MINISTERO DELL'AMBIENTE E DELLA TUTELA DEL TERRITORIO E DEL MARE

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Hydropower in the Alpine Region

Figures, small hydropower and main concerns

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INTRODUCTION

Based on the mandate from the X Ministerial Conference of the Alpine Convention (2009), the Platform “Water Management in the Alps” has worked out common guidelines on the use of small hydropower including good practice examples, then approved by the XI Alpine Conference in 2011. The Platform, jointly chaired by Italy and Slovenia, was then mandated by the XIV Alpine Conference to prepare a follow-up on the Common guidelines in 2017-2018, in order to evaluate how the guidelines serve the needs of regional / local administrations.

BENEFITS AND IMPACTS OF HYDROPOWER

Pros and cons of hydropower generation in the Alpine Region

- ↑ ENV. Almost emission-free form of electricity generation (CO2 savings)
- ↑ ECO. Domestic and renewable source of energy (reduces energy dependency from external sources)
- ↑ ECO. Long lifespan, low operational and maintenance costs, attractive long term payback ratios
- ↑ ECO. Contributes to covering peaks of energy demand
- ↑ ECO. Highly decentralised and close to the consumer (supply security)
- ↑ SOC. Socio-economic development of peripheral alpine regions, in particular if charges are levied
- ↑ SOC. Potential multi-functionality of reservoirs used for hydropower (water storage in low flow and flood lamination in peak flows, recreational purposes, irrigation, etc.)

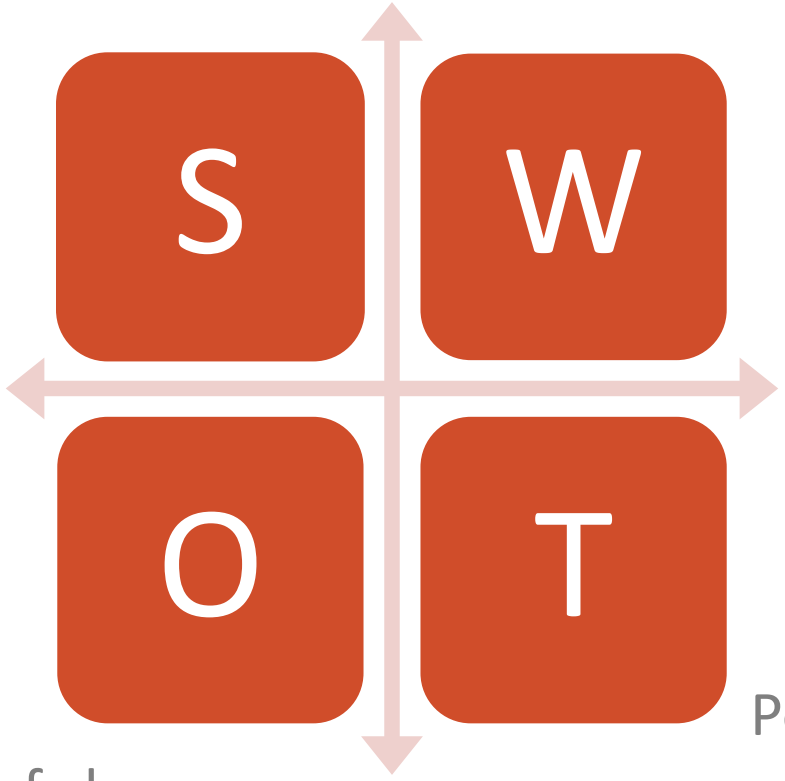
- ↓ ENV. Loss of natural landscape
- ↓ ENV. Interruption of river continuity (impacts on hydromorphology and biocenosis)
- ↓ ENV. Changes in river morphology, loss of habitats (loss of dynamic processes of sediment, thalweg incision)
- ↓ ENV. No residual water or lack of sufficient residual water; hydro-peaking
- ↓ ENV. Impoundment (increase of water temperature and decrease of oxygen content, increased deposition of fine sediment upstream, need for flushing)

STRENGTHS

Renewable energy
"Economic raw material"
Low operational and maintenance costs
Energetic independency
Good payback for investors

WEAKNESSES

"Hard" infrastructures
Cumulative effect of infrastructures on water bodies



OPPORTUNITIES

Reducing greenhouse gases emissions
Skilled green jobs required
Local communities can profit of charges
Multi-functionality of reservoirs i.e. for flood control and droughts mitigation

THREATS

Landscape alteration
Ecosystems alteration
Potential conflicts over the use of water resources

POLICY BACKGROUND

General policy objectives

High hydroelectric potential

National goals for renewable energy

Increasing the production of renewable energy from hydropower generation

Pressures - Expectations

Conflict of Interests

Good reasons and need for achievement of both objectives!

Important value of ecosystems and landscape

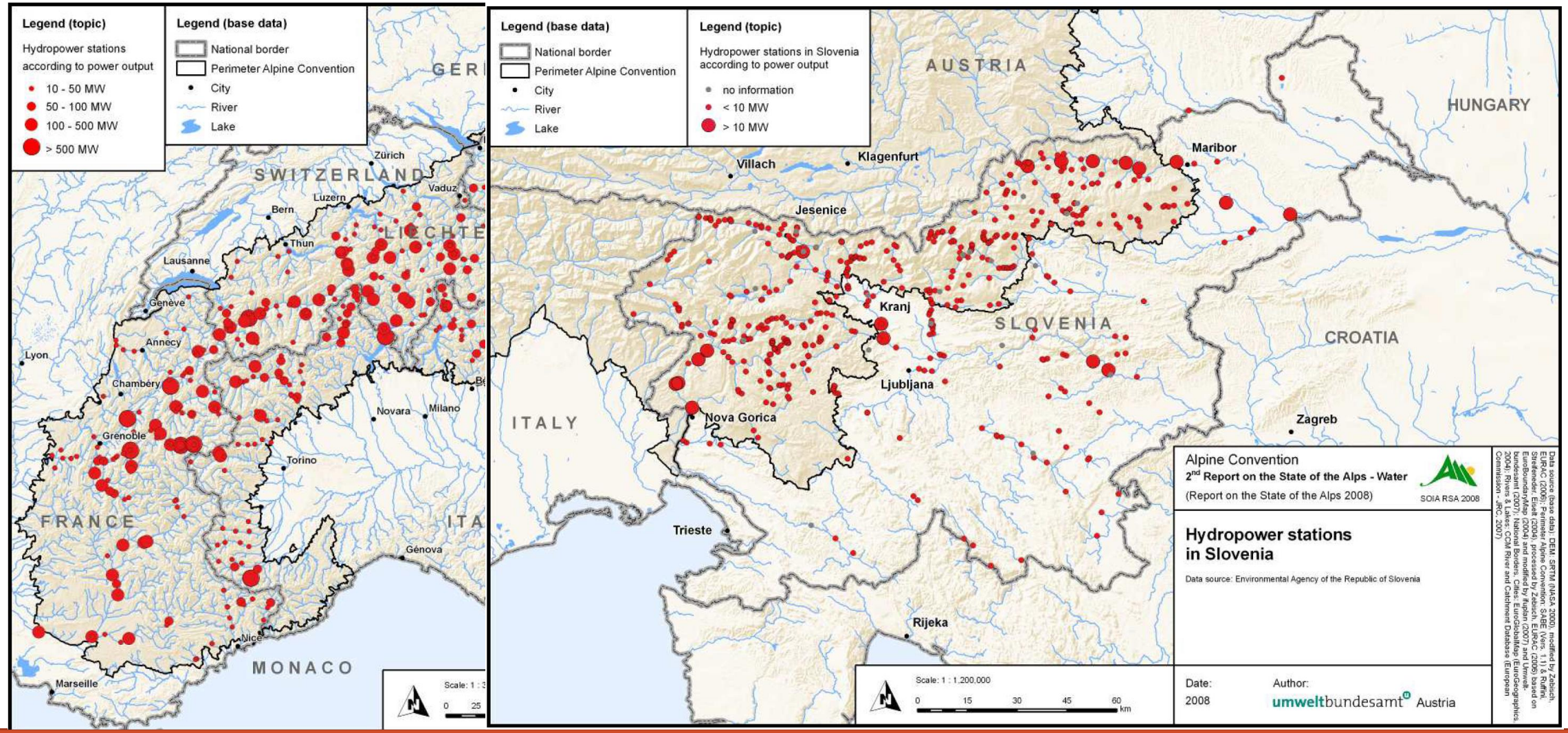
Rarity of remaining unexploited rivers

Minimizing the impairment of the aquatic ecosystem and landscape

How to strike a balance (optimisation task) between these two objectives?

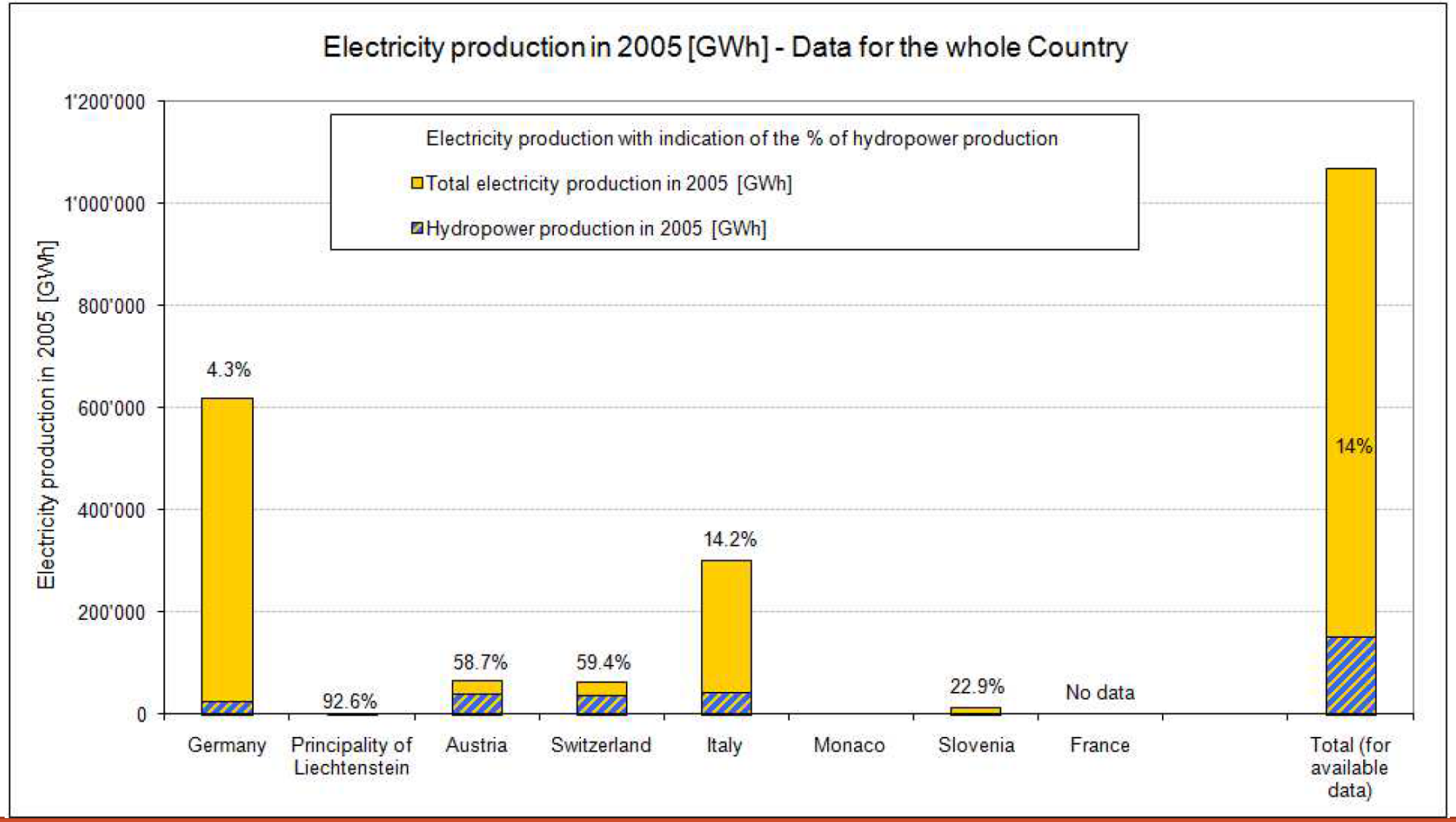
HYDROPOWER DIFFUSION

State of the art based on 2004-2007 data and focus on small HP



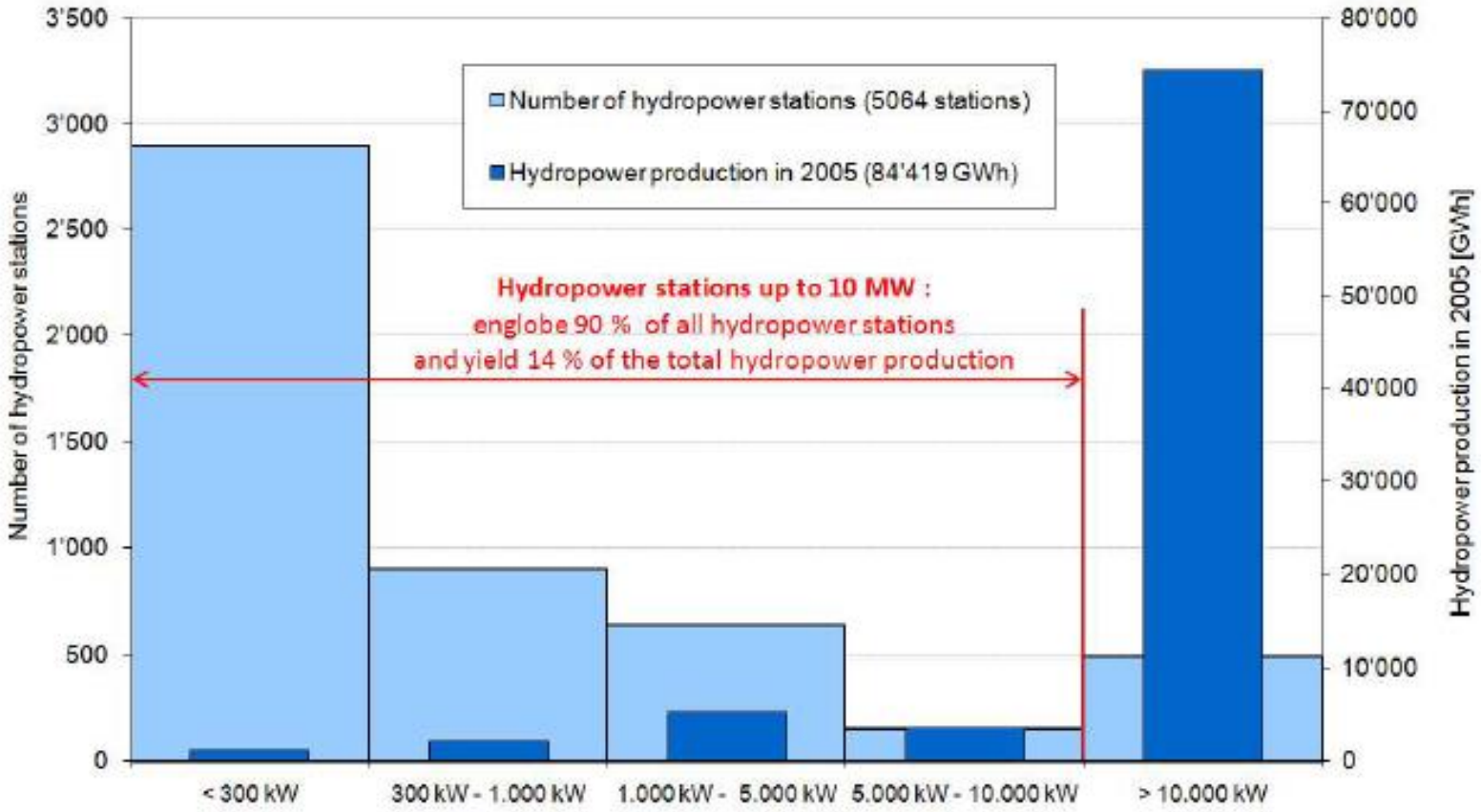
ELECTRICITY PRODUCTION

The share of hydropower in the Alpine Countries



HYDROPOWER PRODUCTION

Synthesis framework on the Alpine region

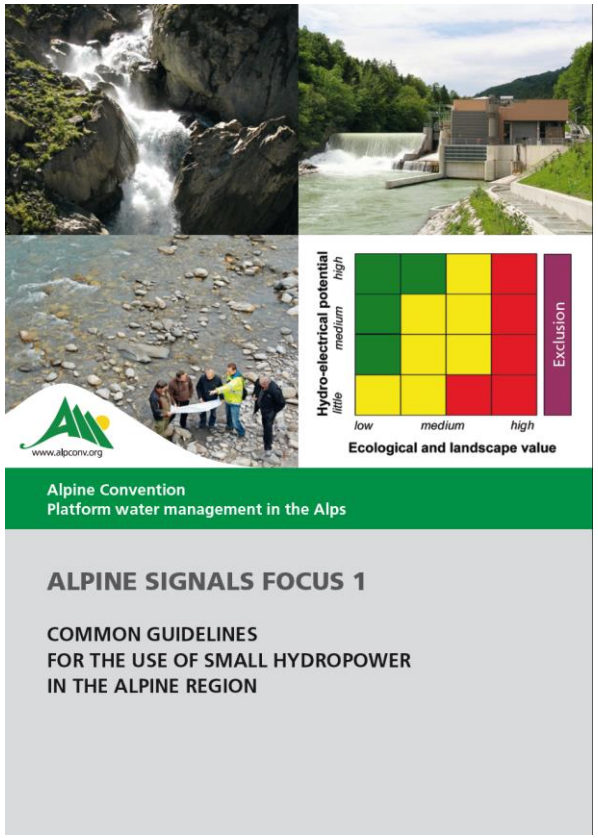


	< 300 kW	300 - 1.000 kW	1.000 - 5.000 kW	5.000 - 10.000 kW	>10.000 kW
Production [%]	1,3%	2,5%	6,0%	4,2%	86,1%
Stations [%]	57,2%	17,6%	12,6%	2,9%	9,7%

MAIN OPEN ISSUES

What can we conclude from these figures?

Is it small hydropower useful for the achievement of the renewable energy goals?
Is it the current incentivisation really sustainable?
Where and when should we promote small hydropower?
How can we avoid major impacts of small hydropower and the cumulative effect of many plants?



WHEN CHOOSING SMALL HYDROPOWER

Recommendations 5 and 6 on small hydropower

Infrastructure related Small Hydropower Plants	Off-grid Small Hydropower Plants
Infrastructure related hydropower plants, exploiting only the water that is already used by the primary goal of the infrastructure, are in general not additionally affecting aquatic ecosystems and are economically favorable. Thus, from an environmental point of view, **such multipurpose SHP is in general considered appropriate and desirable**.	**In the weighing of interests, the purpose of the SHP needs to be given due consideration**: In particular providing electric **auto-supply**, where the connection to the public grid would lead to disproportionate costs and no better environmental options are given, constitutes a **strong argument in favor** of building SHP in such remote individual locations (e.g. Alpine huts, remote farming, etc.)

WHEN CHOOSING SMALL HYDROPOWER

Recommendations 7, 8 and 9 on small hydropower

Refurbishment, reopening	Ecological upgrading	Renewal of concession
Refurbishment of existing operating plants and reopening of disused plants in order to optimize the production of hydropower and minimizing the ecological impacts should be generally **promoted and prioritized**. However there should be a periodical examination if further mitigation of negative impacts and compliance with existing environmental legislation can be achieved by the **application of best practice without entailing disproportionate costs**.	**Ecological upgrading of existing operating plants** in order to mitigate the impacts on the ecological status and on landscape should be generally **promoted by means of incentives** in order to accelerate fulfillment of legal requirements earlier or even to go beyond these minimal requirements 	**Renewal of concessions or licenses** can generally be considered **appropriate** in case it **complies with the existing environmental legislation**. Nevertheless the ecological potential of the site should be considered and **concessions or licenses** should be **limited in time**, being as short as possible **without compromising the investment**.

WHERE?

Where SHP hydropower is desirable and where not?

Where are the favorable locations to increase SHP production in line with national renewable energy targets?

Favorable locations are those that exhibit on the one hand a high hydro-electric potential and have on the other hand a relatively low ecological and landscape value.

The search for the most favorable locations takes necessarily place on a regional level.

Next to the „where“ there is also the how question: if new SHP-facilities are being built, all practical steps have to be taken to mitigate the adverse impacts on the environment and the landscape.

THE TWO-LEVELS PROCEDURE

Each the decision in the right place

Favorable locations - "WHERE" → **Technical solutions - "HOW"**

Transparent, structured and criteria based procedure,
combining two levels:

REGIONAL LEVEL (Where)

Development of a "regional strategy", classifying the potential appropriateness of water bodies for hydropower use Independently from individual application

→ Hydroelectric potential
→ Ecological and landscape value

from general to detail

LOCAL LEVEL (How)

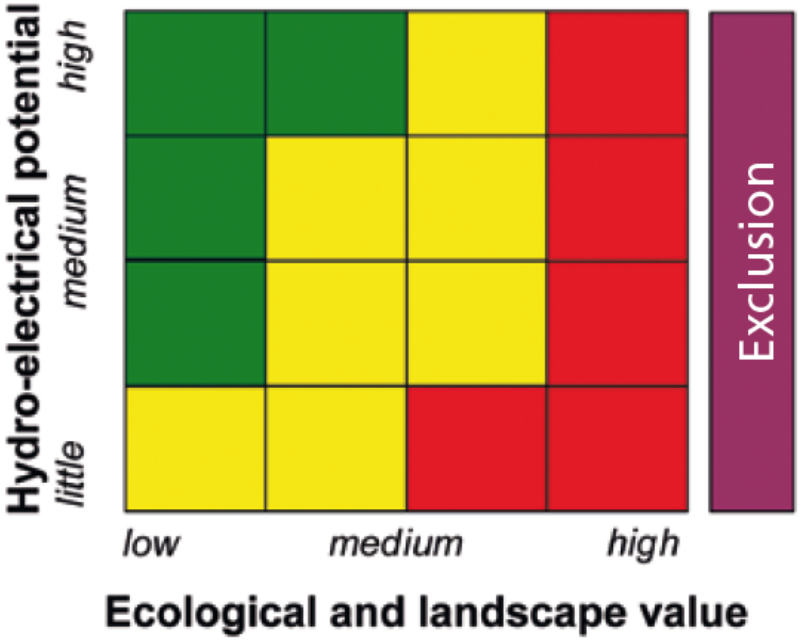
Project specific evaluation of the local situation and the individual application by weighing all pros and cons

→ *Evaluation of the regional level*
→ Installation and site specific criteria
→ Further socio-economic aspects

The common guidelines then provide guidance for this two-level procedure, also **suggesting a pool of common alpine-wide criteria** for that task

THE REGIONAL PRE-PLANNING

Where are the favorable sites for new SHPs?



FAVOURABLE for hydro-electrical exploitation	LESS-FAVOURABLE for hydro-electrical exploitation	NON- FAVOURABLE for hydro-electrical exploitation. Strong interest for conservation	EXCLUSION hydro-electrical exploitation forbidden by law
complying with the legal environmental (and other) standards, construction of SHPs in general possible	additional aspects and in- depth assessment weighing all relevant criteria indispensable Next to complying with legal environmental standards, possibly further or stricter requirements may be necessary	SHPs possible only in exceptional cases (e.g. auto-supply)	No hydro-electrical exploitation possible since protected areas where any interventions are forbidden by law

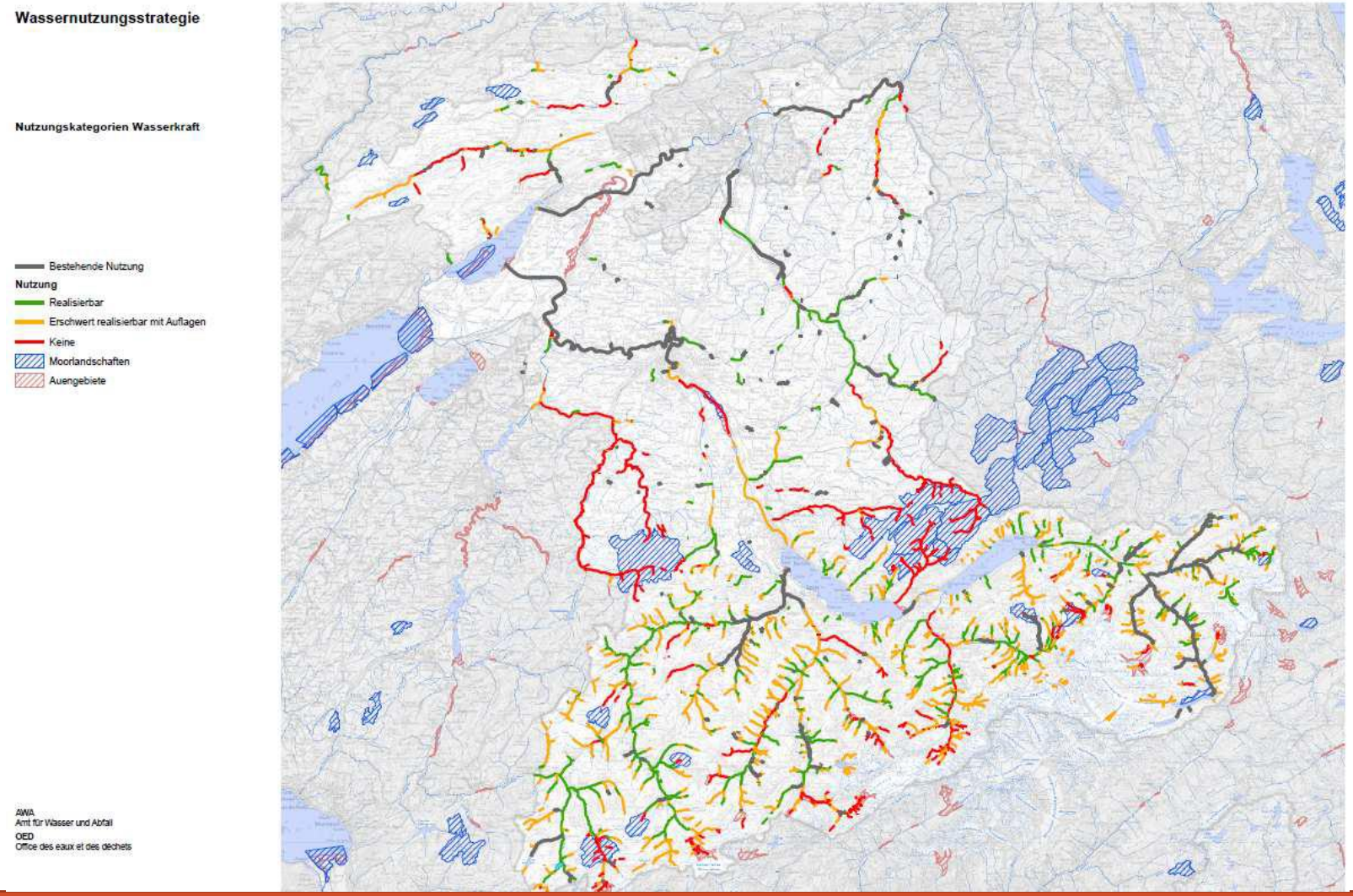
Development of a regional strategy (regional pre-planning). Transparent evaluation and classification of the potential appropriateness of river stretches for hydropower use. Better if shared with the public.

Considered criteria:

- Theoretical hydroelectric potential
- Ecologic and landscape value of the river stretches
- Areas under special protection

THE REGIONAL PRE-PLANNING

Good example



AT THE LOCAL LEVEL

Decision on authorization for individual project applications

Pre-planning at regional level

General information on appropriateness of a location

no project specific aspects

REGIONAL STRATEGY

Hydroelectric potential

Ecological and Landscape value

APPLICATION FOR SHP PROJECT
at a certain location

NEED TO TAKE A DECISION

LOCAL IN-DEPTH ASSESSMENT OF THE CONCRETE PROJECT APPLICATION

For individual applications only
Considering all sustainability dimensions
Holistic weighing of all relevant criteria

→ Evaluation at regional level +
→ Installation specific criteria
→ Further socio-economic aspects including impacts on other sectors.

The authorization is not just about judging if projects should be allowed in certain areas or not but also about the way how projects should be realized.

SITE- AND INSTALLATION SPECIFIC DECISION

Decision on authorization
(including specific requirements)

AT THE LOCAL LEVEL

Example of site-specific criteria to be considered

CRITERIA	U
Energy balance or "energy payback ratio"	
Specific investments	€
Use of hydroelectric potential	%
Minimisation of impacts	
Synergies with existing infrastructures	
Sewage dilution coefficient on the residual flow stretch	
Ecological impacts downstream and upstream	
Integration in the landscape	
Grid relevancy	e.g. Importance for the grid stability

CRITERIA	DESCRIPTION
Conflicts with other water users	Locally, downstream and upstream
Conformity with local spatial planning	
Necessity of further infrastructure for construction and operation	Access, power-lines, etc.
Effect on tourism	Potential positive and negative effects on tourism
Regional economic effects	Taxes, income for the public; investments in local economy, induced employment
Self supply necessity	If distance to the public grid too long and no better environmental option is given.
Relevant certifications[35]	e.g. green energy labels; ISO 14000 ; ...
Other socio-political considerations	

Possible additional criteria for the comparison of applications competing on the same river stretch:

Specific power output	kW/m	Power output related to the length of the residual flow stretch and impounded river length.

CONCLUSIONS

Clear commitment to respect both main objectives (use of the resource and renewable energy goals “vs” protection) → no unilateral maximisation but optimization, it means restrictions and limitations for both sides.

Approach for the development and promotion of (S)HP to reach the targets for renewable energy in a smart way

- 2 levels procedure for a “controlled” increase of production: from general to detail
- smart and transparent “use-and-protection pre-planning” on a regional scale
- optimisation task carried out both, at regional and local level

Being a pre-requisite for the local assessment and decision about authorization of an individual project, the establishment of the regional strategy should be carried out as soon as possible.

CONCLUSIONS

Strategic planning provides “regional maps” showing the appropriateness of river stretches for hydropower use Relevant (environmental) legal framework is translated into information to the potential investor about the chances for building a SHP at a certain place.

Decision based on the regional strategy and grounded on a project and site-specific assessment.

Instruments of public participation such as i.e. “river contracts” can help the dialogue between public authorities, stakeholders and citizens, increasing the public acceptance of the criteria and the approved projects.

The experience gained in the Alpine Convention context has already inspired the ICPDR guidelines and it is at the basis of the Italian binding guidelines → good replicability

Thank you
for the attention

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