevertheless, a broader RTD market could resolve many of the issues through market forces that could see an opportunity in the gains arising from agglomeration.

Despite the problems, the main fact and encouraging aspect is that Greek companies including SMEs are increasingly willing to develop technological capacity and product quality and that Greek RTD performers are increasingly aiming to engage with the real economy. Many of the sited problems are due to the fact that the process of developing and infusing R&D as well as the transition of the corporate sector towards modern methods are at a relatively early stage. The Greek private corporate sector gained strength primarily over the last 15 years while the initiation of most RTD intermediaries and initiatives took place in the late 1990s. Other research performers particularly the Universities and TEIs, although growing more aware regarding their impact on the economy, they are still at an early stage in the transition process. Similarly, policy makers have been engaged with RTD policies relatively recently and, in addition, face problems arising from the overall mediocre state of Greek public administration. Even so, a momentum is present and a key role for policy makers is to sustain and nurture it.

The issues raised in this report could be summarized in the form of key questions for policy-makers as follows:

Questionable regional viability for RTD. Address the question of whether regional breakdown to 13 regions is viable from the point of view of achieving economies of scale or the critical-mass for RTD and whether issues should be addressed at cross-regional level. (Join CM with EMTH or all engulfing within Voreia Ellada)

Sectoral allocation of the economy might call for a more focused RTD strategy. Given the comparative advantage in traditional sectors and small market size, a policy focus towards RTD agglomeration in selective sectoral synergies might be required rather than attempts to shift the economy towards hi-tech and highly innovative products. (An example would be agriculture-tourism-ecology-life sciences with Thessaloniki at the core)

The role of market forces in driving RTD strategy. An alternative strategy to the above could arise as a result of more horizontal-neutral policies like combining the triple-helix interaction, the play-out of market forces and state-of-the-art scientific practices. Are these strategies totally incompatible or is it possible to strike a balance?

Policy makers, taking the initiative and developing leadership. Particularly at regional level by upgrading their expertise to become able to implement policies suited to the region and become more independent from national policy making.

Building efficient institutional links and coordination. This is required at both national and regional levels as coordination amongst ministries, private-public sector synergies and regional actors has not in practice been enforced despite the presence of institutional forums.

Targeted allocation of financial resources. Maximising impact through strategic focus rather than fragmented use of financial resources based on general criteria, availability of funds or ease of implementation.

Building synergies between research performers and corporations. Break the self-contained nature of private and public sector RTD to achieve cooperative outcomes and economies of scale.

Reforming the Higher Education System. This is a major obstacle in achieving RTD skills and outcomes that link skill development and research content with relevance to the needs of the economy.

Upgrading the level of entrepreneurship. Information, dissemination of technological developments, training in new technologies, improving the business institutional environment.

Cultivating the right culture amongst economic actors. Creating awareness of the trends in the globalising world economy, the place of Greece in this process and what is required by economic actors and institutions in order to achieve sustainable competitiveness.

10. Future Policy Approaches

In terms of future policy directions (Table 10.1), it appears that research performers believe that ‘Creating better networks that link companies with universities and other R&D performing organisations’ together with ‘Making more R&D finance available to companies enabling them to become involved further in R&D and knowledge related activities’ should form the core policy issues.

Significant importance is also attached to the creation of start up companies, attraction of high value foreign investment and an improved system of business support and advice. This result shows the increasing awareness of research performers of the need to address corporate requirements through stronger links between companies and R&D performing organizations.

Comparing the above results with those derived from SME replies regarding future policy directions, the fact that SMEs also recognise that the ‘creation of better networks that link companies with R&D performers’ should form a core policy component is quite positive. Further, in addition to ‘making more finance available for corporate R&D’ which ranks high for both communities, the need to ‘stimulate the creation of start-up companies’ and ‘creating an improved system of business support and advice are also the issues where both the community of SMEs and research performers agree that they should form core policy issues.

The almost identical preferences of both communities even in terms of ranking the relative importance of each factor that should form the set of core policy issues is of vital importance in achieving consensus in policy formulation and maximise co-operation for the promotion of regional R&D. This is a result that has not been derived by regional surveys conducted over the late 1990s and the first years of our current decade (reported under deliverable 2.2), where the corporate sector and research performers seemed to be placing much lesser emphasis on synergies between them or even perceiving each other with a relative degree of suspicion.

Table 10.1: Future policy directions

Policy Area	Does not need to be addressed further	Needs addressing but is not the core issue	Should form the core policy
Creating an improved system of business support and advice	5%	40%	55%
Making more finance available to companies enabling them to become involved further in R&D and knowledge related activities	0%	25%	75%
Creating more access to training and workforce development opportunities	0%	50%	50%
Support companies in entering and accessing new markets	15%	35%	50%
Create better networks that link companies with universities and other R&D performing organisations	0%	5%	95%
Make improvements to the physical infrastructure allowing companies to relocate in better equipped premises	10%	50%	40%
Provide more support to companies to improve their supply-chains and logistical needs	25%	50%	25%
Stimulate better supply and demand for knowledge through the attraction of high value foreign investment	5%	40%	55%
Stimulate the creation of new start-up companies	15%	25%	60%

Regarding the barriers faced by research performers for R&D transfer, the lack of contact with the business world, lack of finance and the legal framework surrounding the functioning of R&D organizations seem to be most significant. The limited R&D demand by the corporate sector is also an important factor, partly reflecting the lack of corporate sophistication and partly the limited applicability of knowledge created by R&D performers and their limited commercial orientation. However, research performers recognise that policies aiming to address the need for closer links with the corporate sector should form a core policy regarding the future policy directions. The fact that the survey results for both SMEs (deliverable 4.2) and research performers show a striking resemblance in their perception of which issues should form the core policy is of particular significance.

The major weaknesses of the research performing community are its self-contained nature, its overt dependence on public sector projects and finance and the resulting lack of focus on the needs of the real economy and the corporate sector both in terms

of knowledge applicability as well as developing long-term relations with the corporate sector and explicitly aiming to boost knowledge commercialisation.

The strengths of the community of research performers seem to lie in their improving overall outlook especially in terms of building an international network of relations with other research organisations and in their recognition of the need to engage more intensively with the corporate sector. These improvements are to a great extent linked to the participation in international projects, particularly within the auspices of successive EU Framework Programs. Further the research community recognises the need to make the knowledge supplied more applicable to the requirements of the economy and notes the need to change the legal framework regulating research by making it friendlier to knowledge commercialisation.

Significant opportunities arise from the better utilisation of existing resources, particularly human capital. However, most opportunities would arise from greater focus on triple helix interaction particularly by bringing the corporate sector and research performers in closer interaction considering that both communities have explicitly recognised the need to do so and would both like to see this issue forming a core policy focus.

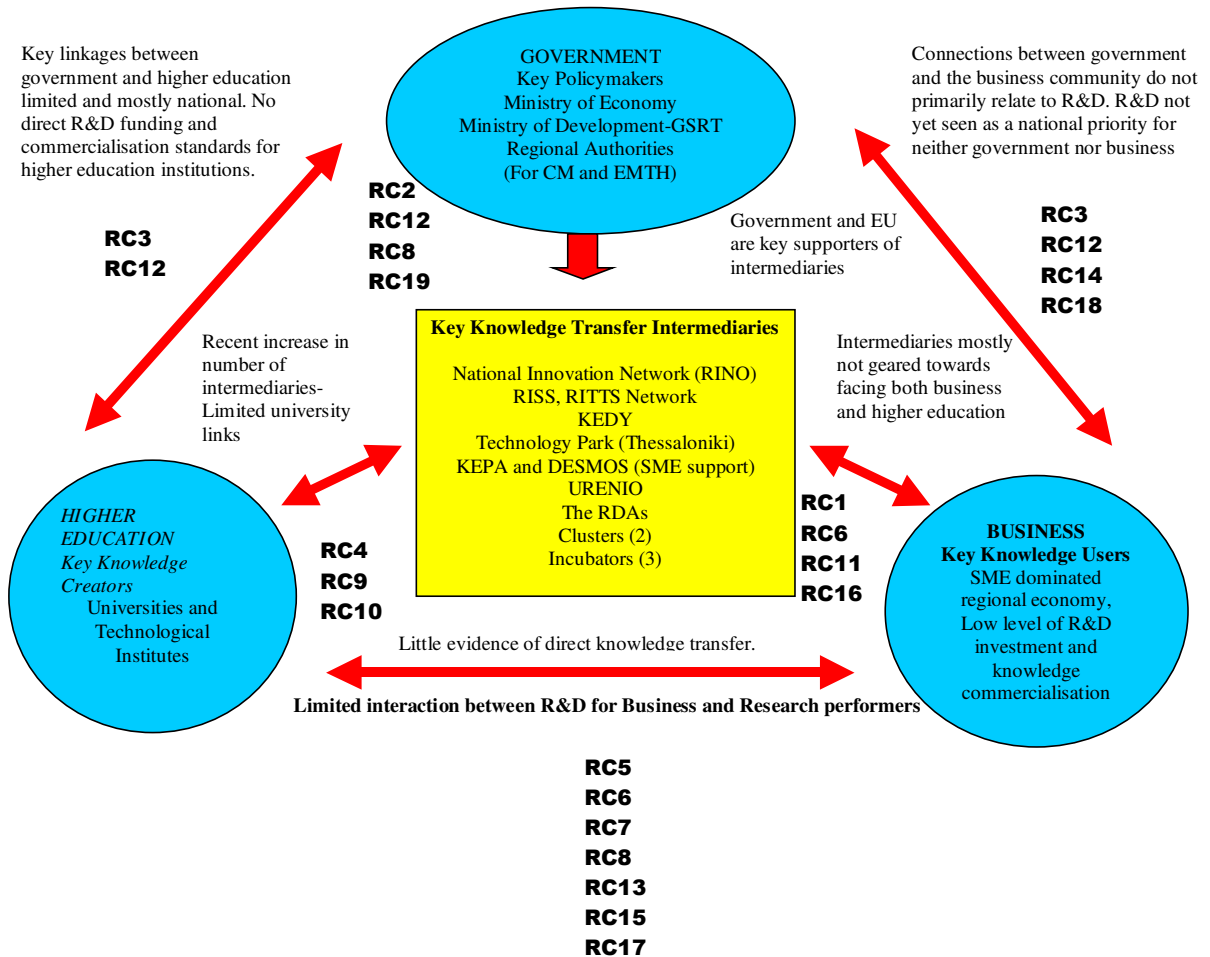
A major threat arises from the limited availability of financial resources dedicated to R&D regarding both the corporate sector and research performing organisations. This risk could be intensified if the public sector does not in practice herald R&D a national priority and hence continue to delay the necessary reforms in the legal framework, the promotion of the triple helix interaction by policy makers and the prioritisation of R&D in terms of financial resources.

As part of the MIRAID process we gathered detailed data on the innovation and knowledge network activities of both SMEs and universities in the region through a range of surveys, in order to gain a better understanding of these activities and how they relate to SME performance. Initially, SMEs were asked to rate a range of factors in relation to their perceived importance to competitiveness and the effectiveness of use of a particular factor in relation to its importance. Table 6.1 presents a summary of those factors that SME managers consider effective or not effective in their firm. Amongst the range of factors identified, it is noticeable that many managers consider factors relating to the ‘innovation culture’ of their firm to lack effectiveness.

Recommendation 19	Rationale
Initiate a foresight exercise with a wide network of participants including intermediaries, to achieve a common understanding, as far as the long terms aims of R&D investment regarding technologies, sectors and clustering prospectives.	The low level of interaction of the regional innovation system creates a diversified view of the directions that R&D efforts and resources should take. The divergence of interests that each actor has within the system should be eliminated and efforts should be directed to common long term objectives set by the foresight exercise.

11. Summary of Recommendations

The regional R&D investment strategy for the regions of Central Macedonia and East Macedonia and Thrace is a complementary policy paper to regional innovation strategies exercised under the RIS initiatives and regional planning of the relative ROPs 2007-2013. The strategy aims to strengthen the weak linkages of the triple helix model analysed for the region of Northern Greece.



The strategy's objective is to suggest improvement at the operational level of the regional innovation system to facilitate R&D to improve performance and utilize all regional resources. It is a series of policy recommendations that each one aims to improve the R&D capacity of the area.

In diagram 11.1 the triple helix model of the region of Northern Greece is presented along with the policy recommendations aiming to improve weak linkages of the regional innovation system.

Each recommendation aims to strengthen weak relative linkages of the regional triple helix model. High priority has been given to the weakest link among higher education R&D and the private sector.

Recommendation 1	Rationale
Identify new areas in between traditional sectors where innovation can flourish, capitalizing in new technologies and shifting to new	The low productivity and performance of traditional sectors of the region prompt for identification of areas in which traditional sectors could expand their activities,

activities. Raising the interest of traditional sectors would be a challenge though, since it also relates to RTD and innovation awareness and culture.	capitalizing on new technological advancements. For example, traditional sectors such as construction could cooperate with the automation high tech sector to produce “smart house” products.
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Recommendation 2	Rationale
This recommendation applies mainly to the region of EMTH. Capitalize on the Science and Technology Legislation to improve R&D infrastructure by creating a science and technology park and relative institutes related to the R&D locally advanced areas, since the region presents high scientific skills, e.g. Biotechnology. The regional policy should be directed in creating a critical mass of R&D resources in selected research areas.	The region of Northern Greece, even though it is not high rated in R&D performance presents a high concentration of R&D infrastructures around the metropolitan area of Thessaloniki. The region of EMTH must also follow in infrastructures to equalize inequalities within the area of Northern Greece and also capitalize on the excellences that it presents, such as the research results of the Biotechnology Department of The University Hospital of Alexandroupoli.

Recommendation 3	Rationale
Create an interregional R&D investment committee for Northern Greece, including R&D actors from Institutes, Universities, Public and Private organizations. This committee should be linked to the National Committee for Research and Technology. It must highlight the importance in order to also include representatives from the private organizations and intermediaries, than just academics and researchers.	The strengths of the regions’ favourable environment, adequate supply of scientific personnel, existence of regional funds, increasing attitude toward R&D investment by the private sector must be coordinated and organized from well represented body of R&D actors and business organizations, aiming to minimize the gap between R&D and the business world.

Recommendation 4	Rationale
Promote cultural changes toward innovation and entrepreneurship, especially in the community of the young generation of scientists and the future R&D human capital including high school students. This culture enhancement should be directed toward entrepreneurship	The high level of unemployment among young scientists indicates the low level of utilization of human scientific resources within the regional innovation system. The uncertainty of the financial environment directs them to seek secure employment in the public sector. Young scientists must capitalize on the benefits and the hospitable environment

and innovation.	of the region to create innovative start-ups. Also younger generations, such as high school students must be infused with the benefits of entrepreneurial skills.
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Recommendation 5	Rationale
Interlink the R&D capacities of the area with business initiatives toward new products and services following extended methodologies and best practices from the past (such as the Technogenesis process for R&D start up creation). Emphasis should be put in raising the interest of the Research Community for business exploitation of research results, so that RTD and innovation performance is strengthened in the long run. There is availability of regional consultants in providing corresponding support services needed.	The low level of cooperation among R&D organizations and the business environment requires cooperative policies seeking mutual benefits. Learning from the example of Technogenesis, which has presented fruitful results for new products and services. This cooperative process must be supported by specialised consultants that will guide all cooperative processes with added value services.

Recommendation 6	Rationale
Increase R&D investment by private organizations outside the higher education system, by building infrastructures and providing incentives so that large scale business organizations will move their R&D activities into the region. The region must implement investment policies, marketing techniques, human capital and infrastructure availability, including financial incentives so large scale corporations will benefit from relocating their R&D departments in the region.	The low performance of the region in private R&D spending and patent creation indicates the inefficiency of the higher education driven R&D system. Furthermore, the creation of the area of critical mass of private sector R&D activities increases the potential for regional growth and for investment as a basis of the local economy.

Recommendation 7	Rationale
Capitalize on the fluent scientific resources of the higher education system by promoting synergies in	The high level of scientific knowledge and human resources concentrated within the limits of higher education system must flow

transfer of know-how with private organizations. Regional incentives should be created for the transfer of R&D personnel from the universities to industry and versus versa.	outside the borders of the universities enriching the start-up repository for new business ideas and technological innovation in the area.
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Recommendation 8	Rationale
Develop new regional metrics that incorporate a holistic means of measuring investment in knowledge. These indicators should measure the qualitative, “fact finding”, aspects of the regional R&D performance using a survey inside the regional organizations than a statistical approach.	Whilst R&D expenditure continues to be an important measure of innovation and the conversion to a knowledge-based economy, it is limited due to its relative inapplicability to growing service-based sectors.

Recommendation 9	Rationale
Enhance knowledge economy by building science parks, where higher education R&D might find applications and meet business demand for knowledge	The isolated higher education R&D system and the unfavourable environment for innovation commercialisation within the universities must find a hospitable environment to experiment the application of these results to the market needs.

Recommendation 10	Rationale
Enhance life long learning activities with the social structure of the region upgrading in a continuous basis the human capacity of the region. Existing quality of training curricula and services and structures should be adopted to serve long term learning action plans instead of partial vocational programmes.	The high level of unemployment among unskilled workers requires immediate actions enriching the human capacity skills of the region.

Recommendation 11	Rationale
Enhance clustering support policies related to R&D activities among R&D researchers and targeted business sectors, strengthening the role of intermediaries in the cluster building process.	The clustering efforts in the region and generally in the country where not adequately supported by a methodological approach that will bring together different sectors and activities into joined R&D activities. The support policies and the role of intermediaries

	are important elements missing from these unsuccessful clustering measures.
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Recommendation 12	Rationale
Implement awareness raising policies and support mechanisms for the organizations in the private and public sector on the importance of IPR's in securing financial stability and future prospective, strengthening their R&D orientation, focusing on universities and R&D centres.	The extremely low performance of the region regarding IPR management indicates the low level of R&D activities. Enhancing the value of IPRs by raising awareness and providing supporting mechanisms for IPRs, is an effective policy to increase the R&D capacity of the region.

Recommendation 13	Rationale
Implement policies to increase the inwards information flows from regional researchers and R&D institutes to local innovation actors.	Although innovation actors have a profound need for knowledge creation, they rely mostly on external to the region sources. This fact weakens the opportunity to transform knowledge into regional R&D activities.

Recommendation 14	Rationale
Implement policies to engage private organizations into the 7 th Framework Programme and the relative national initiatives, by providing them with incentives for networking with other European organizations, establishing R&D links and interconnections.	The participation of the regional actors into the Framework Programmes derives mainly for public organization, mainly from the higher education area. The participation of private sector into these activities requires high level of networking with other European organizations, participation in conferences, forums and business clubs.

Recommendation 15	Rationale
Increase and highlight regional R&D corporate demand bringing together private organizations and the R&D actors. Policies must include proactive measures inside the business organizations to identify and match R&D demand to the regional supply. Such policies could include post-doctoral internships and incentives for building internal R&D departments.	The low level of interaction among R&D organizations and the business world requires the fulfilment of demand driven R&D processes. The demand stimulates R&D performers to target their activities into applicable and commercial areas.

Recommendation 16	Rationale
Improve commercialisation of R&D results setting marketing support mechanisms and consulting services to R&D performers.	The effort to commercialisation of R&D results is a long-term attitude changing process and is problematic within the region and countrywide. This attitude is not assisted by the current environment and commercialisation structures of the higher education systems, which fosters most of the R&D activities. Synergies must be achieved with capable marketing support organizations to promote R&D commercialisation.

Recommendation 17	Rationale
Initiate a dialogue for IPRs ownership within the region clarifying the question of “who is the proprietor?” in case of collaborative projects between Universities and the private sector.	A major obstacle in the R&D collaboration efforts is the unclear status of IPR ownership within the higher education system. Private organizations are reluctant to engage in collaborative R&D projects and invest in a not well-defined and complex IPR management status.

Recommendation 18	Rationale
Identify the main corporate actors with R&D potentials and involve them into cooperative activities to increase the regional level of R&D spending	Since the business environment of the region is dominated by small and medium size businesses, the few corporate leaders must be utilised to raise R&D capacity. Smaller businesses could cluster around these corporate leaders.

Recommendation 19	Rationale
Initiate a foresight exercise with a wide network of participants including intermediaries, to achieve a common understanding, as far as, the long terms aims of R&D investment regarding technologies, sectors and clustering prospectives.	The low level of interaction of the regional innovation system creates a diversified view of the directions that R&D efforts and resources should take. The divergence of interests that each actor has within the system should be eliminated and efforts should be directed to common long term objectives set by the foresight exercise.

The proposed strategic actions lines will be distributed among the main innovation and R&D actors in the regions. Upon receiving comments, the final strategy will be presented to a wide audience and decision makers of CM and EMTH.