



WMF Top 10 Technologies

Key Innovations and Steps to Advance Decoupling

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Increased clarity on the approach

- by focusing on key materials and related technologies
- by pursuing WMF principle: **Decoupling our economic growth from the use of our natural resources while creating value for our industries**

Expanded coverage of the subjects

- Innovative recycling & all « less » technologies: green mining, 3D manufacturing, decarbonation of bulk
- Smarter usage: Spintronics, AI & Quantum, improved performance on batteries and of course Hydrogen system

2021 List of Top 10 Technologies

1. Chemical Recycling of plastics
2. Recycling of EV batteries
3. Improving mobility performance of EV batteries
4. Improving storage performance of stationary batteries
5. Less energy and water for green mining
6. Spintronics & less energy for data storage/usage
7. No CO₂ production of bulk materials
8. Hydrogen based on renewables for fuel cells at reasonable cost
9. 3D manufacturing
10. AI and Quantum for less energy and smarter usage

Evolution of the Wise-Use* Concept

- Life-cycle design in batteries for EV and stationary use
- Less CO₂ emission production of bulk materials (iron, cement and aluminum)
- Spintronics – huge potential in smarter use of energy for increasingly connected world
- Green mining – less energy & water

Development of the Hydrogen System

- H₂ (green, blue, etc.) production plants – increase in construction or planning
 - Use in power generation + in iron making + as emission-free fuel
 - H₂ supply chain expanding under public-private collaboration
 - Challenges to lower H₂ production, storage & transportation cost – competition speed up
- * Use less, longer, smarter*

Smooth Transition toward Green Economy

- Practical and affordable pathways to satisfy differences in geographical condition, as well as level of industrialization and urbanization
- Evolution of CCUS* and other proven technologies available to each country with its unique circumstances

DX and Synergetic Collaboration

- Digital transformation (DX) to be studied further to advance our activities (for example) in recycling, material tracing, optimized supply chain, etc.
- Operations and technologies increasingly correlated: let's stimulate each other for synergetic collaboration/better solutions

** Carbon Capture Utilization and storage*



**THANK YOU
FOR YOUR ATTENTION**