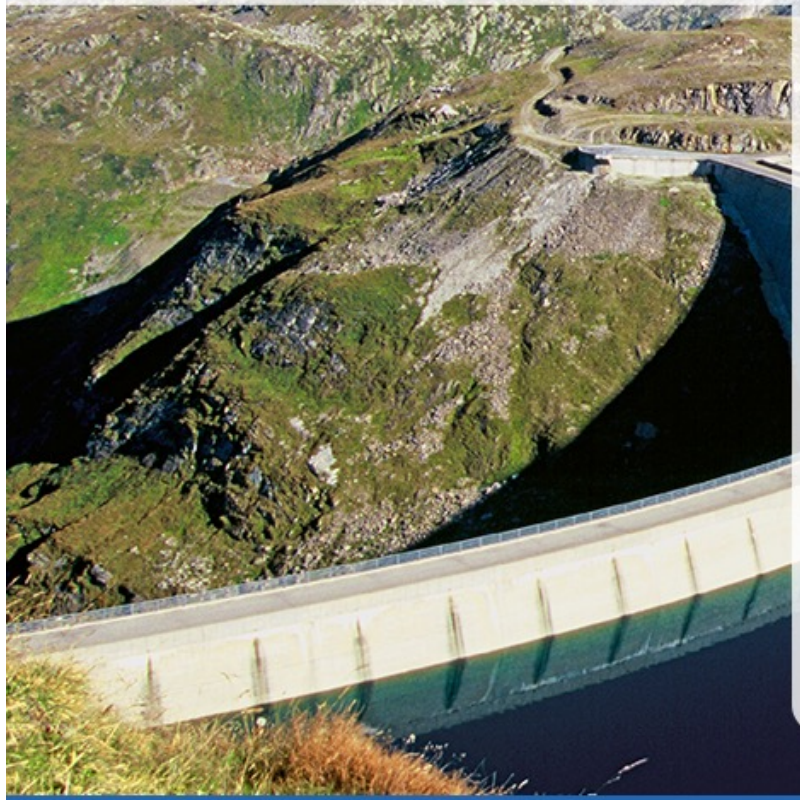
HYDROPOWER EUROPE

Highlights from Hydropower Europe project -

achieve a research and innovation agenda and a technology roadmap for the hydropower sector



Prof. Dr. Anton J. Schleiss

Hon. President of the International Commission on Large Dams (ICOLD)

Coordinator of Hydropower Europe

International Conference on Fishfriendly Hydropower
FIThydro final Conference, 17 – 18 March 2021

The HYDROPOWER EUROPE Forum is supported by a project that has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 826010

www.hydropower-europe.eu

Hydropower at the source of the development of Europe in the last century

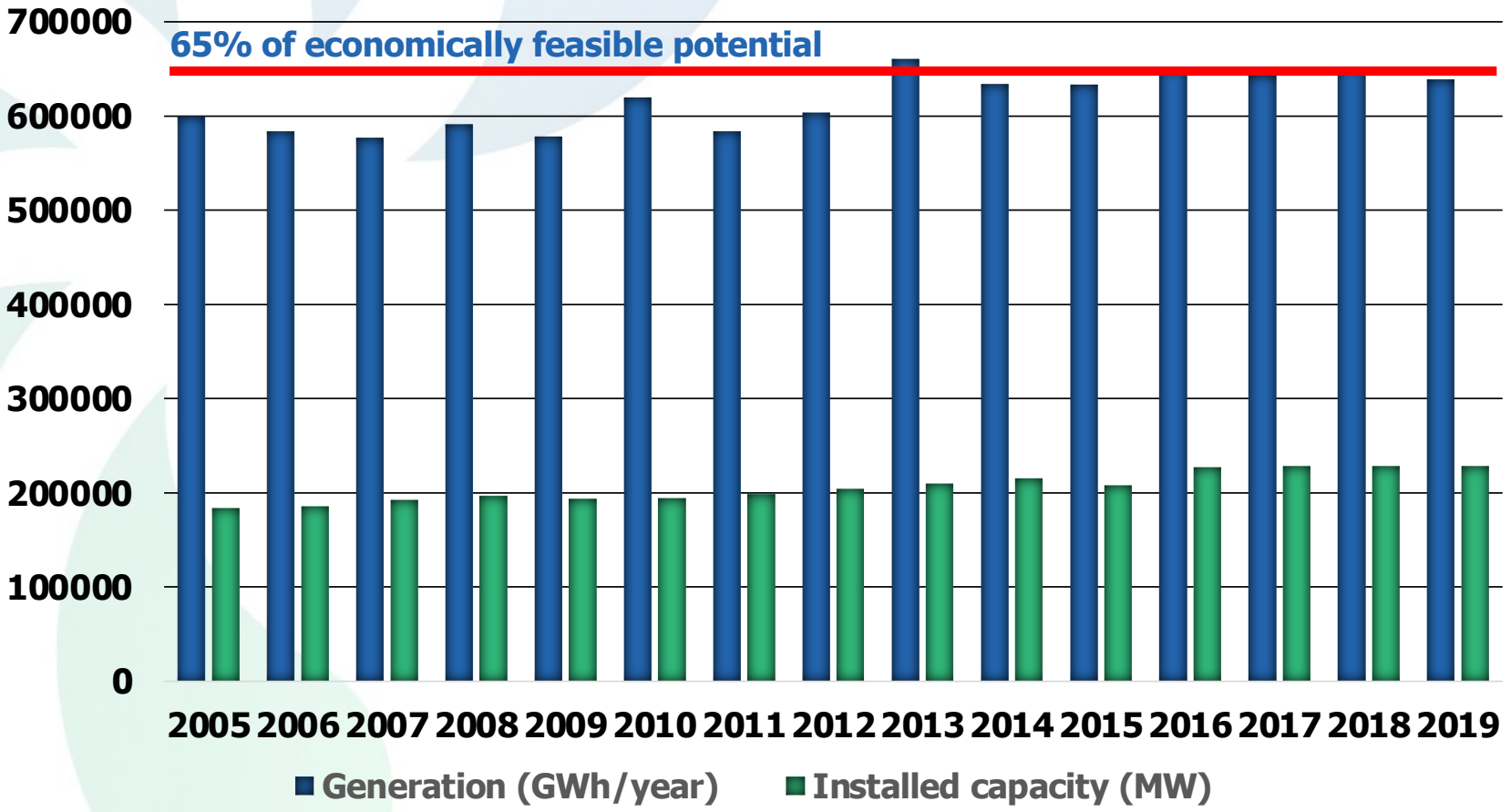
Advantages of hydropower

- Renewable energy without direct emission of CO2, excellent energy gain or pay back factor
- Excellent efficiency, production can be easy adapted to the demand (flexible peak energy)
- In-country energy creating jobs and financial resources in remote areas (taxes and concession fees)
- Improvement of infrastructures and touristic attractiveness
- Strong contribution to flood and drought protection

Thissavros Dam, Greece, 172 m

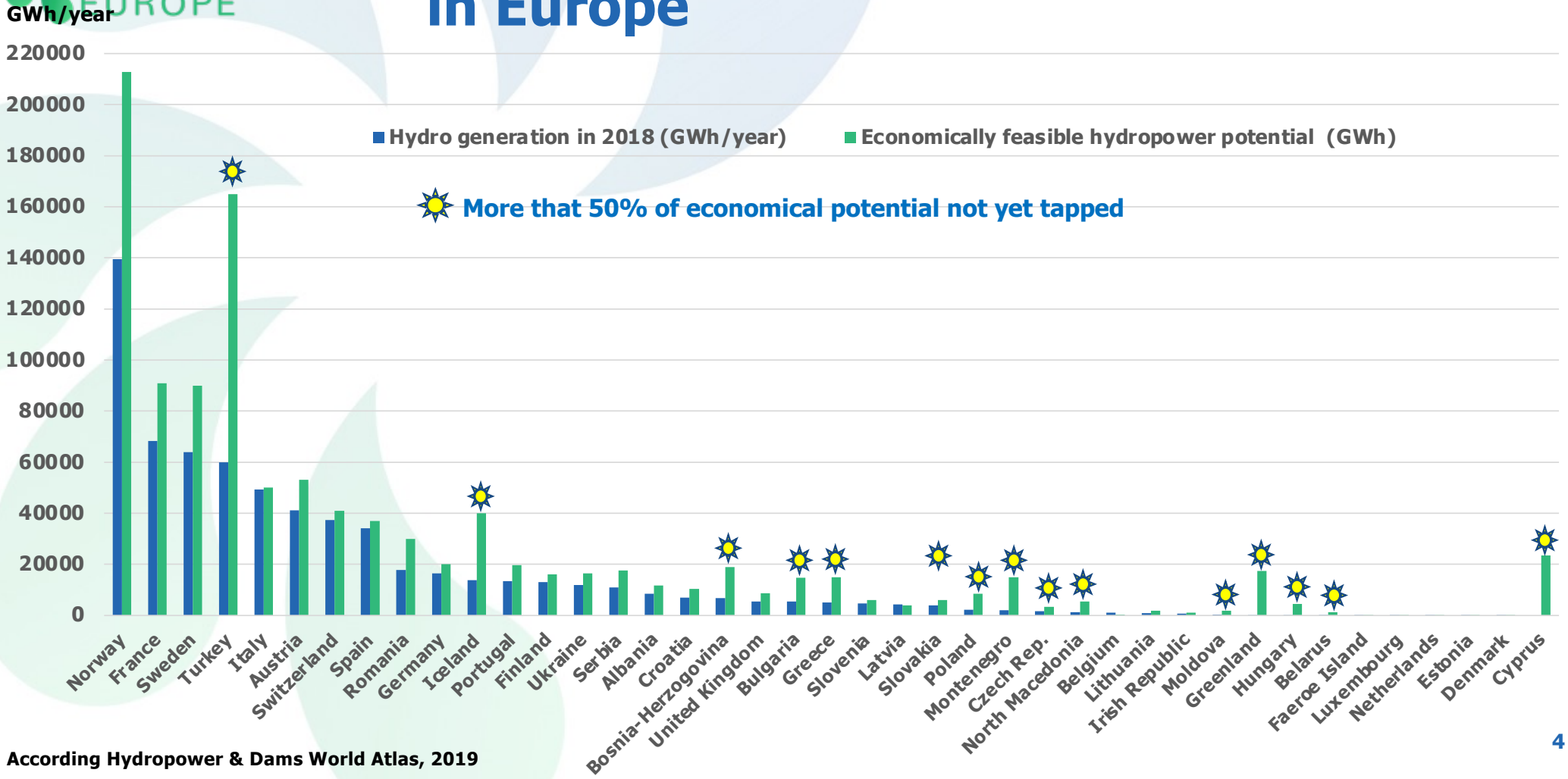
Hydropower at the source of the development of Europe in the last century

Situation of Hydropower in Europe (with Turkey)



According Hydropower & Dams World Atlas 2020

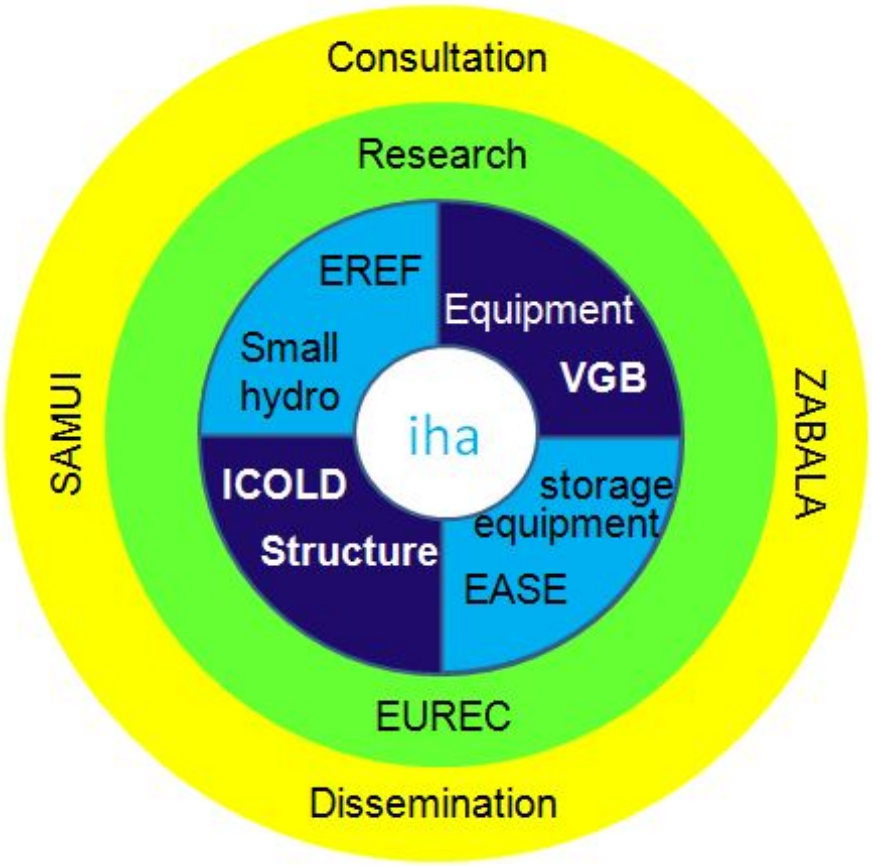
Generation and Potential of Hydropower in Europe



According Hydropower & Dams World Atlas, 2019

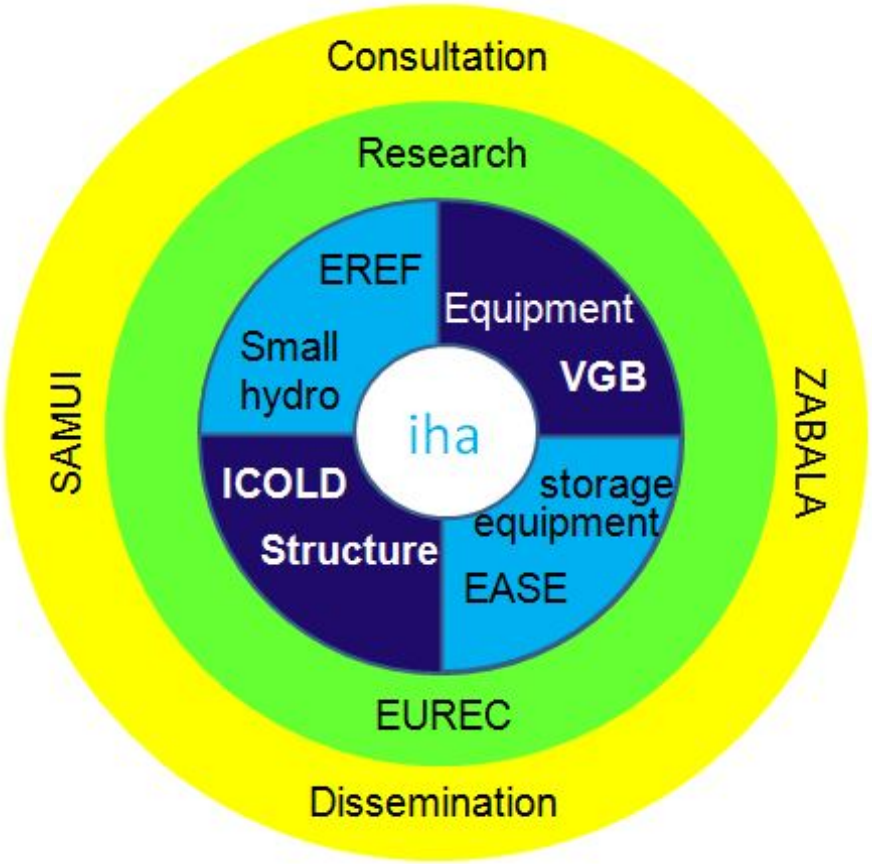
H2020 objectives for Hydropower: Hydropower Europe Forum

- **ICOLD Leader**
- **Coordinators:**
  - **Jean Jaques Fry**
  - **Anton J. Schleiss**
- **+ 7 core partners**
- **+ 5 third linked Parties**



EASE - European Association for Storage of Energy
EREF - European Renewable Energies Federation
EUREC - Association of European Renewable Energy Research
ICOLD - International Commission on Large Dams
IHA – International Hydropower Association
VGB - International Technical Association for Generation and Storage of Power and Heat

H2020 objectives for Hydropower: Hydropower Europe Forum



The forum is producing Strategic Industrial Roadmap (SIR) and Research and Innovation Agenda (RIA) for the hydropower sector in Europe, targeting an energy system with high flexibility and renewable share.”

Hydropower as a catalyst for the energy transition in Europe
VISION "Hydropower Europe"

1. **Increasing hydropower production** through the implementation of new environmental friendly, multipurpose hydropower schemes and by using hidden potential in existing infrastructures.

Pinios Dam, Greece, 50 m

Hydropower as a catalyst for the energy transition in Europe
VISION "Hydropower Europe"

2. **Increasing the flexibility of generation from existing hydropower plants by adaptation and optimization of infrastructure and equipment combined with innovative solutions for the mitigation of environmental impacts.**

Moiry Dam, Switzerland, 148 m

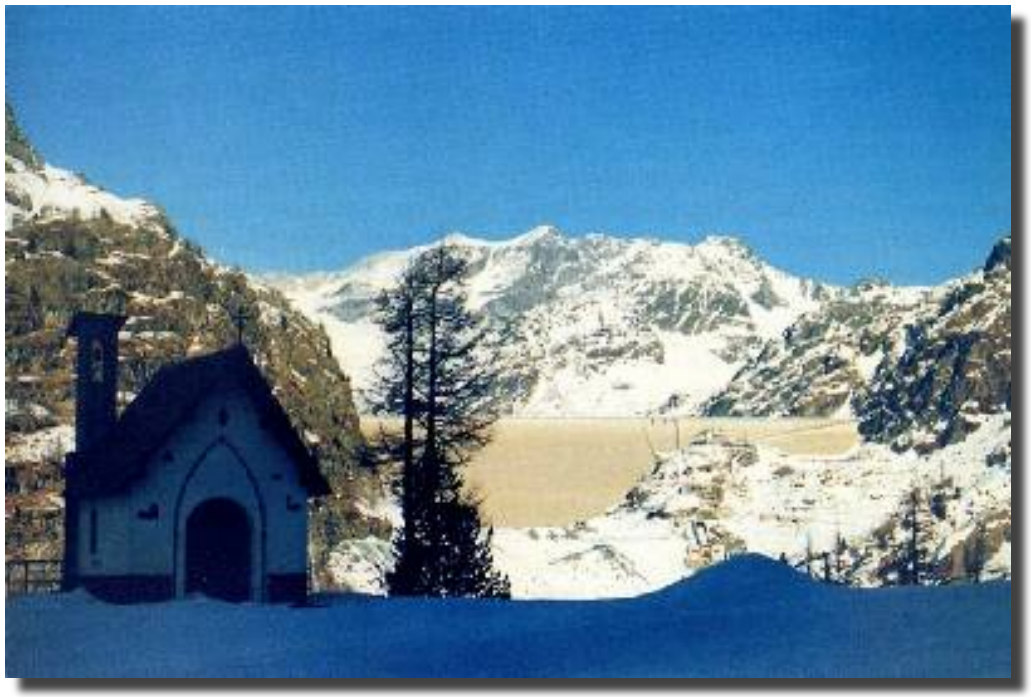
Hydropower as a catalyst for the energy transition in Europe
VISION "Hydropower Europe"

3. **Increasing storage** by the heightening of existing dams and the construction of new reservoirs, which have to ensure not only flexible energy supply, but which also support food and water supply and thus contribute to the Water-Energy-Food NEXUS and achievement of the Sustainable Development Goals of the United Nations.

Tignes Dam, France, 180 m

Hydropower as a catalyst for the energy transition in Europe
VISION "Hydropower Europe"

4. Strengthening the contribution of flexibility from pumped-storage power plants by developing and building innovative arrangements in combination with existing water infrastructure.



Alpe Gera Dam, Italy, 172 m

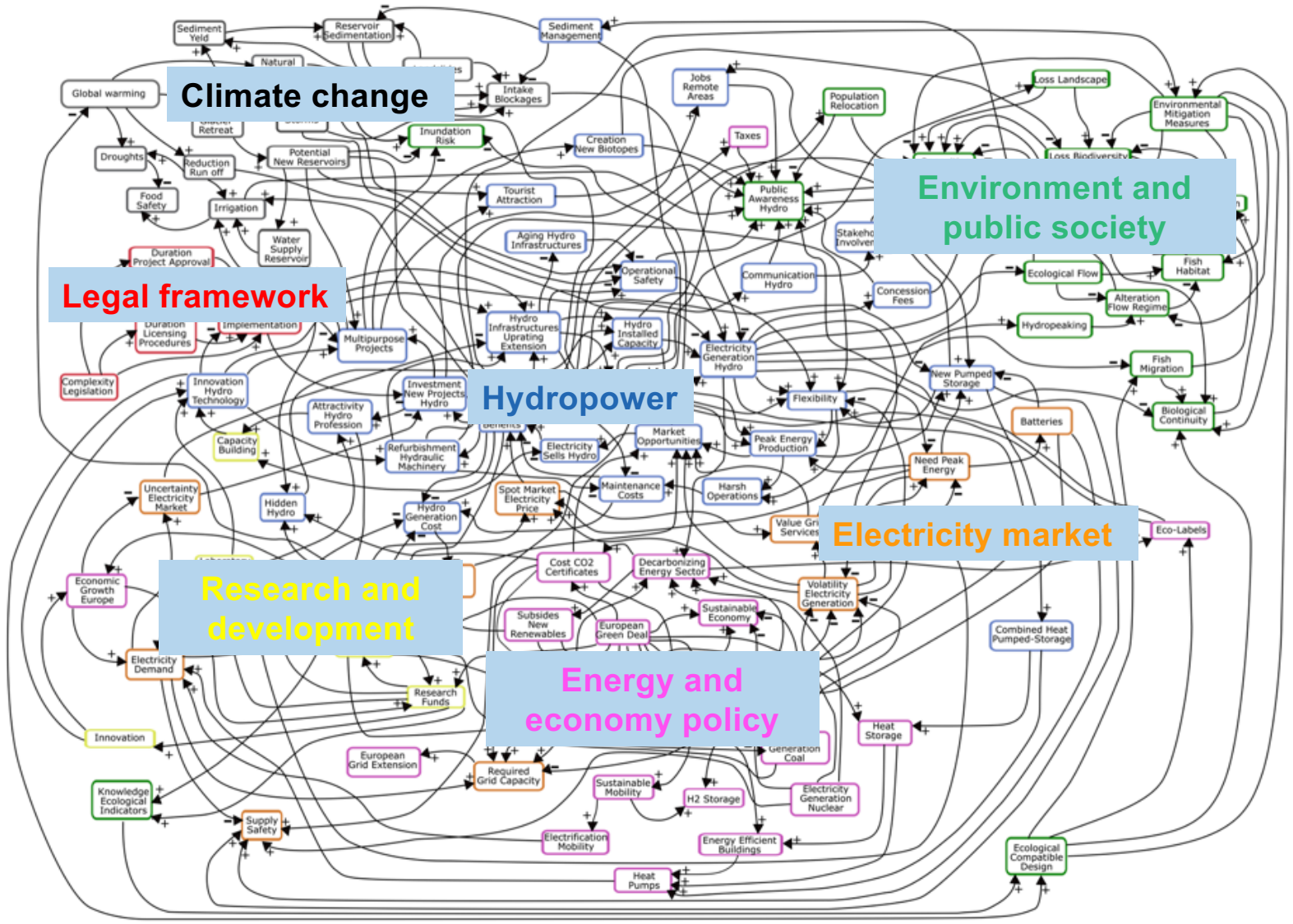
Hydropower in Europe in a complex world

A global system analysis approach as a supporting tool for evaluating strategic actions and research directions

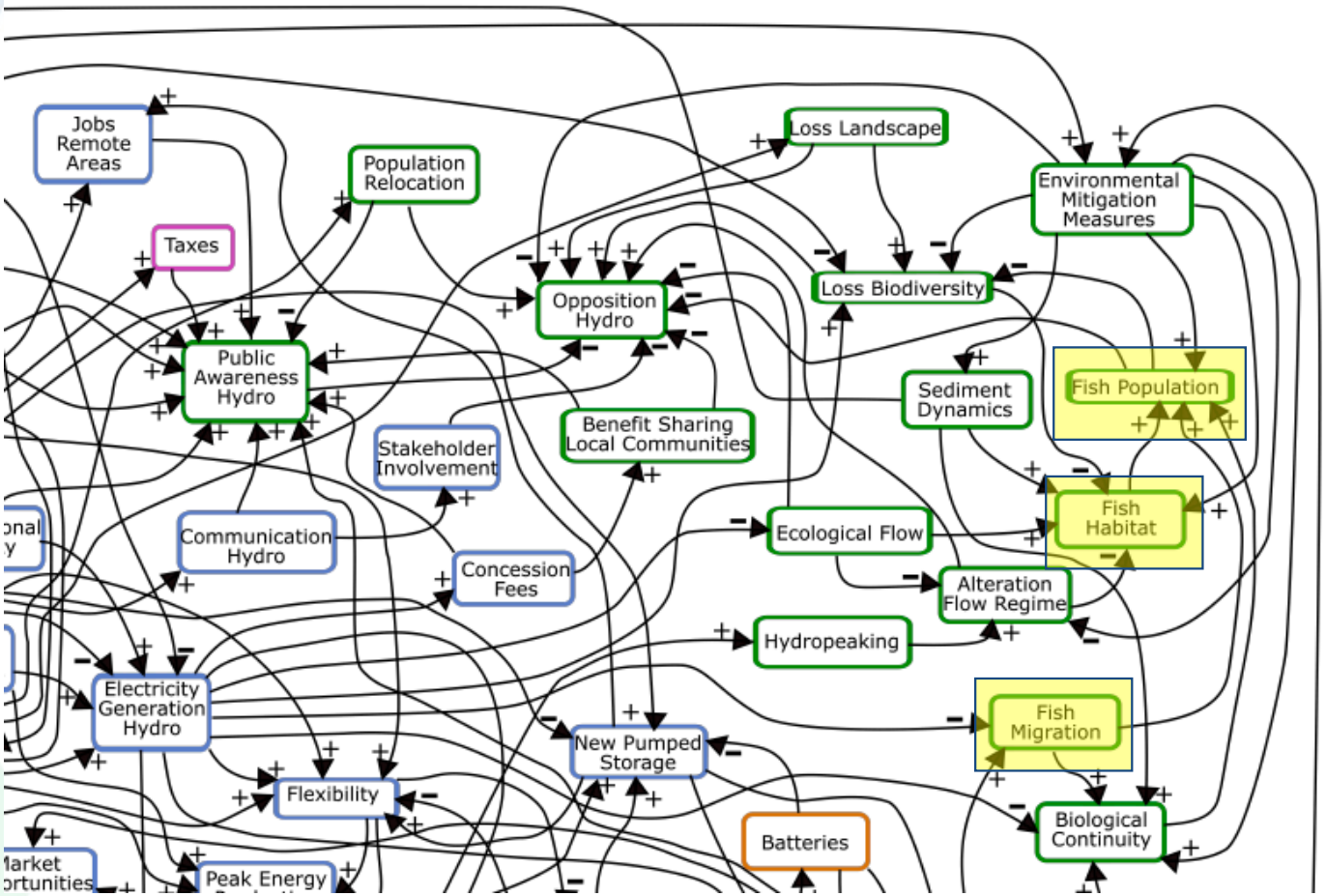
Ruppoldingen run-of-river power plant on Aar River in Switzerland

HYDROPOWER EUROPE

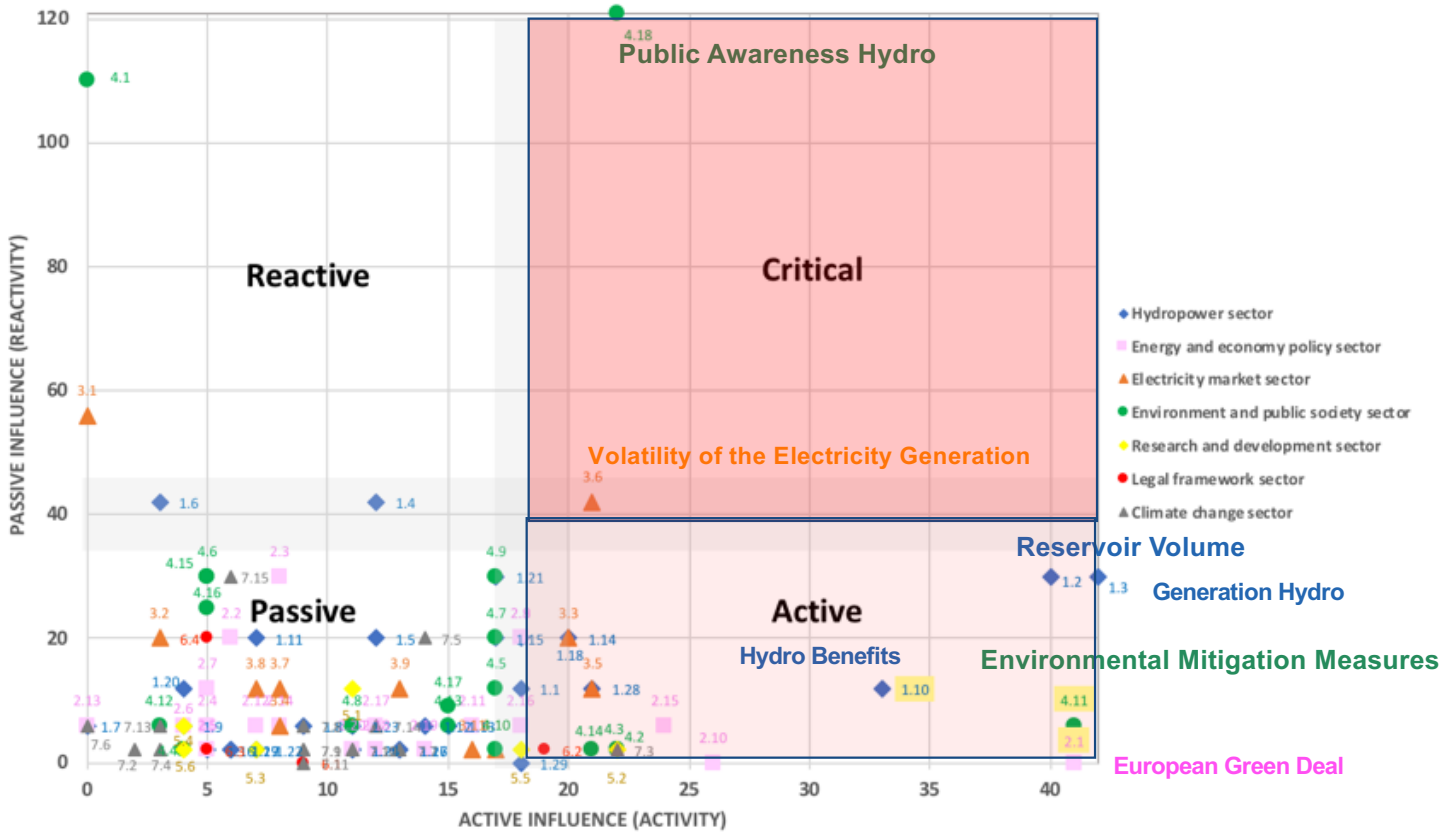
Network of 103 factors representing the sectors Hydropower (blue), Energy and economy policy (pink), Electricity market (orange), Environment and public society (green), Research and development (yellow), Legal framework (red) and Climate change (black).



Environment and public society
Focuss on Fish



Result of matrix analysis considering second degree of influences (connections)

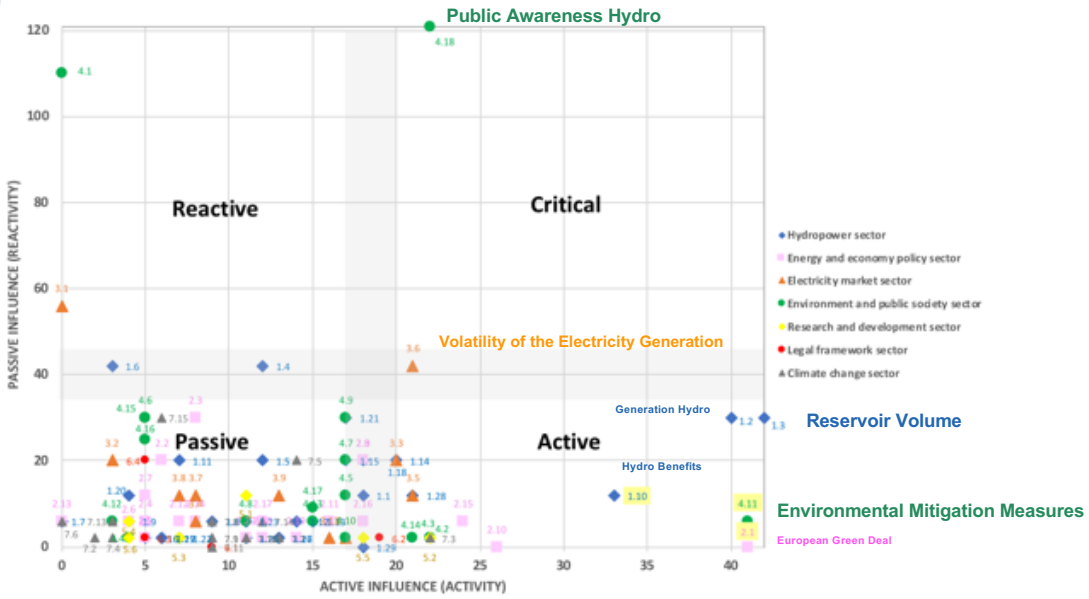


Ranking of of controllable active factors

1st highest activity
- **Communication Hydro (1.17/4.18)**
- **Reservoir Volume (1.2)**
- **Environmental Mitigation Measures (4.11)**

2nd highest activity
- **Benefit Sharing Local Communities (4.2)**
- **Ecological Flow (4.3)**
- **Population relocation (4.14)**
- **Innovation Hydro Technology (1.28)**

3rd highest activity
- **Hydro Installed Capacity (1.1)**
- **Multipurpose Projects (1.18)**
- **New Pumped-storage (1.21)**
- **Sediment Management (1.29)**
- **Eco-labels (2.16)**
- **Fish Habitat (4.6)**
- **Loss Biodiversity (4.9)**
- **Loss Landscape (4.10)**
- **Digitalization (5.5)**

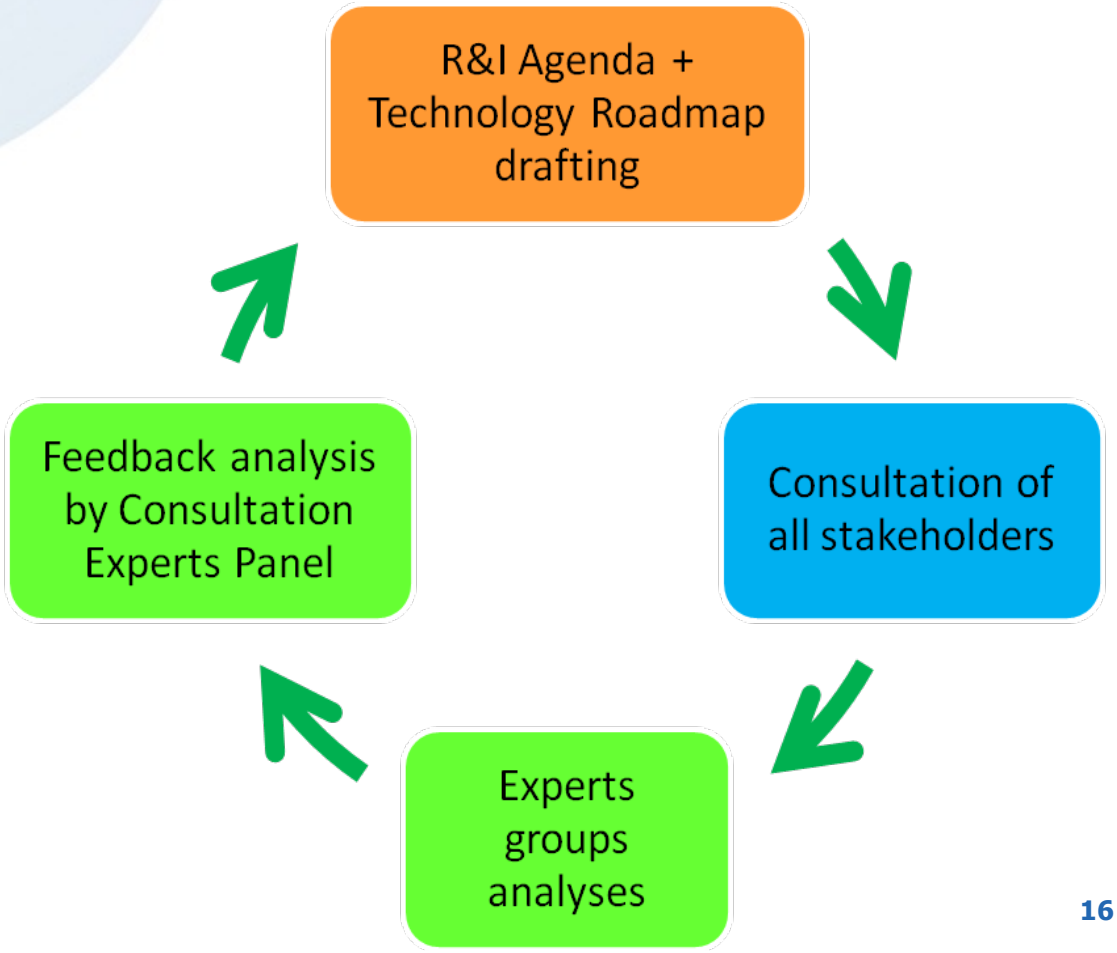


The controllable active factors can be used as a lever to improve the hydropower situation in the system and therefore they are important for the prioritization of any strategic actions and research directions.

The consultation process

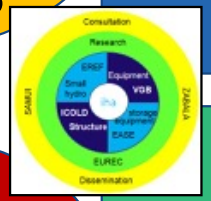
How the Hydropower Europe Forum (HPE) is working to approach the VISION:

"Hydropower as a catalyst for the energy transition in Europe"?



The outcomes of HPE Forum

R&I Priorities



Barriers

RIA Recommandations

14 research themes – 110 topics

SIR

Steps to new hydro deployment

11 strategic direction – 40 detailed actions

European Commission

560 registered on consultation platform - 185 participants on the second on line consultation

High priority research themes

Developing new designs and concepts for distributed pumped storage systems and improving feasibility and cost-efficiency of underground PSP	Storage Flexibility
New simulation tools for new harsher operation conditions in conjunction with the material properties of the machine sets	Peak Energy Flexibility
Integrating storage and pumped storage with other generation such as wind, (floating) PV and water services such as desalination	PSP Integration REN
Measures and approaches to protect fish populations	Biodiversity
Investigation inter-regional potential of reservoirs mitigating floods and long dry periods including the combination of these reservoirs with hydro to mitigate volatile renewable energy production	Storage Climate Change

High priority strategic actions

Collect a catalogue of best practice of successful multi-purpose projects creating a win-win situation between all stakeholders	Multi-purpose
Develop innovative approaches to address environmental issues and biodiversity protection with comprehensive approaches allowing compromises	Biodiversity
Increasing awareness of European citizens for the importance of hydropower	Public awareness
Sustainable sediment management strategies for ensuring sustainable reservoir capacity and sediment dynamics in rivers	Sustainability
Develop a more stable regulation framework which promotes green renewable power with a fair price, tax policy and subsidy model designed for a level playing field among different technologies, based on a comprehensive analysis of the carbon footprint and life cycle	Regulation Market design

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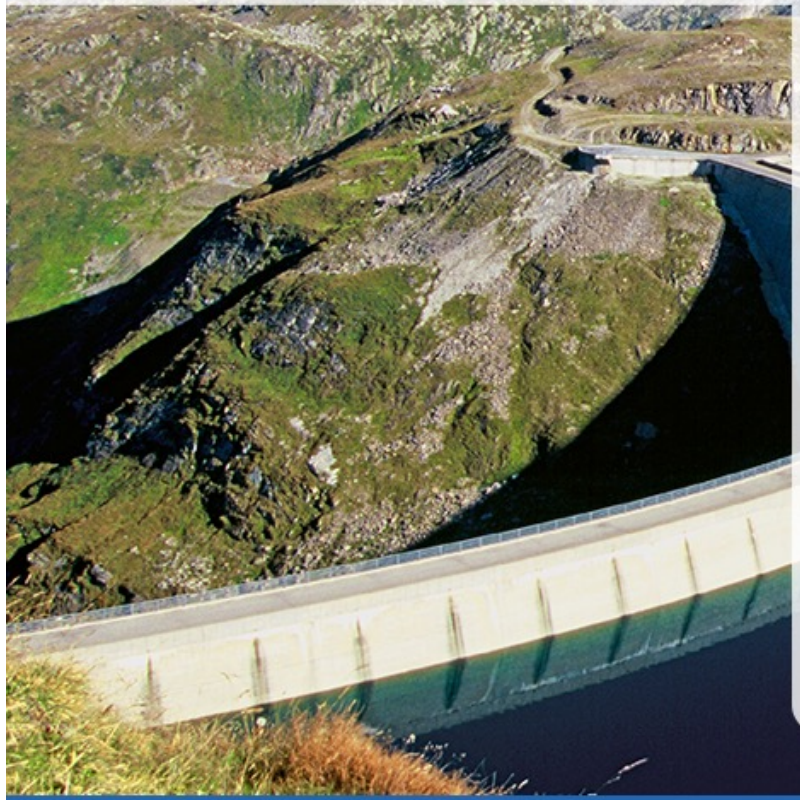

Thank you for your attention

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