



Policy Brief

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Outsourcing and Offshoring R&D in Green Technology to Emerging Economies: Opportunities and Challenges for Europe

Key messages:

- Research and development (R&D) is increasingly taking place at a global scale across a geographically dispersed set of interlinked units and activities.
- An element of the globalization of R&D is the outsourcing and offshoring of R&D to emerging economies, such as India, China and Brazil by multinational companies (MNCs) based in Europe.
- Outsourcing and offshoring of R&D involves opportunities as well as challenges for European MNCs and their home country regions and economies.
- There is scope for policy interventions aimed at assisting European MNCs in reaping the full benefits of R&D outsourcing and offshoring.

The CARISMA Project started in February 2015 and received funding from the European Horizon 2020 programme of the EU under the Grant Agreement No. 642242. CARISMA intends, through effective stakeholder consultation and communication to ensure a continuous coordination and assessment of climate change mitigation options and to benefit research and innovation efficiency, as well as international cooperation on research and innovation and technology transfer (<http://carisma-project.eu/>).



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Authors

Ulrich Elmer Hansen (uleh@dtu.dk)

UNEP DTU Partnership

Cecilie Larsen (cecila@dtu.dk)

UNEP DTU Partnership

Thomas Hebo Larsen (thelar@dtu.dk)

UNEP DTU Partnership

Project Coordinator

Heleen de Coninck

Radboud University

Project Dissemination

Wytze van der Gaast

JIN Climate and Sustainability

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Radboud Universiteit





1 Introduction

The reduction of greenhouse gas (GHG) emissions has become increasingly urgent in order to limit the global average temperature increase to well below 2°C above pre-industrial levels.

This was most recently highlighted in the Paris Agreement, which recognized that the development and diffusion of climate technologies, such as renewable energy technologies, should be a central element in achieving this goal.

Europe has taken a leading position in relation to reducing GHG emissions by adopting ambitious policies for the development and diffusion of renewable energy technologies.

However, research and development (R&D) in new technologies is increasingly taking place on a global scale. This globalization of innovation not only involves collaboration in R&D activities across OECD countries in the traditional Triad (Europe, Japan and the US), but increasingly also involves the relocation of R&D and value-adding innovative activities to emerging economies, such as China, India and Brazil, by multinational companies (MNCs) from Europe.

Indications of this trend are discernible, for example, in the increasing number of foreign-owned R&D centres in China, which appear to have increased from 700 in 2005 to around 1,250 in 2009. Also, the number of co-invented patents involving partners from China and India, in international R&D collaboration projects conducted by European companies, has increased significantly.

In the biotechnology industry, relocated R&D activities from European parent companies to local R&D units in emerging economies include laboratory tests and enzyme development.

This relocation of R&D to emerging economies is generally encouraged by the accumulation of innovative capabilities in firms and industries and the availability of skilled and cost-efficient labour over recent decades in emerging economies.

The implications of this globalization of innovation activities for (i) the involved European firms and industries; (ii) the European host economies and regions in which they are embedded; and (iii) the development and diffusion of renewable energy technologies in Europe and beyond, are currently not well understood.

This policy brief will present findings from ongoing research conducted by the UNEP DTU Partnership (UDP) on the globalization of R&D in green technology as part of the Horizon 2020 CARISMA project.

With a view to provide information to relevant decision-makers concerning the adoption of initiatives to support the development and diffusion of renewable technologies in Europe, we focus on describing emerging opportunities and challenges related to R&D outsourcing and offshoring in green technology to emerging markets by European-based MNCs (see Table 1).



Table 1: Definitions of international R&D outsourcing and offshoring to emerging economies

International R&D *outsourcing* involves placing parts of the innovative tasks conducted by European MNCs to foreign (external) contract vendors.

International R&D *offshoring* involves the establishment of foreign-owned R&D centres by European MNCs to conduct high-value company functions, such as design and engineering.

Sources: Olsen (2006), Contractor et al. (2010).

The policy brief provides information for the consideration by European and national policy-makers and planning agencies in order to fully reap the benefits of R&D outsourcing and offshoring.

The preparation of the policy brief is based on results obtained from:

- (i) a review of the academic literature on R&D offshoring, reported in Larsen (2016)¹;
- (ii) a workshop on R&D offshoring, held in March 2016 in Copenhagen, engaging key representatives from industry, policy and academia (see <http://carisma-project.eu/>); and
- (iii) in-depth interviews carried out with representatives of case study firms in Denmark and India as part of the CARISMA project.

2 Opportunities in R&D outsourcing and offshoring

Our findings suggest that there are a number of economic benefits for European MNCs that can be derived from the outsourcing and offshoring of R&D activities to emerging economies.

These benefits include:

- Increases in productivity and innovative performance
- Reduced costs of innovation activities
- Access to new and emerging markets
- Economic growth and job creation
- Access to multiple and diverse knowledge pools.

R&D outsourcing and offshoring therefore can play a defining role in sustaining the competitive advantage of European MNCs. The available evidence also suggests that direct benefits for individual MNCs may spill over to create additional increases in productivity and employment in the local and regional economies in Europe in which the MNCs are located.

European MNCs generally appear to invest in R&D activities in emerging economies by following two different strategies: the 'home-base exploiting strategy', and the 'home-base augmenting strategy'. The characteristics

¹ The reference list comprises key papers reviewed in Larsen (2016), which have also been used to prepare this Policy Brief.



of the two strategies are explained in Table 2.

Table 2: Strategies for investing in R&D activities in emerging economies

	Home-base exploiting strategy	Home-base augmenting strategy
Role of local R&D units	Involves establishing local R&D centres with a primary mandate to adapt existing products, services and technologies to local market conditions and preferences.	Local R&D units are mainly established to contribute to the generation of new knowledge to be integrated into the ongoing (global) innovation activities of the MNC.
Push factors	Driven mainly by market-seeking investments with the aim of taking advantage of the often large market potential in emerging economies by increasing the profits from the sale of existing products.	The shortage of qualified labour in the home markets of European MNCs (especially of scientists and engineers) has created a global race for talent.
Pull factors	Being closer to the end- markets and customers is believed to enable a faster response to changing market conditions and the consequent need for product-related R&D.	Involves tapping into local knowledge pools and talent and the often relatively low cost of skilled labour, especially in technical disciplines in emerging economies, and especially in green technology industries.

Following the home-base exploiting strategy allows European MNCs to access new market opportunities by establishing R&D centres with a mandate to adapt existing products and technologies to local markets and user preferences.

Adopting the home-base augmenting strategy enables European MNCs to benefit from access to a local pool of talented and skilled labour, especially in engineering, where there is generally a shortage in Europe. As R&D is a cost-intensive process, the outsourcing and offshoring of R&D allows European MNCs to conduct R&D in a more cost-efficient manner, due to the lower labour costs of R&D personnel in emerging economies.

Often the mandate that European MNCs give to local R&D units expands over time, from exploitation to augmentation as their ability to perform increasingly complex R&D tasks grows. In most cases, however, local R&D units are typically not involved in the development of cutting-edge technologies at the global frontier, as this is mostly carried out by the European MNCs in their home countries.

This means that local R&D units in emerging economies are mainly responsible for conducting low- and medium-tech R&D, while core R&D related to the most strategic activities of the parent firm is retained in-house in Europe.

Sources: Lewin *et al.* (2009), Idea Consult (2014), Noailly and Ryfisch (2015).



3 Challenges in R&D outsourcing and offshoring

Our findings indicate that R&D outsourcing and offshoring does indeed involve challenges, not only for individual MNCs and firm managers, but equally so for European and national policy-makers and planning agencies.

A key challenge for firm managers is to overcome different types of "hidden" costs of R&D outsourcing and offshoring. These costs are related to the operational challenges in managing a globally dispersed network of R&D units and activities, which may lead to generate lower outcomes than anticipated in terms of productivity and performance.

To that end, the establishment of appropriate means of communication and interaction mechanisms is a key element in ensuring the effective coordination and integration of knowledge developed across cultural, geographical and language differences.

Especially for MNCs that are seeking to include emerging market R&D units in their innovation activities globally, mechanisms to coordinate and integrate knowledge effectively become crucial.

For European and national policy-makers and planning agencies, the outsourcing and offshoring of R&D to emerging economies involves a risk of 'hollowing out' the knowledge base in the home countries of European MNCs, thereby undermining the traditional position of

technological leadership, including green technology.

The relocation of employment in R&D to emerging economies may also involve the loss of knowledge-intensive (white-collar) jobs in high-technology sectors in Europe, especially at a time of economic downturn accompanied by widespread job losses and/or stagnating wages.

Lastly, the weak intellectual property rights (IPR) regimes in many emerging economies may reduce the ability of European MNCs to capture a return from R&D conducted in those economies. The weak IPR regimes may also increase the risk of new competitors emerging from these markets as a result of strategic knowledge revealed through linkages with and spill-over from European MNC R&D units.

4 Conclusions and recommendations

While the bulk of R&D activities is (still) carried out in Europe and the traditional Triad, innovation is increasingly undertaken at a global level involving the relocation of originally co-located innovation activities across distances.

With the rise of emerging economies, especially China and India, as new global players in innovation, we are observing an increase in outsourcing and offshoring of R&D to such countries by MNCs from Europe.

This particular feature of the increasing globalization of R&D seems likely to



increase in the years to come and may be considered to reflect broader processes of ongoing global economic integration.

This policy brief emphasized that outsourcing and offshoring of R&D involves opportunities and challenges for European firms and industries and their home economies and regions, which has implications for the development and diffusion of renewable energy technologies in Europe and beyond. Advantages of R&D outsourcing and offshoring include increases in productivity, reduced costs of innovation activities and access to new and emerging markets.

Given the identified challenges, there seem to be scope for European and national policy makers and planning agencies to identify and adopt suitable interventions aimed at assisting European MNCs in capturing the benefits of R&D outsourcing and offshoring.

To help reducing the hidden costs of operating R&D projects across geographical and cultural distances, such initiatives could, for example, include government-funded training programs in doing business abroad and global R&D management.

To avoid hollowing out the knowledge base and the loss of knowledge-intensive jobs in Europe related to R&D outsourcing and offshoring, the adoption of policies aimed at increasing the supply of scientists and engineers in the European home countries could be considered. This could, for example, involve increasing investment in technical education and public-funded R&D programs.

An alternative role for government could also be considered to assist MNCs in taking advantage of R&D outsourcing and offshoring. This could, for example, be in the form of the establishment of local centres providing various types of consultancy and extension services to European MNCs in the emerging economies in question. The development of a policy framework at the national and/or European level for actively supporting European MNCs in R&D outsourcing and offshoring could also be considered.

National and European policies may have a limited role to play in avoiding IPR violation in emerging economies and some degree of knowledge spill-over might be considered an unavoidable part of the R&D outsourcing and offshoring conducted by European MNCs.



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