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"Transforming learning and teaching and research in Universities: A European perspective„

IEASA Conference on Internationalisation of Higher Education in the context of the Fourth Industrial Revolution (4IR)

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Sommerset West, Western Cape,
South Africa
22 August 2019

About the European University Association (EUA)

- Established in 2001
- Non-governmental membership organisation
- More than 800 individual university members
- 34 National Rectors' Conferences Members
- 47 countries

- ***Takes account*** of up-to-date developments in higher education and research and works with its members to enhance the conditions to develop universities' missions
- ***Provides collective, independent voice*** of the university sector in university education and research matters, including evidence-based EU policy development
- ***Provides for a for exchange, peer learning*** for members on a broad range of matters concerning university activities: learning and teaching, funding, governance, research, innovation

About the EUA Council for Doctoral Education (EUA-CDE)

- ***Constitutes*** a member service of the European University Association
- ***Brings together*** a community of academic leaders and professionals from 254 universities in 36 countries
- ***Works on*** doctoral education policies and good practices of common interest to our members
- ***Organises*** regular conferences, workshops, focus groups, webinars and thematic peer groups, addressing fundamental and emerging topics of doctoral education
- ***Participates*** in policy dialogues on the European and global levels
- ***Serves*** as the “one-stop-shop” for doctoral education in Europe

Virtuous Circle of internationalisation: Reputation based on …

Students satisfaction statistics

Research performance statistics

University Rankings

Political contexts

Personal contacts!

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Evolution of curricula development

Sommerset West, Western Cape, South Africa
22 August 2019

The transformation of the education and training of professionals in the Fourth Industrial Revolution must not happen in 'technology silos'

Circular Economy:

- Minimal use of raw materials
- Minimal use of energy
- Minimum environmental impact
- Lifecycle analysis
- Economical analysis
- Role of consumers

EU Energy Transition & EU Climate and Energy Targets for 2030

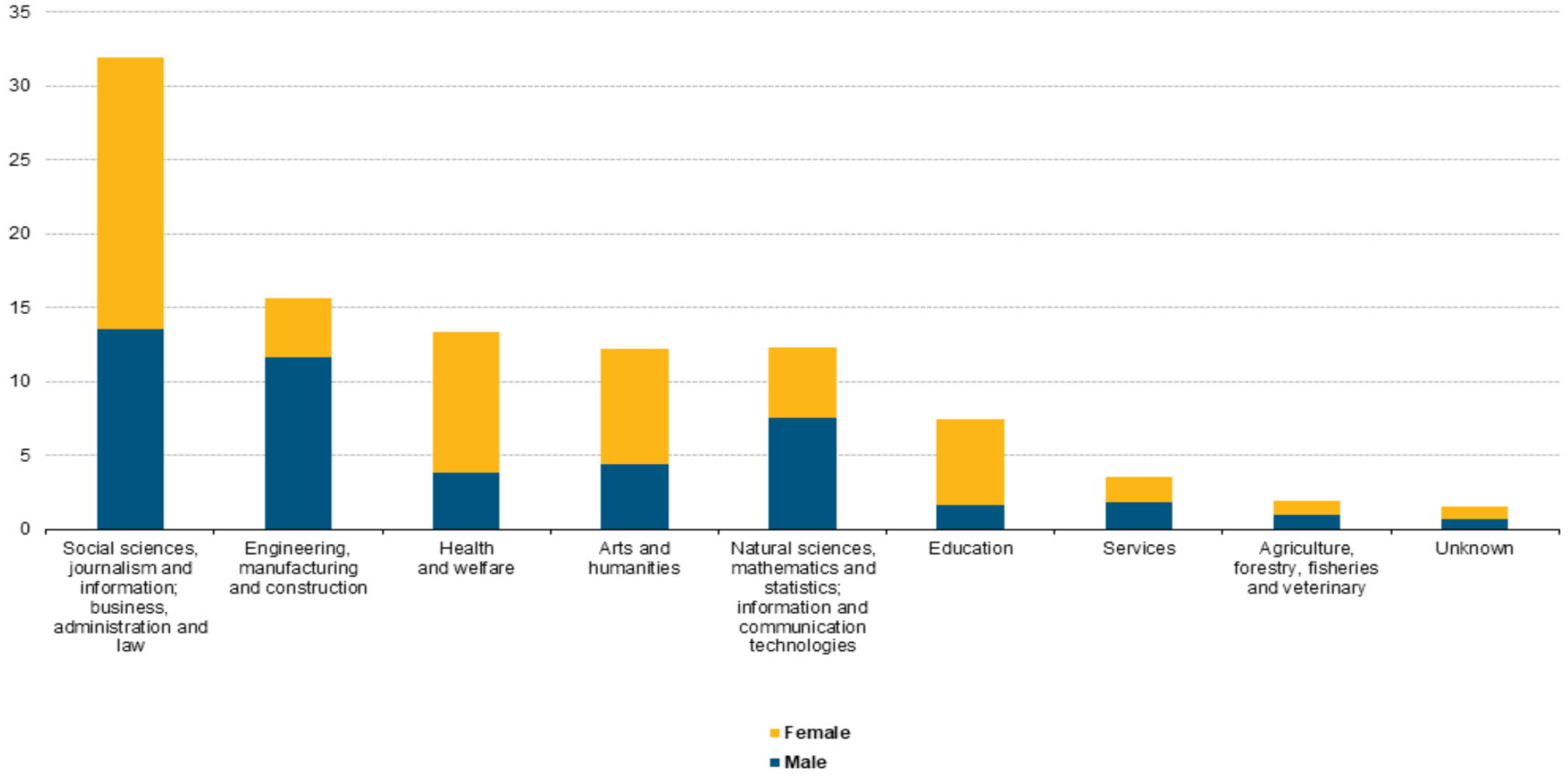
- At least 40% cuts in **greenhouse gas emissions** (from 1990 levels)
- At least 32% share for **renewable energy**
- At least 32.5% improvement in **energy efficiency**

Digital industry and Artificial Intelligence

Social Transformations (including gender balance)

Example: the importance of attracting more women into the Manufacturing sector

Distribution of tertiary education students by field and sex, EU-28, 2016
(%)



Note: including 2015 data for the Netherlands.
Source: Eurostat (online data code: educ_uoe_enrt03)

Strategic Needs

Universities are required to:

- Narrow skills gap in higher education and business sector
- Develop novel frameworks for interdisciplinary and innovative energy-related programmes and courses
- Better integrate social sciences and humanities with science, technology and engineering disciplines
- Consider technical, social, economical, political aspects

Challenges ahead

- New technologies & ways of working require new skills
- Curricula, learning & teaching need to adapt
- Expansion of research-based learning, entrepreneurship & innovation skills
- Ability to work with inter-/multidisciplinary challenges and teams
- More attention to holistic & systemic perspectives, especially for complex societal challenges such as energy
- Interface between technical solutions and society needs careful consideration
- Need for specialised experts & scientists – universities play critical role in training and supply of skilled workforce

Changing role for universities?

Upgrade & innovate own programmes

Listen to societal, industry needs & collaborate

Modernise learning & teaching

Break down disciplinary barriers

More flexibility: Short courses Lifelong learning

Example:

Methodology for the development of skill framework for the Energy Transition

Developed with the participation of more than 200 Universities and 120 companies

For technical, social, economical & political aspects in energy related to:

- **Industrial/Manufacturing**
- **Environmental**
- **Future Developments**

(FP7 UNI-SET Project Partners)

Source Slides 10-12: Energy Transition and the Future of Energy Research, Innovation and Education: An action agenda for European Universities (FP7 UNI-SET), 2019

This project has received funding from the European Union's Seventh Framework Programme for research, technological development and demonstration under grant agreement no 609838

24. Related industrial

Topics (for courses)	Understanding, Background Knowledge, Comprehension, General Appreciation of …	Design and Implementation / Deeper (Master level) Appreciation of …	Employment Skills
Technical	Manufacturing processes and issues	The implementation of waste recovery technologies	Propose solutions for recycling waste
	The impact of wasteful production processes	Minimising manufacturing waste from the design process onwards	Improve product design to minimise waste
	Waste treatment challenges	Design taking many requirements (economic, waste, social, etc.) into account from the start	
Social	The impact of product manufacturing and social acceptance	New products that are socially accepted and have lower environmental impact	Consider social limitations
	Socially acceptable marketing	Marketing the social value of products	Socially acceptable product design and marketing
	Social conflict between perceived and real product value		
Economical	Economic models for manufacturing	Innovative economic models for waste management and recycling	Make recycling profitable
	The economic effectiveness of resolving problems at each design stage	The economic value of waste in a circular economy	Develop circular economy opportunities
	The economic cost of waste		
Political	The legal and political framework for waste management	Adapting legal and governance frameworks to the circular economy	Promote the circular economy
	The impact of the legal framework on sustainable, socially responsible manufacturing	Developing a legal framework to inform people of the social/ environmental impact of products	

23. Related environmental

Topics (for courses)	Understanding, Background Knowledge, Comprehension, General Appreciation of …	Design and Implementation / Deeper (Master level) Appreciation of …	Employment Skills
Technical	The relationship between technology and the environment - constructive and destructive	The relationship between technology and the environment and how it can be improved	Design new technologies that have lower/ no environmental impact and support the environment
	The environmental impact of using specific materials, e.g. precious minerals	Technology design to aid the environment by taking some basic principles, e.g. circular economy, into account	
Social	The social importance of the environment (food, water, agriculture, etc.)	Methods to improve the understanding/acceptance of living with as opposed to living off the planet	Socially and environmentally aware
	Society's acceptance of the importance of our environment/ planet	Analyse models for the change towards a 'give and take' principle versus a 'take only' approach	
Economical	The economic costs/benefits of getting technology right for the environment	Economic environmental costs	Know that economics is a human construct and that the environment is often 'a given'
Political	Political responsibilities to improve/respect the environment when designing technology	Political responsibility and demands on legislation to ensure respect for the environment	Possess political awareness of legislation and its environmental impact
	Community impact on the development and need for political legislation to support the environment		

20. Future developments

Topics (for courses)	Understanding, Background Knowledge, Comprehension, General Appreciation of …	Design and Implementation / Deeper (Master level) Appreciation of …	Employment Skills
Technical	The time frame of technology design and use	Design technologies that will be compatible with the technologies of the future	Customer/future focused design
	The impact of flexible technology design	Customer centric design	
		Technologies beyond current thinking/incremental change	
Social	Selected, cutting-edge and emerging energy technology innovations	How cutting-edge energy tech science suggests new kinds of behaviours, including those not previously imagined	Identify and promote energy technology innovations for sustainable transitions
	The fact that change is an essential part of life, to be embraced	Consumer interaction to better understand their needs for new developments	
Economical	The applicability and application of the circular economy model	Economic justification of investment to develop revolutionary technologies	Understand economic models and their impact on future developments
		The social enterprise models applicable to the energy sector	
Political	Regulations and incentives in the field of energy, and any incompatibilities and trade-offs	How to steer future legislation	Develop future-proof legislation
	The trade-off between legislation and flexibility	Ensuring application flexibility and avoiding abuse of legislation	

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Learning and Teaching Methods: evolution and strategic needs (1/2)

Source: Energy Transition and the Future of Energy Research, Innovation and Education: An action agenda for European Universities (FP7 UNI-SET)

New learning approaches emerging in 'active learning':

- Peer to peer learning
- Experiential learning
- Digital learning
- Industrial experiences
- opportunities to develop a broad range of professional skills including communication, management, teamwork, interdisciplinary work

Universities:

- New learning models – active learning, e.g. challenge-based, case-based, short courses
- Incorporating digital technologies (virtual learning environments, online training, virtual and blended approaches) as learning assistance
- Knowledge management

Learning and Teaching Methods: evolution and strategic needs (2/2)

Strategic Needs:

- Support for multidisciplinary programme development
- Development of state-of-the-art programmes for the fair univeristy-business collaboration in the interest of society at large
- Digital Infrastructure
- Educational repositories
- Open Access
- Public and Institutional Support

Source: Energy Transition and the Future of Energy Research, Innovation and Education: An action agenda for European Universities (FP7 UNI-SET)

Cross-cutting key messages for the transformation of higher education

- **Active learning methodologies – use of ‘blended’ learning and teaching material and activities – presence and digital**
- **Exposure to University-Business Collaboration**
- **Methodologies for knowledge management**
- **For educators: develop up-to-date short modules or courses**
- **Consideration towards Citizens & Society – invest in multidisciplinary approaches, using Global frameworks such as the Sustainable Development Goals**

Based upon: evidence from energy-related master and doctoral programmes: Energy Transition and the Future of Energy Research, Innovation and Education: An action agenda for European Universities (FP7 UNI-SET)

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Doctoral education

Sommerset West, Western Cape,
South Africa
22 August 2019

A bottom-up process leading to the reform of doctoral education in Europe

Established 10 'Salzburg Principles for Doctoral Education"

2010

2015

The aim of doctoral education

"The goal of doctoral education is to cultivate the research mindset, to nurture flexibility of thought, creativity and intellectual autonomy through an original, concrete research project. It is the practice of research that creates this mindset."

Salzburg Recommendations 2010.

"The core component of doctoral training is the advancement of knowledge through original research.

At the same time, it is recognised that doctoral training must increasingly meet the needs of an employment market that is wider than academia."

Salzburg Principles 2005.

Internationalisation and inter-sectorial experience in the Salzburg Recommendations

- *Tool in increasing the quality in doctoral education and in developing institutional research capacity.*
- *From internationalisation at home and collaborative doctoral programmes to international joint doctoral programmes …The mobility of doctoral candidates must be **driven by the research project**"*
- *All stakeholders should engage in measures to facilitate cooperation between providers of doctoral education and the non-academic sectors to the mutual benefit of all partners. It is essential to **create awareness about the qualities of doctorate holders as well as to build trust between universities and other sectors**"*

Salzburg Recommendations 2010.

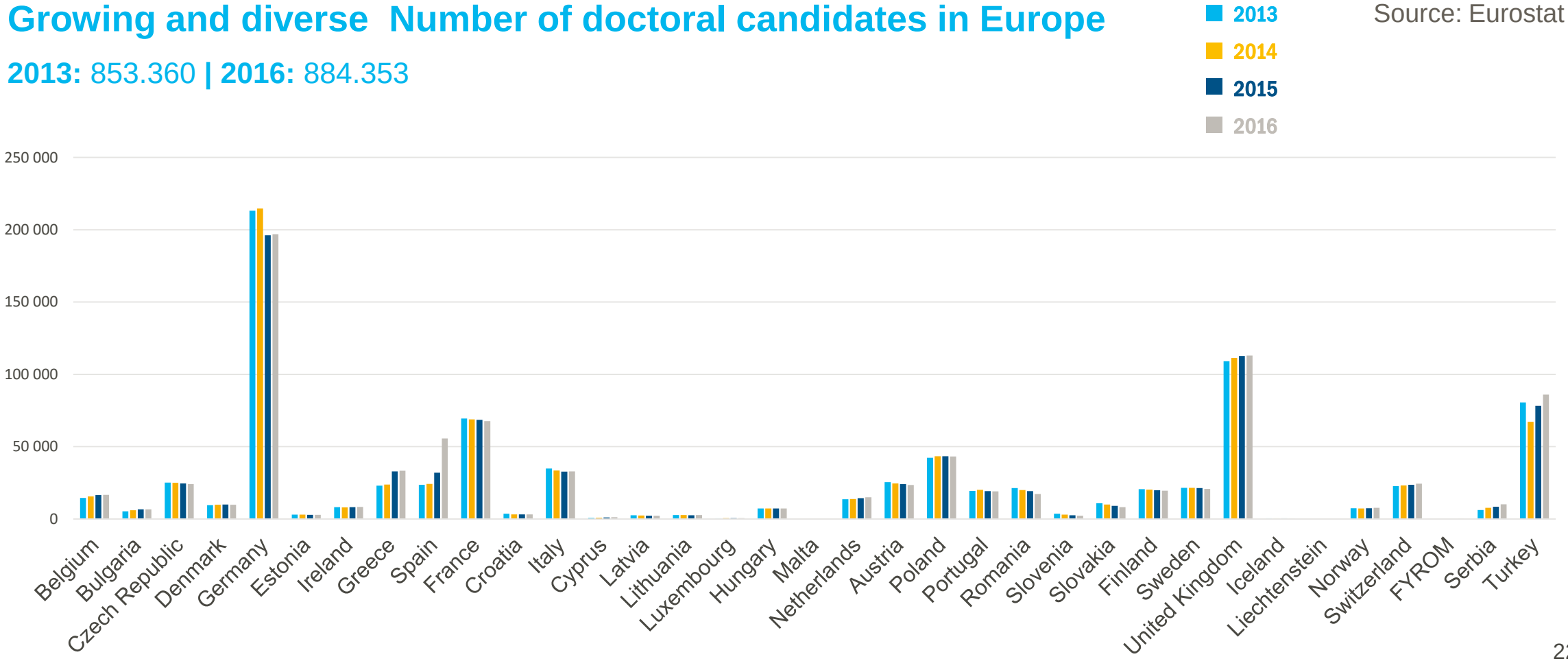
- *Universities have **a particular responsibility** associated with the international doctoral candidates they recruit.*
- *Institutions must **integrate international doctoral candidates** in their research environments, value their contribution in terms of intellectual and cultural diversity, and support their development and careers in Europe or beyond.*
- *Experience in non-academic settings **gives added value** to individual doctoral candidates. It provides them with first-hand knowledge about career options and different work cultures.*

Salzburg Recommendations 2015.

Growing and diverse Number of doctoral candidates in Europe

2013: 853.360 | **2016:** 884.353

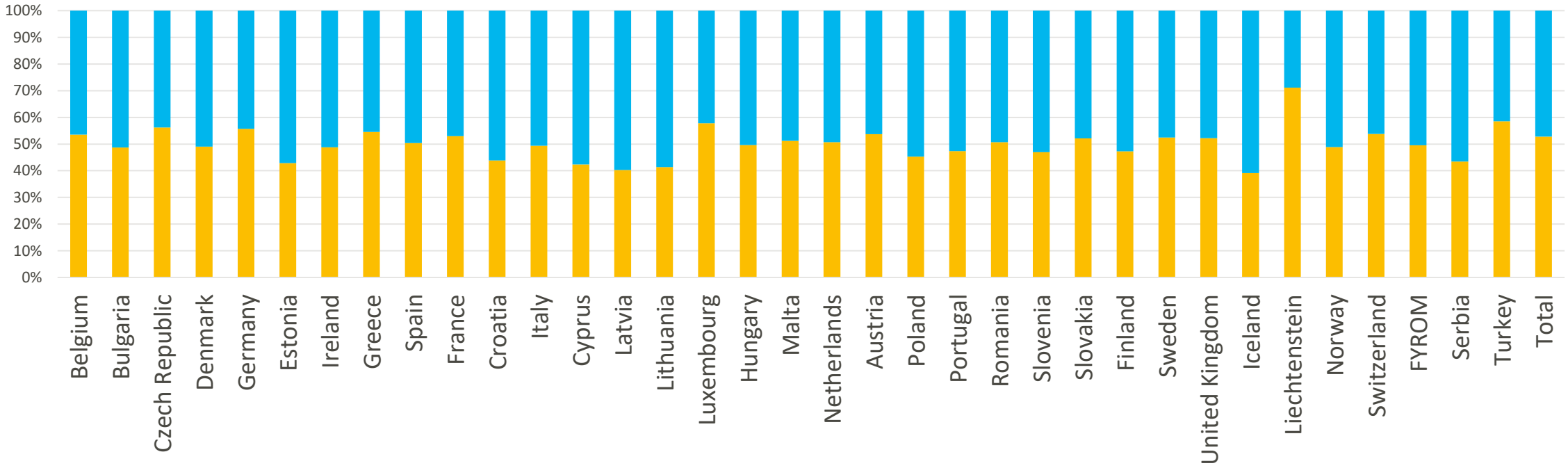
Source: Eurostat



Gender distribution of doctoral candidates in Europe (2016)

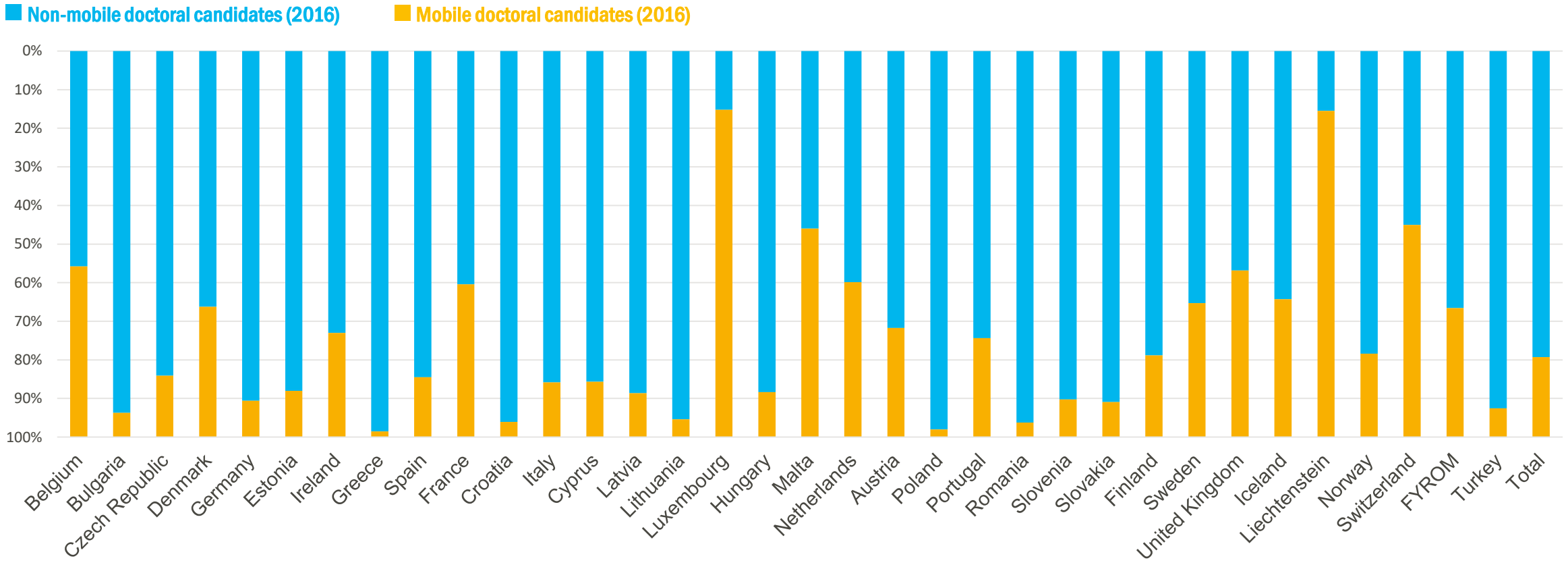
(48% female doctoral candidates)

Source: Eurostat

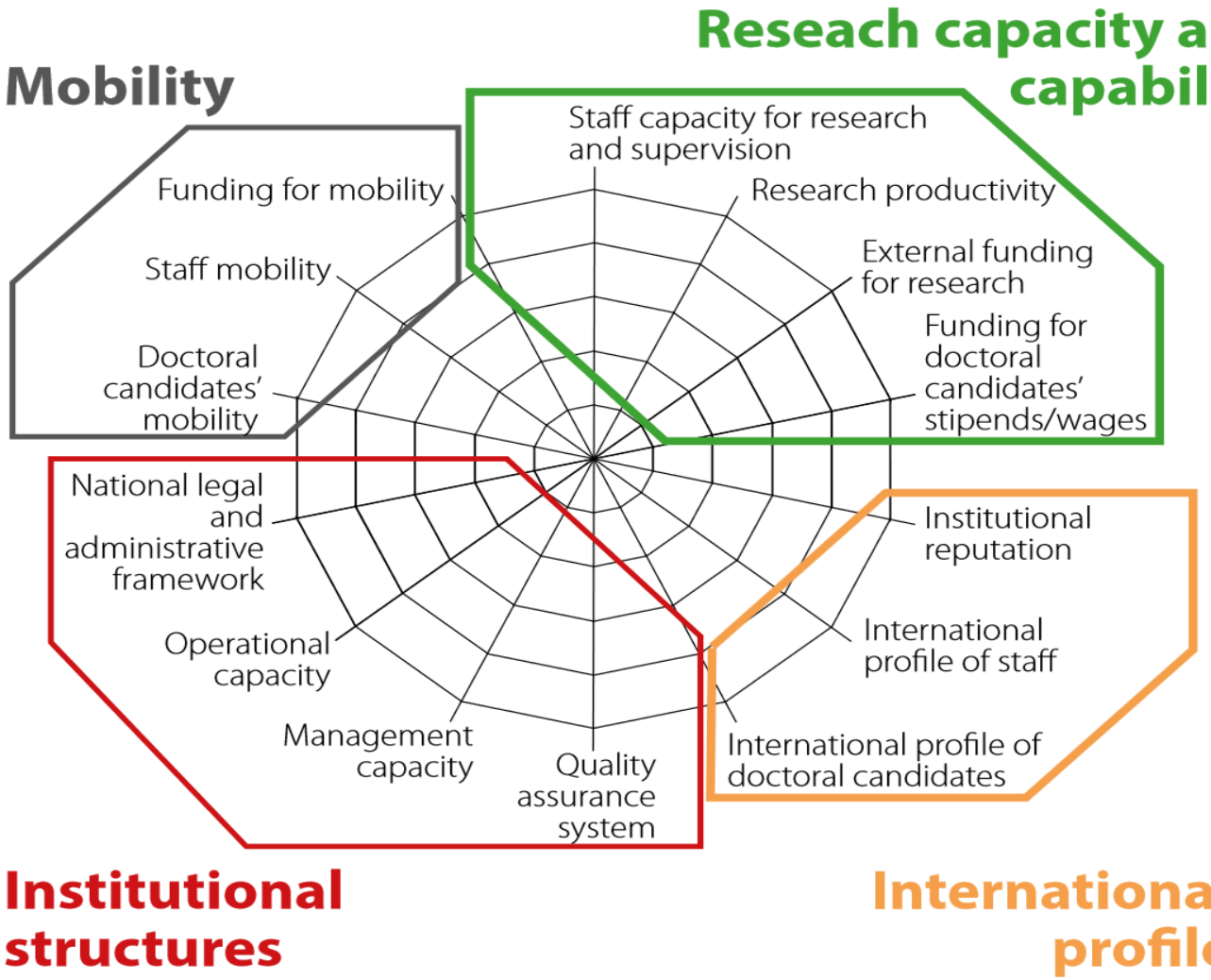


International mobility of doctoral candidates

Source: Eurostat



Summary of main Factors fostering mobility of doctoral candidates



Source: FRINDOC Project report, 2015

Emerging topics in doctoral education

- **Mental Health / Mental wellbeing**
  - Increasing public attention to the topic
  - Institutional responsability to provide support to the doctoral candidate
  - Need for further research and the developement of best practices

- **Postdocs**
  - Exploring the issue
  - What are the specific needs of postdocs?
  - What can doctoral education provide to postdocs

Source: EUA-CDE Doctoral Survey Report, 2019

Emerging topics in doctoral education

- **Research Asssesment**
  - The career of early career researcher are strongly dependent on assessment systems
  - Open science needs ending with the focus on only a few quantity-oriented indicators
  - Doctoral candidates need to be able to do the “right” decision

- **Sustainable development goals**
  - Addressing the big societal challenges
  - New skills needed
  - Opportunities for global collaboration

Source: EUA-CDE Doctoral Survey Report, 2019

Engaging with the knowledge society

- Doctoral education build bridges between Universities and societies
- There is a need for supporting of intersectorial mobility: university/research center and business, enterprises, policy bodies, cultural organisations, etc.
- Professional development of doctoral candidates
- Regional anchoring with a global outlook
- Research ethics and integrity
- The digital challenge

Source: EUA-CDE Doctoral Survey Report, 2019

Embracing the globalisation of research

- Research is becoming increasingly global
- New technologies enable international exchange
- International mobility enriches research
- Internationalisation as part of the institutional strategies
- Institutions have the responsibility towards doctoral candidates with an international background
- International capacity building

Source: EUA-CDE Doctoral Survey Report, 2019

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Research and Innovation policies for internationalisation

Sommerset West, Western Cape,
South Africa
22 August 2019

European Research and Innovation policies and values for internationalisation

- **EU Framework Programmes for Research and Innation: Horizon 2020 and Horizon Europe**
- **European Research Area (ERA) policy priorities:**
  - Effective National Systems
  - Optimal transnational cooperation
  - Access to Research Infrastructures
  - Open labour market
  - Open circulation of knowledge
  - Gender balance
  - International cooperation

  A new, more holistic and dynamic concept of ERA is currently being developed, more intimately linking research, innovation and education, with knowledge and free science as core values
- **Academic freedom and institutional autonomy**
- **Research ethics and integrity**
- **Researchers motivation and careers**
- **Open Science**

Open Science:

Sharing of research-generated knowledge.

Easy and affordable accessibility to research publications and data

- **Researchers motivation and careers**
- **Quality** of research (research assessment methods)
- **Costs** of access to publications and data
- **Policies** fostering Open Access to research publications and data (e.g. national policies, OA2020 – Max Plank Digital Library initiative, EUA recommendations - universities, Coalition S - funders)
- **Access to e-infrastructures**, e.g. European Open Science Cloud

Underpinning conditions

- **Transparency of the research process and outcomes publication**
- **Research ethics and integrity**

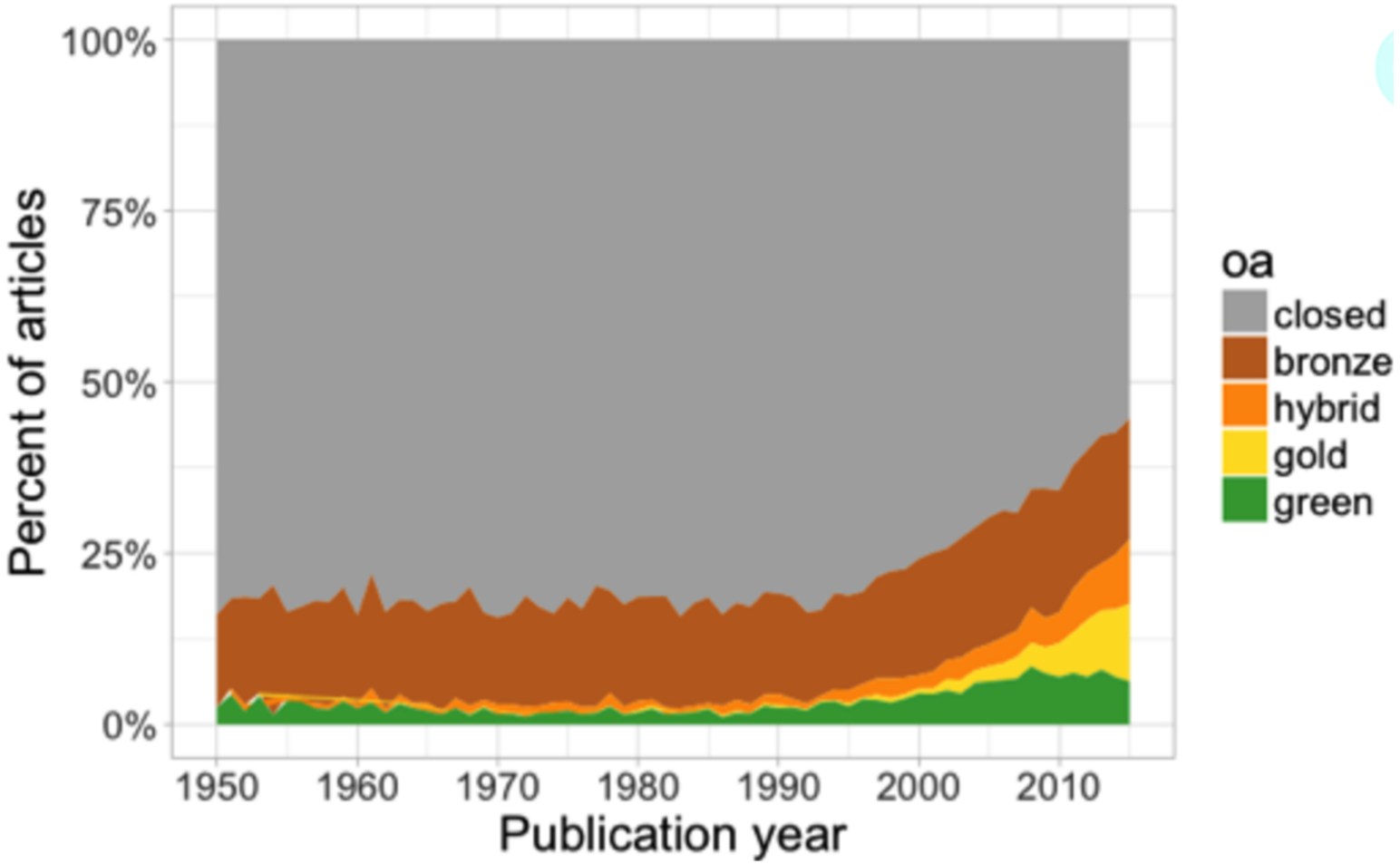
Constraints for Open Science:

Limited engagement of a large part of researchers for several reasons

Necessary (although not sufficient) conditions to make Open Science a reality

- **Clarification of legal issues concerning sharing and reuse of publications and data – copyright regulation**
- **Original authorship respect – ethical considerations**
- **Reputation and research career progression – linked to research assessment and outputs**

Share of Scholar Publications in Open Access worldwide is far from 100%

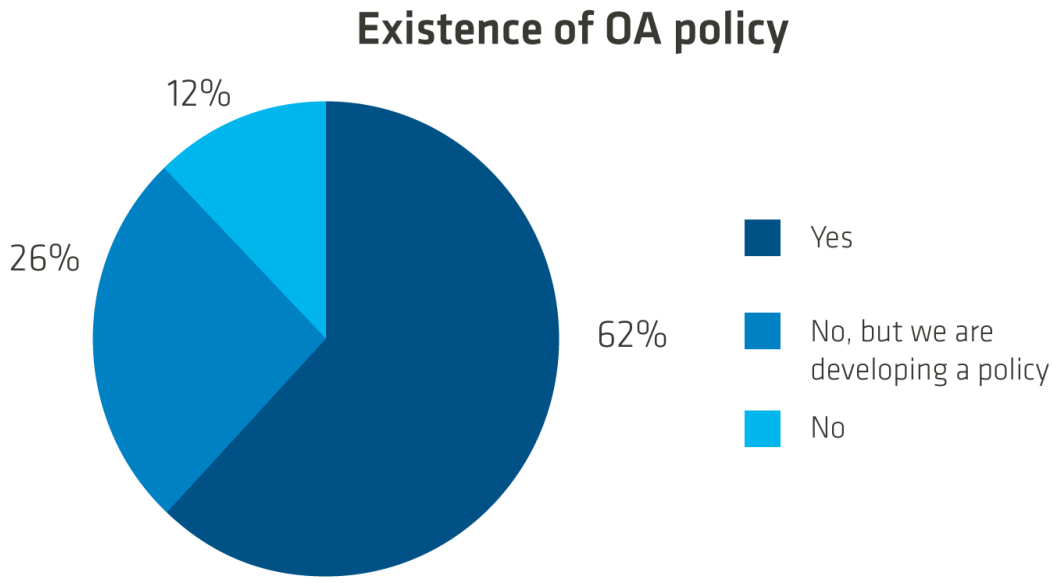


*Piwowar, Heather; Priem, Jason; Larivière, Vincent; Alperin, Juan Pablo; Matthias, Lisa; Norlander, Bree; Farley, Ashley; West, Jevin; Haustein, Stefanie (2018-02-13). "The state of OA: a large-scale analysis of the prevalence and impact of Open Access articles". PeerJ. **6**: e4375. doi:10.7717/peerj.4375. ISSN 2167-8359. PMC 5815332. PMID 29456894.*

Share of Open Access scholarly publications is far from 100%

Estimation OA < 35 % of the total of scholarly publications

EUA Open Access Survey 2017-2018 :



Key information

- Data collection: August-November 2018
- Respondents:
- 31 Consortia negotiating on behalf of the university sector and other higher education and research performers
- Focus: Periodicals
- 5 major publishers (Elsevier, SpringerNature, Taylor & Francis, Wiley, American Chemical Society)

- Data analysed in aggregated fashion
- Most data refers to big deal contracts ongoing in 2017 or 2018

Total annual expenditure on big deals

For all subscriptions to electronic resources (including periodicals, databases, e-books) by national consortia:

Total (30 European countries) = ~ 1 025 253 055 EUR (estimate 2018, 3.5% yearly increase)

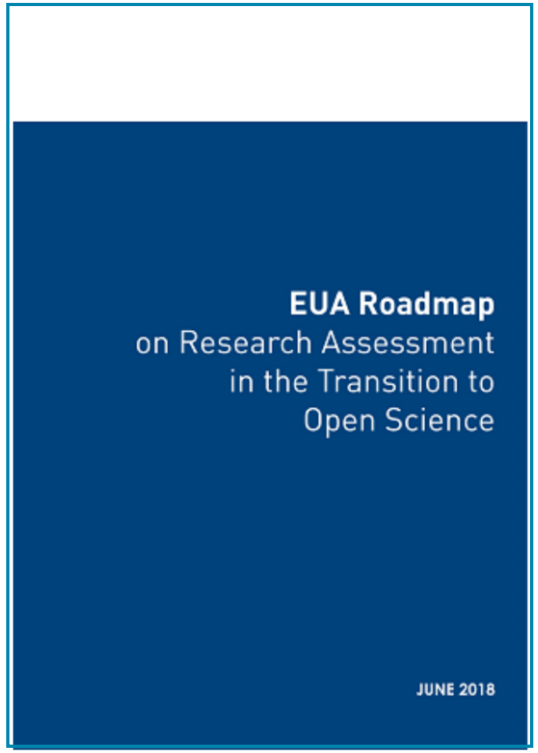
This is a conservative figure not including:

- *Article Processing Charges (APCs)*
- *Consortia other than those participating in the Survey*
- *Individual institutional contracts with publishers*

For periodicals only in the surveyed consortia:

Total (31 consortia, representing 30 European countries) = ~ 726 350 945 EUR (average yearly increase 3.6%)

Proportion of costs covered by universities in the consortia = 519 973 578 EUR (~72%)



Source:

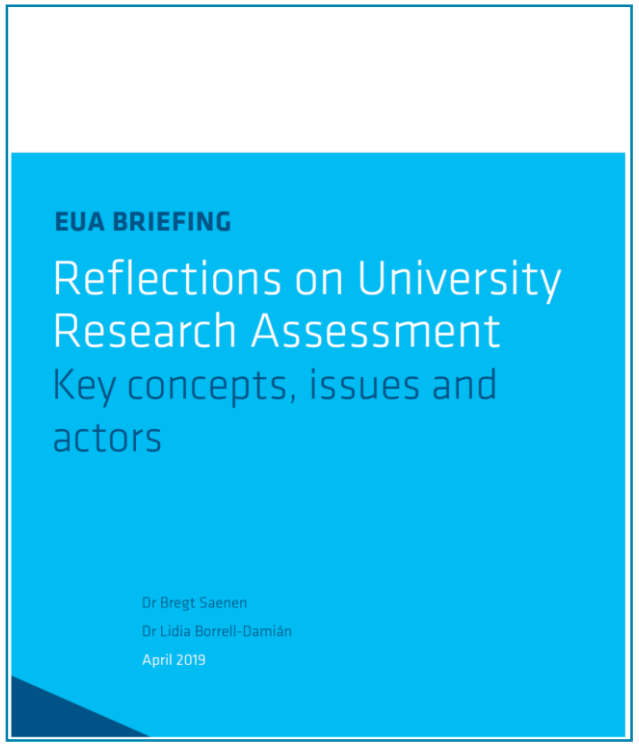
EUA (2018) EUA Roadmap on Research Assessment in the Transition to Open Science

The dominance of the journal impact factor leads to two main problems:

1. the quality of an article produced by researchers is not evaluated directly, rather through a proxy, i.e., the reputation of the journal it is published in;
2. this situation reinforces the dominant position of commercial academic publishers and disproportionately adds to their power in shaping the way research is funded and conducted.

EUA commitment

Raise awareness and support universities in the improvement of research assessment approaches that focus on research quality, potential and future impact, and that take into account Open Science practices.



Researchers, universities and other research performing organisations, research funders and policymakers are revisiting their approaches to research assessment:

- Current approaches related to negative trends in academia
- Discussion about the current state and future direction of scholarly research, as well as technical discussions
- Sprawling field involving a wide variety of actors, creating the need for a concerted approach

Source:

EUA (2019) Reflections on University Research Assessment: Key concepts, issues and actors

Open Questions

- **How can universities better collaborate with relevant industrial and societal actors?**
- **How to achieve a multi-disciplinary approach in education, training, research?**
- **How to establish widespread recognition by all stakeholders for innovative modules and programmes in universities?**
- **How to improve standards for inter-university international collaboration**

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YEBO!

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Thank you for your attention