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## Editorial

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**Biographical notes:** Christien Enzing is a Senior Researcher and Consultant at the Innovation Policy Group of the Netherlands Organisation for Applied Scientific Research (TNO) in Delft, the Netherlands. She has been active in biotechnology policy studies for the past 25 years. Her research also includes technology foresight and assessment studies, policy monitoring and evaluation, and economic outcome and impact studies in the field of life sciences and their application in industrial sectors.

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This editorial introduces this special issue of the *International Journal of Biotechnology* on 'Policy approaches towards supporting biotechnology across Europe: current trends and outcomes'. This special issue draws upon the results of the BioPolis project, which provides an inventory and an analysis of national policies that stimulate biotechnology research, its exploitation and its commercialisation by industry across Europe (Enzing *et al.*, 2007). The inventory part of the BioPolis project includes a detailed overview of the national and regional policies and policy instruments of 32 European countries for the period 2002–2005. These include the 15 old EU member states, the ten member states that joined the European Union in May 2004 (Hungary, Poland, Czech Republic, Slovak Republic, Slovenia, Estonia, Latvia, Lithuania, Malta and Cyprus), the two which joined in January 2007 (Bulgaria and Romania), two countries which are in accession negotiations (Croatia and Turkey) and Iceland, Norway and Switzerland. National reports were prepared for each of the 32 countries in the study. They aim to provide a complete overview of the national policies and, more specifically, the policy instruments and their funding that national governments have intentionally designed to foster biotechnological innovation. Although the availability and comparability of data on biotechnology policies for the new member states and accession countries are still rather poor, BioPolis provides a first and in-depth overview of the biotechnology policy-making systems and policies in these countries. The Final Report of the BioPolis project has analysed the national reports to assess the effectiveness of biotechnology policies by exploring the relationship between national policy approaches towards biotechnology and the performance of the respective national biotechnology innovation systems.

The BioPolis project tries to fill the gap that general innovation studies do not cover, by providing insight into how policy-makers have tried to complement generic innovation policies with technology-specific (in this case biotechnology) policies and instruments. Also, it is one of the first studies that try to explain national performance in a specific technology by the mix of policy instruments that national governments have used to foster that specific technology. Overall, the BioPolis final report and the 32 national reports can provide an important input to national policy learning processes and contribute to the development of more efficient policies across Europe. It may also have relevance to other countries. Throughout this special issue, the authors of the report have tried to make the results of the BioPolis project available for an academic and policy audience, while addressing a number of research questions which are relevant for the development of the field of science, technology and innovation policy studies.

The data collected in the BioPolis project provide a rich source which – in combination with data collected in a number of related projects (Enzing *et al.*, 1999; Reiss *et al.*, 2003; 2005) – has been used by the authors to address a set of important issues relating to biotechnology policy-making in Europe. The BioPolis project is an update of the Inventory report (Enzing *et al.*, 1999) that provided an overview of national and regional policy instruments for the period 1994–1998; it covered the 15 old member states and also Iceland, Norway and Switzerland.

On the basis of the two data sets (BioPolis and Inventory), Enzing *et al.* analyse the dynamics in national biotechnology policy-making in the 15 old member states over a relatively long period of time (1994–2006). They investigate how the changes in policy mixes used since 1994–1998 relate to the development of biotechnology in the last decade, from an activity that focused mainly on R&D into a mature set of technologies that is applied in many industrial sectors. They try to understand these dynamics in national policy-making in terms of first and second generation policies.

Reiss and Dominguez Lacasa compare the performance of the EU-25 with the USA on a number of indicators of biotechnology research and commercialisation, both at the aggregate level of the EU-25 and disaggregated for individual European countries. The data show a clear correlation at the national level between scientific and commercial performance and allow a clustering of European countries into high-performing, mid-performing and low-performing groups. Their analysis does not provide evidence that the USA has a clear leading role in terms of scientific performance in biotechnology. A major conclusion that can be drawn from their analysis is that the best European countries perform better than the USA.

The article by Enzing and Reiss addresses an important issue: how to evaluate the effectiveness of public policies in biotechnology. They have applied an input-output approach. In this approach the set of national policy instruments and their related funding in the period 1994–1998 is considered as the input and the scientific and commercialisation performance in biotechnology measured for the period 2000–2004 is the output of a national biotechnology innovation system. They found that some countries have policy mixes that include generic and biotech-specific policy instruments which support both the science base and commercialisation activities. Such policy mixes correlate with higher performance levels.

The last two papers of this special issue deal with the group of new member states in Central and Eastern Europe (CEE). The paper by Senker *et al.* is the first paper to provide an overview of the biotechnology policy-making systems and policies in the ten new

member states. The paper provides in-depth information about policies, policy instruments and performance in biotechnology. One main finding is that CEE countries are not adhering to their earlier pattern of specialisation, but are converging towards the EC-25 pattern, which focuses on health biotechnology. The authors argue that it would be wise for the CEE countries not to concentrate their limited resources for biotechnology on a few specialised areas of health biotechnology only. They are more likely to gain advantage from their investments in public biotechnology research if they support biotechnology research relevant to strong economic sectors within their countries.

In the last paper, Dominguez Lacasa makes a comparative, systematic assessment of the four CEE countries with the leading biotechnology performance: the Czech Republic, Estonia, Hungary and Slovenia. She considers their biotechnology capabilities, as well as policies aimed at promoting these capabilities. The paper describes the major differences of the national innovation systems in these four CEE countries, as well as the challenges for latecomers in the field of biotechnology. It identifies policy strengths and policy gaps in their biotechnology upgrading process in the period 2002–2005. The four CEE countries have identified biotechnology as a priority area and have developed comprehensive policy profiles from an innovation system perspective. However, biotechnology-specific programmes and policy instruments that foster university-industry collaboration, develop human resources and promote international networking are lacking in the policy profiles of the CEE 4, varying from country to country.

I hope that the papers presented in this special issue will spur other researchers to examine this important area of the policy dynamics, performance and policy effectiveness of generic and technology-specific policies.

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Each article of this special issue has been reviewed anonymously by at least two expert reviewers. In closing, I wish to thank these reviewers for the sound evaluations and helpful advice they provided on the papers submitted for this special issue.

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