

Enabling Sustainable Uranium Production: The Inter-regional Technical Cooperation experience

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IAEA

International Atomic Energy Agency

In readiness for Uranium Rush III

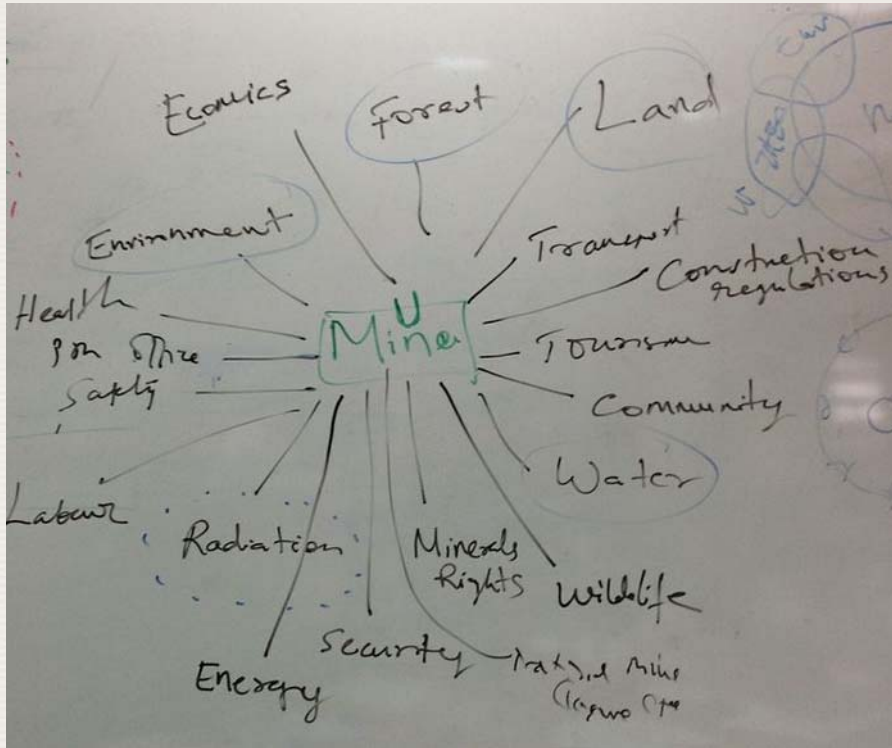
Sustainable uranium production cycle activities, encompassing exploration, mining and processing to final site remediation, are efficiently carried out through the sharing of good practices and collective wisdom gained from past experiences.



Learning from the past - Sofia Barbosa, presenting remediation work at the Cunha Baixa U mine site, Portugal, IAEA Workshop 15-18 October, 2012, Portugal

Talking a common language ?

Photo H Tulsidas, IAEA



IAEA Uranium Production Site Assessment Team (UPSAT) reviewing the planned Mkuju River Uranium Project, Tanzania - on the edge of Selous Game Reserve and UNESCO World Heritage Site – 27 May to 5 June, 2013

The challenges in uranium mining (1)

- **Technology:** Systematic efforts to understand uranium is only a few decades old, compared to other energy or mineral sources that may have centuries of study and research.
- **Planning:** Interest in uranium peaked in the 1970s, but fell in the three decades following that due to many reasons, notably due a deluge 'cheap oil'. Uranium exploration is driven by a relatively small market demand as of now, which could change in a major way in the future.
- **Optimization:** Very little research and development has gone into making uranium extraction more efficient. There are many processing plants in the world with grossly poor extraction efficiency that up to 1000 ppm of uranium is left behind in the tailings.



Uranium mining, WISMUT, Eastern Germany, 1947-90



Radium (Uranium) mining, DR Congo 1906 – 1924; 1937 - 45



The challenges in uranium mining (2)

- **Sustainability:** Extraction of uranium from unconventional is another indicator on how seriously we are thinking about sustainability. Every year some 12000 tonnes of uranium is being permanently lost because of our lack of interest in recovering uranium from phosphoric acid.
- **Coordination:** Certain amount of competitiveness is unavoidable in a market driven economy. But the challenges of uranium can better managed only if a higher level of unified action by all stakeholders is realized.



Uranium production - A small world!

- **50 mines / centres in 15 countries**

- **Asia – (37)**
 - Kazakhstan – (12)
 - Uzbekistan
 - China – (7)
 - India – (6)
- **N America – (11)**
 - Canada – (3)
 - United States – (8)
- **Pacific – (3)**
 - Australia – (3)
- **Africa – (9)**
 - Namibia – (2)
 - Niger – (2)
 - **Malawi (1) Now suspended**
 - South Africa – (4)
- **Europe – (4)**
 - Russia – (2) (including Asian part)
 - Ukraine – (1)
 - Czech Republic – (1)
- **S America – (1)**
 - Brazil – (1)



- **28 potential 'new comers'**

- **Africa**
 1. Botswana
 2. Cameroon
 3. Central African Republic (by product)
 4. DR Congo
 5. Gabon
 6. Madagascar
 7. Mauritania
 8. Mali
 9. Morocco (also by product)
 10. Mozambique
 11. Somalia
 12. Tanzania
 13. Tunisia (by product)
 14. Zambia (also by product)
- **S. America**
 - Argentina, Peru, Colombia, Paraguay, Guyana, Chile (by product)
- **Europe**
 - Finland (by product), Greenland, (Denmark)– (by product), Spain, Slovak Republic, Sweden
- **Asia**
 - Mongolia, Jordan (also by product)

Inter-regional project

- **Supporting Uranium Exploration, Resource Augmentation and Production Using Advanced Techniques**
- Objective:
 - To address gaps in transferring a coherent body of knowledge on sustainable uranium production
- Emphasis on:
 - Enabling the new practitioners in the uranium production industry to avoid the mistakes of the past and to apply good practices established elsewhere, adapted to local needs.
 - To bring considerable cost savings while attracting elevated levels of social acceptance.

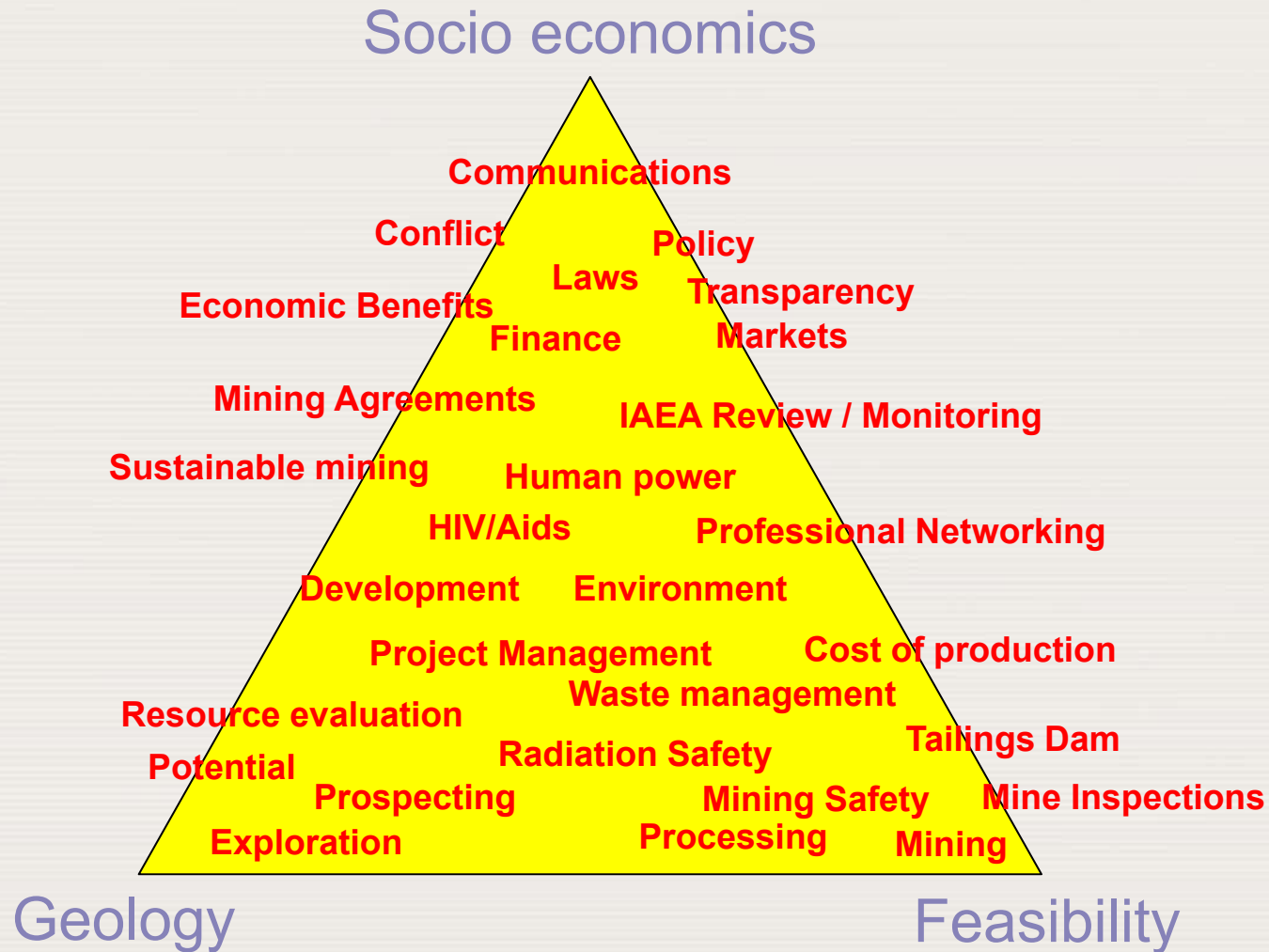
'Pathway to preparedness'

- **Supporting Uranium Exploration, Resource Augmentation and Production Using Advanced Techniques**
- Participation from **42 Member States** in 4 regions:
 - **Asia-Pacific** (13): China, India, Indonesia, Iraq, Jordan, Mongolia, Nepal, Philippines, Sri Lanka, Syrian Arab Republic, Thailand, Turkey, Yemen
 - **Latin America** (8): Argentina, Brazil, Chile, Cuba, Paraguay, Peru, Uruguay, Venezuela,
 - **Africa** (15): Chad, Cameroon, Egypt, Ethiopia, Mauritania, Malawi, Mali, Niger, Nigeria, Senegal, Sudan, Tunisia, Uganda, Tanzania, DR Congo
 - **Europe** (6): Finland, Portugal, Poland, Russia, Slovakia, Tajikistan
- **International expertise**
 - Australia, Brazil, Canada, France, UK, China, India
- **Partnership** with International Organizations:
 - UN Economic Commission for Europe (UNECE)
 - Latin-American Programme for Science, Technology and Development (CYTED)

Methodology

- **Major group events**
- **Meetings/workshops:**
 - Planning and Coordination Meeting with focus on **"Uranium exploration and production priorities outlook"**, 26-29 June, Espoo, Finland – 40 participants and 5 international experts
 - Workshop on **"Recent Developments in Evaluation of Uranium and Thorium Resources"**, 45 participants and 5 international experts
 - Workshop on **"United Nations Framework Classification for Fossil Energy and Mineral Reserves and Resources – 2009 (UNFC–2009) Applications in Uranium and Thorium Resources: Focus on Comprehensive Extraction"**. Santiago, Chile, 9-12 July 2013. 40 participants + 5 international experts
 - Workshop on **"Social Licensing and Stakeholder Communications in Uranium Exploration and Mining Industry"**, Ankara, Turkey, 10 - 14 February 2014 60 participants + 5 international experts
- **Training Courses:**
 - Interregional training course on **"Uranium deposit models and exploration"** Beijing, China, 12-16 November 2012 – 50 participants + 5 international experts
 - Interregional Training Course on **"Uranium Production from Phosphate Rocks"** , Amman, Jordan, 10-14 October, 2012 – 45 participants + 5 international experts
 - Interregional training course on **"Performance optimization in uranium and REE production from phosphate rocks"**. Tunis, Tunisia, 11-15 February 2013 – 46 participants + 5 international experts
 - Interregional Training Course on **"Uranium Exploration Strategy, Mining and Processing Techniques"**, Jamshedpur, India, 8-12 April, 2013, 60 participants + 5 international experts

High-level view of issues



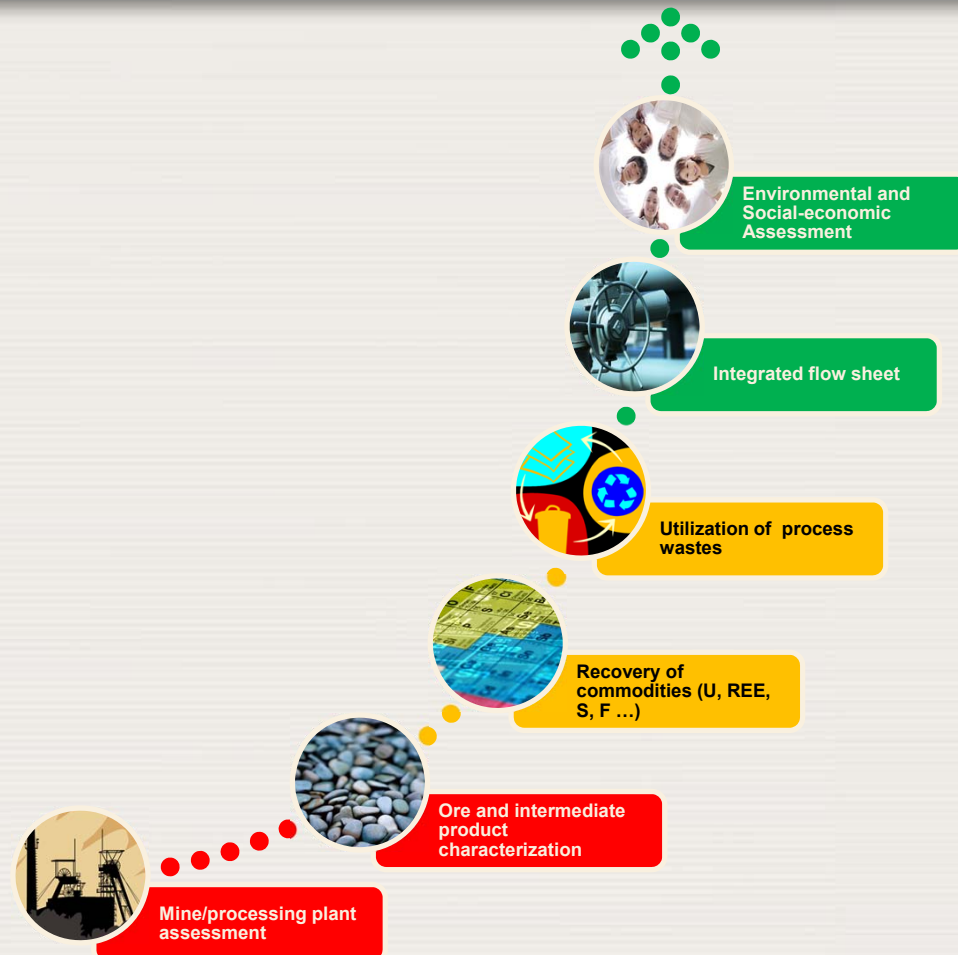
Methodology

- **Introducing availability of advanced tools to:**

- Make operations more efficient and productive
- Reduce footprint
- Increase competencies in control and management
- Make activities sustainable

- **2012-13**

- 8 Workshops/Training courses saw **participation of over 200 experts**
- Over **40 international experts** interacted with the participants
- Over **8000 contact hours**
- Online follow-up

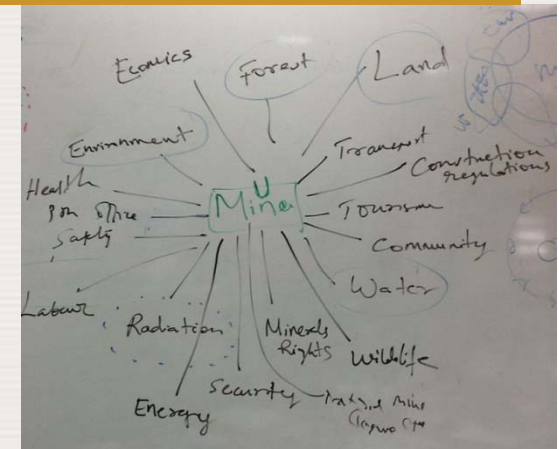


Engagement

Lectures



Class rooms



Site visits



Group Discussions



Beyond the meeting room

Mapping the Full Life Cycle of Uranium Mining: Landmark Meeting in Lisbon

Mapping the Full Life Cycle of Uranium Mining: Landmark Meeting in Lisbon

9 November 2012 | International experts from more than 30 IAEA Member States met in Lisbon, Portugal, and mapped the full life-cycle of uranium mining, from exploration to end of mine-life remediation and 'future-proofing' for eventual reopening. They also discussed using the United Nations Framework Classification for Fossil Energy and Mineral Reserves and Resources 2009 (UNFC-2009) for resource reporting.

This was a landmark event – it was the first time that such a comprehensive approach has been taken to uranium mining. It even included a review of techniques for characterising and quantifying minerals of interest remaining in closed tailings piles from former uranium mines.



The Cunha Baixa uranium mine site, Portugal, under remediation by EDM

UNFC – the tool of choice for optimizing natural resource management

Published: 12 July 2013

After four years of review and refinement, the United Nations Framework Classification for Fossil Energy and Mineral Reserves and Resources (UNFC) is being pilot tested in countries all over the world. Those responsible for the testing gathered this week at a workshop in Santiago de Chile to report on their results to date and to plan a full roll-out focused on sustainable development objectives in emerging economies. These economies are seen as key because of the high and increasing contribution made to their GDP by mineral resources – anywhere from 10-20%. Many have little or no experience in reporting and managing mineral resources and hence are vulnerable in negotiations of mining development agreements.

Where better to meet than Chile, the only country in the world to anchor mining in its national constitution, to review the merits of a unified classification and reporting tool for managing all energy, mineral and renewable resources in a consistent way? UNFC is a classification system based on principles of simplicity, flexibility and transparency that is a new tool for a new age in natural resource management.



Photo courtesy of Monica Belling, ProActivo/Mining Press

Web reports, Blogs, Social Media ...

Uranium Extraction from Phosphoric Acid?

Origins of Wave 3: November 2009 - June 2012

Uranium from Phosphate Resources (UxP): A Third Wave?

At the Technical Meeting, **Uranium from Unconventional Resources**, Vienna (4-6 November 2009), first identified the opportunity, the prospect of Wave 3 of industrial scale uranium extraction from phosphoric acid has come a long way. In late March 2013, the members of the Uranium action from Phosphates (UxP) Expert Working Group conducted a strategic progress review with Scientific Secretary Hari Tulsidas, (March 25-28, 2013). The overall conclusion was that such has been the momentum generated by UxP since its IAEA sponsored capacity-building programme in September 2011 that emphasis can now shift from awareness-raising to project implementation. Wave 3 may be coming to life.



IAEA Workshop Visit to the GCT Uranium Extraction Pilot Plant, Gabès, February 14, 2013



Lessons learned

- Each uranium project is technically, environmentally and socioeconomically **unique**
- **One-size-fits-all** type of approach is not suitable
- Application of **good practices** appropriately applied to a new context
- Informal **on-line and social media** communications

Sustainable
Development

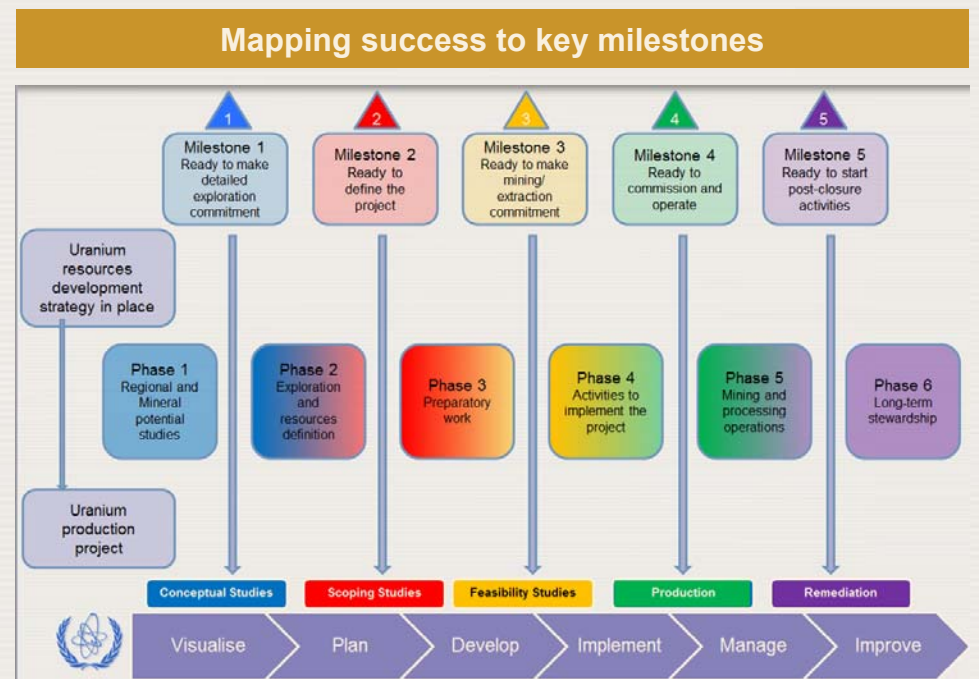
Comprehensive
Extraction

Waste
Minimisation

Life-cycle
management

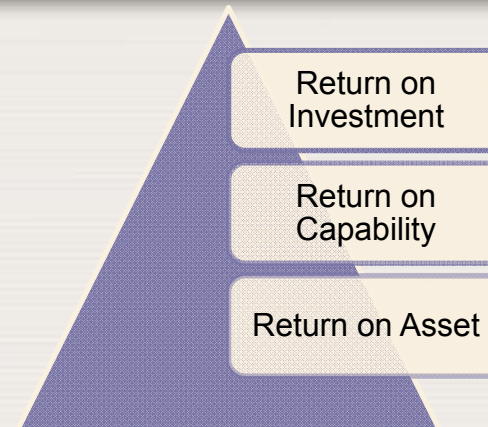
Key success factors

- Emphasis on **holistic and global view** of the uranium production life cycle, while addressing topical and local challenges.
- Concentrate on **gradual, incremental progress** and seek continuity of activities.
- Focus in **individual learning experiences** within a network of peers.

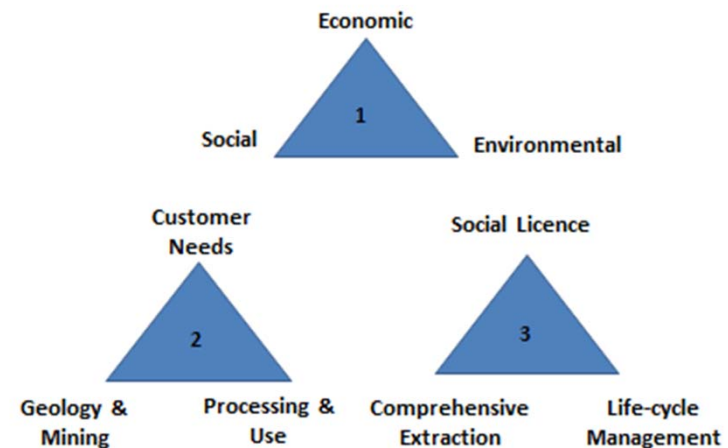


Quality criteria

- **Key performance indicators** in
 - Technology
 - Socioeconomics and
 - Environment
- Applied to a limited number of definitive **milestones**
 - Conceptual model
 - Exploration
 - Resources discovery
 - Feasibility studies
 - Mining start
 - Mine closure
 - Remediation and handback



Performance “dashboard/ scorecard” by measures of return



What next ?

- **C-PROMPT**
 - “Comprehensive” Project Design and Management Methodologies for Optimising the Recovery of Uranium and Related Resources Using Integrated Minerals Processing Techniques and Technologies (C-PROMPT)
 - To address challenges in project design and management capability.
 - Provide road map for project execution - beyond technology development,
- **Leadership Academy**
 - Build a new generation of leaders
 - Think globally, act locally
 - Focus on economic, environmental and social returns
 - In partnership with individuals and institutions in Member States

Thank you

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