UNESCO Natural Sciences Sector
United Nations Educational, Scientific and Cultural Organization

UNESCO science for Sustainable Development

European Dimension in International Cooperation and Mobility of Scientists: UNESCO's Perspective

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Our Science Policy Programme

Policy Advice to member states in STI policy formulation/review

Capacity-building in STI policies

International and regional cooperation in STI governance

Elaboration of tools for STI governance

Science legislation – strengthening links between science and parliaments

Promoting innovation - development of science parks, incubators, entrepreneurship programmes

Popularizing science – science centres, museums, UNESCO prizes

Promoting gender equality in science

Mission and Strategy in STI policy

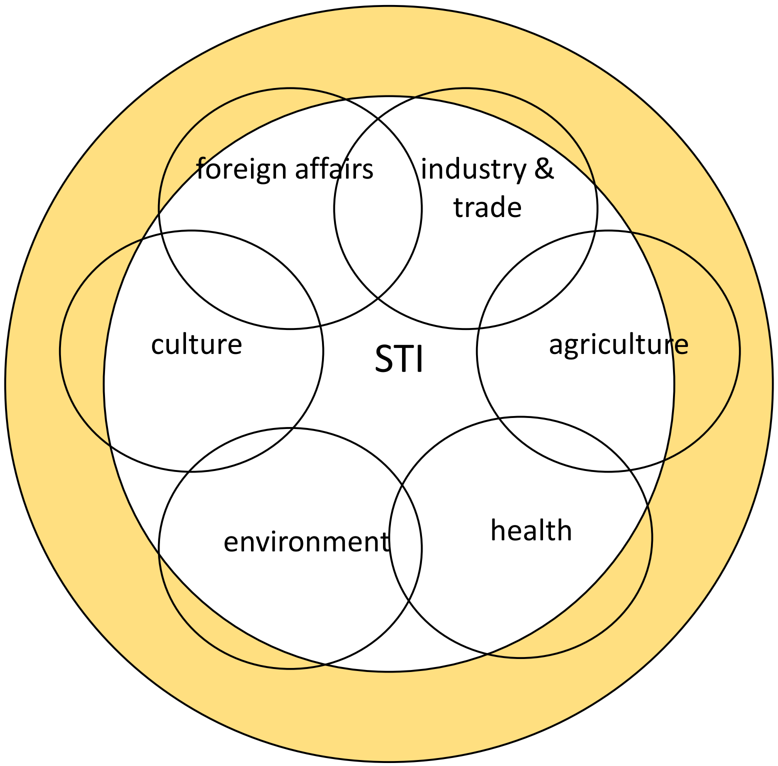
Supporting our Member States to strengthen STI systems and governance to improve **socio-economic** and **sustainable development**

- ✓ Cooperating with Member States in **developing and integrating national science, technology, innovation (STI)** policies and economic reforms
- ✓ Strengthening human and institutional capacities in STI policy to **foster the role of STI in socio-economic development**
- ✓ **Contributing to national development goals** by improving STI governance
- ✓ **Identifying emerging STI policy trends** that will shape the future of STI
- ✓ **Broadening interaction** among scientific and indigenous knowledge systems

UNESCO’s action in STI policy and reform

- Technical assistance and guidance for the formulation, assessment and monitoring of STI policies and strategies at national, regional and global level
- Policy advice to developing countries for the generation and effective utilization of their STI potential
- Design of STI policy instruments and legal frameworks
- Building awareness among STI stakeholders on the need to improve STI governance and to integrate STI into the development agendas of countries

Lack of capacities for managing STI in developing countries



Building of capacities for analysis, planning, implementation of development policies and programmes

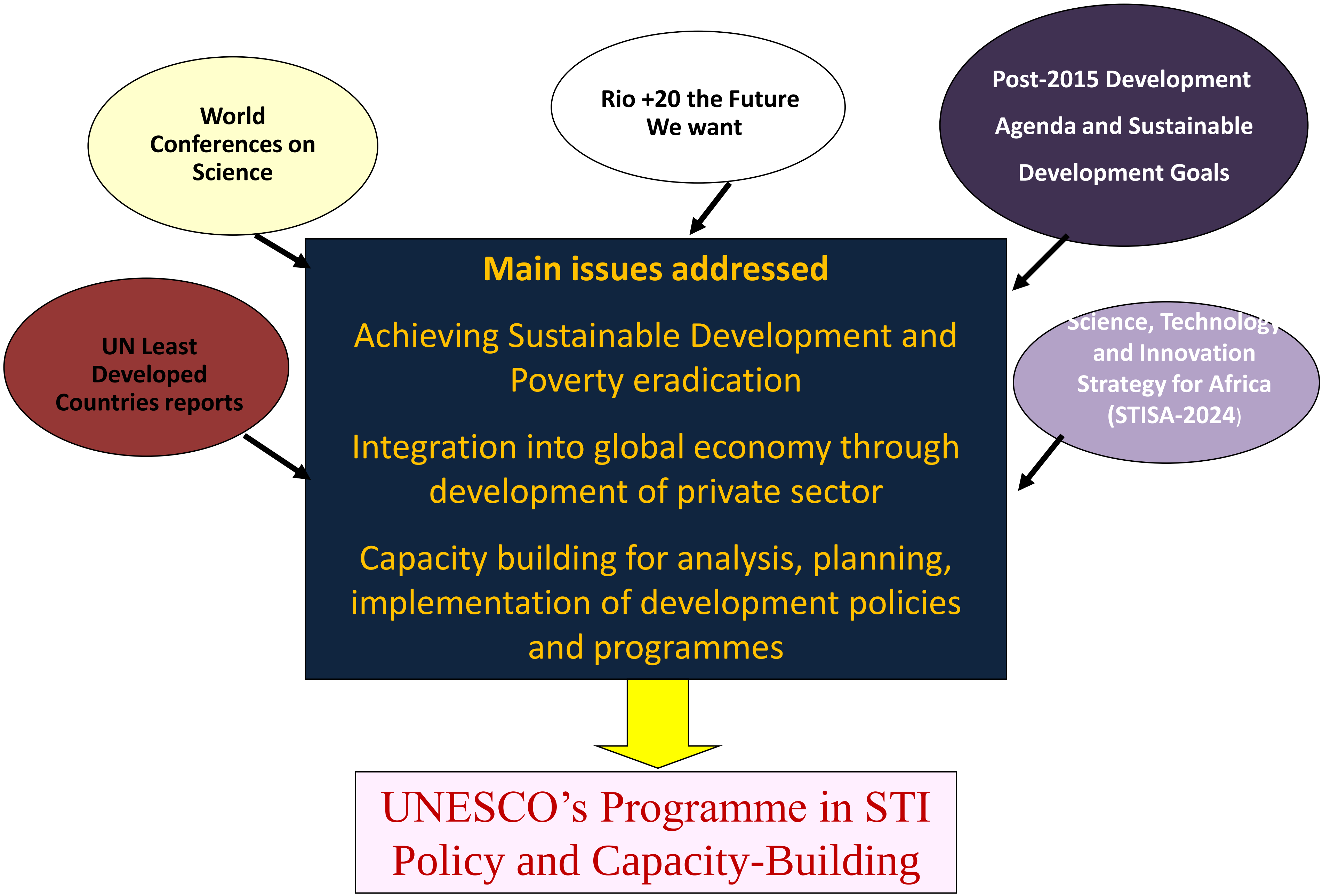
- Europe & North America:

more than 100 universities propose programmes in STI policy

- Developing countries:

very few - in Africa : three universities in South Africa and one in Nigeria

UNESCO's programme
in Capacity building
in STI policy and governance


World Conferences on Science
Rio +20 the Future We want
Post-2015 Development Agenda and Sustainable Development Goals
UN Least Developed Countries reports
Science, Technology and Innovation Strategy for Africa (STISA-2024)
Main issues addressed
Achieving Sustainable Development and Poverty eradication
Integration into global economy through development of private sector
Capacity building for analysis, planning, implementation of development policies and programmes
UNESCO's Programme in STI Policy and Capacity-Building

UNESCO's action in Capacity building in STI policy and governance

- Establishment of new STI policy programmes and degrees in universities (focus on Africa);
- Setting-up academic and inter-university networks worldwide for STI policy training programmes and research;
- Capacity-building activities at national and regional level – At least 600 STI policy-makers and managers received training in STI policy and governance in the last 4 years;

creating a critical mass of expertise in STI policy and governance

Country Support

Policy Advice

Capacity Building

International

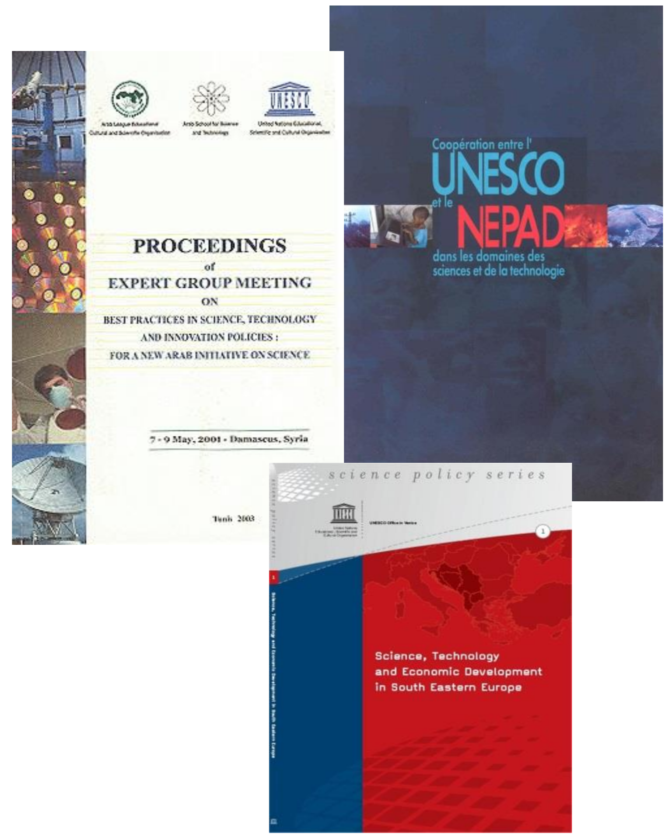
WORLD SCIENCE FORUM
BUDAPEST

Regional Cooperation

Regional Strategies

Harmonizing Policies

S&T Policy Forums



Celebration of World Science Day for Peace and Development

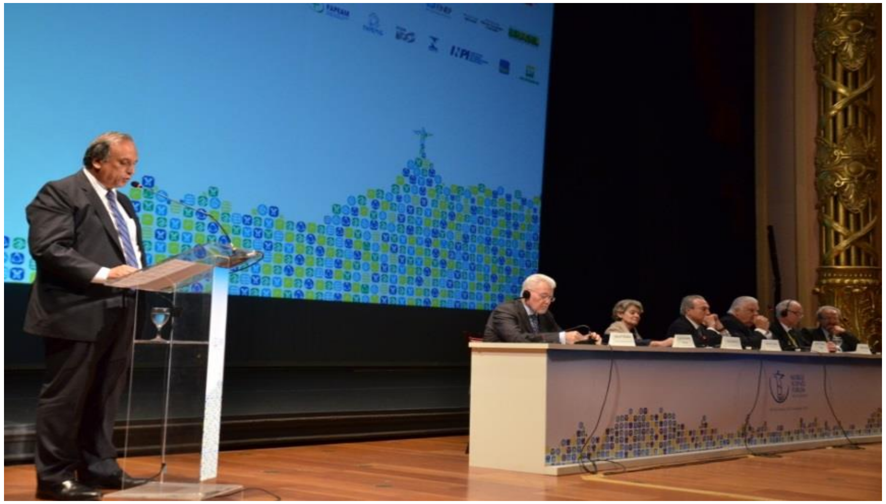
Allows UNESCO to;

- advocate for relevant issues in science

- improve the connection between science society and policy

- mobilize stakeholders each year for action and collaboration on scientific issues

Co-organization of the World Science Forum



Allows UNESCO to;

- Contribute to greater global dialogue on and collaboration in science

- Contribute to the finalization and follow up of a global declaration on Science and its use for sustainable development

- Support the participation of scientists and policy makers particularly from developing countries to participate in a global forum

UNESCO Medium-Term Strategy **37 C/4 2014-2021**

Overarching Objectives:

Peace / Sustainable Development

Global Priorities:

Gender / Africa

Guiding Principles

- **Partnerships** with international organizations, UNESCO entities (i.e. Chairs/Centres) and the private sector
- **Interdisciplinarity** and collaboration among UNESCO divisions /HQs-Field Offices (FO)
- **Encourage fund-raising** opportunities, also with the private sector

UNESCO Medium-Term Strategy **37 C/4 2014-2021**

Strategic Objectives

SO 1: Developing education systems to foster quality lifelong learning opportunities for all

SO 2: Empowering learners to be creative and responsible global citizens

SO 3: Shaping the future education agenda

SO 4: Promoting the interface between science, policy and society and ethical and inclusive policies for sustainable development

SO 5: Strengthening international science cooperation for peace, sustainability and social inclusion

SO 6: Supporting inclusive social development and promoting intercultural dialogue and the rapprochement of cultures

SO 7: Protecting, promoting and transmitting heritage

SO 8: Fostering creativity and the diversity of cultural expressions

SO 9: Promoting freedom of expression, media development and universal access to information and knowledge

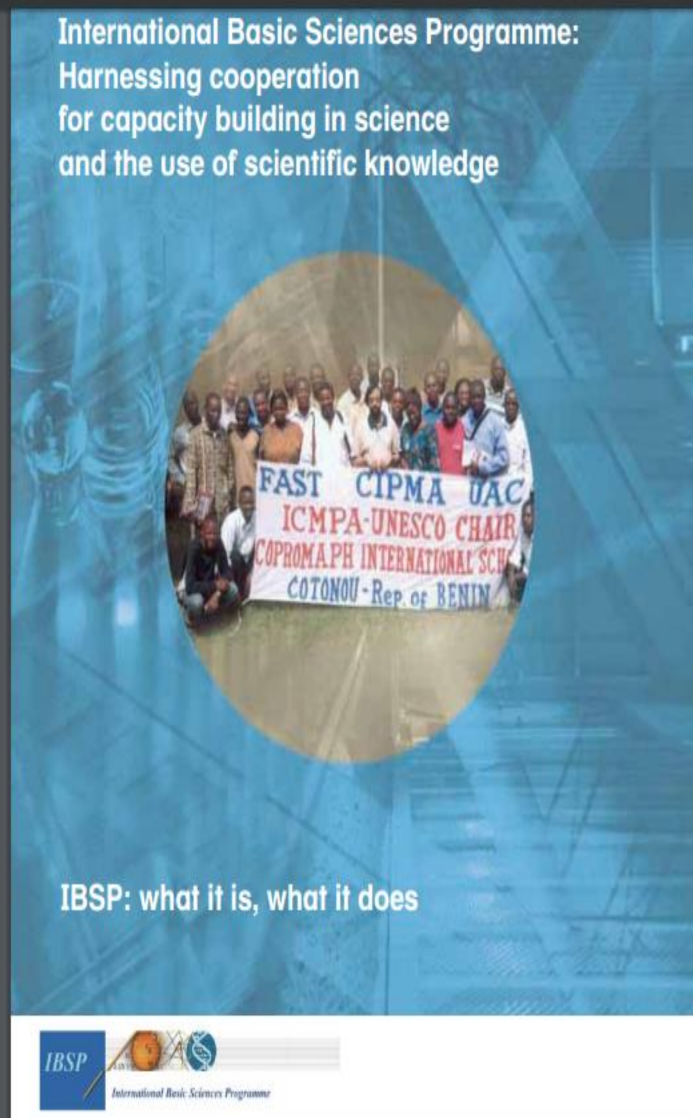
Science Programme

Strategic Objective (SO):

Science for Responsible Development

Territorial Mandate:

- **South East Europe (priority)**
- **Mediterranean, Central Europe, Black Sea and Caucasus**


International Basic Sciences Programme:
Harnessing cooperation
for capacity building in science
and the use of scientific knowledge

IBSP: what it is, what it does

IBSP
International Basic Sciences Programme

International Basic Sciences Programme (IBSP)

- international multidisciplinary programme established by UNESCO MSs in order to reinforce intergovernmental cooperation and co-operation between partner organizations in science to strengthen national capacities in the basic sciences and science education;
- focuses on fostering major region-specific actions that involve a network of national, regional and international centres of excellence or benchmark centres in the basic sciences;
- carried in partnership with the Academy of Sciences for the Developing World (TWAS), scientific unions of the International Council for Science (ICSU), the European Organization for Nuclear Research (CERN) and other science centres, IGOs and NGOs;
- promotes North-South and South-South co-operation which is at the root of the strategy of the Programme .

Every five years, the UNESCO Science Report (most recent edition 2015) provides a global overview of the main emerging trends and developments in scientific research, innovation and higher education.

UNESCO Science Report: towards 2030 launched on 10 November 2015.

Written by about 60 experts who are each covering the country or region from which they hail, the Report provides more country-level information than ever before. The trends and developments in science, technology and innovation policy and governance between 2009 and mid-2015 described here provide essential baseline information on the concerns and priorities of countries that should orient the implementation and drive the assessment of the 2030 Agenda for Sustainable Development in the years to come.

Clear trends have emerged

Firstly, despite the financial crisis, global expenditure on research and development has grown faster than the global economy, showing confidence that investment in science will bring future benefits.

Much of this investment is in the applied sciences and is being spearheaded by the private sector.

This points to an important shift in the landscape, with high income countries cutting back public spending, while private sector funding has been maintained or increased, and with lower income countries increasing public investment in R&D.

The debate between quick scientific gains and long-term public investment in basic and high-risk research to enlarge the scope of scientific discoveries has never been so relevant.

Foreword of Irina Bokova, UNESCO Director General
(UNESCO Science Report 2010)

Secondly, the North–South divide in research and innovation is narrowing, as a large number of countries are incorporating science, technology and innovation in their national development agendas, in order to be less reliant on raw materials and move towards knowledge economies.

Broad-based North–South and South–South collaboration is also increasing, in order to solve pressing sustainable developmental challenges, including climate change.

Foreword of Irina Bokova, UNESCO Director General
(UNESCO Science Report 2010)

Thirdly, there are ever more scientists in the world and they are becoming more mobile.

The number of researchers and publications worldwide increased by over 20% during the period from 2007 and 2014.

A growing number of countries are putting policies in place to increase the number of women researchers; at the same time, scientists are not only publishing more in international scientific journals but also co-authoring more with foreign partners, with more articles becoming freely available through open access.

At different income levels, countries across the world are striving to attract and retain scientific talent, upgrading their higher education and research infrastructure and developing new scholarships and scientific visas.

Private firms are relocating research laboratories and some universities are setting up campuses abroad to tap into a bigger talent pool.

Foreword of Irina Bokova, UNESCO Director General
(UNESCO Science Report 2010)

Facing the challenge of mobilizing these accelerating trends of

- scientific enterprise,
- knowledge,
- mobility *and*
- international co-operation *to*
    - inform policy
    - take the world on a more sustainable path.

This calls for a stronger science–policy interface and for the relentless drive towards innovation.

Achieving many of the Sustainable Development Goals will depend not only on the diffusion of technology but also on how well countries partner with one another in the pursuit of science.

International scientific collaboration is obviously invaluable for tackling global scientific issues *such as*

- climate change
- water, food or energy security *and for*
- integrating local and regional actors into the global scientific community.

It has also been widely used as a strategy for helping universities improve the quality and quantity of their research output.

Universities: increasingly global players

- Universities have become institutions of a global world, in addition to assuming their traditional local and national roles.
- The answers to global challenges (energy, water and food security, urbanization, climate change, etc.) are increasingly dependent on technological innovation and the sound scientific advice brokered to decision-makers.
- The findings contributed by research institutes and universities to the reports of the IPCC and the Consensus for Action1 statement illustrate the decisive role these institutions are playing in world affairs.
- Research universities also attract innovative industries.
- Universities themselves have become global players. Increasingly, they are competing with one another to attract funds, professors and talented students2 .
- The reputation of a university is made at the global level. This trend will accelerate with the digital revolution, which is giving worldclass universities an even greater global presence through their online courses.

A more developmental approach to science

- Researchers and academics are now sharing their data and research results across web-based platforms, so that the global scientific community can utilize them and further build upon these raw scientific datasets, through collaboration.

- One example of this type of collaborative science can be seen in the big data generated for climate change projections developed by using global-scale models (Cooney, 2012).

- Research such as this provides a case for the utilization of large datasets assimilated and compiled in different parts of the world to solve local problems.

- This type of big data 'downscaling' can bridge the gap between global and local effects by layering larger-scale data with local-level data.

- The combined impact of online tools and advocacy for a culture of open science at the institutional and national levels has fueled the accumulation and sharing of big data in virtual knowledge banks.

- Such sharing of metadata will, for example, allow for the generation of locally relevant projections of weather patterns and the development of cultivars that can best adapt to a particular climatic condition.

- In this way, studies in various scientific disciplines have become increasingly interconnected and data-heavy.

- This has made science more dynamic and given rise to two dimensions of scientific practices.

- As a specialized agency, UNESCO is, itself, committed to making open access and open data one of the central supporting agendas for achieving the Sustainable Development Goals.

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Key influences on STI policy and governance

- Geopolitical events have reshaped science in many regions.
- The past five years have witnessed major geopolitical changes with significant implications for science and technology.
- To name just a few: the Arab Spring in 2011; the nuclear deal with Iran in 2015; and the creation of the Association of Southeast Asian Nations (ASEAN) Economic Community in 2015.
- Environmental crises raising expectations of science Environmental crises, be they natural or human-made, have also influenced STI policy and governance in the past five years.
- The shockwaves from the Fukushima nuclear disaster in March 2011 carried far beyond Japan’s shores. The disaster prompted Germany to commit to phasing out nuclear energy by 2020 and fostered debate in other countries on the risks of nuclear energy.

- In 2010, the EU adopted its own growth strategy, Europe 2020, to help the region emerge from the crisis by embracing smart, sustainable and inclusive growth.

- The strategy observed that ‘the crisis has wiped out years of economic and social progress and exposed structural weaknesses in Europe’s economy’.

- These structural weaknesses include low R&D spending, market barriers and insufficient use of information and communication technologies (ICTs).

- Horizon 2020, the EU’s current seven-year framework programme for research and innovation, has received the biggest budget ever in order to drive this agenda between 2014 and 2020.

- The 2020 Strategy adopted by Southeast Europe mirrors that of its EU namesake but, in this case, the primary aim of this growth strategy is to prepare countries for their future accession to the EU.

- Europe remains a pole of excellence and international cooperation in basic research.

- The first pan-European funding body for frontier research was set up in 2008: the European Research Council (ERC).

- Between 2008 and 2013, one-third of all ERC grantees co-authored articles listed among the top 1% most highly cited publications worldwide.

- The Horizon 2020 programme for research and innovation, which has been endowed with by far the biggest budget yet of any EU framework programme (nearly € 80 billion), is expected to boost EU scientific output further.

- Although the R&D intensity of the ten countries which joined the EU in 2004 remains lower than that of the older members, the gap is narrowing.
- The same cannot be said of Bulgaria, Croatia and Romania, which contributed less to EU GERD in 2013 than in 2007.
- Several member states are promoting technology-intensive manufacturing, including France and Germany, or seeking ways to give SMEs greater access to finance.
- Of some concern is the fact that the innovation performance of 13 countries out of 28 has slipped, owing to a declining share of innovative companies, fewer public–private scientific partnerships and a lesser availability of risk capital.
- Southeast European economies are at different stages of EU integration, which remains a common goal: whereas Slovenia has been part of the Eurozone since 2007, Bosnia and Herzegovina's Stabilisation and Association Agreement with the EU only entered into force in June 2015.
- In July 2014, all non-EU countries in the region announced their decision to join the EU's Horizon 2020 programme. Slovenia is often considered a leader in the region.

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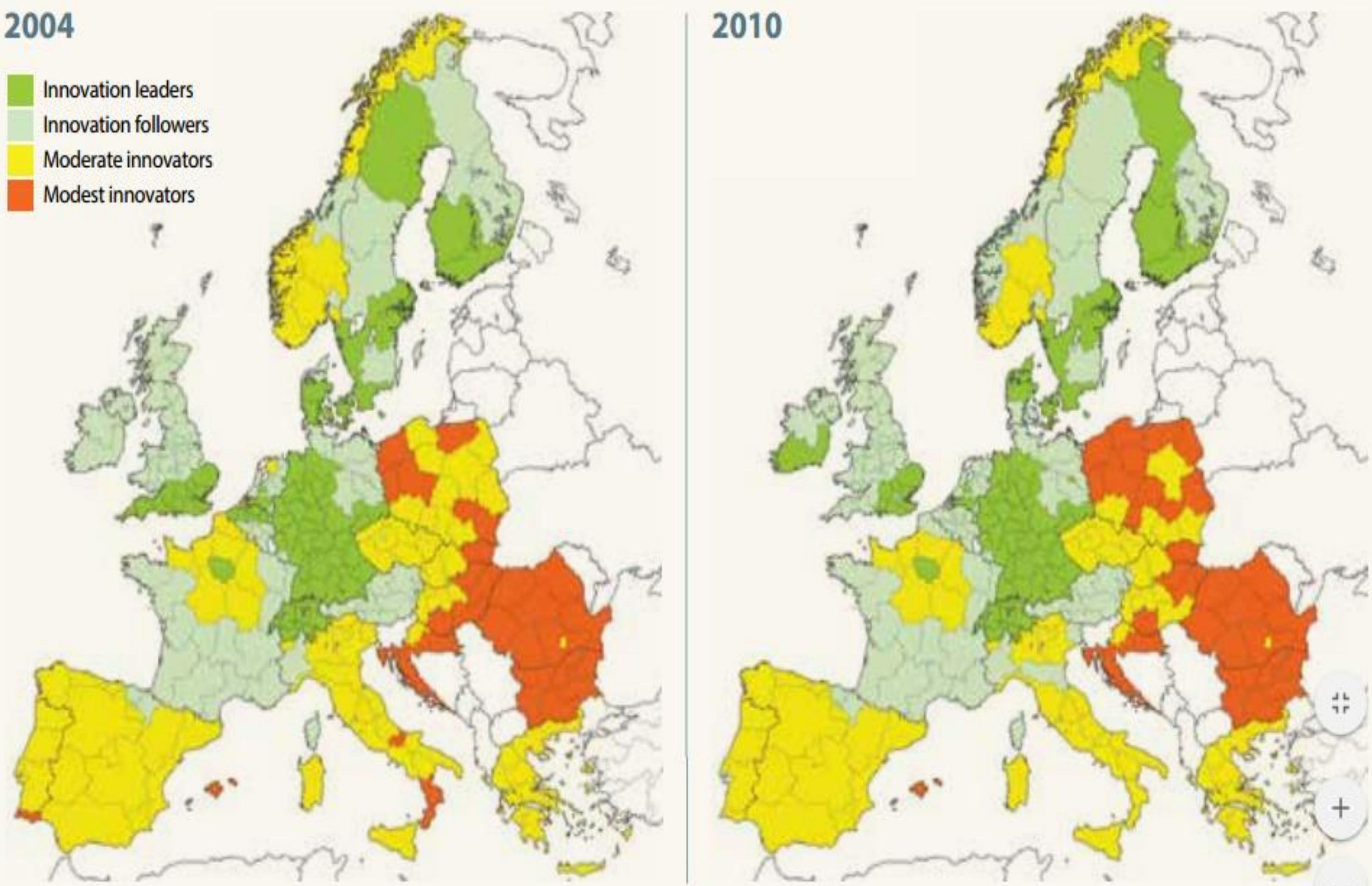
Figure 9.6: **Innovation performance of EU regions, 2004 and 2010**



Source: European commission (2014c), Regional Innovation Union Scoreboard 2014; maps created using Region Map Generator

Global trends in human capital

- Today, there are some 7.8 million researchers worldwide.
- Since 2007, the number of researchers has risen by 21%. This remarkable growth is also reflected in the explosion of scientific publications.
- The EU remains the world leader for the number of researchers, with a 22.2% share.
- Since 2011, China (19.1%) has overtaken the USA (16.7%) despite a downward readjustment of the Chinese figures since this publication's release.
- Japan's world share has shrunk from 10.7% (2007) to 8.5% (2013)
- The Russian Federation's share from 7.3% to 5.7%.
- The Big Five thus still account for 72% of all researchers, even if there has been a reshuffle in their respective shares.

A number of countries have put policies in place to foster gender equality.

Three examples are

- Germany, where the coalition agreement of 2013 introduced a 30% quota for women on company boards of directors,

- Japan, where the selection criteria for most large university grants now take into account the proportion of women among teaching staff and researchers, *and*

- the Republic of Congo, which established a Ministry for the Promotion of Women and Integration of Women in National Development in 2012.

Trends in knowledge generation

- The EU still leads the world for publications (34%), followed by the USA on 25% .
- Despite these impressive figures, the world shares of both the EU and the USA have fallen over the past five years, as China has pursued its meteoric rise: Chinese publications have nearly doubled over the past five years to 20% of the world total.
- Ten years ago, China accounted for just 5% of global publications. This rapid growth reflects the coming of age of the Chinese research system, be it in terms of investment, the number of researchers or publications.

Trends in scientific mobility

The diaspora can boost innovation at home and abroad

- Although new technologies like the internet have opened up possibilities for virtual mobility, physical movement remains crucial to cross-fertilize ideas and spread scientific discoveries across time and space.

- Recent trends in international scientific mobility, defined as the cross-border physical movement of people who participate in research training or research work.

- Drawn on the international learning mobility and career of doctorate-holders studies undertaken jointly by the UNESCO Institute for Statistics, OECD and Eurostat.

Scientific mobility nurtures international research collaboration

- When Woolley et al. (2008) surveyed scientists in six Asia–Pacific countries, they found that those who had obtained research degrees and trained overseas were also active participants in international research collaboration.
- Jöns (2009) discovered that research collaboration between visiting academics and their German colleagues survived beyond the end of the academic’s stay.
- Meanwhile, Jonkers and Tijssen (2008) found that the growth in China’s internationally co-authored publications could be explained by the high population of the Chinese scientific diaspora established in various host countries; they also found that Chinese returnees had an impressive record of international co-publications.

Competition for skilled workers likely to intensify

- A number of governments are keen to promote scientific mobility as a route to building research capacity or maintaining an innovative environment.

- In the coming years, the competition for skilled workers from the global pool will most likely intensify.

Regional schemes in Europe and Asia promoting mobility

There are also regional policies promoting scientific mobility.

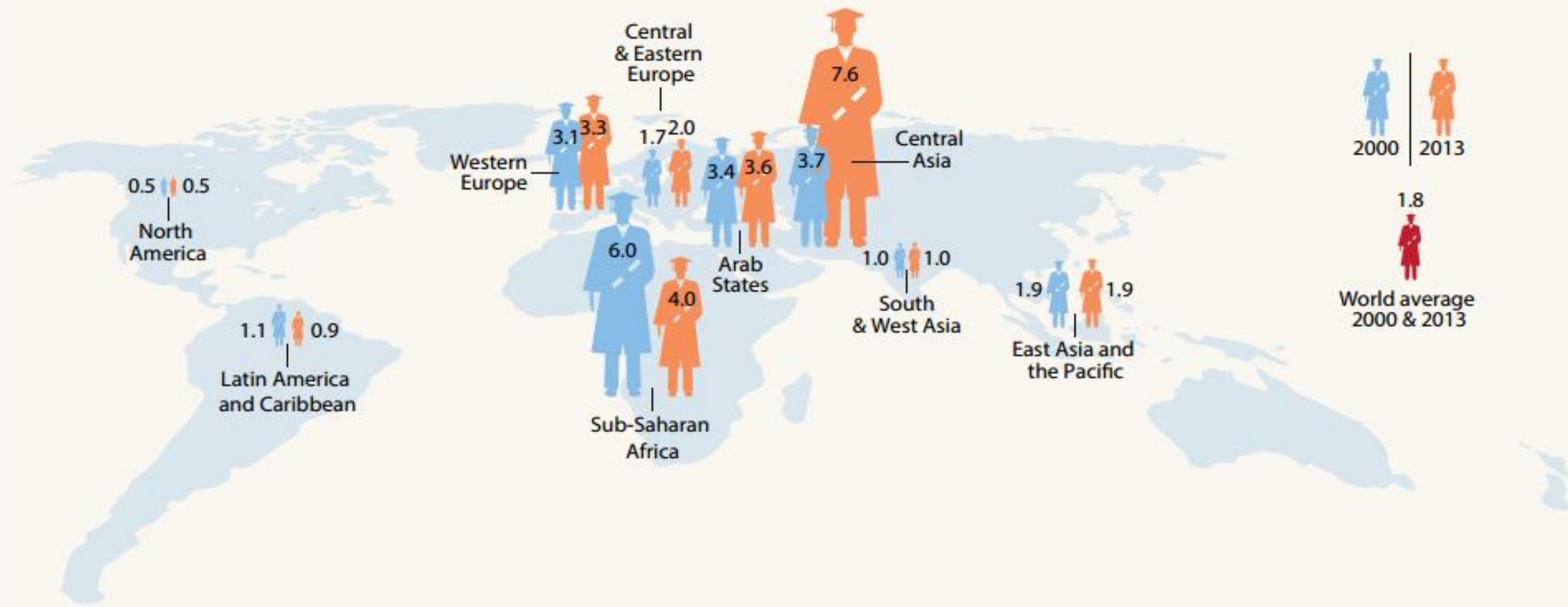
Launched in 2000, the EU's European Research Area exemplifies this trend.

To enhance the competitiveness of European research institutions, the EC has launched a range of programmes to facilitate researchers' international mobility and strengthen multilateral research co-operation within the EU:

- The EU's Marie Skłodowska-Curie actions programme provides researchers with grants to promote transnational, intersectorial and interdisciplinary mobility.
- Another initiative that is influencing cross-border mobility is EU's requirement for publicly funded institutions to announce their vacancies internationally to provide an open labour market for researchers.
- Moreover, the 'scientific visa' package expedites administrative procedures for researchers applying from non-EU countries.
- Around 31% of post-doctoral researchers in the EU have worked abroad for over three months at least once in the past ten years (EU, 2014).

Figure 2.10: **Outbound mobility ratio among doctoral students, 2000 and 2013**

By region of origin (%)



Note: The outbound mobility ratio is the number of students from a given country (or region) enrolled in tertiary programmes abroad, expressed as a percentage of total tertiary enrolment in that country (or region).

Source: UNESCO Institute for Statistics, June 2015

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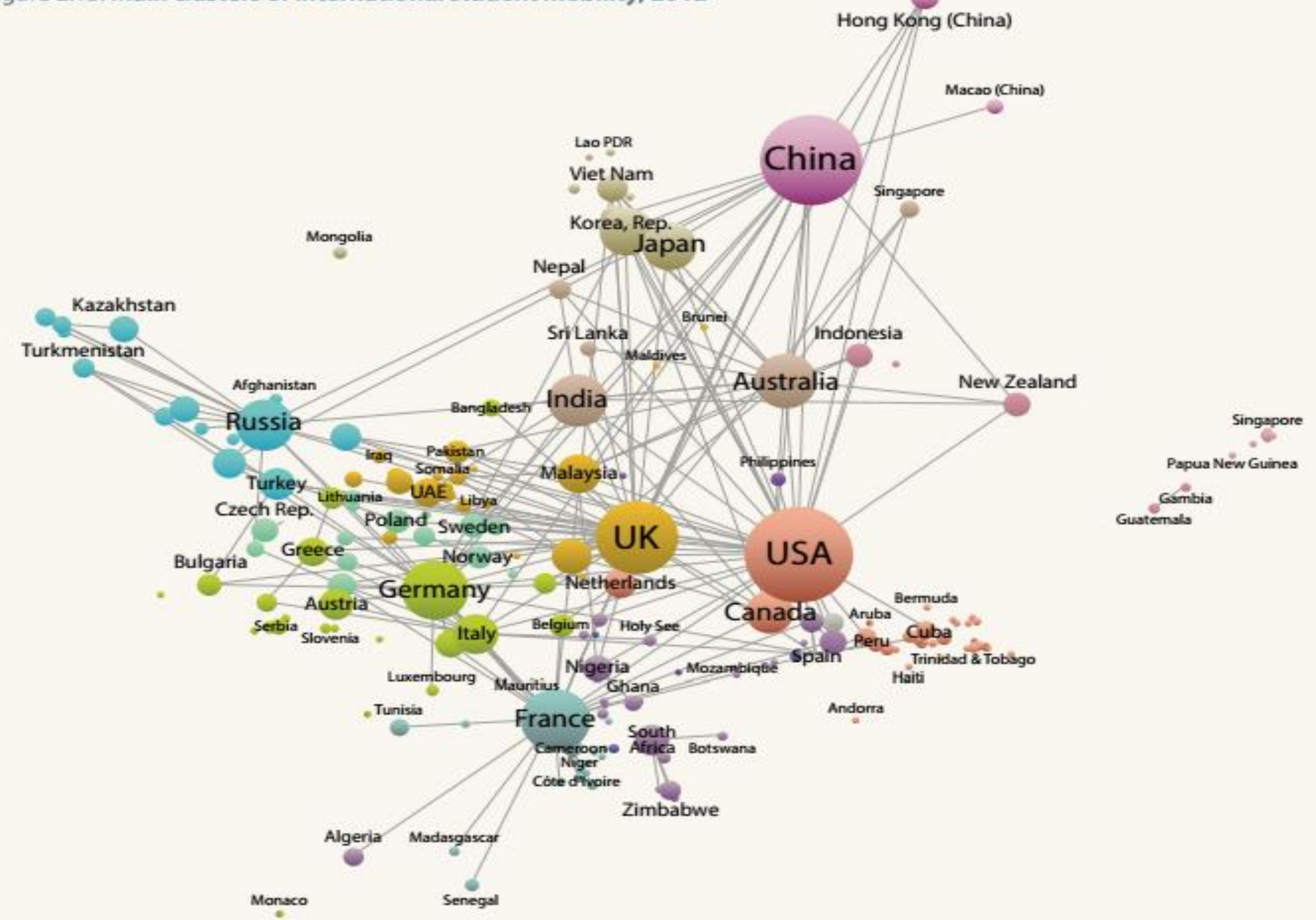
Figure 2.13: **Main clusters of international student mobility, 2012**



Source: Data from UNESCO Institute for Statistics, October 2014; map created using VOSviewer

- International scientific mobility can nurture an innovative environment by enhancing skills, knowledge networks and scientific collaboration.

- International knowledge networks do not form naturally, however, and the potential benefits stemming from such networks are not automatic.

- Lessons learned from past and current success stories show that four main ingredients are required to sustain these international knowledge networks:
  - a demand-driven approach;
  - the presence of a local scientific community;
  - infrastructural support and committed leadership; *and, lastly*,
  - quality higher education to upgrade the skills of the general population.

- Over the past decade, there has been significant growth in cross-border scientific mobility, a trend that is showing no sign of letting up.

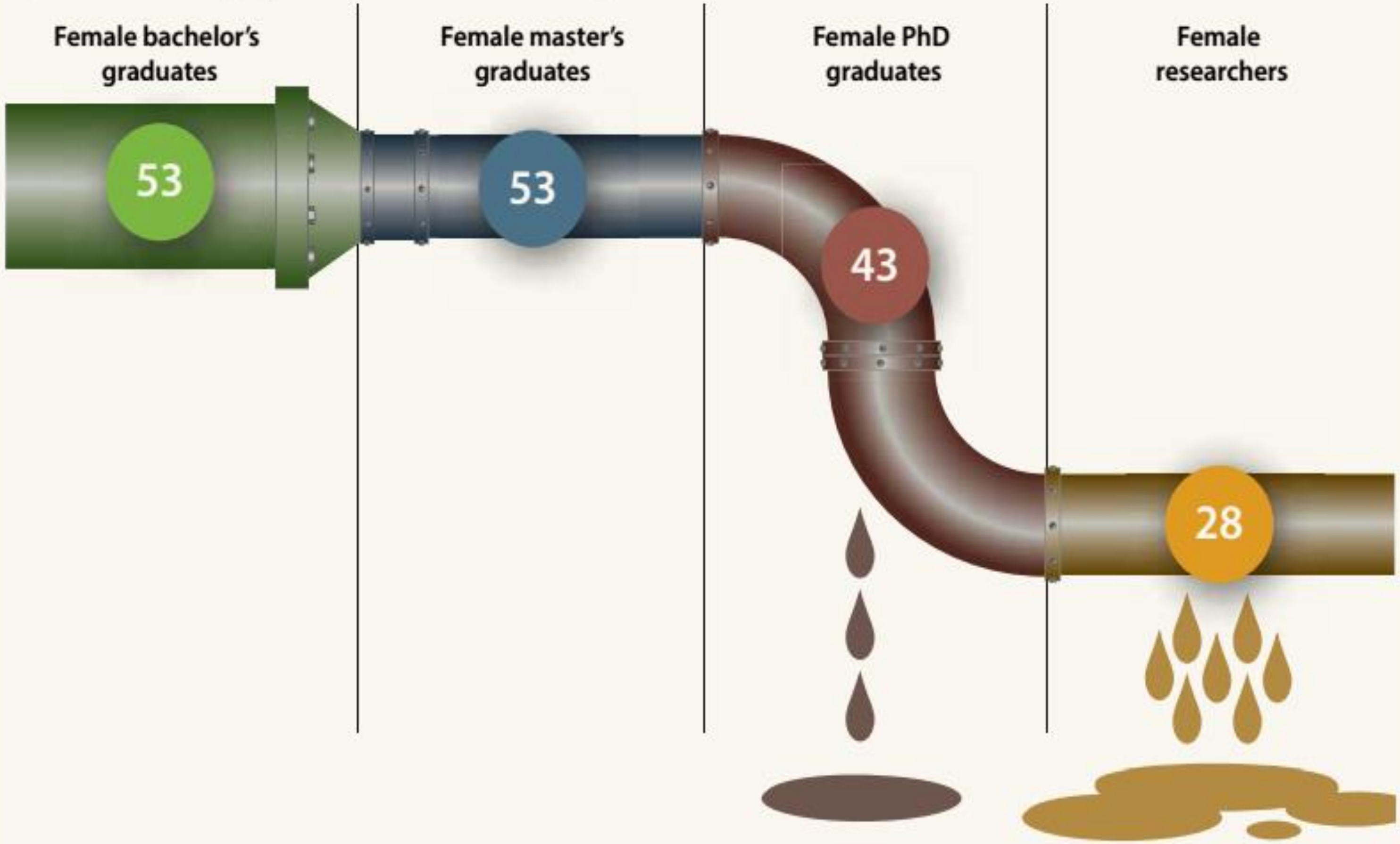
- Creating an enabling environment to facilitate cross-border mobility and collaboration is becoming a priority for national governments.

- To accompany this trend, governments need to introduce programmes which teach scientists and engineers to be sensitive to cultural differences in research, research management and leadership and to ensure research integrity across borders.

Gender parity remains elusive among researchers

- When it comes to women's participation in research overall, globally, we are seeing a leaky pipeline.
- Women are actively pursuing bachelor's and master's degrees and even outnumber men at these levels, since they represent 53% of graduates, but their numbers drop off abruptly at PhD level.
- Suddenly, male graduates (57%) overtake women.
- The discrepancy widens at the researcher level, with men now representing 72% of the global pool.
- The high proportion of women in tertiary education is, thus, not necessarily translating into a greater presence in research.

Figure 3.1: **The leaky pipeline: share of women in higher education and research, 2013 (%)**



Source: UNESCO Institute for Statistics estimates based on data from its database, July 2015

- Although women account for just 28% of global researchers, according to available data, this figure masks wide variations at both the national and regional levels.

- Women are highly represented in Southeast Europe (49%), for instance, and in the Caribbean, Central Asia and Latin America (44%).

- One in three researchers is a woman in the Arab States (37%), the European Union (33%) and the European Free Trade Association (34%), which are closely followed by sub-Saharan Africa (30%).

- For many regions, gender parity (45–55% of res.) is a legacy of the former Soviet bloc, which stretched across Central Asia, the Baltic States and EE to SEE.

- One-third of the MSs of the EU today were once part of the Soviet bloc.

- Over the past decade, several SEE countries have managed to recover the gender parity in research that they had lost in the 1990s following the break-up of the former Yugoslavia: Croatia, FYROM, Montenegro and Serbia.

The following steps, among others, can foster greater diversity in the scientific labour force:

Governments are encouraged to:

- ✓ collect data disaggregated by gender consistently in key sectors;
- ✓ implement policies that promote the participation of women in society and the labour force, as well as in science and innovation; *and*
- ✓ take steps to ensure that science and education systems are accessible, of a high quality and affordable.

Research, science and government institutions are encouraged to:

- commit to the equal representation of women in science, research and innovation management and decision-making;

- support a commitment to gender equality and diversity through funding, programming and the monitoring of progress; *and*

- introduce fellowships and grants to increase the representation of underrepresented groups.

Employers and governments are encouraged to:

- adopt open, transparent and competitive recruitment and advancement policies;

- adopt strategies to promote diversity in education and the workplace, including targets for the participation of different groups, financial support and access to employment opportunities; *and*

- ensure supplementary support for women in the form of training, access to finance and backing for entrepreneurship.

- Gender equality is more than a question of justice or equity.
- Countries, businesses and institutions which create an enabling environment for women increase their innovative capacity and competitiveness.
- The scientific endeavour benefits from the creativity and vibrancy of the interaction of different perspectives and expertise.
- Gender equality will encourage new solutions and expand the scope of research.
- This should be considered a priority by all if the global community is serious about reaching the next set of development goals.

Thank you