Observations from International Bio-Economy Strategies

Paul O’Reilly

College of Business
Dublin Institute of Technology
Funding Acknowledgement

Bio-Éire Project funded by the Department of Agriculture, Food and the Marine’s Competitive Research Programme
Overview

- Overview of current policy and strategy activity
  - European Union
  - EU countries
- High level observations on strategy approaches, challenges and implementation issues
Approach

- Desk-based research
- Thematic review
- High level observations and learning points
Why look at other national bioeconomy strategies?
THE FIVE MAJOR ELEMENTS OF STRATEGY

Where will we be active?

ARENAS

How will we obtain our returns?

ECONOMIC LOGIC

How will we get there?

VEHICLES

What will be our speed and sequence of moves?

STAGING

How will we win in the market place?

DIFFERENTIATORS

SOURCE:
“Are you sure you have a strategy?”
Donald C. Hambrick and
James W. Frederickson
Academy of Management Executive 2001
Vol. 15 No. 4
Purpose of strategy is to provide direction

Which way is that?
National strategies are relatively new – too early to know outcomes…

- Austria: Bioeconomy Background Paper (2013)
- Australia: Bioenergy – Strategic Plan 2012–2015
- Canada: Blueprint beyond Moose and Mountains (2011)
- Denmark: Agreement on Green Growth (2009)
- Finland: Sustainable Growth from Bioeconomy (2014)
- Great Britain: UK Bioenergy Strategy (2011)
- South Africa: Bioeconomy Strategy (2013)
- USA: National Bioeconomy Blueprint (2012)
Bioeconomy – where to start?

Bio-based economy

Biotech

Green economy

Circular economy

Bioenergy

Green industry

Renewable resources

Green growth

Biomass
One size does not fit all…

- Great deal of variation
  - Political aims
  - Prevailing industry and economic profiles
  - Natural resource portfolio
  - Scientific platform

- Bioeconomy is not a single sector
  - Food, forestry, marine, etc..
  - Sector specific interventions required
  - Reflected in national strategies

- Different approaches
  - Economic, scientific, political
Bioeconomy in the EU

On 13th February 2012 publication of the first strategy of this kind for Europe:

“Innovating for Sustainable Growth: A Bioeconomy for Europe”
EU Bioeconomy Strategy

- Bioeconomy Strategy aims at focusing the EU’s common efforts in the right direction to
- “help Europe to live within its limits. The sustainable production and exploitation of biological resources will allow the production of more from less, including from waste. The Bioeconomy will also contribute to limiting the negative impacts on the environment, reduce the heavy dependency on fossil resources, mitigate climate change and move Europe towards a post-petroleum society” (EC, 2014a).
EC: “Innovating for Sustainable Growth: A Bioeconomy for Europe” - broad strategy

New technologies emphasised in the Communication are biotechnology, nanotechnology and ICT.
EC Bioeconomy Action Plan

Pillars

- Investing in science and skills
- Reinforcing policies and partnerships
- Boosting bioeconomy markets and their competitiveness
The Bioeconomy Strategy and Action Plan

INVESTMENTS IN RESEARCH, INNOVATION AND SKILLS
- Ensure substantial EU and national funding for bioeconomy and innovation
- Increase the share of multi-disciplinary and cross-sectoral research and innovation
- Promote the uptake and diffusion of innovation in bioeconomy sectors; create feedback mechanisms on regulation and policy
- Build the human capacity required to support growth and integration of bioeconomy sectors

REINFORCED POLICY INTERACTION AND STAKEHOLDER ENGAGEMENT
- Create a Bioeconomy Panel to enhance synergies and coherence between policies; foster participation of researchers, end-users, policy-makers and civil society
- Establish a Bioeconomy Observatory and develop forward-looking and modelling tools
- Support the development of regional and national bioeconomy strategies
- Develop international cooperation to jointly address global challenges (e.g. food security, climate change)

ENHANCEMENT OF MARKETS AND COMPETITIVENESS IN BIOECONOMY SECTORS
- Provide the knowledge-base for sustainable intensification of primary production;
- Promote the setting up of networks for integrated and diversified biorefineries; establish a PPP for bio-based industries
- Support expansion of new markets; facilitate green procurement for bio-based products
- Develop science-based approaches to inform consumers about product properties
EUROPEAN BIOECONOMY STRATEGY

**DG Research & Innovation***
- Horizon 2020

**DG Agriculture & Rural Development***
- Common Agricultural Policy (CAP)
- EIP Sustainable and Productive Agriculture

**DG Maritime Affairs & Fisheries***
- Common Fisheries Policy (CFP)

**DG Environment***
- Roadmap Resource Efficient Europe
- Waste Directive
- Biodiversity Strategy

**DG Enterprise***
- LMI for Bio-based Products
- Key Enabling Technologies
- Industrial Policy Flagship Initiative

**DG Energy***
- Renewable Energy Directive
- "iLUC Proposal"

**DG Regional Policy***
- Smart Specialisation Strategy

**DG Climate Action***
- Roadmap Low Carbon Economy by 2050

**Joint Research Centre**

**DG Trade**

**DG Education & Culture**

* Co-signatories of the European Bioeconomy Strategy
Global stakeholders

- Despite global challenges (food security, climate change, etc.) EU and OECD only supranational stakeholders with bioeconomy strategy


- Intergovernmental Panel on Climate Change?
How is the bioeconomy managed in various EU Member States?

- Integrated concepts and strategies with different levels of integration:
  • Austria, Belgium, Denmark, France, Netherlands, Denmark, Norway, Sweden, Finland

- No integrated strategies BUT specifically Bioeconomy-related policies and activities:
  • Czech Republic, UK, Italy

- More or less no specific activities and policies, but acknowledgement of its political importance and potential:
  • Estonia, Greece, Lithuania, Slovenia, Portugal
## How is the bioeconomy managed in various EU Member States?

<table>
<thead>
<tr>
<th>Country</th>
<th>Current state of play</th>
</tr>
</thead>
<tbody>
<tr>
<td>Austria</td>
<td>Bioeconomy research initiative undertaken by research, science and economy has started. Stakeholder conference.</td>
</tr>
<tr>
<td>Flanders</td>
<td>‘Bioeconomy in Flanders – the vision and strategy of the Government of Flanders for a sustainable and competitive Bioeconomy in 2030’. Action plan shortly.</td>
</tr>
<tr>
<td>Spain</td>
<td>Task force to work out a national bioeconomy strategy under the leadership of the Ministry of Economy.</td>
</tr>
<tr>
<td>Italy</td>
<td>Currently examining potential to develop a strategy on the bioeconomy for Italy for the end of 2015.</td>
</tr>
<tr>
<td>France</td>
<td>Biotechnologies and Bioresources included as one of 11 top topics in industrial investment programme. Bioeconomy features in new RTD strategy. Comprehensive national policy strategy on the bioeconomy under the auspices of the Ministry of Agriculture.</td>
</tr>
</tbody>
</table>
How is the bioeconomy managed in various EU Member States?

<table>
<thead>
<tr>
<th>Country</th>
<th>Current state of play</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scotland</td>
<td>Regional strategy on industrial biotechnology and a roadmap for biorefineries approved in 2014 foreseeing impressive financial means and investments.</td>
</tr>
<tr>
<td>Poland</td>
<td>National platform on Bioeconomy (stakeholder platform) has been formed in 2015 with a strong emphasis on the Bioeconomy in Polish regions.</td>
</tr>
<tr>
<td>West Nordic</td>
<td>In March 2015 Iceland, Greenland and the Faroe Islands approved a joint action plan for bioeconomy.</td>
</tr>
<tr>
<td>Norway</td>
<td>Launched a 10 years programme and is preparing a comprehensive bioeconomy strategy. An integrated bioeconomy research institute opened July 2015.</td>
</tr>
<tr>
<td>Germany</td>
<td>National Research Strategy and the Policy Strategy on the Bioeconomy.</td>
</tr>
</tbody>
</table>
Finland

- Strategy implemented between several ministries and other stakeholders
- Coordinated by a strategic programme set by government
- Strategic goals
  - Competitive environment for bioeconomy
  - New business from bioeconomy
  - Strong know how base for bioeconomy
  - Accessibility and sustainability of biomass
- Supported by bioeconomy panel of stakeholder chaired by the Minister of Economic Affairs
- Clear allocation of responsibilities
The "Bioeconomy-race" is on: US, Brazil, Russia, India, Thailand, Malaysia, South Africa, and many others.
US Strategy

- The National Bioeconomy Blueprint of the United States of America understands the bioeconomy as “an economic activity that is fuelled by research and innovation in the biological sciences”.

- Technologies emphasised include genetic engineering, DNA sequencing, manipulation of biomolecules and the use of microorganisms or industrial enzymes, as well as the direct engineering of microbes and plants.

- Expresses the wish to replace petrochemical products by bio-based products and thus mitigate climate change.

- Strategy has a development policy dimension – USAID supports agricultural research designed to benefit smallholder farmers in developing countries.
Rationale for national bioeconomy policies?

- For most national strategies, the development of the bioeconomy or of specific biotechnology sectors promises innovation, economic growth and job creation.

- Bring benefits to rural areas by enabling them to supply and process renewable raw materials.

- Address need to reduce dependency on oil and combat climate change.
Strategic objectives

• Emphasis is on enhancing the economy, providing new employment and business possibilities.

• Innovation focused on developing new markets, not global challenges

• Aspects of sustainability and resource availability are ever-present but only addressed to a limited extent.
A national bioeconomy strategy: structure and players

**Governance and Strategic Oversight**
- Government departments
- All stakeholders

**Implementation and Operational Support**
- Implementing agencies
- Research Councils
- HEIs
- PPPs

**Industrialisation and Economic Development**
- Venture capital
- Industrial partners
- Entrepreneurs
- PPPs
- Markets
Governance and strategic oversight

- Some countries the Government responsibility is assigned to a single ministry (e.g. Canada) – others involve multiple ministries (e.g. Finland, UK) with coordination by central ministry
  - Agriculture, Marine, Environment, Education, Science, Enterprise, Finance
  - Required ownership and commitment

- Stakeholders must feel responsibility – not just Government
  - Finland – Bioeconomy panel of stakeholders
  - EC- European Bioeconomy Panel
Governance and strategic oversight

- Limited development of action plans – especially where strategies are developed by 1/2 ministries
- Task owners tend not to be identified
Evolution from research oriented resource strategies towards innovation and industry strategies
Enablers & cross-cutters

World-class research standards

Human capital development

Targeting next generation technologies

Communication and marketing

Close gaps in innovation cycle

Ethical framework

National priorities

Regulatory alignment

Access global IP & knowledge pools

Incentives and funding – esp SMEs

Public Private Partnerships

BIO-ECONOMY

Integration of biological production and biological processing through partnerships, within an innovation cycle that targets next generation technologies, and aligns national priorities with international standards. This requires world-class research standards, human capital development, incentives and funding, cross-cutters and ethical frameworks. The integration of biological production and processing is facilitated by communication and marketing, regulatory alignment, and access to global IP and knowledge pools. Public private partnerships are critical for successful implementation.
Enablers & cross-cutters

GOVERNMENT
HEIs

Human capital development

World-class research standards

Targeting next generation technologies

Entrepreneurs

Close gaps in innovation cycle

Policymakers
National priorities

Access global IP & knowledge pools

VCs

Public Private Partnerships

BIO-ECONOMY

Incentives and funding – esp SMEs

Legal

Regulatory alignment

Communication and marketing

Ethical framework

HEIs
Research Investment

- Dedicated strategies for research and investment in bioeconomy research (US, UK, Japan, Germany)
- Other countries (Italy, Canada) leverage existing private sector and public research initiatives.
- WHICH IS RIGHT?
- Increased emphasis on funding collaborative research.
  - Particularly as a means to engage SMEs in bioeconomy innovation
Measuring progress

- Mechanisms to measure progress not prominent in policies and strategies
- Tends to be limited to economic values and shares of GDP but little detail provided
- Indicators but few targets
- Difficulty may relate to:
  - Lack of definition of bioeconomy
  - Tendency for less than concrete goals
- This needs closer attention because bioeconomy development requires major investment in infrastructure and technology
- In general, there appears to be few economic estimates of value of bioeconomy sectors
Measuring progress… not limited to economic benefits

- Environmental metrics (e.g. CO$_2$, reduction)
- Societal and cultural change (e.g. adaptation of renewable energy)
- Scientific progress (e.g. patents, papers, collaborations)
- Finland
  - Growth of bioeconomy
  - Added value produced for natural resource use
  - Environmental benefits (greenhouse gas emissions avoided)
  - Sustainability of the bioeconomy
- Germany
  - Actions in strategy plans include developing appropriate mechanisms for measuring and modeling progress.
## Indicators

<table>
<thead>
<tr>
<th>Bioeconomy</th>
<th>Human Capital Dev</th>
<th>R&amp;D</th>
<th>Commercialisation</th>
<th>Coordination</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bioeconomy contribution to GDP</td>
<td>Student outputs per year</td>
<td>No. of publications and citations in high-impact journals per capita.</td>
<td>No. of products and services</td>
<td>No. of collaborative research partnerships</td>
</tr>
<tr>
<td>Technology balance of payment of bio-innovation outputs.</td>
<td>Throughput of non-academic skills training (incl. entrepreneurship)</td>
<td>Cumulative no. of bio-patents / plant breeders rights</td>
<td>No. of start up companies No of companies reaching break even</td>
<td>No. of collaborative product development partnerships</td>
</tr>
<tr>
<td>No. of bio-innovation firms, including dedicated bio-innovation firms by sector</td>
<td>Size of bio-workforce as percentage of S&amp;T workforce.</td>
<td>No. of regulatory approvals for locally produced health/agricultural products.</td>
<td>No. of multinational corporations in bio-economy sectors locating R &amp; D facilities locally</td>
<td>No. of funding partnerships</td>
</tr>
<tr>
<td>No. of regulatory approvals for locally produced health/agricultural products.</td>
<td></td>
<td></td>
<td>Leveraging international resources</td>
<td></td>
</tr>
</tbody>
</table>
Some concluding observations

- Clearly defined NATIONAL objectives and guiding principles are necessary to enable those working in the bio-economy sectors to contribute to a common set of goals and to allow progress to be assessed.

- Engagement, ownership and oversight important – particularly given investments required.
  - The full range of stakeholders from industry, government, technical institutions and civil society should be included in the development of the bio-economy from the outset.
  - Advisory body to drive forward goals and coordinate activities in the development of the bio-economy and focus needs of government, agencies and public bodies, industry and other stakeholders.

- The Bioeconomy can be a useful forward looking framework to promote the better management and reduction of waste in society as well as establishing new value chains and economic activity – NEEDS TO BE COMMUNICATED.

- Focus on changing consumption habits and attitudes including consumer research – tends to be limited but required to create markets.
Some concluding observations

- The case for dedicated research and knowledge exchange to generate a better understanding of emerging aspects of the bio-economy needs to be considered.

- Policies offering incentives for different economic uses of biomass – such as food, feed, bio-based products and bio-energy need to be aligned with strategic goals for the bio-economy (e.g. public procurement)

- Regulatory frameworks may need to be reviewed.

- Financial framework – PPPs to SME support

- FOCUS on SMEs – identified as key vehicles for innovation in bioeconomy.
Thank you