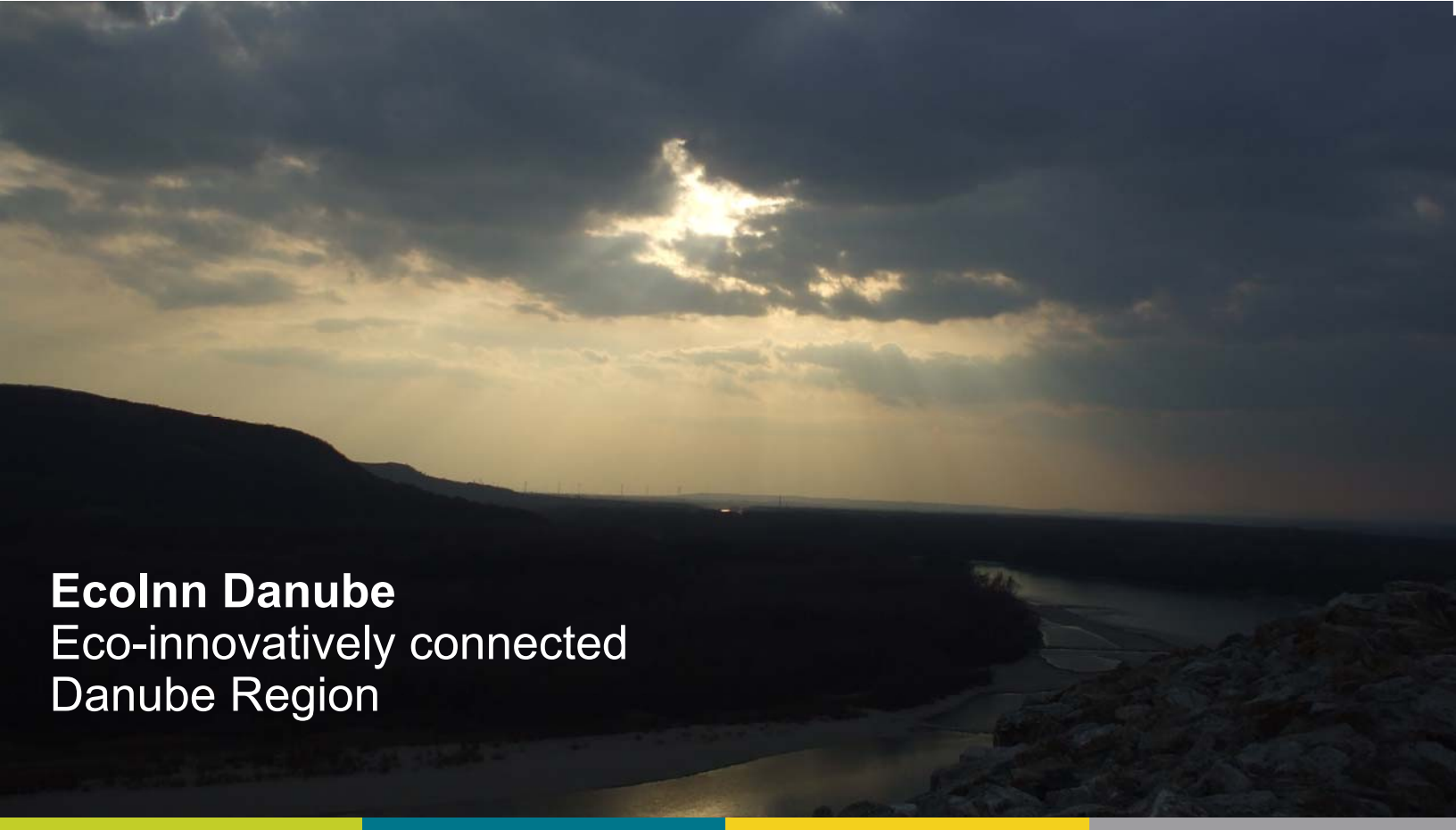


GUIDELINES

ON SUCCESSFUL TRANSFER OF ECO-KNOWLEDGE TO PRAXIS BASED ON PREVIOUS EXPERIENCE IN THE REGION



EcoInn Danube
Eco-innovatively connected
Danube Region



General objective of the project is to increase the cooperation of innovation actors in the field of eco-innovations with special emphasis on development and application of ecotechnologies in the Danube Region.

Project Specific Objectives:

- Increase transnational cooperation in eco-innovations
- Increase the match of demand and supply in eco-innovations
- Bring eco-innovation actors together

Programme: Danube Transnational Programme

Priority: Innovative and socially responsible Danube Region

Specific objective: Improve framework conditions for innovation

Start date: 01/12/2016

End date: 31/05/2019

Budget: Overall: 2 126 924,97 €

ERDF Contribution: 1 587 447,2 €

IPA Contribution: 220 439 €

www.interreg-danube.eu/ecoinn-danube

Project co-funded by European Union funds(ERDF, IPA)



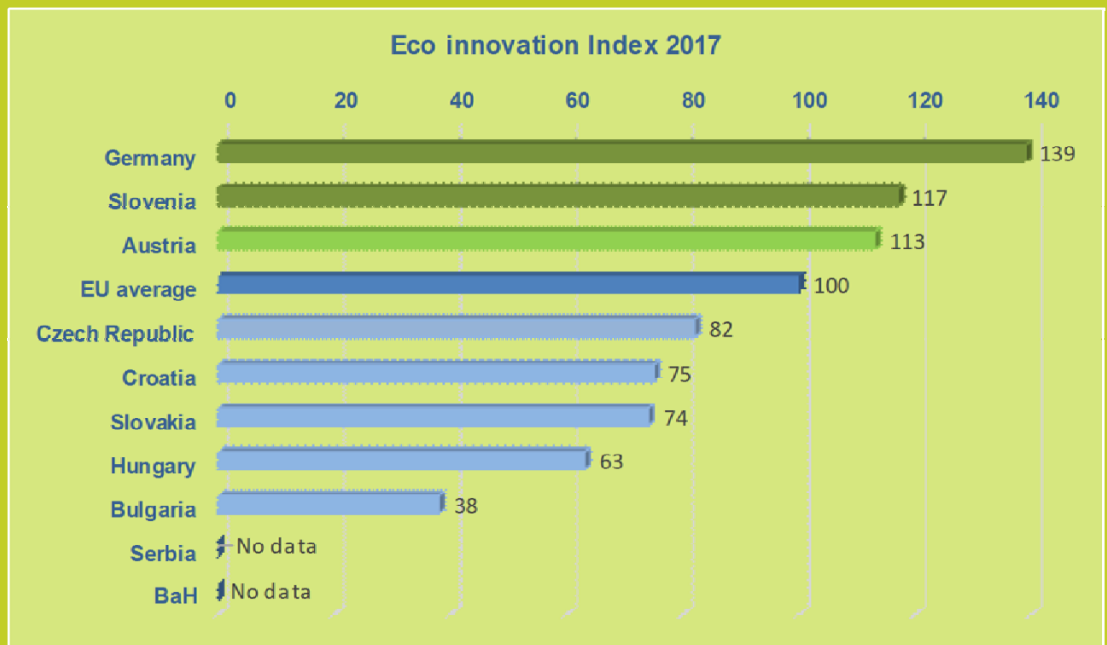
Humanity is increasingly feeling negative changes in the environment. Through our activities, we have changed our environment and have disrupted natural ecosystems. We have polluted both surface and underground water, planted monoculture plant communities, created surface landfills, we polluted the air and engaged more and more ecosystems.

Notwithstanding the obvious consequences of our actions, many populations do not consider the change to be necessary. Fortunately, there is an increasing number of communities that are aware of the consequences of their actions and are trying to minimize their impact on the environment. Increasing numbers of ecologically conscious people are putting pressure on local authorities and policy makers to create effective regulation. The regulations themselves, however, will not be enough to save the environment. Innovations of recent technologies and new procedures will need to be created and applied. Innovation process is always challenging. The outcome of the process is often very uncertain and there are numerous reasons for that. Inventors don't talk much about them in public, except in cases where innovation finally gets into commercialization phase when inventors admit that path to innovation is hard and full of disappointments. Many innovation attempts that failed do not "go public" but the fact that more innovation attempts fail than succeed is widely known. Despite the global nature of the problem, everyone has to start from their region.

Our project is dedicated to the Danube region. The area is a geologically, politically and culturally very diverse, with a turbulent history. Each country of the region has a different spectrum of environmental challenges, but many of them are common. For this reason, it is even more important to share the successful solutions within the region.

Innovations need support. From the point of view of innovation support and according to eco-innovation index, We can divide the countries of the region into ecoinnovative leaders, average ecoinnovative performers and countries catching up with innovators (see the table below). According to the latest ratings (2017) among the ecoinnovative leaders belongs Germany and Slovenia. Austria is the only country in the region that belongs to average innovators group. The Czech Republic, Croatia, Slovakia, Hungary and Bulgaria belong to countries with a lower index. Serbia and Bosnia and Herzegovina, as non-EU members, are not included in the Eco-innovation Scoreboard. However, according to the information available, they belong to countries with weaker support of eco-innovations.

Generally, countries with a high eco-innovation index are characterized by sophisticated support policies and projects with greater international impact. On the contrary, in countries with low innovation support, there are less ambitious projects addressing, in particular, the problems of a particular region. Despite the significant differences in the past, the Danube region has succeeded in successfully applying a number of technologies and ideas to the market. In this document, we chose various successful innovations in the different countries of the region. We believe that a positive example will help the promising innovator with their own eco-innovations.





Overview

Austria has the second highest intensity of R&D of all EU member states in terms of allocated GDP. All forms of eco-innovation activity are very well represented, particularly from the side of companies that are introducing environmentally relevant innovations within their internal business processes, as well as in terms of output of patents and publications. Despite the comparatively high level of awareness in the field of ecology amongst the general public, accompanying strong political support at the local/regional and national levels, Austria has the largest ecological footprint (per-capita) amongst all the Danube region countries. Austria's ambition is to join the group of Innovation leaders by 2020. As outlined in the National Innovation Plan, achieving this ambition will require a strategic evaluation of completed projects. We selected one of these projects as a successful example.

National Innovation Plan

Since the end of summer 2016, Austria has been working on the implementation of its finalized Open Innovation Strategy that was drawn up under the leadership of Federal Ministry for DIGITAL and ECONOMIC AFFAIRS and the Ministry for Transport, Innovation and Technology and with the technical support of innovation consulting GmbH and Community-based Innovation Systems GmbH. Open innovation is a two-way process that supports selective sharing of research results and transfer of knowledge. More recent data proves that innovation partnerships are increasingly gaining importance in Austria. In the last two decades the number of Austrian firms with innovation partnerships has more than doubled, rising to 22% of all companies or 51% of all companies engaged in innovation. Collaborating for innovation is especially pronounced between industry and science, in particular with universities. Austrian firms work twice as frequently (22%) with universities than the EU average (11%). Even though, there is no particular policy programme specifically dedicated to eco-innovation or circular economy in Austria to date, a number of measures and initiatives have been introduced by different government bodies in recent years. They are devoted to eco-innovation and/or circular economy.

Successful case of eco-innovation :

Green Tech Valley: ECO World Styria

ECO World Styria, the cluster of the Green Tech Valley that supports renewables and cleantech companies in their strategic goals, focusing on innovation, knowhow and new markets, is one of the leading examples of such initiative that has received support from European Commission's Europe INNOVA Project, and is a participant of the ECOCLUP ('Eco-innovative cluster partnership for growth and internationalisation'). The cluster is part of the European Cluster Collaboration Platform. ECO World styria, contingent on three "I"s of business model Innovate, Internationalise, Initiate, supports companies with R & D project development, the concise Technology-Radar magazine, open innovation tools and the Green Tech Innovators Club with free space for new ideas. The project received investment worth EUR 888 000 with the EU's European Regional Development Fund contributing EUR 444 000 for the 2007 to 2013 programming period.

Green Tech Valley: ECO World Styria

The cluster is home to 186 companies of which 179 are small and medium scale industries. With over 20 global technology leaders as participants, Green Tech Valley companies have grown faster than the global competition. In 10 years, they have more than tripled the sales of environmental products and services and the number of employees has more than doubled. In 2015 alone, the companies have jointly initiated 24 innovation projects, generated 1158 ideas including innovations that have already become established in the market, such as the ATT Powerfilm and the LED Booster from EcoCan. In particular, the technology-oriented small companies such as ensowa (organic cleaning of oil-contaminated soils without dredgers), EcoCan (even higher light output in LED luminaires) and pro aqua (water disinfection with diamond electrodes) more than doubled sales. In addition to being the driving force behind innovative initiatives of the companies, the ECO World Cluster has generated more than 20 000 jobs in Styria.

Conclusion

Open Innovation is aimed at eliminating knowledge and knowhow barriers between organisations, sectors and disciplines to generate new knowledge and to develop new products, services or processes. It also means that civil society, science, industry and public administration work together share perspectives, generate (also non-conventional) knowledge and thus drive more radical innovations. ECO World Styria presents a good example of cooperation. The main technology fields of the cluster's companies are energy management and smart grids concentrating on S3 EU priority areas; power generation / renewable sources and other professional, scientific & technical activities. The main support that is provided under this framework are: Access to public support, Facilitation of collaboration between members, Facilitation of cross-sectorial cooperation, Trend-scouting (Ideas for innovative projects) and Innovation Management / Support of innovation processes. Green Tech Research Alliance involving 1 200 researchers or the Innovators Club, an innovative initiative undertaken with support from this cluster, endeavors to bring together industry and academia to tackle and solve R&D challenges.

Guidelines:

- An example of ECO World Styria has shown us the advantageous of using support of an organization that brings together several innovative companies.
- Innovation-based clusters can be a suitable environment for start-ups and the transfer of eco-innovations. Companies can more easily participate in partner projects and apply their technologies.
- Startups can benefit from a reduced annual membership fee. For example, in the case of ECO World Styria, the annual fee for startups is 12 € / first year, substantially lower than the cheapest partners fee (750 €/year)



Overview

In July 2015, the Council of Ministers of BiH, Government of Republika Srpska (RS), and Government of the Federation of Bosnia and Herzegovina (FBiH) adopted a joint program of structural reforms known as the reform agenda. In regards to eco innovations Bosnia and Herzegovina is still not on the development level where focused programs for development of eco innovations exists. Programs that exist are providing support to development of innovative products or introduction of new technologies but are not primarily focused on eco aspect of doing business. EU accession process brings towards Bosnia and Herzegovina set of rules and regulations that has to be adopted focusing on energy efficiency, pollution, waste management which will improve policy framework and set some standards in mentioned fields as well as create some new markets in Bosnia and Herzegovina.

Successful case of eco-knowledge transfer: CAPABAL

CAPABAL aimed to enhance the capacity, in particular professional knowledge, skills and access to networks and emerging research, of forest and natural resources governance, policy, and economics young future leaders in research, policy making, and forest management in the Western Balkan region in order to facilitate the achievement of international standards of sustainable forest management and governance as well as promote economic development. As the Western Balkan countries work toward preparing for EU membership, policy reform, economic reform, and governance reform are critical to comply with EU directives and legislative requirements. CAPABAL targeted early stage researchers (ERS), future policy leaders, and young resource managers employed in regional institutions ranging from forestry faculties and research institutes to natural resources ministries, forest enterprises, businesses, and NGOs.

CAPABAL's activities (including meetings to develop broad networks learn from others, STSMs to develop deep professional relationships and Training Schools to provide information to larger groups) and the associated exposure to international researchers, policy makers, and resource managers as well as European and international policy processes had immediate effects on the improvement of governance, policy, and economic reforms in the Western Balkan countries. In addition, strengthening personal relationships among future leaders in science, policy, and practice within the region supported the necessary trust and capacity for strong science-policy-practice communication. One important objective of this Targeted Network was development of a Vision document on the Future of Balkan Forest and a Strategic Research Agenda to address those challenges and opportunities identified in the vision.

R & D funding by the state

Bosnia and Herzegovina is at the bottom of the list of countries in Europe with 0,2% of GDP invested in R&D, which is significantly lower than the average of EU – 2,4%. It is evident that R&D capabilities in both the public and private sector are weak and R&D undertaken at universities has a weak relevance to industry. Therefore, base for development of innovations is a fairly poor. The field of technological development is characterized by the low awareness of decision-makers about the importance of innovation and the necessity of using modern technology. At the same time, there are a small number of large companies investing in innovation. Also, a marginal government funding does not initiate and encourage R&D which in conjunction with much bigger problems that private sector face, results with a situation where R&D activities are left aside

Conclusion

In Bosnia and Herzegovina, support for innovation and its subsequent transfer has a number of obstacles. Poorly defined legislative framework, low level of communication and interconnection between academia, research and industry, low government investment in support R&D, missing up-to date statistical data are only few of them. Despite this difficult situation, compliance with environmental regulations as defined in relevant EU legislation has been achieved to a certain extent. It is necessary to accelerate the completion of the harmonisation process with EU legislation in the area of environmental protection.

Technological development is negatively affected by low awareness of decision-makers about the importance of innovation and the necessity of using best available technology as well as their low motivation for carrying out necessary reforms. Despite the above-mentioned complications, the country has managed to make several interesting innovative projects. Suitable example is CAPABAL or the project of energy efficiency, which is implemented by Ministry for environment and ecology and with funds from World Bank. Both examples were international projects to support the development of the Western Balkans countries.

Guidelines

- Based on the lessons learned from a successful example, it should be noted that there is little chance of receiving support from the state. However, it is possible to obtain support from both the World Bank and the EU funds
- Past examples show that it is much more likely to obtain support if Bosnia and Herzegovina joins an international consortium



Overview

Bulgaria has undergone a significant transformation over the past three decades. It has changed from a highly centralized, planned economy to an open, market-based, upper-middle-income economy securely anchored in the European Union (EU). Today, Bulgaria faces the two interrelated challenges of raising productivity and addressing the country's rapid demographic change. Higher productivity growth is critical to accelerating convergence, as Bulgaria's income per capita is only 47% of the EU average, the lowest in the EU. Productivity will need to grow by at least 4% per year over the next 25 years if Bulgaria is to catch up to average EU income levels and boost shared prosperity. In terms of innovation support, Bulgaria is among the least investing in the EU with 0.75% GDP



Successful case of eco-knowledge transfer: ECHOES

This case is about transfer of knowledge in the field of Sustainable eco-construction under the EU project called ECHOES (Eco-design for Construction of Habitat Optimising Energy for Sustainability) implemented under programme the European Commission Specific EEN actions in Bulgaria. The ECHOES project was implemented in cooperation between business support organizations from six different countries, Sweden, United Kingdom, Iceland, Bulgaria, Greece and Spain. All organizations are members of the Enterprise Europe Network. The transfer of eco-knowledge was implemented through various activities such as: studies, identifications, conceptions, trainings, matchmaking event for companies and other. The most relevant one was the Preparatory study on Eco-design in Bulgaria. The study focuses on the Tools used in Eco-design in Bulgaria. The targeted group were manufacturers of Sustainable Constructions and more specific manufacturers of: windows, doors, isolation, heating, walls, roof landscaping, flooring, chimneys and ICT panels. Popularization of the project outputs went through newspapers, advertising on websites, scientific papers, and leaflets.

ECHOES in Bulgaria

Eco-design is an approach to design of a product with special consideration for the environmental impacts of the product during its whole lifecycle. If we think of waste products as an opportunity, we can start to find solutions that close the loop between production, consumption and decomposition.

The Preparatory study on Eco-design in Bulgaria had a major role in describing the eco-design tools used in the country, which are the laws and rules in the eco-design branch, the trends, certification and the economic impact of the Eco-design. The study showed that the main tools used in Eco-design in Bulgaria are investigation of motivation factors for eco-design and product selection/eco-design potential questionnaire.

Main action and activities of the project which focused on transfer of eco-knowledge

- preparatory study on Eco-design in sustainable construction in all project countries.
- Identification, conception and use of eco-design tools;
- Training on eco-design for environmental experts in the project;
- Training on eco-design for EEN members and consortium members;
- Organization of awareness raising activities for SMEs;
- Matchmaking event for companies in sustainable construction;
- Provision of specialized individual consultations to local SMEs, trainings, audits;
- Popularization of the project;

Conclusion

The main findings based on ECHOES project show the lack of eco-design solutions in Bulgarian SME's. One of the main problem for many construction companies is the coverage of the standards for environmental, quality and safety of products. In the period of crisis facing the construction companies there are new requirements and challenges. Despite that the project managed to overcome a lot of obstacles so it can be efficient. ECHOES was actively involved in the Eco-design Trends in Bulgaria: low energy prefabricated houses, passive houses, heating, renewable energy sources. Recommendation of improvement in transfer of eco-knowledge in Bulgaria is mainly making the relevant target group more active. Making them believe that eco solutions are needed and could make their business and live better.

Guidelines

- As in the case of other countries in the region with a lower eco-innovation index, R&D support in Bulgaria is weak and supported mainly by EU funds.
- Chosen successful case showed us, that it is necessary to be part of bigger international consortium to obtain funds for eco-innovation transfer



Overview

Croatia is a heavily regulated country with many weaknesses cumulated over 20 years. After a protracted six-year recession, Croatia's economy returned to growth in 2015. Upon joining the EU in mid-2013, Croatia gained access to the EU internal market, which helped connect part of the economy to global value chains. In addition, tourism has been experiencing historic highs in recent years. Yet these factors are not enough to deliver pre-crisis growth rates. Large administration, heavy tax pressure to entrepreneurs inhibit economic growth. Structural reforms are slow and insufficient to push growth of economy. This makes investments in research and development harder and riskier than in other countries. Despite the slightly pessimistic environment, positive examples of technology transfer have been found. One of them is presented in this document



Successful case of eco-knowledge transfer: Eco-Sandwich

The project Eco-Sandwich – an innovation in construction sector that was a result of a long-year tradition of co-operation between university and private sector. ECO-SANDWICH® stands for ventilated prefabricated wall panel utilising recycled construction and demolition waste and mineral wool produced using innovative and sustainable Ecosse® technology for reduction of primary energy consumption in building stock. Main objectives of the project included encouraging the re-use and recycling of construction and demolition waste (CDW). Promote substitution of conventional thermal insulation materials by mineral wool produced using innovative and sustainable technology, leading to a reduced environmental impact. Promote implementation of prefabricated, energy efficient products to enable reduction of primary energy consumption. Reduce embodied energy, embodied carbon and production of by-product wastes. Possibility of ECO-SANDWICH® panel recycling at the end of its life. Modernise the production line making it capable of producing the ECO-SANDWICH® as well as to develop marketing strategy for the introduction of a new, eco-innovative product. Development of a marketing strategy for the introduction of an innovative, environmentally friendly and sustainable product. Set up a mechanism to exploit it across Europe

Support and funding

ECO-SANDWICH® – Energy Efficient, Recycled Concrete Sandwich Facade Panel was a project funded by the European Commission within the framework of CIP-EIP-Eco-Innovation 2011 Programme. The project was also supported by 16 relevant institutions in Croatia, including two relevant Ministries (Republic of Croatia, Ministry of Environment and Nature Protection and Republic of Croatia, Ministry of Construction and Physical Planning), City of Koprivnica and City of Samobor, associations of relevant stakeholders, international energy agencies (ABEA, SOFENA), University of Ljubljana, Faculty of Architecture, the Regional Environmental Center in Romania and in Croatia. Assuring the support from various stakeholders was a major reason for the success of this project. All supporters contributed to the success of the project, either through promotion on various levels and interest groups, financial support and political support.

Promotion and Commercialisation

Promotion and marketing were major components of the project. Partners acknowledged that to get a traction for the product, they had to find ways to persuade the market actors that innovation is indeed usable and deliver on its promised features and parameters. To do that, additional resources needed to be engaged to build a pilot building by using the innovative product. First ECO-SANDWICH® house was built in the City of Koprivnica as a socially-supported housing construction in the A+ energy standard. The application of ECO-SANDWICH® panels was accomplished in the close cooperation with the Agency for Socially-supported housing construction of Koprivnica, as non-profit organisation that plans and builds dwellings as socially-supported housing constructions. Later on, ECO-SANDWICH® was also used in the newly built kindergarten in Sarvaš (Osijek-Baranja County).

Conclusion: The share of industrial production in GDP continuously decreases in last years. This influences the capacities for research and development, and consequently innovations. Further-more, the economic recession that lasted for nearly 6 years decreased capacities in all sectors. Until recently, eco-innovation as rather horizontal concept was not given a special attention. In last couple of years there were some attempts to create networks, dedicate time on traditional media channels and develop various promotional and marketing activities to increase the visibility and emphasize importance of eco-innovation. However only a few organized promotional projects became sustainable. A support mechanism for an end-to-end process of innovation does not exist and activities are fragmented among many different stakeholders and institutions. That is one of the reasons why inventors rarely organize events, workshops, create clusters/networks that cover the whole process of innovation. Some good examples like the State of Green25 could be a model for establishing a platform that would support companies and research institutions in transfer of knowledge. Structural funds could be a strong impetus in establishing such an infrastructure. However, other measures should also follow, and one of most important is to offer competitive salaries to the most successful individuals in eco-system.

Guidelines:

- Success of presented case was strongly dependent on huge cooperation of many partners. This situation is rare, but not impossible. Innovator should try to find as many partners as possible to help transfer their innovation
- Universities in Croatia are more and more successful in applications for Horizon 2020 programme, government decided to strongly support public universities and research institutions in a hope to make them key stakeholders in boosting innovation to reach national goal of R&D spending to 1.4% of GDP by 2020 with financial support for R&D infrastructure. Innovators should look for incoming support programs published by universities



Overview

Czech Republic represents country with healthy economy and medium size market where new technologies can be applied. Investment in innovation has been increasing from both the public and private sectors. However, the national innovation rating is has still not reached the EU average. Czech economy is still growing and the R&D sector is getting more and more attention. With the increased public and private funding supported by cooperation of the two, it may be a question of time until Czech Republic further develops a broader hub of experts, increasing its merit in the international community and becoming the innovative leader together with the strongest economies in the region.

Successful case of eco-knowledge transfer

The project name is *Sustainable Process Integration Laboratory* carry out several eco-knowledge transfers. The project, established at the **NETME Centre** (Faculty of Mechanical Engineering at the Brno University of Technology), is guided by an international research team. The project has been drafted and developed at the NETME Centre and subsidized from the Operational Program Research, Development and Education. The project commenced on 1 February 2017, and will last five years. The SPIL project will initiate cooperation with four renowned international universities: the University of Manchester from the UK, University of Maribor in Slovenia, Universiti Teknologi Malaysia in Johor Bahru, and Hebei University of Technology in Tianjin, China. The main objective is to establish an international, competitive research facility, and to simultaneously provide both unique and practical knowledge which will promote an increase in efficiency of processes and power industries, in other words knowledge that will help minimize the so-called greenhouse, nitrogen, ecological and water footprints. The financial support is from the subsidized from the Operational Program Research, Development and Education (Czech Republic) and co-funded by EU.



NETME Centre

NETME Centre is a regional R&D centre built at the Faculty of Mechanical Engineering, Brno University of Technology, Czech Rep. The Centre was established in 2010 and quickly became a modern R&D centre. The NETME Centre especially strives to innovate mechanical engineering and machine industry in the Czech Republic. The Centre further helps promote expert knowledge so that the mechanical engineering disciplines may thrive and be sustainable in the future. The Centre focuses on four technical disciplines: aircraft industry, automobile industry, power industry and manufacturing technology.

The promising eco-knowledge is the methodology for shape and physical properties optimization of phase change materials for energy and process engineering. The main part of the project is focused on simulation and numerical investigation of phenomena in energy and process engineering. Based on the simulation optimization methods are used in order to get the optimum state for the particular problem. The successful case of transfer of eco-technology was using the Phase change materials in solar collectors. The results prove significant energy savings based on numerical simulations and experimental measurement. Now negotiations are underway with manufacturers of solar collectors in the Czech Republic.

The eco-knowledge transfer is targeted mainly on public sector with a focus of civil engineering (greenhouse, smart house ...). Other way how eco-knowledge is transferred is hosting annual conferences since 2017

Conclusion

The presented example of eco-innovation is based on research at the research centre. The resulting innovations can then be transferred as a technology or as a product of the newly created spin-up company. The great advantage of such a form of development is the use of university infrastructure by talented young scientists or students. With a high degree of environmental awareness among young people, it is highly likely that a multiplicity of necessary eco-innovations will be created. Besides the fact that eco-knowledge technology can bring significant energy savings, the main issue is to convince the producers to change their manufacturing processes in order to fulfil the meaning of eco-technology. For this reason, it is necessary to convince producers with the greatest possible amount of scientific evidence, economic analyses of feasibility and, last but not least, a good marketing strategy. Another option is to persuade policy-makers, with empirical evidence, about the need to introduce regulations to reduce the burden on the ecosystem

Guidelines:

- Innovations arise mainly at universities and their scientific centers. They have infrastructures that can be used to create new eco-innovations.
- Universities and technology transfer centers often organize public lectures where it is easy to get an overview of new trends in eco-innovation or technology transfer



Overview

Germany is the largest and with over 82 million inhabitants, the most populated country in the region. The huge market is the engine of the strongest economy reaching GDP over 4 trillion euros. A strong growing economy also allows a high rate of public as well as state investment to support innovation and R&D activities. Strong environmental awareness of the population is constantly force policy makers to create regulations and goals that ultimately supports the application of innovations. Germany supports practically all types of eco-projects. From supporting small innovators and talented students up to transnational projects. We selected one of these projects as an succesfull example in our do-cument



Successful case of eco-innovation transfer: IZES gGmbH

In the specific case of the German partner IZES gGmbH involved in the project ARBOR. The active ties and tools developed in the project comprehend a pilot project focused on the valorization of organic waste and sewage sludge in Saarland, the development of three regional strategies for the utilization of organic residues, an sustainability assessment, including an analysis of the environmental impacts (Life Cycle Assessment) and the economic implications related to use of biomass in the particular concepts. In close cooperation with the state institutions, the IZES gGmbH developed three regional strategies for the utilization of organic residues. The strategies were developed under consideration for the utilization of ecologic, economic and legal-policy aspects. The local stakeholders and main decision makers of the pilot projects were involved in the strategy development for the implementation in the federal state Saarland. The German partner IZES gGmbH was furthermore responsible for ARBOR's sustainability assessment, including an analysis of the environmental impacts and the economic implications related to use of biomass in the particular concepts. The results of these studies, together with the comparison of the political and legal framework on bioenergy utilization, were included in the development of strategies for the transfer and implementation of pilot solutions to the different regional contexts across North-Western Europe.

Regional strategies developed by IZES gGmbH:

- Development and accompaniment of implementation of a holistic strategy for a sustainable regional organic utilisation under consideration of climate protection effects, efficiency criteria, acceptability and aspects of a regional added value
- Development and accompaniment of implementation of sustainable utilization model for the area "municipal greenery cuttings" and "landscaping conservation material out of extensive agriculture" at the best-practice example model region biosphere reserve Bliesgau (integrated land-use concept)
- Development and accompaniment of implementation for a sustainable sewage sludge strategy under consideration of current solution scenarios including a defining of practical measures

The project ARBOR

“Accelerating Renewable Energies through valorisation of Biogenic Organic Raw Material”

ARBOR aimed to foster and accelerate development and use of biomass in North West Europe. The project provided useful intelligence where transnational cooperation may help to address individual country supply and demand issues around biomass. The project has focused on the sourcing of biomass, improving conversion efficiencies and improving regional capacities for biomass utilisation. Overall, the project aimed to help to reach the achievement of targets set in National Renewable Energy Action Plans for renewable energy by 2020. These were expected to result in a 34% increase by 2015 and a 69% increase by 2020. ARBOR brought together key stakeholders involved in the various stages of the biomass supply-chain. These included academics, local authorities actively piloting novel experimentation with biomass, and manufactures who assist in exploring new methods and processes.

Conclusion

The main findings, based on the pilots, investments and actions, have been clustered and summarised in five Case Study Reports. Additionally, strategic guidelines for transferring the biomass use concepts to other regions were developed based on local case studies and the particular fields of application of the project. Although the activities performed in the project demonstrate a high quality and scientific value and can be considered as successful, it is difficult to assess the real impact they have produced in the regions involved in the project. In the specific case of the ARBOR project, the information collected as well as the demonstration activities performed in the pilot definitely constitutes a rich source of information on biomass that is still actual and relevant and public available today. Nonetheless the real sustainability of all actions performed in the project is with the information available online difficult to assess. It is furthermore difficult to assess if the large investment made in the ARBOR project (EUR 7.361.958,83) has really produced long-term results and has significantly contributed in shaping the strategy of local municipalities on the use of biomass as a renewable source of sustainable energy.

Guideline:

- This example demonstrates the need to closely monitor the long-term plans of the local government, the region or the EU. EU support organisations prefer projects that help address long-term goals
- Consequently, it is advisable to actively seek international partners with suitable specialisation and prepare a project to support the region's long-term objectives
- One of the ways to find suitable partners in a consortium is to look at actively on-going and completed support projects and to contact partners involved. Successful investigators are experienced and are a guarantee of quality cooperation



Overview

Following the severe 2008 recession, Hungary's economy has expanded strongly, based on export recovery and macroeconomic stimulus. However, Hungary's income per capita remains among the lowest in the EU area. This partly reflects a low level of productivity and weak business investment in capital and human resources. While growing in recent years, R&D intensity in Hungary, at 1.35% of GDP in 2017, is still significantly below the EU average, due to a lack of both private and public investment. Hungary has a strong industrial sector. However, business innovation capacities are mostly concentrated in foreign-owned companies and some large domestic companies. The national priorities are strongly influenced by EU programmes, especially structural funds.

Successful case of eco-knowledge transfer: JKH greENERGY Ltd.

The presented case as a success story of eco-innovation, as it involves stakeholders and experts in the field of renewable energy from multiple fields to create a zero emissions continuous energy scheme to those that have not had access to the electrical grid system. The transfer of technology generated from a private company to a public company involving academic side.

The aim of the development was to be able to provide an access to the more than 6000 regional areas in Hungary that are currently not served by any major electrical grid or utilities company. The innovation and aim was not only to serve and embrace these areas into a modern society but that the technology serves the communities and the environment in an ecological manner, in other words it creates the least amount or Zero CO2 emissions while upholding the eco-innovation concept.

Technology description

The system is a containerized, off grid electricity producing and power storage system capable of supplying electricity to a household throughout the year without interruption at 3 x 16 Amp, max 10kWh/day. The structure of the container is a 20 feet long and is insulated ventilated and heated, there are 36 pieces of MPPT PV modules (300Wp) optimized and equipped with a microprocessor, with an output of 300WP each. The combined area of the module is 76m² in an 9x5 structure arrangement. The weight of the structure is 1024 kg. The combined output of the modules is 10,8 kWp. According to computer models run for the territory of Hungary, the estimated and expected average annual yield of the PV system is 14 MWh. The outside electrical connector box has both a two phase and a three phase connection outlet. The container is insulated with 20cm thick rock-wool lining. Further the inside of the container is divided by an explosion proof and safe partition wall made of steel. In the months when there is very little sunlight available, the system is able to produce and store energy from its photovoltaics system in the form of hydrogen energy, which can at a later time be released and utilized when little or no sun activity is available.

Support

JKG greENERGY Ltd. received funds of HUF 10.000.000 from the Economic Development and Innovation Operational Programme (Central Hungary Operative Program (KMOP) and Economic Operative Program (GOP) in 2011. This program aims to stimulate the economies of less developed regions in Hungary in the programming period 2007-2013. Its most important priorities are the competitiveness of small and medium sized enterprises, research and innovation, and employment. The program also aims to develop the tourism industry, enterprises' energy efficiency, and information and communication technologies. Moreover it will stimulate the use of financial instruments to cover other objectives, like increasing renewable energy production and improving the energy efficiency of households and public buildings.

Conclusion

The aim of the development was to be able to provide an access to the more than 6000 regional areas in Hungary that are currently not served by any major electrical grid or utilities company.

The implementation of eco-innovation in subsequent Operative Programmes and further appearances in other government policies could boost the presence and the dynamics of the sector in Hungary and specific subsidies to increase the share of eco-innovation as an industry might have positive long-term effects on both employment and the quality of life. In order to achieve this there is subsequent need for a more efficient and better supported implementation of the eco-knowledge transfer processes. In the future there could be more successful organizations who are capable of improving the eco innovation of the country and accomplish more successful transfer of eco-knowledge.

Guidelines

- The country on a national level is just starting to realize that R&D, innovation and SME's need to be considerably invigorated in order to compete and excel with both Eastern and Western economies while realizing potential sustained economic growth. The current and past levels of innovation and R&D opportunity in Hungary have been limited due to the fact that governments have had very little input into this sector of the economy and society as a whole.
- From the selected successful example, follows that it is necessary to search for an appropriate Operative Programme program to get support



Overview

For decades, Serbian economy has facing big challenges. High unemployment rate, obsolete technology in manufacturing sector, very low level of patent applications etc. results with its uncompetitiveness in general. This way, eco-innovation issue is not a priority for the Government so far. As a consequence, there are many areas in eco-innovation field where Serbia has no official statistics. This is a huge disadvantage leaving no room to create any reliable policy in relevant field. As a major problem in uptake and then support eco-innovation with ultimate goal to transfer it into the practice, is lack of awareness what eco-innovation really is, in various social sectors such as: governmental, business and households as well. In terms of innovation support, Serbia spend 0.93% of GDP on R&D support, witch is bellow EU average, but higher than spending of Slovakia, Croatia and Bulgaria

Successful case of eco-knowledge transfer: ECO FLAME 3

Environment Friendly Combustion System for Sawdust In Function of Space Heating – ECO FLAME 3 Energy, its effective use and ecological aspects of its generation remain challenging and huge area for innovations. In Serbia, like in many countries subject to seasonal climate conditions, heating issue is one of the most important in public institutions, business and households. For some small businesses, particularly those where business and private premises are heated by same system, heating issue becomes priority in energy cost reduction. This fact became the starting point in designing the innovation and the selling point of the presented innovation and its successful transfer to practice. In operating his business for almost 30 years, the innovator faced high costs related to heating. In last 6 years, he started to research heating systems and energy sources, particularly renewables. After systematic work in research, design, testing and improvements, the third generation of Environment Friendly Combustion System for Sawdust In Function of Space Heating – ECO FLAME 3 was created.

During subsequent period he solved technical issues related to unstable flame of the burner, cost effectiveness, ability to use various fuels for energy generation, feeding, maintenance and ergonomics. The ecological properties of this innovation are usage of waste material as energy source, and usage of wood based materials (renewables). The innovation is commercialised and offered to potential clients as blueprints for do-it-yourself building, or as a final product with set up by innovator. In both cases, the innovator takes the responsibility for providing advices during system operation (free of charge) and for repairs in cases of the system malfunction (charged by working hours). The next phase of innovation development is orientated to its full commercialisation. In order to achieve that, the innovator started to work on technical characteristics official testing (determining the burner power, nominal efficiency, safety issues etc.) in order to get necessary documentation/approvals to place the system on regular market and possible modifications in order to get the „eco sign“.

Environment Friendly Combustion System for Sawdust In Function of Space Heating – ECO FLAME 3

Created innovation had big impact inside the company, because the owner decided to change his business orientation, his marketing and institutional approach.

Possibility of adjusting the system for larger companies or even heating plants for smaller cities, created innovation could be a good example of successful eco-technology transfer.

Conclusion:

When it comes to eco-innovations, the main conclusion is that eco-innovation issue in Serbia is in “shady” area. In order to enlighten it and bring it to public agenda as a first step it is necessary to create and/or integrate numerous indicators that miss or at least aren't adjusted to the methodology used in EU countries. As a consequence of that, there is no systematic approach in dealing with eco-knowledge at national level, and it seems that any achievement in this area is a result of individuals as innovators/entrepreneurs or as enthusiastic ones in some institution that deals with eco issue. Available domestic R&D funds for investments in this area are based in favor of basic, as opposed to applied science, and are weakly linked to the needs of the business sector, disconnected from areas of revealed competitive advantage. As a general conclusion could be, that Serbia is missing systematic approach in eco-knowledge transfers. Modest achievements in eco-innovations and eco issue at all, on macro level, are serious signal that there is urgent need to create some strategy in this area.

Guidelines

- Based on the lessons learned from a successful example, it should be noted that there is little chance of receiving support from the state or from foreign funds. In addition to financing private-sector innovation, there is an opportunity to find an investor through agencies
- Serbia has several business support agencies. They include the following agencies: Development Agency of Serbia (DAS), Chamber of commerce and industry of Serbia (CCIS), Chamber of commerce of the province of Vojvodina, Science Technology Park Belgrade (STP), Business Technology Incubator of Technical Faculties Belgrade (BITF), Serbian Innovation Fund, Business Incubator Novi Sad and so on.



((SENSONEO))

Overview

The Slovak Republic is one of Europe's most dynamic economies. Yet, along with other post-communist countries, the country still faces major challenges in the field of innovation and in moving towards a knowledge-based economy. Business and public R&D remain well below the EU average. Although gross domestic expenditure on R&D has grown steadily, investment in R&D as a share of GDP is below EU average. Publicly financed R&D reached 0.55% of GDP in 2014, which is 27 % of the average in EU economies. Improvements in governance and reforms to the public research sector have continued in recent years. Fifteen EU funded strategic projects to create university parks and research centres were completed in 2015 and will help to fill the gap in R&D infrastructure.

Successful case of eco-knowledge transfer: SENSONEO

Sensoneo provides smart enterprise-grade waste management solutions for cities and businesses to cost-efficiently manage the waste lifecycle and improve the environment and well-being of people. Through its unique smart waste management technology, Sensoneo is redefining the way waste is managed. The solution combines in-house produced ultrasonic Smart Sensors that monitor waste in real-time with sophisticated software, providing cities and businesses with data-driven decision-making capabilities, and optimization of waste collection routes, frequencies and vehicle loads.

The Sensoneo solution for smart waste management was developed in 2014. Since then, this Slovakia-based tech company has managed to make an incredible journey from highly demanding R&D; testing, and patenting processes to first installations, happy customers and global expansion. The Sensoneo smart waste management solution is currently deployed in 76 locations on 4 different continents.

Promotion and Commercialisation

Sensoneo smart waste management has gained interest in cities and business around the world and the solution has been installed in numerous locations across Europe, North America, South America, Middle East, Australia and New Zealand. In Slovakia, they manage waste management in the Nitra region or for the Hospital in Veľký Krtíš. The company became a Startup Awards 2015 finalist and was nominated for the Via Bona 2016 award in the Green Company category, and the IT project of the year in the IT GALA 2016 poll. Sensoneo also received the Golden Ant 2016 award in the Innovative Solution category, Mission award 2017 for working on innovations that tackle important social challenges, Innovation of the Year award 2017 from Ministry of Economy and prestigious Microsoft Award in Public administration & Smart city category.

Slovakian support structure

Slovakia has a system of Technology Transfer (TT) implemented in years 2010-2015 by SCSTI (Slovak Centre of Scientific and Technical Information) as a project funded through the structural funds (National infrastructure for supporting technology transfer in Slovakia – NITT). Within this project, a national system of support of the technology transfer was developed and a centre of technology transfer was established. This centre supports the local TT offices placed at R&D institutions. SCSTI and 8 institutions (R&D, universities) also established an association - the National Centre of Technology Transfer which manages the patent fund, supports the standardization in technology transfer, and defines the rules of procedures how the support is provided. Direct support is mainly provided to the public R&D institutions; SMEs are supported mainly by counselling and search in patent databases.

Conclusion

We assume that for a startup company, besides finance, advertising is important. It is very important to choose direct communication and approach to companies in the process of advertisement and marketing of the scientific products. Innovators like Sensoneo can use different schemes or programs for support. Slovakian support is not used only for eco-innovations but for all technology transfers. Eco-innovations support is not their primary interest. Despite presence of different possibilities, many innovators have problem to identify the most suitable one. This leads to unsuccessful attempts to obtain support in the wrong schemes and to extend the realization of the idea. Also presenting of innovative ideas long time can cause to increase a risk of imitation from other group. In many cases, there is also a problem in the length of approval of the aid application and huge bureaucratic requirements. This problem occurs mainly in the case of State aid. Our recommendation is more to promote the national technology transfer center to the public. It is also necessary to exert pressure on the state authorities responsible for approving the aid in order to speed up the approval process.

Guidelines:

- Startups in Slovakia can apply for support which consists of tax benefits as well as direct start-up financing (15 000 € per startup)
- Innovator can use services of national technology transfer centre, which is represented in CVTI (Slovak Centre of Scientific and Technical Information) and the 8 largest universities
- As in other EU member countries, Innovators can apply for European projects such as H2020



Overview

Slovenia is smallest country from danube region with population about 2 millions inhabitants. Country has a high share of private economy with a liberal market and it is highly integrated in European and international markets. Several companies from Slovenia have in the past developed innovative products for their own manufacturing processes, which represent good practices in green business also on the international level. Besides private companies, local public authorities and non-governmental institutions have taken an important role in promoting sustainable living and eco-innovative development. Several local decision makers have taken the transition towards sustainability very seriously and have taken the initiative to make the necessary steps, in a large extent by accessing EU structural and cohesion funds. We selected one of projects as an succesfull example in our document

Successful case of eco-innovation transfer:

PIPISTREL / MAHEPA (Modular Approach to Hybrid Electric Propulsion Architecture)

Pipistrel is the world's leading company in the field of development, design and production of ultralight aircraft, which are mostly sold on foreign markets, and at the same time one of the leading companies in Slovenia, which includes environmental protection in every step of its production and its existence. The company's goal is to produce ecologically sound aircraft in a environmentally-friendly business building. The innovative culture and vision, as well as a commitment towards minimising environmental impact has been the companies modus operandi from its inception. This is clearly reaffirmed within the companies own research and development Institute - a scientific and cultural centre, which includes an in-house laboratory for applied technology and research, a development department of Pipistrel, a lecture room for cooperation and knowledge exchange with universities, a multipurpose space - Visionary, new prototype aircraft and several departments of the aircraft manufacturing itself. In the building of the Institute with an area of 2.400 m², the most advanced technologies in the field of efficient use of energy and renewable energy are incorporated. The building is completely energy self-sufficient, which was achieved using the following design solutions and systems.

The affirmation of the strong cooperation with academia and research and development institutions is evident with **the international European MAHEPA project, in which the company have one of the key roles**. To this end, the company together with the partner consortium organized for e.g. a three-day hackathon- a creative marathon is taking place in Slovenia. With the project, the company wishes to encourage students to explore and propose innovative solutions when designing new aircraft with hybrid-electric drives. Students explored a number of topics, like how the hybrid-electric airplane's cab should look like, what the efficiency of the airplane's shape should be, how to get the new innovative airplane accepted by pilots and travellers as safe, comfortable and interesting for traveling. A group of students who, at the discretion of the internal commission, proposed the best solution, received a paid three-month traineeship at Pipistrel in Ajdovščina as the main prize. Hackathon is a type of event that brings together creative individuals in a multi-day intensive collaboration.

The MAHEPA project

The MAHEPA project (Modular Approach to Hybrid Electric Propulsion Architecture) will develop future propulsion technology for small airplanes, capable of using small local airports to provide micro-feeder service to larger hubs and eliminating gaseous emission impact on surrounding communities. The project will develop new modular components for powering two four-passenger hybrid electric airplanes scheduled to fly in 2020. One will be equipped with a hybrid powertrain utilizing an internal combustion engine and the other will use fuel cell hybrid powertrain, which will demonstrate the possibilities for zero-emission flight. Developed components will be integrated, installed and tested in actual flights which will provide useful data about benefits and challenges of hybrid electric powertrains for aviation, in line with future emission reduction scenarios. With respect to the transfer of eco-knowledge, the project is focused on young talented persons from mechanical, electrical, chemical and IT engineering, students or otherwise

Conclusion

From the standpoint of eco-knowledge transfer to actual marketable products, the approach utilizing innovative forms of co-creation events is the most effective way to bring eco-innovation to the market. As such, co-creation events such as **summer schools or development design hackathons with industry should be included as elective courses** that can be credited with ECTS (European Credit Transfer System) within formal education programs. A stronger focus of diploma thesis and dissertations from universities should be put on subjects directly addressing industry requirements. Maintaining and expanding communication channels between students and industry such as Pipistrel has been promoting from the start, will be beneficial to both the industry as well as the quality of formal education. Actions such as those carried out within MAHEPA have a strong potential for exploitation, replication and scalability. High-tech companies like Pipistrel have substantial demand for qualified, talented experts from engineering backgrounds. Profiles such as this are in high demand, especially now in times of the upward phase of the economic cycle. Accessing and engaging the human resource pool of universities directly, by means of co-creation events where students work with specific problems of the industry will remain important.

Guidelines:

- Selected case of eco-technology transfer presents the opportunity to show ideas and abilities by attending summer schools and hackathons. Actions such as this help young talented students find a place in high-tech firms where they can gain important experience.
- Summer schools and hackathons are co-organized by universities, science parks, or technology transfer centers. It is therefore appropriate to search for information here.

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