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# Enhancing transparency in hydropower development– a strategic approach to balance conflicting aims of energy provision and conservation

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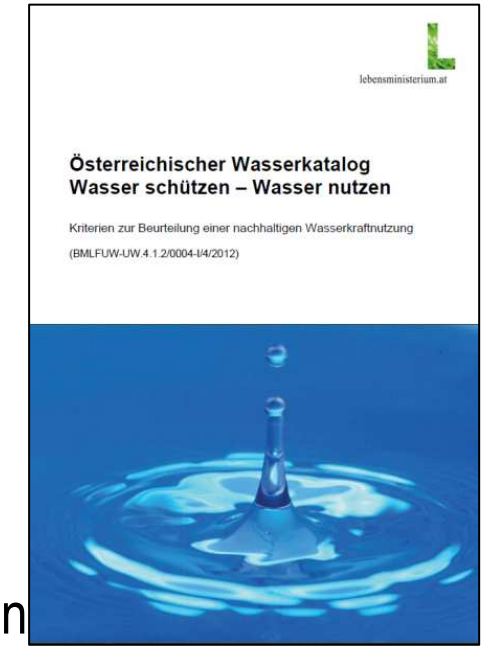
- Identification of Conservation needs
  based on ecological criteria
- Assessment of Hydropower attractiveness
  based on energy economic criteria
- Results - HPP characteristics, conservation value of selected senarios
- Conclusions

# Background of the study

## ➔ Austrian Water Catalogue (AWC): Water Protection – Water Use

- Published by the Austrian Ministry of Life (2012)
- Defines important assessment criteria
  - Energy
  - Ecology
  - Other water-management related criteria

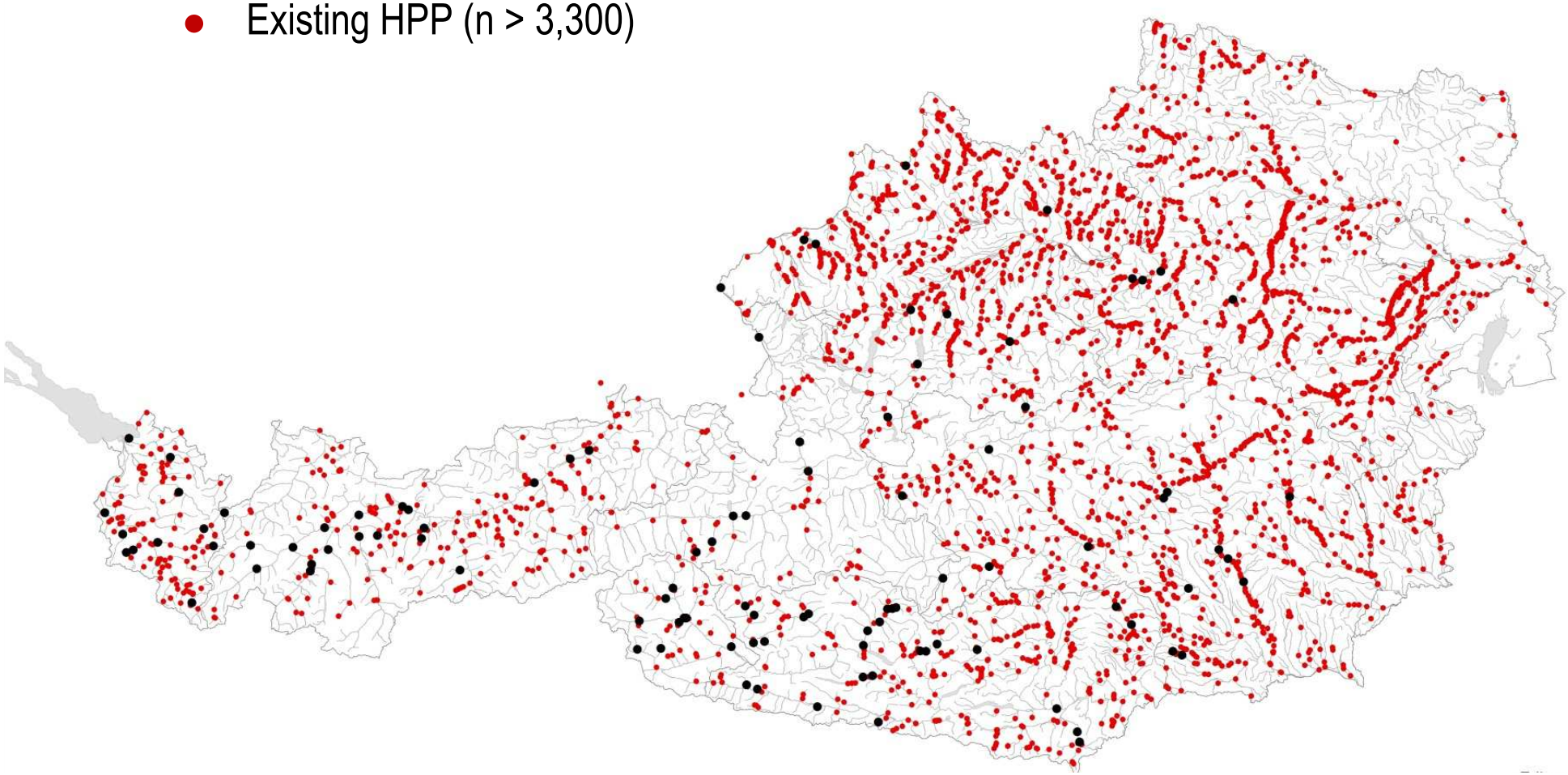



AWC does not include an approach
on how to combine the criteria to an overall assessmen

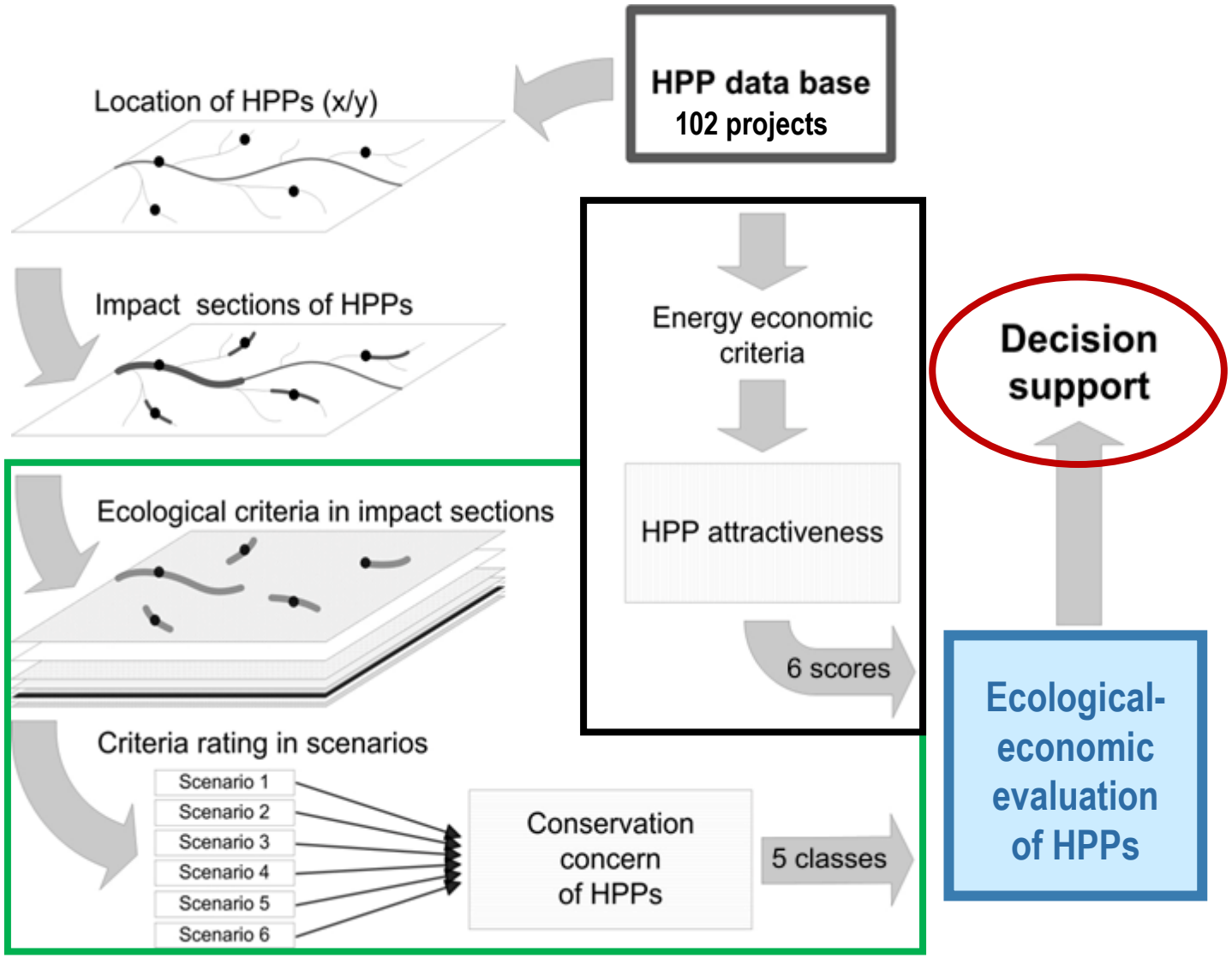
➔ **Instrument** is needed for **identifying projects** with ***high energy efficiency*** & ***least conservation concern*** based on economic & ecological criteria

# Hydropower in Austria - existing and planned projects

- Planned HPP (n 102)
- Existing HPP (n > 3,300)



# The HY:CON approach (national scale: rivers, catchment area >10 km²)



# Identification of Conservation needs – based on ecological criteria

## 8 groups out of > 40 conservation criteria

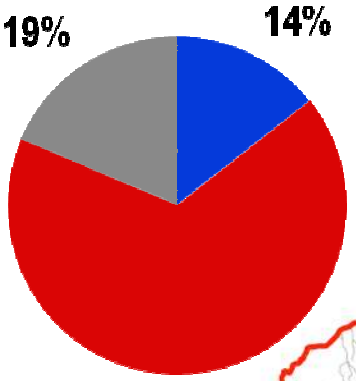
- Ecological status
- Hydro-morphological status
- Key habitats (e.g. lake outflow, rare river types…)
- Key species (e.g. *Hucho hucho, Margaritifera margaritifera*)
- Floodplain forests
- Protected sites with strict restrictions (e.g. national park)
- Other protected sites (e.g. protected landscapes)
- Free flowing sections and migration corridor of medium-distant migrating fish species




# Ecological criteria: Distribution of the Danube salmon (*Hucho hucho*) in Austria

historic distribution:

current distribution: conservation status — excellent (A) or good (B) — average or reduced (C)






Source:
Hofpointner, M (2013): Verbreitung, Gefährdung und Schutz des Huchens (*Hucho hucho*) in Österreich, Master thesis, University of natural ressources and life sciences, Vienna, Austria

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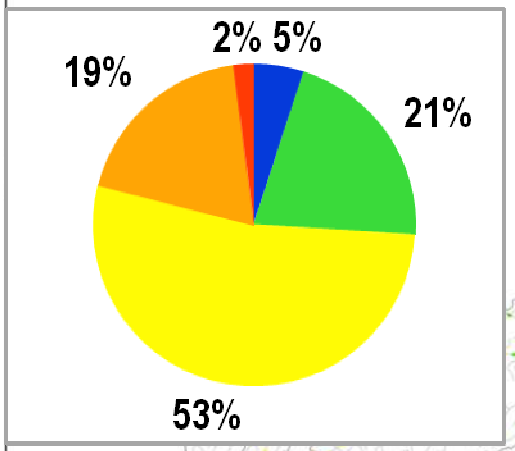
# Ecological criteria:
# Distribution of floodplain forests in Austria







Source:
LAZOWSKI, W. et al. (2011): Aueninventar Österreich - Bericht zur bundesweiten Übersicht der Auenobjekte (inkl. Anhänge). Umweltbundesamt. Wien

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# Conservation scenarios

## 6 scenarios to cover possible future developments

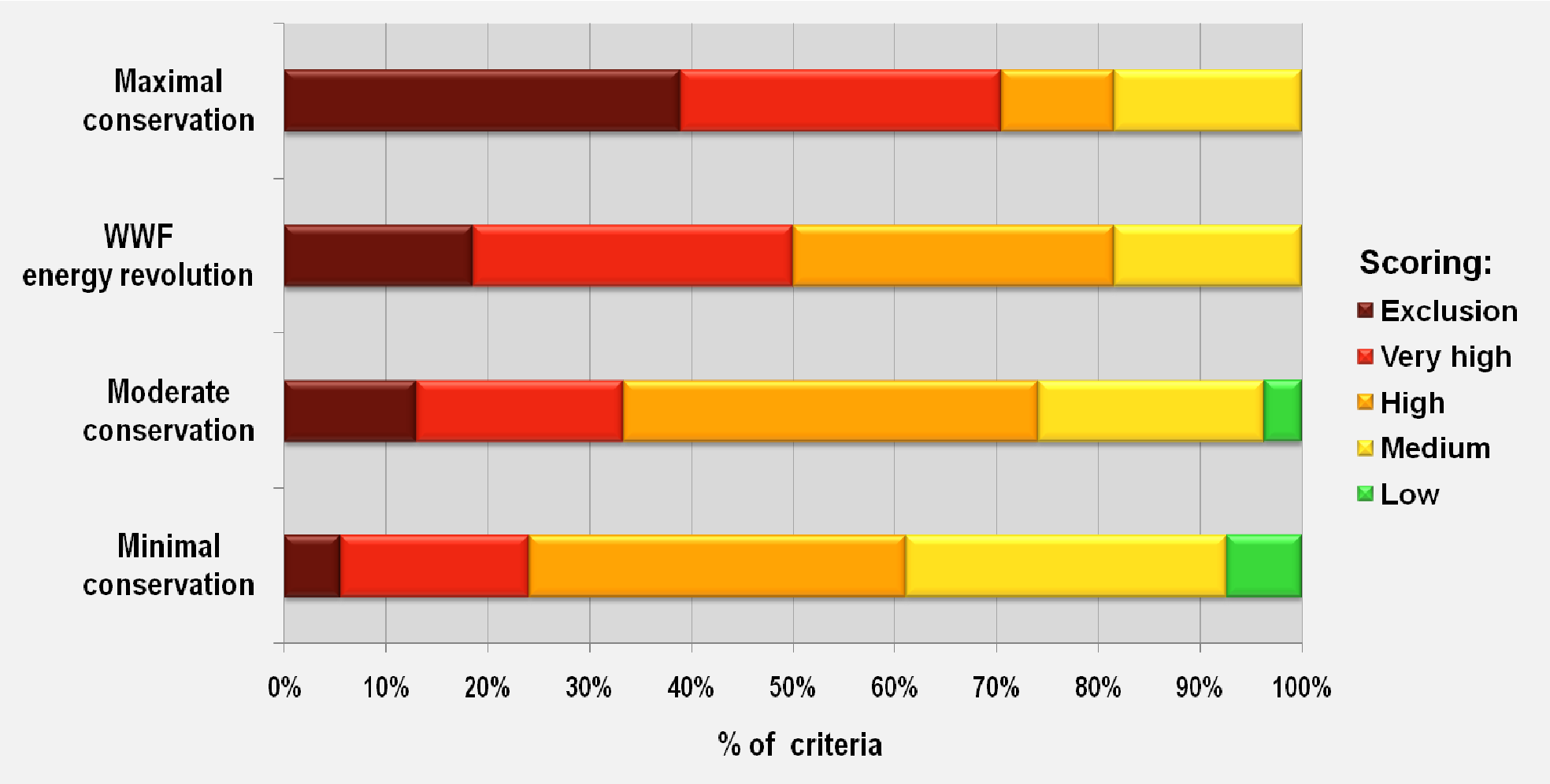
- **„Maximal conservation“**
- **„WWF energy revolution“**
- **„Moderate conservation“**
- **„Minimal conservation“**
- „Austrian Water Catalogue“
- „WWF eco-master-plan“

**Highest conservation need**

**Lowest conservation need**

# Conservation scenarios:

## Conservation conflict potential with respect to ecological criteria



# Hydropower attractiveness based on energy economic criteria



| Group | Criteria | HP type | Overall weight |
|---|---|---|---|
| Economic attractiveness | Specific investment costs<br>€/kWh<br>€/kW | run-of-river, storage<br>pumped-storage | 33% |
| Security of supply | Annual production (GWh/a) | all | 17% |
| Quality of supply | Production c | | 33% |
| | Installed cap | storage | |
| | Storage dura | storage | |
| | Pump storage | storage, pumped-storage | |
| Climate protection | $CO_2$ avoidance ($ktCO_{2eq.}$ p.a.) | all | 17% |
| | Renewables support | all | |

➡ **Scoring 0-5**

# Results

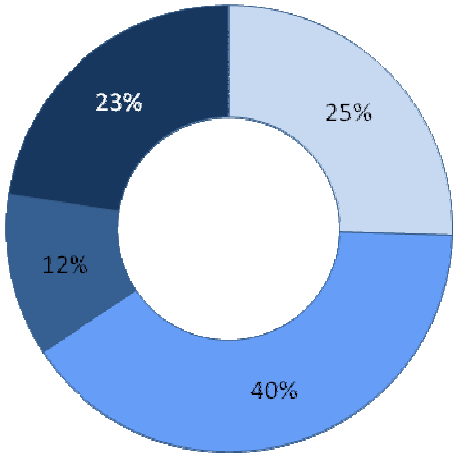
## The HY:CON approach

## Aim:

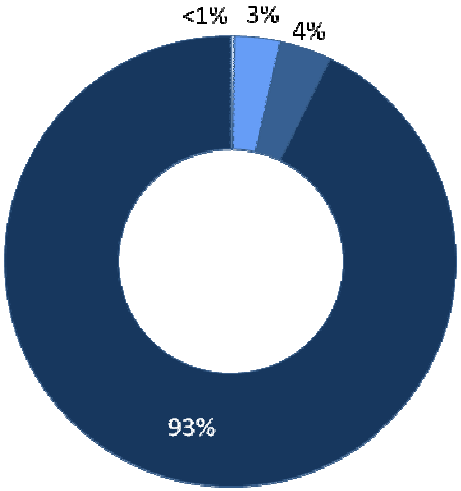
identify **projects** with the ***highest energy efficiency*** and ***least conservation concerns***

# HPP – size, installed capacity, annual production

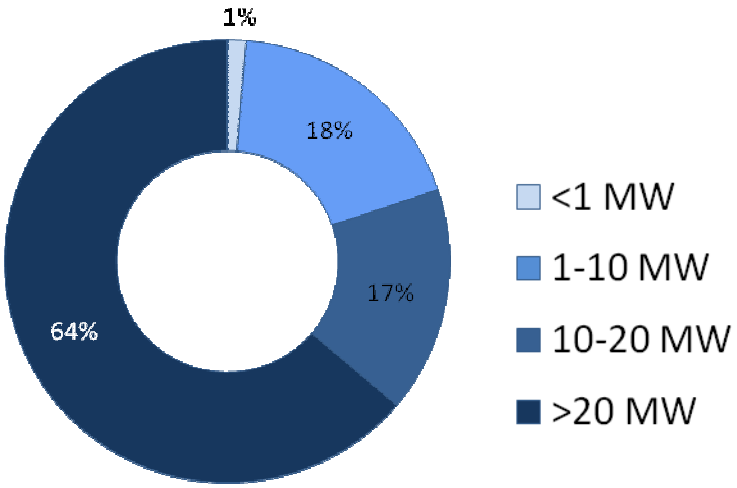
**102 projects**




**4,742 MW installed capacity**

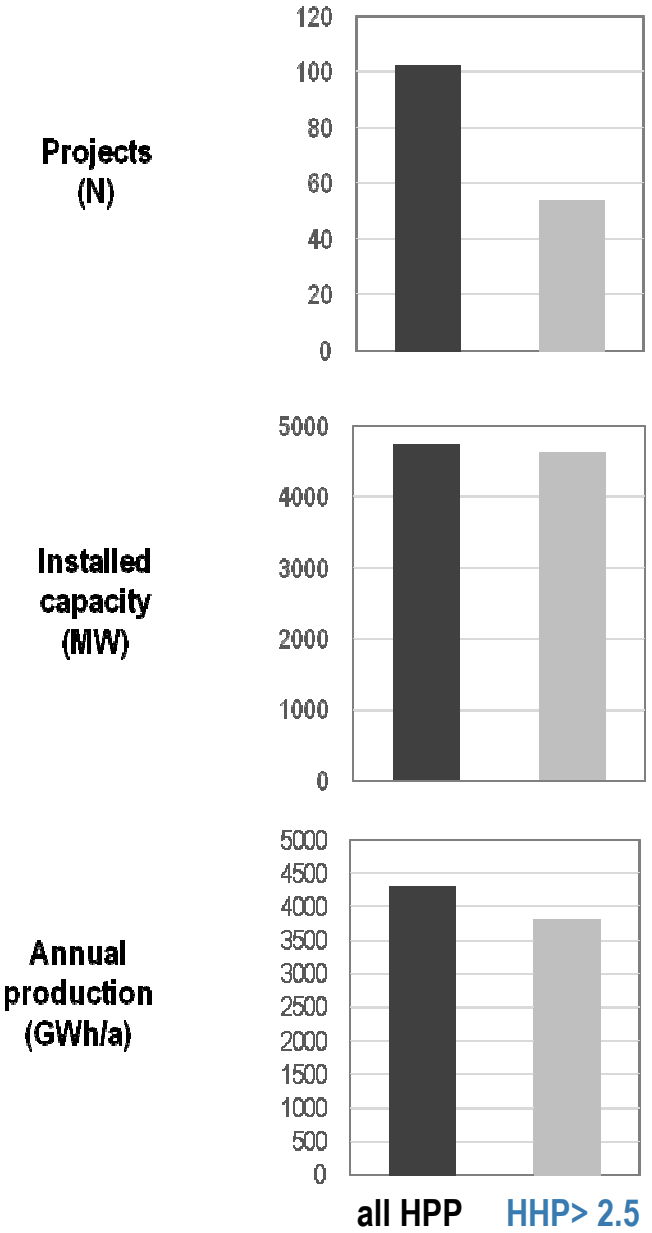



**4,304 GWh annual production**




- **Large HPPs provide more than 90% of the overall installed capacity and about two thirds of the total annual production.**

# Results: all HPP ⟷ attractive projects (>2.5)



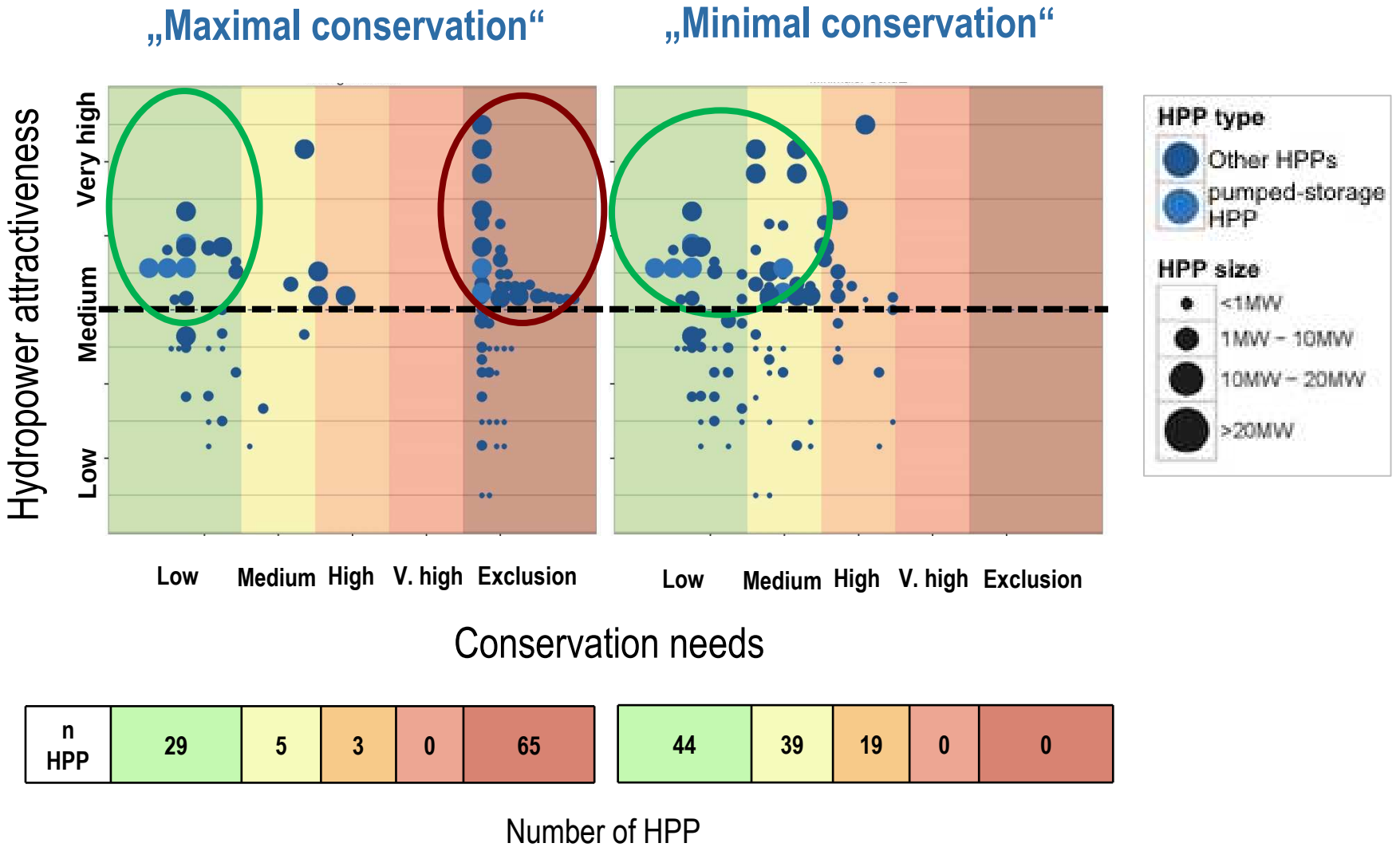

**Consideration of projects with economic rating >2.5 cause a reduction:**

➔from 102 to 54 projects (-47%)

➔from 4,742/ to 4,632 MW (-2.3%)

➔from 4,304/ to 3,805 GWh/a (-12%)

# Results – combined evaluation



# Conclusions

- A **high share** of the analysed projects **is in conflict with conservation needs** in almost all scenarios

- **Only in the "minimal conservation scenario"** more t**han half of the projects seem ecologically acceptable** (i.e. medium to low conservation conflicts)

- Half **of the projects are not attractive** (ratings <2.5) and therefore their implementation has to be critically reflected

- **Task: Provide well processed data and transparent results for decision making**

- **Need to reconsider the national HP development; deal with limitation of HP use**

- **Base further HP development plans on a large scale assessment, integration of conservation needs & energy economics**



# Thank you for your attention