

An Overview of Photonics Innovation Clusters and National Technology Platforms in Europe

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... **Photonics Unit**



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Executive Summary

Photonics is today a key innovation driver in many established applications like communications (fast Internet), measurement and security, and laser-assisted manufacturing. Photonics also provides solutions to upcoming global challenges such as energy (photovoltaics; energy efficient lighting) and health-care (bio-photonics for early disease detection).

European photonics production now accounts for 20.3% of global production (according to [1] below, the photonics world market was 270 B€ in 2008). There are more than 5,000 photonics companies in Europe, mostly small and medium enterprises (SMEs), directly employing about 300,000 people.

The European photonics landscape is characterised by the presence of high-level research groups in public research centres and universities and also by strong industries in both SMEs and large companies. Most of these are clustered around so called "regional clusters" and "national technology platforms", which play a catalytic role in the further development of photonics in Europe.

This report provides an overview of the actual state of play of these regional clusters and national technology platforms in Europe. The main findings are as follows:

- In an attempt to better organise the optics and photonics community in Europe, at least two types of networks have been created in the last two decades:

1. Photonics innovation clusters have been the first entities organised on a regional basis. Partners in such clusters are: large companies and SMEs, start-up companies, public and private research centres, universities, specialised suppliers, investors, consultancies, and regional and government agencies. In particular, such agencies, together with cluster networks, often act as intermediaries between the cluster and national or regional governments. Usually, the members of the cluster work in partnership under a common

development strategy and in mutual interest in order to generate synergy in Research, Development and Innovation (RDI) in one or more given markets.

2. National technology platforms for photonics have existed since 2005, following the successful launch of the Photonics21 European Technology Platform (ETP)¹. Such national consortia are networks of public and private players sharing strategic topics in photonics. They work together in order to overcome the fragmentation of resources, to define a common strategy and to achieve visibility at political level for the domain. Possible follow-ups for national platform activities are national R&D funds and innovation policy measures specific to photonics, and increased national and international visibility.

- The RDI potential in photonics has not yet been fully exploited in Europe. Direct and visible links between academic research and industries are sometimes lacking at national level, leading to a waste of expertise and potentiality for RDI. This somewhat fragmented national landscape results in only partial recognition for photonics at political level and very few specific regional/national funding programmes.
- National and regional clusters and platforms are promoted by the EU as an effective mechanism for RDI. Their role and importance for Europe is stressed in the European Commission's communication COM(2008) 652 of 17 October 2008², which calls for efforts to facilitate "world-class" clusters in the EU in order to achieve the critical mass and innovation capacity to face global competition. Also related to this COM is the European Commission decision of 22 October 2008³ on setting up a European Cluster Policy Group.

¹ <http://www.photonics21.com/>

² "Towards world-class clusters in the European Union: Implementing the broad-based innovation strategy", COM(2008) 652

³ Commission Decision 2008/824/EC

Photonics Innovation Clusters and National Technology Platforms in Europe

1. Introduction



development. A detailed description of the organisation and main activities of existing photonics regional clusters and national technology platforms is provided in the annex

Photonics and optics innovation clusters and national technology platforms have been developing in Europe in the last decade.

This report is a working document about their present status of development, R&D and training activities and their involvement in the regional, national and/or European innovation policy. Issues related to future development potential and opportunities for further growth of photonics clusters and national technology platforms are also addressed.

Firstly, the report briefly presents the present status of regional/thematic clusters and national technology platforms. This is then followed by analysis and discussion of requisites for successful photonics clusters and platforms, their main achievements, the main obstacles to and needs for their further

2. Present status of Photonics Innovation Clusters and National Technology Platforms



On 17 October 2008, a Commission communication² called for efforts to facilitate "world-class" clusters in the EU in order to achieve the critical mass and innovation capacity to face global competition. On 22 October 2008 there was also a Commission decision³ on setting up a European Cluster Policy Group. The expected benefits of this policy in supporting regional/national clusters are: to help close the European innovation gap; to work with regional and national governments and stakeholders to strengthen the industry and to support local communities; and to create quality jobs.

Different terms are currently used in Europe to name regional/thematic concentrations of public and private stakeholders dealing with Research, Development and Innovation (shortly, RDI) activities. Cluster is, without doubt, the most largely used term to define a regional/thematic concentration of companies (mainly SMEs), specialised suppliers, universities and research organisations that operate and co-operate in order to:

- Enable interaction and exchange of knowledge;
- Help re-direct resources for RDI to new innovative players;
- Increase productivity and innovation;
- Promote photonics solutions to integrators/users;
- Stimulate the formation of new business: development of new and lead markets of products and services;

- Promote photonics excellence (local, national, European) to potential foreign partners;
- Improve human, financial and knowledge capital and mobility.

Also worth mentioning are trans-national clusters that *'help to preserve a local system of embedded ties while favouring their international openness to other local clusters'*⁴. Starting from this cluster definition, photonics and optics clusters have been developing in Europe in the last decade (Figure 1).



Figure 1: Distribution of Photonics clusters (yellow stars) and National Technology Platforms (orange stars) in Europe.

These clusters are partnerships that have the necessary critical mass in terms of size and range of activities and which have usually received some sort of political recognition to act on behalf of their members in order to

⁴ 'Developing Photonics Clusters: commonalities, contrasts and contradictions', Advanced Institute of Management Research (AIM Research), London (UK), April 2007.

combine and focus resources (R&D, education and training, innovation, financing) at regional or national level to set strategic directions⁵. They are very different in organization, size, activities and level of political recognition depending on the country. There is also a great deal of variation among the types of funding: some are mainly government-funded, some entirely privately-funded and most have some form of membership fee based funding. Among their strategic goals is the need to prevent photonics market fragmentation and to ensure that photonics is central to the regional/national innovation strategy.

Regional thematic clusters in optics and photonics exist in several European countries such as Belgium, France, Germany, Ireland, the Netherlands, Poland, and the UK (see Table 1). Their activities are often focused on the needs of SMEs, including training and education issues.

In some countries like Germany and UK, the photonics regional clusters are supported and/or coordinated by the government. The photonics and plastic electronics knowledge transfer networks, PPE KTN⁶ in the UK and OptecNet Deutschland⁷ in Germany have also to be mentioned as successful examples due to the impact they have achieved. In fact, their experience of speaking as a single voice at national level has led to political recognition for Photonics at regional, national and European level and to specific national/regional funding programs for photonics.

The photonic clusters mainly operate at local or regional level but sometimes their activities expand to European level. This is evident for example through their participation in international R&D programmes and in European projects concerning transnational cluster cooperation. Examples include: POPSUD-OPTITEC⁸ and **Opticsvalley**⁹ that coordinated ENOC - 'European Network of **Optical Clusters**' and OMIN-NET '**Opto-Micro-Nano Innovative Network Exploiting Transversality**' projects under the EU INNOVA¹⁰ programme.

⁵ Such clusters should not be confused with research centres, centres of competence, centres of excellence or centres of expertise, which exist in several European countries, mainly providing research, training and educational support.

⁶ <http://www.ppektkn.org/>

⁷ <http://www.optecnet.de/>

⁸ <http://www.popsud.org/>

⁹ <http://www.opticsvalley.org/>

¹⁰ <http://www.europe-innova.eu>

In addition to regional photonics clusters, a number of national technology platforms have emerged since 2005 (see Table 1), following on the successful launch of the Photonics 21 European Technology Platform (ETP)¹. National technology platforms can be defined as associations of academic and public research institutes, private research centres, companies and other stakeholders involved in photonics RDI. Their main mission is:

- To fight against the fragmentation of the photonics, which often exists at national level;
- To achieve visibility and political recognition for photonics at regional and national level;
- To influence policy development at regional and national level and to ensure photonics is central to the national RDI strategy.

In Greece, Italy, Slovenia and Spain, the photonics community (academia, research and industry) has chosen to set up national platforms that copy the management and working group structure of Photonics21. The platforms include some additional working groups linked to the specific needs and expertise of each country. Members of these platforms are often actively involved in the Photonics21 ETP.

Two additional national technology platforms also appear to be in preparation in France and Sweden respectively:

- The French national optics and photonics committee (CNOP) has recently launched an initiative with the support of the French government to involve the French optics and photonics community at the European level. This can be viewed as the first step towards the creation of a French photonics technology platform.
- The Swedish photonics community is also about to launch a national technology platform with the ambition to become the voice of the Swedish photonics in contacts with the public, the government and the EU.

Slightly different is the situation in Finland which has not yet a national platform, but has several research centres in photonics¹¹ and optoelectronics^{12,13,14, 15} organised on a

¹¹ <http://www.hermia.fi/>

¹² <http://www.orc.tut.fi/index.html>

¹³ <http://www.micronova.fi/brief/index.html>

¹⁴ http://www.vtt.fi/research/technology/micro_and_nanophotonics.jsp




regional basis and tightly linked to universities. These centres provide research, training and education or dedicated services to their members with the ultimate aim of promoting innovation and technology transfer and strengthening cooperation between industry and research.


The detailed organisation and activities of regional / thematic clusters¹⁶ and national technology platforms are reported in the annex, in separate paragraphs for each country.

¹⁵http://www.nanocluster.fi/nano_en/nanoklusteri/home/about_us/cluster/north_karelia/



¹⁶ Although this is not an exhaustive list, all the clusters mentioned in this report fulfil the definition of cluster provided above.

TABLE 1: An overview of the existing Photonics innovation clusters¹⁶ and national technology platforms in Europe

Country	Organisation	Status of Development	Funding	Web-Sites
Belgium	<p>Regional thematic clusters</p> 	<p>Cluster Photonique de la Wallonie: created in 2008 as a PROMOPTIC's initiative. Operational activities have recently started. The first event of the cluster was held in Wavre in December 2009 to inform the members about the funding opportunities for photonics at regional, national and European level.</p>	<p>Approved clusters receive financial support from the government.</p>	<p>http://clusters.wallonie.be/photonique/en</p>
France	<p>Regional thematic clusters</p> 	<p>Several photonics clusters, among them POPsud-OPITTEC, Route des Lasers and Elopsys have the status of Pôle de compétitivité. Main activities are: to support SMEs and, in some cases, to support joint R&D projects of its members. Since early 2010, France is working towards the creation of a French photonics technology platform.</p>	<p>Since July 2005 the government funds the clusters recognised as Pôles de compétitivité.</p>	<p>http://www.popsud.org/ http://www.routedeslasers.com/ http://www.elopsys.fr http://www.opticsvalley.org/ http://www.rhenaphotonics.fr/ http://www.pole-ora.com/index.htm http://www.technopole-anticipa.com/</p>
Germany	<p>Regional competence networks coordinated by OptecNet Deutschland</p> 	<p>OptecNet was founded in 2000 as an initiative of the German Ministry of Research and Education (BMBF). Activities: establishing working groups to initiate R&D projects; organizing seminars and workshops and supporting study programmes; providing marketing and public relations expertise.</p>	<p>Partially funded by membership fees (50 %).</p>	<p>http://www.optecnet.de/ and links therein</p>

Country	Organisation	Status of Development	Funding	Web-Sites
Greece	National Platform PHOTONICS _{GR}	Launched May 2008. The executive board is now preparing the memorandum of understanding according to Greek law. Several ongoing activities aiming at the preparation of a roadmap and to prioritise Photonics in the official Greek national research policy.	No financial support from the Greek government.	Web-site not yet available
Ireland	Optics and Photonics Network	A "network" of optics companies, optics and photonics public research centres and national agencies. The cluster wants to enlarge its activities by creating a national network that can hopefully serve as a better interlocutor with the Irish government.	Funded by the Applied Optics group, no external funding is provided to Applied Optics.	http://www.nuigalway.ie/lighthouse
Italy	National Platform 'PHORIT'	Launched in February 2008, approved by the Italian Ministry of Education, Research & Industry. A study on the present status of the Photonics research in Italy was published in February 2009.	No funds for national technology platforms are available from the Italian Ministry of Education, Research & Industry.	http://www.phorit.it
The Netherlands	Photonics Cluster Netherlands 	Platform for knowledge transfer in Photonics. Main objectives: To stimulate Photonics Education on all levels. To advise companies on how to integrate Photonics in their products and/or production activities. International cooperation.		http://www.photonicscluster-nl.org/

Country	Organisation	Status of Development	Funding	Web-Sites
Poland	National Platform	A national technology platform is about to be created. The first meeting was held in Warsaw in January 2009. Specific events are planned in February 2010, as part of the Piano+ scheme.	Not yet recognized and funded by the Polish Government.	Web-site not yet available
Poland	Regional thematic clusters	<ul style="list-style-type: none"> • Wrocław Research Centre EIT+ • Knowledge and Innovation Community for Information and Communication Technologies • OPTOKLASTER – Mazovian Photonic Technology Cluster 	Optoklaster has no financial support from the Polish government and local authorities.	http://www.wcb.eitplus.pl/ http://www.ict-cluster.wroc.pl/en/ http://www.optoklaster.pl
Slovenia	National Platform 'Fotonika21'	Set up in March 2006, recognized at political level. Activities: regular meetings, participation in governmental committees, support to R&D projects.	Partially funded by its members and by the Technology Agency of Slovenia (TIA).	www.fotonika21.si
Spain	Southern European cluster in photonics and optics 	SECPHO was founded on 29 April, 2009 in Terrassa, Spain. It is a business-oriented cluster for the optics and photonics sector in Spain and in southern Europe. The cluster has now 40 members, mainly SMEs.	Partially funded by the Spanish Ministry of Industry.	http://www.secpho.org/
Spain	National Platform 'Fotonica21' 	Set up in March 2007. SRA presented to the Spanish government in 2009. Work in progress: a map of photonics competences in Spain.	Financial support from the Spanish government.	www.fotonica21.org

Country	Organisation	Status of Development	Funding	Web-Sites
Sweden	Towards a national platform 'PhotonicsSweden'	The platform is actually under creation. It is expected to become fully operational within 2010. Its ambition is to become the voice of the Swedish photonics in contacts with the public, the government and the EU.		
Switzerland	SLN (Swiss Photonics and Laser Network)	Network of the photonics industry and institutes in Switzerland. The cluster has 35 members: industries, universities and research centres.	SLN is supported by the Swiss innovation promotion agency CTI.	http://www.swisslaser.net/home.html
UK	National "network of networks" 	Photonics and Plastic Electronics Knowledge Transfer Network (PPE KTN) has been in operation since September 2009 following the merge of the Photonics KTN and Displays and Lighting KTN. It is considered as the UK photonics national platform. It collaborates with the photonics regional clusters.	PPE KTN is funded by the Technology Strategy Board, an executive non-departmental public body sponsored by UK government.	http://www.ppektn.org
UK	Coordination of regional/thematic clusters 	Several photonics and optics clusters operate in UK to promote Photonics regionally, nationally and internationally. They are members of the UK Consortium for Photonics and Optics (UKCPO) that was founded in 1999.		http://www.ukcpo.net and links therein to the regional clusters

3. A Critical Analysis of Photonics Innovation Clusters and National Technology Platforms



Photonics is a multidisciplinary domain that cuts across many technology areas ranging from lighting & displays to photovoltaics, telecommunicatio

ns, sensing, security and manufacturing.

The photonics world market was 228 B€ in 2005 and 270 B€ in 2008 (an annual growth rate of 6%)¹⁷. European photonics production accounts for 20.3 % of global production. This share varies a lot between the different photonic market sectors. Europe is absent in half of the Photonics markets (notably in flat panel displays and in IT products like digital cameras, CD and DVD drives, scanners and laser printers) but has a significant market share (25% to 45%) in optical communications, lighting, medical technology and life sciences, measurement and vision, production technology, and photovoltaics. There are now between 5,000 to 6,000 photonics producers in Europe, mostly SMEs, employing around 300,000 employees.

As enabling technology, photonics has recently been included among the key enabling technologies¹⁸ (KET) for Europe. According to a recent communication from the European Commission¹⁹ *'a significant part of the goods and services that will be available in 2020 are as yet unknown but the main driving force behind their development will be the deployment of key enabling technologies (KET)'*. In view of this, the Communication proposes some

actions from the European Commission and the Member States as being necessary towards achieving a wider deployment of the KETs at European level. Development of innovation clusters as well as cluster networks and national technology platforms can help Europe reach such objectives by preventing fragmentation at national level, capitalizing European R&D results, supporting SMEs in their effort for innovation and reinforcing knowledge transfer between research, industry, financial intermediaries and institutions.

In this respect some of the characteristics of Photonics regional clusters and national technology platforms reported in table 1 above and in the annex appear particularly relevant:

- The emergence of photonics clusters/platforms is driven by economic realities: a mushrooming photonics industry, made up mainly of SMEs in Europe that has great potential for further economic development but needs innovation through research.
- There is a strong need for the creation of photonics clusters/platforms in some countries, characterized by the presence of high-level research groups in public research centres and universities and strong industries but with weak links existing between the two.
- Successful photonics clusters/platforms are structured around ecosystems that often cover the whole value chain: from research to technology transfer and innovation, including specific training and educational activities; and from materials research to device and component manufacturing, system integration and to photonics end-users.

Regional clusters are particular vehicles for helping SMEs to be closer to large companies in their area as well as to the research centres, to work effectively with

¹⁷ Source: Study of Photonics²¹ ETP with OPTECH consulting, released 2007

¹⁸ COM(2009)512/3 *'Current situation of key enabling technologies in Europe'*

¹⁹ SEC(2009)1257 *'Preparing for our future: Developing a common strategy for key enabling technologies in the EU'*

the regional and local public authorities (Regional Development Agencies or Devolved Administrations) and to influence the economic and innovation policies in that area. Both regional clusters and national technology platforms can also complement the activity of the Photonics21 ETP: they provide further inputs to strategic RDI issues to promote at EU level and help Photonics21 in further advancing the photonics field by supplying it with information on the local photonics community and by providing political support at local level. Furthermore, examining the main activities of the existing photonics clusters and platforms, they can also play a catalytic role in giving support to the European Commission's policy of training and education in photonics.

In what follows, a brief **SWOT analysis** of photonics clusters and national technology platforms is carried out.

Strengths: As illustrated in the previous paragraphs and in the annex, the main ingredients of successful clusters or platforms are the following:

- Talking directly to and getting support from local, regional and national governments;
- Direct involvement of local industries and mainly SMEs, including strong support to SMEs in their innovation activities;
- Efficient networking of regional and national actors across the value chain (including industry and academia), which consists of:
 - Pooling resources together around commonly agreed RDI targets;
 - Coordination of a number of operational activities (e.g. through promotion of innovation and technology transfer activities; support to R&D projects, business consulting or financing; training and education, etc.) at regional / national level.
 - Coordination of the effective implementation of the jointly agreed regional or national strategic development plan.

Best practise examples of such qualities are the UK, Germany, France but also smaller countries like Slovenia.

Weaknesses that have emerged in the photonics clusters/platforms include:

- Difficulties for academia and industry in networking efficiently at regional and/or national level;

- Narrow focus on rather small, local or regional niche markets; limited capabilities, because of lack of sufficient local markets; lack of ambition or inability to extend targets and cooperation at national or cross-border level;
- Important actors missing along the value chain (e.g., lack of big end-users for the utilisation of innovative photonic solutions)²⁰.

Opportunities that the creation of clusters and platforms are offering to their members are the following:

- Offering visibility for photonics activities at political level: photonics recognition as a key enabling technology at regional and/or national level;
- Developing new areas of excellence in R&D that combine local strengths in academia and industry and developing regional and national employment strategies;
- Enhancing their national visibility and European dimension through a larger and easier access to European and international R&D programmes and a better role in EU policy definition;
- Teaming up with appropriate partners along the whole value chain in order to fill knowledge gaps, access to the right support in terms of necessary infrastructure, business experience and consulting and finally, helping SMEs, in particular in their innovation efforts to develop products addressing local, national or international markets.

Threats to the further development of existing photonics clusters and national platforms or to the creation of new clusters/platforms are the following:

- A poor political recognition of photonics and a weak national policy with regard to RDI in general and to innovation clusters and technology platforms in particular;
- A too fragmented national landscape for photonics;
- Reduced competitiveness and loss of market segments to competitors from Asian countries because of reduced ability to respond swiftly to changes, market evolution, etc.
- Inappropriate competition between clusters due to local government strategies versus European industrial strategies.

²⁰ It is to be noted here that as photonics is a global industry, it is rather difficult for a regional or even a national cluster to have a full value chain of companies within its geographic boundaries.

ANNEX

Presentation of the Regional/thematic Clusters and National Technology Platforms in Photonics

A.1 National technology platforms

Greece

The Greek photonics platform, PHOTONICS^{GR}, was launched in May 2008. The coordinator is Dr Stavros Pissadakis from FORTH. The platform has 23 stakeholders from research institutes and universities, large private and public sector companies and SMEs and a monitor/observer interconnection body. The platform is managed by an executive board supported by an advisory board and a monitor body.

The main objectives of the platform are: to represent Greek Photonics at national and international level, to define the national roadmap and the strategic research agenda for photonics in Greece; to enhance complementarities and synergies between the registered organisations and strengthen collaboration at national and EU level; and, to act as a lobby to the Ministry of Development for obtaining targeted and increased national funds for R&D in Photonics.

The current actions are: elaboration of a memorandum of understanding (MoU) according to the Greek legislation for a voluntary association body; building an active database of competences and market data for Photonics in Greece; consideration / review of the platform thematic priorities according to national needs/strengths and elaboration of a detailed Roadmap for Greece; prioritise Photonics in the official Greek national research policy; strengthen the representation of the platform at National and European level.

A website is not yet available. So far, the platform does not receive any support from the Greek government.

Italy



The Italian photonics technology platform, PHORIT²¹, was launched in February 2008. It is coordinated by Prof. Svelto²² from Politecnico of Milano. Several universities, public and private research centres and the main Italian photonics companies (FINMECCANICA, Centro Ricerche Fiat, Marconi-Ericsson, Pirelli Labs etc.) were involved in the founding committee. Members of the core group of this platform are also involved in the ETP Photonics21. PHORIT is one of the three platforms recently approved by the Italian Ministry of Education, Research and Industry (MIUR) but funding is foreseen for the approved platforms in Italy.

The aim of PHORIT is to fight against the fragmentation of the Photonics community in Italy, to obtain both political recognition for Photonics and a specific national funding programme. In order to reach such objectives, the platform is structured in seven working groups similar to those of ETP Photonics21. A new Working Group is devoted to photonics for environment and cultural heritage.

A study on the present status of Photonics research in Italy was published by the platform in February 2009 and the English version was distributed at the 3rd European Cluster meeting in Munich last June. According to this study the Italian landscape is characterized by high-level Universities and research institutes active in photonics and optics together with quite a strong industry in the field, such as communications, lighting and industrial manufacturing. Notwithstanding such potentiality, the Italian photonics

²¹ <http://www.phorit.it/>

²² Prof. Svelto is also the Italian representative nominated by MIUR in the mirror group of PHOTONICS21

community is still fragmented and no national and/or regional funding programme for R&D exists so far.

Poland

The optics and photonics community in Poland supports the organisation of a national photonics platform to prevent existing fragmentation within the Polish academia and to push them, along with researchers, to create strong links with the industries in Poland. To this purpose a meeting was organized in January 2009 in Warsaw. This was considered as a first step towards the launch of a Photonics National Platform in Poland. The meeting was led by Polish academia. No industrial stakeholders seemed to be involved.

The claimed aim of the proposed national technology platform is:

- To develop a national vision towards research priorities and national competencies in Photonics;
- To complete a Polish Strategic Research Agenda in Photonics and keep this updated;
- To advise national authorities (Ministries, Regional authorities) on defining their national research programmes regarding Photonics;
- To empower Polish participation in European R&D projects;
- To enhance cooperation between research organizations, industry and SMEs.

The photonics industrial landscape in Poland is characterised by the presence of a few multi-national companies in the Wroclaw region and a few SMEs. Future meetings will permit to create and strengthen the link between Polish photonics industries and photonics clusters already in existence in the Wroclaw region. The participation of Poland in the Piano+ERANET Plus²³ initiative is a very good opportunity for the further development of the Photonics community and platform in Poland.

Slovenia

The Slovenian platform, Fotonika21²⁴, was set up in March 2006 with encouragement from the Slovenian Chamber of Commerce. It is based on Slovenian industry and is focused on Photonics medical applications (dermatology, dentistry, ophthalmology)

and microelectronics. The motivation to set up a national technology platform was to support Slovenia in its endeavours to help Europe become the number one knowledge-based economic area in the world and to fight against the challenges of globalization and Asian and American competition. The platform is partially funded by its members.

Within Fotonika21 there are four working groups. The most active are: WG1 "Life Sciences and Health" and WG2 "Industrial Production and Quality". Their members are involved in operational activities with regular meetings and participation in governmental committees.

Fotonika21 is well recognized at political level and its President, Mr Vedlin, is in the workgroup "Light sensing and medicine" of the Slovenian government's Strategic Committee for competitiveness.

Since 2007, the Technology Agency of Slovenia (TIA) has played an active role in supporting technology platforms and co-financing activities such as cooperation between technology platforms and identification of research priorities of interest to several technology platforms. Fotonika21 (together with other technology platforms) has recently supported a consortium of six Slovenian companies and two academic partners to submit an R&D project to TIA related to new diode-pumped light sources for medical and industrial applications ("New light").

As outcome of the present activities, FOTONIKA21 aims to point out new and more focused national research priorities and to play an important and active role in setting up photonics-related centres of excellence with substantial government funds to further extend cooperation between industry and academic institutions in Slovenia.

Spain



The Spanish technology platform on photonics, FOTÓNICA21²⁵, was set up in March

2007. Launched by the industry and supported by the Spanish Ministry of Industry, Tourism and Trade, it aims to coordinate activities in photonics at national level. It has now more than 130 members from academia, research, and from industry, mainly SMEs. AIDO runs the Technical

²³ <http://www.pianoplus.eu/>

²⁴ www.fotonika21.si/

²⁵ www.fotonica21.org

Secretariat of the platform²⁶. The platform is financed by Ministry of Industry, Tourism and Trade, and received funding of around 79 K€ in 2008 and 57 K€ in 2009 for its secretariat activities.

FOTÓNICA21 is a mirror of ETP Photonics21. Its mission is the development of a national vision for photonics providing the following key economic sectors for national research priorities in Spain: information and communications, industrial manufacturing and quality, life sciences and health, lighting and displays, security and energy through creating the required critical mass?, increasing efforts and effectiveness of photonics RD projects and their impact on society and economy.

The activities carried out by FOTÓNICA21 are divided into five groups: research, dissemination, business support, connection to other platforms and internal coordination. The main objectives of the platform are:

- To complete the Spanish strategic research agenda (SRA) in Photonics, and keep it up to date.
The drafting of the 2009 version of the Spanish strategic research agenda for photonics was carried out by more than 70 members of the platform, led by members of the Committee of Representatives. The final version of the 2009 SRA was formally presented to the Spanish Ministry in summer 2009.
- To empower the Spanish participation in European R&D projects.
Photonics R&D activity in Spain is currently financed from the *Ministry of Industry, Tourism and Trade and the Ministry for Science and Innovation* with different Calls for Proposals in different fields of activity. No specific unit for photonics has been established up to now. Photonics in Spain is further supported by a Singular Project on nanophotonics sensors, a 3 M€ project funded by the *Ministerio de Industria, Turismo y Comercio*.
- To advise national authorities (Ministries, CDTI, Regional authorities) on defining their national research programme for Photonics.

Sweden

The Swedish photonics actors are organised around several associations and centres of excellence: SOS (Swedish Optical Society)²⁷, which is part of EOS; KISTA photonics

²⁶ sfotonica21@aido.es

²⁷ <http://www.svenskaoptiksallskapet.com/english.html>

research centre²⁸, Swedoptronics²⁹; ACREO's Partner Association³⁰ FMOF (Föreningen för Mikroelektronisk och Optisk Forskning), the Swedish industry Association for Microelectronic and Optical Research; Stockholm Photonics; and various other centres mainly created by ACREO³⁰ with diverse companies such as: AFOC (Acreo Fiber Optic Center), IMAGIC (IMAGING Integrated Components), IBBC (Institute for Broadband Communication), etc.

A Swedish technology platform in Photonics, *PhotonicSweden*, is actually being created by Prof. Fredrik Laurell (KTH - Royal Institute of Technology), Dr Pierre-Yves Fonjallaz (ACREO) and Dr Lennart Svensson (LaserTech). Its mission will be "concerted strategic planning and coordination and facilitation of industrial and research activities in photonics in Sweden".

The platform will be industry-driven and will replicate the same structure as Photonics21 (management structure + seven WGs). Its ambition is to become the voice of Swedish photonics in contacts with the public, the government and the EU. At the present moment, more than 20 companies have joined the platform.

It is expected that *PhotonicSweden* will be operational within 2010. The Swedish players are also working on the formulation of a national plan for optics and photonics to be coordinated with the European agenda.

Switzerland

The Swiss Photonics and Laser Network, SLN, is a non-profit association which serves as a network for a common vision and for the development of the photonics industry and research institutes cluster in Switzerland. It was launched by Swiss institutes active in the field of material processing with laser beam tools (photonic manufacturing and photonic toolmakers).

The mission of the SLN is to promote 'the competitiveness and the chances for growth of its members through the support of the innovation forces'.

Today, SLN has 35 members: companies, including SMEs, universities and research facilities. SLN serves the full field of photonics, including photonic manufacturing, optical input/output

²⁸ <http://www.kprc.se/Framed/index.html>

²⁹ <http://www.swedoptronics.se/>

³⁰ <http://www.acreo.se>

(imaging and photonic life sciences), optical communication, photovoltaics and lighting. SLN is supported by the Swiss innovation promotion agency CTI.

SLN's operational activities help its members to find research partners, obtain funding, and gain access international photonics networks, etc. SLN also facilitates and supports networking within the Swiss photonic cluster and establishes contacts with national and international partners and networks. It pledges to serve as a lobby for the Swiss Photonic industry.

A.2 Regional and thematic innovation clusters¹⁶

Belgium



The Cluster Photonique de la Wallonie³¹ was created in 2008 as a PROMOPTIC's initiative. It has now 39 members mainly SMEs and R&D and training organisations.

According to the Belgian "Décret relatif au soutien et développement des réseaux d'entreprises ou clusters" of 18 January 2007, approved clusters can receive financial support from the government of up to 160.000 € per year. The mission of the cluster is to communicate with the government with a single voice and to obtain political recognition for photonics as a strategic field.

The first event of the cluster was held in Wavre in December 2009, aiming to inform the members about funding opportunities for photonics at regional, national and European level. A two-week intensive training course on Entrepreneurship in Photonics was organised by the cluster and held in Brussels at the end of January 2010.

France

In France, there are several regional and thematic clusters in photonics grouped together in CNOP (Comité National d'Optique et de Photonique)³². CNOP serves as a contact point for national and European authorities and aims to promote optics and photonics in France and to coordinate national activities. In July 2005 according to

³¹ <http://clusters.wallonie.be/photonique/en>

³² <http://www.rhenaphotonics.fr/comite-national-optique-et-de-photonique-cnop.php>

the new French innovation policy, three of these clusters were recognized by the French government as a Pôle de compétitivité³³: POPSud-OPTITEC⁸, *Route des Lasers*³⁴, and Elopsys³⁵. The government funds clusters that achieve the status of "Pôle de compétitivité".



In addition to the Pôles de compétitivité, there are four main regional clusters in optics and photonics: Opticsvalley⁹, Rhénaphotonics³⁶, ORA³⁷ and Anticipa³⁸. Regarding their European dimension it should be mentioned that POPSud-OPTITEC and **Opticsvalley** coordinated European projects concerning transnational cluster cooperation under the EU INNOVA³⁹ programme: ENOC-'European Network of Optical Clusters' and OMIN-NET 'Opto-Micro-Nano Innovative Network Exploiting Transversality'.

Among their major tasks, the French photonics clusters are very committed to support joint R&D projects of their members also at European level. Particularly relevant is the activity of POPSud that has created a process to validate R&D projects and provide them with a nation-wide label to make access to funding from national agencies and local governments easier. Coordinators of labelled projects are then given support in their search for funding that is adequate for these projects. The possibility to make their projects known at European level has been recently taken in consideration by the OPTITEC directorate.

The annual event "Invest in Photonics"⁴⁰ is a unique photonics event that is organised by the Bordeaux Chamber of Commerce and is supported by the Bordeaux photonics cluster *Route des Lasers*. The event is an



'international business convention devoted to financing development projects for SMEs with high growth potential in the photonics market'. The 2010

³³ <http://www.polesdecompetitivite.gouv.fr/>

³⁴ <http://www.routedeslasers.com//index.php>

³⁵ <http://www.elopsys.fr/>

³⁶ <http://www.rhenaphotonics.fr/>

³⁷ <http://www.pole-ora.com/index.htm>

³⁸ <http://www.technopole-anticipa.com/>

³⁹ <http://www.europe-innova.eu>

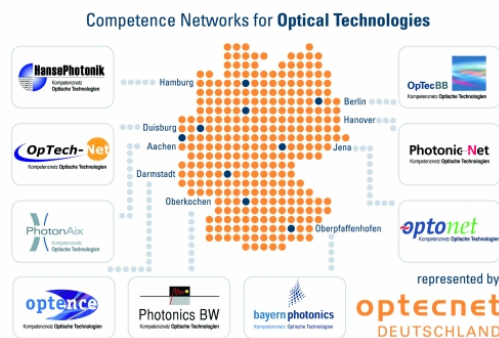
⁴⁰ <http://www.invest-in-photonics.com/>

edition is organised in close coordination with and support from ETP Photonics21.

In January 2010, the French clusters and CNOP launched an initiative with the support of the French government to involve French optics and photonics at European level, for example, through the publication and distribution of newsletters to all CNOP members. This development shows that France is now on a direct route towards the creation of a French photonics technology platform in the near future.

Germany

Seven regional competence networks were promoted by the German Ministry of Research and Education (BMBF). These regional competence networks unite large enterprises, SMEs and start-ups, both manufacturers and users, as well research and education institutions, technology transfer agencies, business development companies, investors and public-law corporations. Their common aim is to support the development and application of Optical Technologies 'made in Germany'.



These regional competence networks⁴¹ are coordinated at national level by OptecNet Deutschland e.V. , an association of the nine German regional Competence Networks for Optical Technologies (seven promoted by the government and two privately financed) and founded in 2000 as an initiative of the German Ministry of Research and Education (BMBF).

OptecNet Deutschland network is focused on the following supra-regional tasks: support and initiation of innovation processes, regional business development & marketing and start-up coaching, encouragement of co-operation and technology-transfer between research and industry, initiation and co-ordination of R&D-projects, training and further education.

⁴¹ <http://www.optecnet.de/> and links therein

The activities of OptecNet address three main areas: supporting R&D through establishing working groups of company representatives and researchers in order to initiate R&D projects and to exchange information; supporting education and training by organizing several seminars and workshops throughout the year, and also by supporting study programmes on optics-related courses; providing marketing and public relations expertise to its members and a platform for information exchange and for making contacts.

OptecNet Deutschland e.V. is partially funded by membership fees, which make up 50 % of the network's total funding. Several federal funding programmes of relevance for optics and photonics science and technology exist. In addition there are other funding programmes dedicated to optical technologies sponsored by regions.

Ireland

The optics and photonics cluster in Ireland was initiated by the National Centre for Laser Applications and the Applied Optics Research Group in the National University of Ireland, Galway⁴². It is a "network" of companies, the core business of which is optics and companies which apply optics in their processes.

This effort is funded by the Applied Optics group from revenue-generated from training and related activities. No external funding is provided to Applied Optics for the network.

This network engages a wide range of stakeholders such as established SME's in optics/photonics, medical devices and ICT sectors, start-up micro-enterprises and campus incubation companies, large multinational companies, optics/photonics research centres in universities and several national agencies (e.g. National Enterprise Development Agencies, the National Policy Agency for Science, Technology & Enterprise, National Scientific Research Funding Agencies, etc.).

Once a year, the network organises the Photonics Ireland event and also industry networking events (e.g. *Light-forum*). It is also active in training and education initiatives such as industry-sponsored PhD programs, subsidised training in the programme BESTNet Training Network etc. Industry training is also provided as 1-2 days courses and as visits by target companies to Applied Optics or vice-versa. Other activities include connecting Irish companies to

⁴² <http://www.nuigalway.ie/lighthouse/index.html>

international photonics networking events and technology transfer seminars and invitations to local companies to attend specific colloquia in Applied Optics.

The Applied Optics group is currently aiming to convene a group of stakeholders to launch an initiative aiming to establish an Irish national platform in photonics that could serve as a better interlocutor with the Irish government.

The Netherlands



The interests of the photonics cluster in the Netherlands spans a large area ranging from education and consultancy to international networking⁴³. According to the study "Photonics in Europe: Economic Impact", the Dutch photonics industry is one of the strongest in Europe together with those of the German and British.

Poland

Some Photonics clusters and centres of expertise exist in Poland such as the Wroclaw Research Centre-EIT⁴⁴, the cluster "Knowledge and Innovation Community for Information and Communication Technologies - KLAster"⁴⁵ in the Lower Silesia region and the Mazovian Photonics Technology Cluster – OPTOKLAster⁴⁶. The Mazovian Photonics Technology Cluster – "OPTOKLAster" was established in the Mazovia region in 2008. It is coordinated by the Institute of Applied Optics⁴⁷, the only industry oriented research unit in photonics technology. 58 % of Polish optoelectronics is based in this region.

Spain



In April 2009, the Southern European cluster in photonics and optics (SECPHO)⁴⁸, was founded in Terrassa, Spain. This is a business-oriented thematic cluster that aims to become a source for Spanish companies, research centres and universities to improve the competitiveness of the optics and

photonics sector in Spain and in southern Europe.

The initiative is industry's response in order to improve competitiveness and promote the region's optics and photonics sector worldwide, and to consolidate collaborative RDI. SECPHO presented its Strategic Plan to the Ministry of Industry. In this Strategic Plan, three main strategic objectives have been identified and drive the activities:

- Encourage collaborative RDI projects and increase productivity;
- Increase international presence and visibility of its members;
- Attract, improve and maintain qualified human resources.

The cluster has now 40 members, mainly SMEs. The first SECPHO exhibition and meeting was held in Terrassa in December 2009. The general assembly and end-user session was held on 26th April 2010 aiming at helping identify cross-industry innovative projects.

United Kingdom



The Photonics and Plastic Electronics Knowledge Transfer Network (PPEKTN)⁶ officially started operating in September 2009 following the merger of the Photonics

KTN and Displays and Lighting KTN. PPEKTN can be considered as the UK national platform for photonics and plastic electronics. It is currently funded by the Technology Strategy Board, an executive non-departmental public body sponsored by UK government.

Main activities of PPEKTN are: networking to stimulate new opportunities and new collaboration at regional, national, and international level; bridging technology suppliers and technology users; building collaborative R&D partnerships e.g. FP7 and UK TSB; road mapping key opportunities and emerging technologies in photonics; overseas missions in partnership with UK Trade & Investment and Foreign & Commonwealth Office; informing and influencing UK Government.

The PPE KTN is the "network of Networks" for UK photonics and collaborates with the photonics regional clusters in organising events and initiatives.

⁴³ <http://www.photonicscluster-nl.org/>

⁴⁴ <http://www.wcb.eitplus.pl/>

⁴⁵ <http://www.ict-cluster.wroc.pl/en/>

⁴⁶ <http://www.optoklaster.pl>

⁴⁷ <http://www.inos.pl>

⁴⁸ <http://www.secpo.org/>

The regional photonics clusters in the UK are:

- Northwest Photonics Association⁴⁹;
- Scottish Optoelectronics Association⁵⁰;
- Photonics Cluster UK⁵¹;
- SEPNET (South East Photonics Network)⁵²;
- Welsh Opto-Electronics Forum⁵³;
- Yorkshire Photonics Network;
- Eastern Regional Photonics Association

These clusters began with the objectives of: increasing awareness of local photonics capability; stimulating economic growth at regional level through the knowledge, manufacture and application of Optoelectronics/Photonics; providing service and support for RDI to their members; encouraging the interaction of industry, academia and research organisations in the region; and, promoting photonics in education and training programmes. These clusters are members of the UK Consortium for Photonics and Optics⁵⁴ (UKCPO).



UKCPO was founded in 1999. Its members are organisations or associations based on industry or academia at national level (e.g., Association of Industrial Laser Users (AILU); Engineering and Physical Sciences Research Council (EPSRC); UK Industrial Vision Association; Institute of Engineering and Technology; The Fibreoptic Industry Association), as well as at regional level.

The main objectives of UKCPO are: to build up the UK infrastructure in photonics, to increase the communication between the UK photonics manufacturing sector, research, academia and users and promote technology transfer; to provide a unified national body to act and speak for photonics in the UK and to coordinate training. On behalf of its members, UKCPO bids for appropriately funded projects, exerts influence and lobbies, provides support for coordination and networking and service for training and dissemination.

⁴⁹ <http://www.nwphotonics.co.uk/>

⁵⁰ <http://www.optoelectronics.org.uk/>

⁵¹ <http://www.photonicscluster-uk.org/>

⁵² <http://sepnet.net/>

⁵³ <http://www.wof.org.uk/>

⁵⁴ <http://www.ukcpo.net>

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