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# REGIONAL STRATEGY FOR SUSTAINABLE HYDROPOWER IN THE WESTERN BALKANS

## Approach and Methodology

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1st Workshop, Podgorica, 30-31 March 2017

## Project Synopsis

**Client:** European Commission, DG NEAR

**Contractor:** WBIF-IPF3 Consortium

**Expert team:** 30 experts (EU and WB6) and 2 subcontractors

**Duration:** Scoping Phase (May-June 2016 + **Study Phase** (Oct. 2016 – June/August 2017)

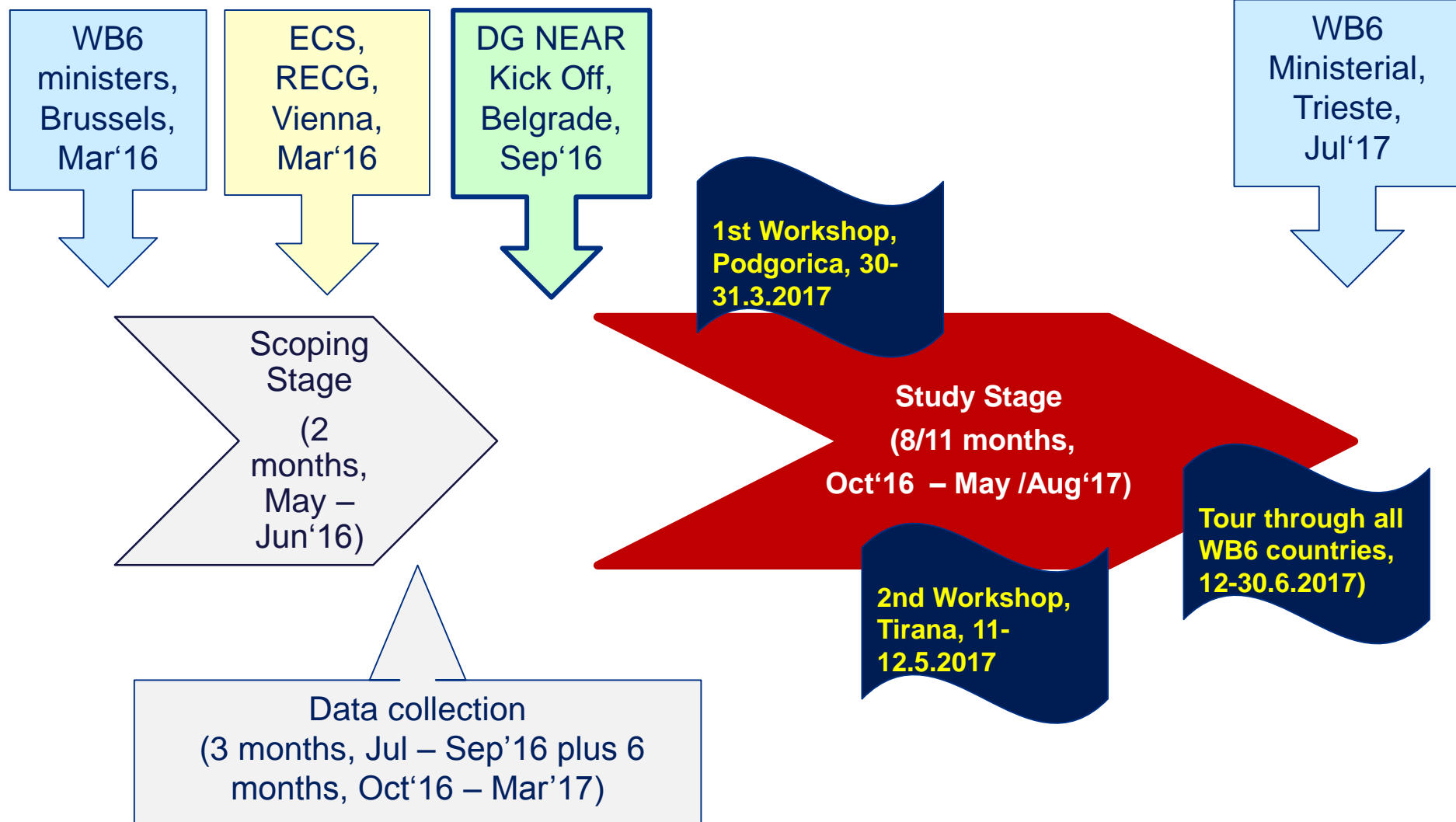
**Deliverables:** 9 technical Background Reports, Final Report, 1 conference, 2 workshops, results-dissemination tour, inputs to the next MC-WB6 meeting (Trieste, 12.7.2017)

**Objective:** Contribute to **fostering the harnessing of environmentally and climate change sustainable hydropower generation in the WB6 region** in line with strategic objectives of the European Union and the ECT obligations of its Contracting Parties.

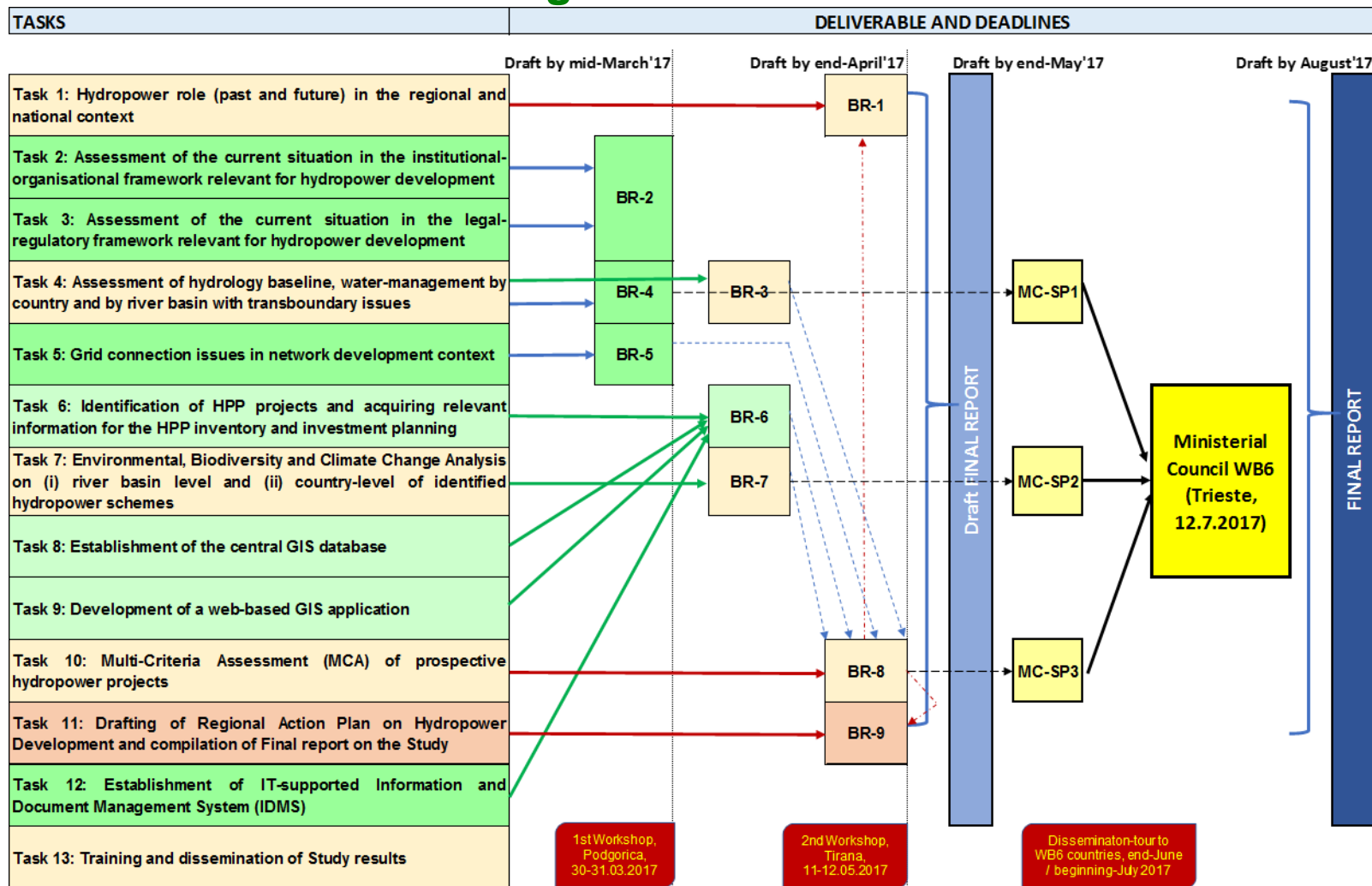
**Purpose:** Development of a study determining a list of hydro power project (HPP) **development priorities** by (i) river basin, (ii) type of planned HPP facilities (storage, run-of-river, reversible), through which the remaining hydro-power potential in the region will be evaluated. Aiming at utilising the **sustainable** hydropower potential, the following priorities shall apply:

1. **Repair, refurbishment, upgrade and rehabilitation of existing HPPs**
2. **Sustainable greenfield HPPs**

## Timeline – Important Study Stages and Events



# Task & Deliverables: Progress



## LEGEND

	Completed
	Great progress
	Medium progress
	Less progress

## STRATEGY PAPERS TO MINISTERIAL COUNCIL OF WB6

MC-SP1 'On Transboundary Issues'

MC-SP2 'On Guidelines for Integration of Environmental Issues in HPP Planning in WB6'

MC-SP3 'On Priority Investment Projects (Rehabilitation and Greenfield HPP Projects)'

## LIST OF BACKGROUND REPORTS

BR-1 'On the Role of Hydropower in the Past and Prospects in the Future by 2030/2050'

BR-2 'On Gap Analysis of the Legal-Regulatory and Institut.-Organ. Framework Relevantfor Hydropower Develop.'

BR-3 'On Baseline Data on Hydrology and Water Management Issues'

BR-4 'On Transboundary Issues in the WB6 Region'

BR-5 'On Grid Connection Issues Relatedto Prospective HPP projects'

BR-6 'On Inventory of Prospective HPP Projects, GIS and IDMS'

BR-7 'On Environmental Analysis'

BR-8 'On Multi-Criteria Assessment of HPP Projects – Portfolio of HPP Investments'

BR-9 'On Regional Action Plan on the Hydropower Development'



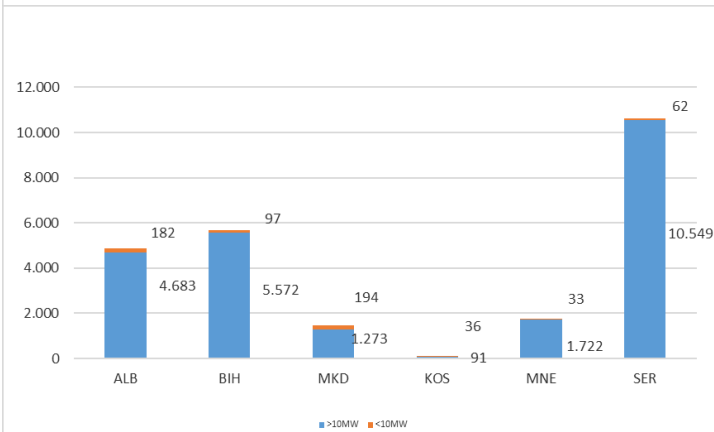
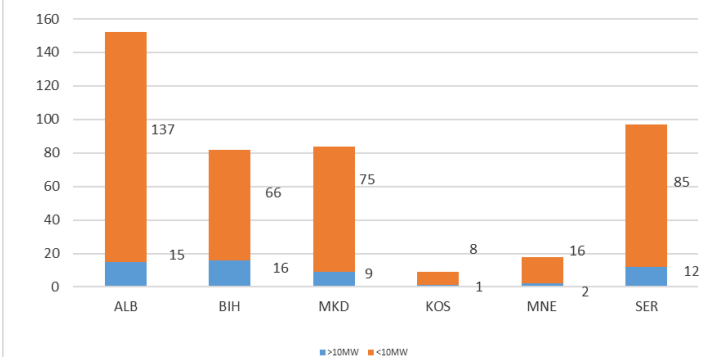
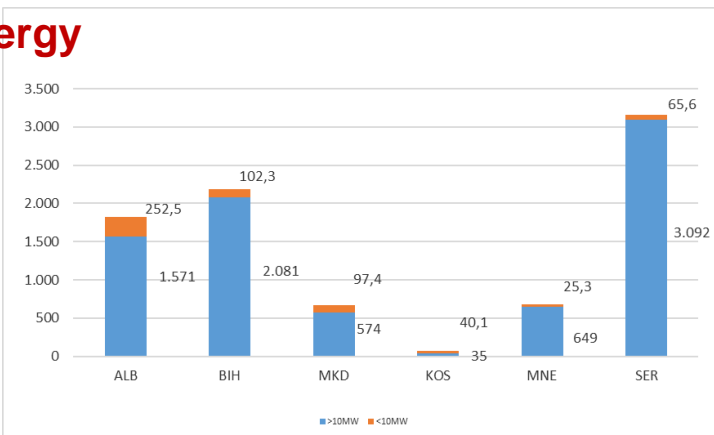
# Existing HPPs of all capacity Ranges in WB6

55 HPPs (12%) of all existing HPPs produce 97% of energy

		Number of hydro power plants (-, %)					
		>10MW	(%)	<10MW	(%)	Total	(%)
1	ALB	15	27,3	137	35,4	152	34,4
2	BIH	16	29,1	66	17,1	82	18,6
3	MKD	9	16,4	75	19,4	84	19,0
4	KOS	1	1,8	8	2,1	9	2,0
5	MNE	2	3,6	16	4,1	18	4,1
6	SER	12	21,8	85	22,0	97	21,9
	<b>WB6</b>	<b>55</b>	<b>100,0</b>	<b>387</b>	<b>100,0</b>	<b>442</b>	<b>100,0</b>
	<b>Share</b>	<b>12,4</b>	<b>(%)</b>	<b>87,6</b>	<b>(%)</b>	<b>100</b>	<b>(%)</b>

		Installed capacities in hydro power plants (MW, %)					
		>10MW	(%)	<10MW	(%)	Total	(%)
1	ALB	1.571	19,6	252	43,3	1.824	21,2
2	BIH	2.081	26,0	102	17,5	2.183	25,4
3	MKD	574	7,2	97	16,7	671	7,8
4	KOS	35	0,4	40	6,9	75	0,9
5	MNE	649	8,1	25	4,3	674	7,9
6	SER	3.092	38,6	66	11,3	3.157	36,8
	<b>WB6</b>	<b>8.001</b>	<b>100,0</b>	<b>583</b>	<b>100,0</b>	<b>8.584</b>	<b>100,0</b>
	<b>Share</b>	<b>93,2</b>	<b>(%)</b>	<b>6,8</b>	<b>(%)</b>	<b>100</b>	<b>(%)</b>

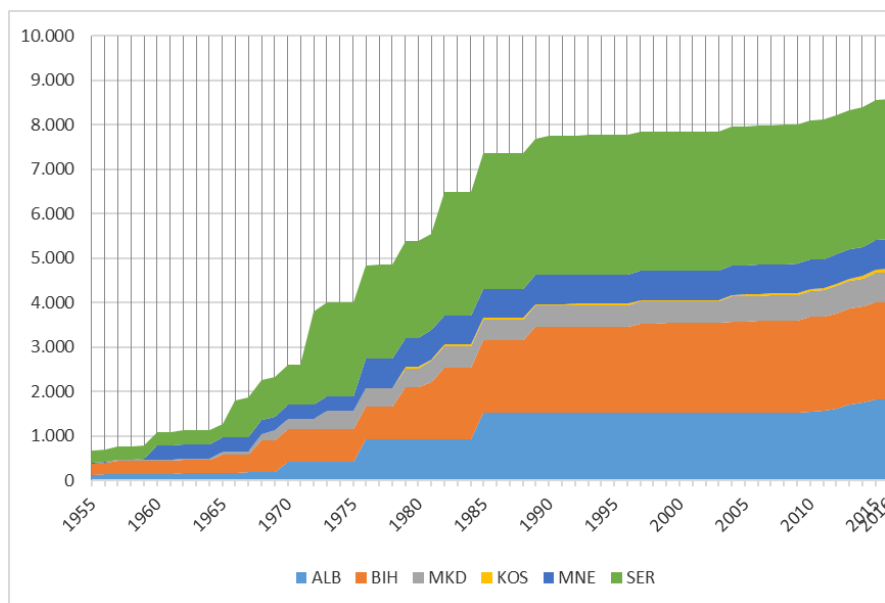
		Electricity generation in hydro power plants, 2001-2015 (GWh, %)					
		>10MW	(%)	<10MW	(%)	Total	(%)
1	ALB	4.683	19,6	182	30,2	4.865	19,9
2	BIH	5.572	23,3	97	16,0	5.669	23,1
3	MKD	1.273	5,3	194	32,2	1.468	6,0
4	KOS	91	0,4	36	5,9	127	0,5
5	MNE	1.722	7,2	33	5,4	1.755	7,2
6	SER	10.549	44,2	62	10,3	10.611	43,3
	<b>WB6</b>	<b>23.891</b>	<b>100,0</b>	<b>603</b>	<b>100,0</b>	<b>24.495</b>	<b>100,0</b>
	<b>Share</b>	<b>97,5</b>	<b>(%)</b>	<b>2,5</b>	<b>(%)</b>	<b>100</b>	<b>(%)</b>



# Historic Commissioning of HPPs (1955-2016)

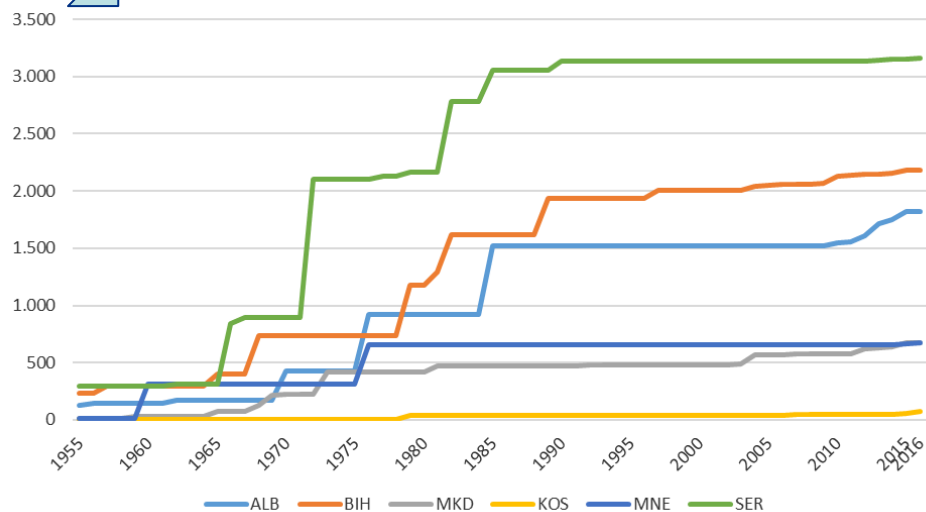
Average HPP-capacity addition achieved during 1955-1990 was **202 MW** per annum while in the period 1991-2016 it dropped to mere **32 MW** per annum.

Period	MW	%	MW/a
Before 1955	678	7,9	
During 1955-1990	7.081	82,5	202,3
During 1991-2016	825	9,6	31,7
Total	8.585	100,0	



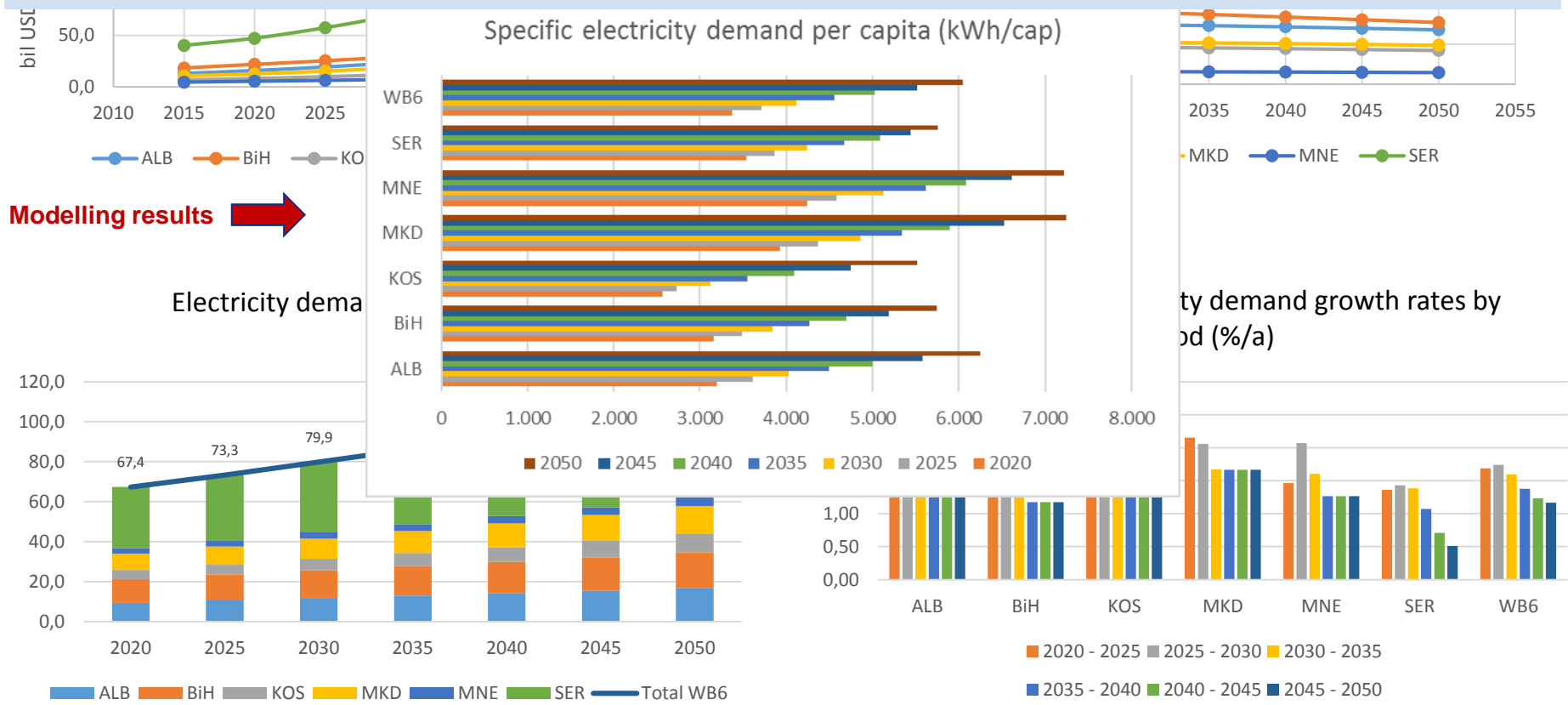
Reasons can be attributed to:

- “Best” HPPs already implemented,
- Disintegration of former SFRJ followed by wars in the '90s,
- End of central planning and coordinated water management, lack of cooperation between newly established states,
- Lack of financial capacity of power utilities / states for investment intensive projects,
- Growing investment risks in emerging market conditions, and
- Continued unresolved transboundary issues



# Electricity Demand Forecast to 2050

In all WB6 countries, electricity consumption will grow (including the effect of EE measures) during 2020-2050, in total for WB6, from 67 TWh in 2020 to 104 TWh in 2050. Average annual growth from 2020-2025 (1.69%) will however gradually decrease to 1.17% (2045-2050).





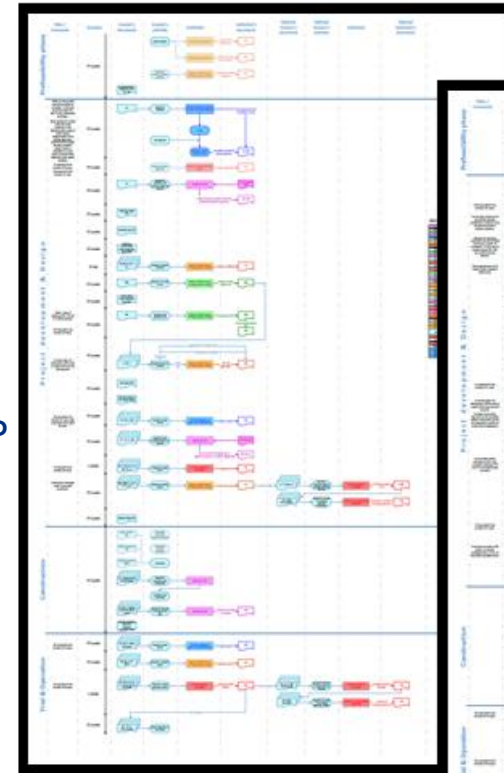
# Comparative Gap Analysis in Institutional-Regulatory and Legal-Regulatory Frameworks Relevant for HPP Development in WB6

7 detailed IOLR flow diagrams for 6 WB6 countries (2 for FBiH and RS in BiH) developed, analysed and conclusions / recommendations drawn:

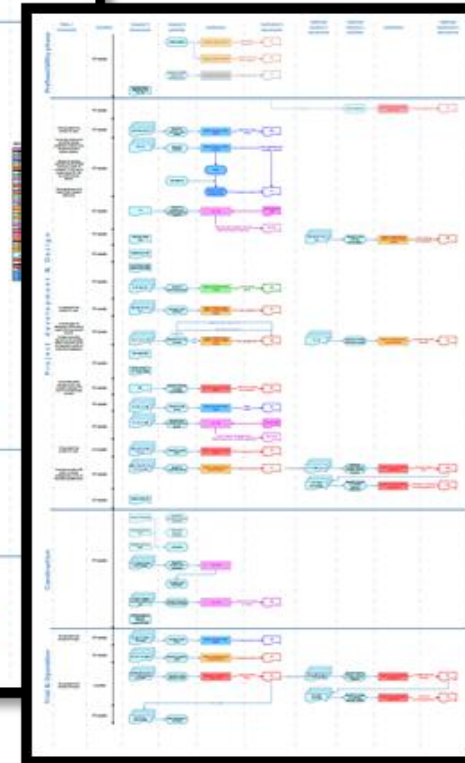
- IOLR framework reasonably developed and functional but **insufficiently tested** in practice due to **lack of large HPP development projects** in the last decades
- Severe **lack of formal cross-sectoral integrated coordination** (energy, flooding, irrigation, fishery, tourism etc.) (except in Kosovo)
- From the existing strategic planning documents at the country level in the region, it is unclear **who is responsible for the overall coordination** of multiple aspects (flooding, irrigation, fishery, tourism, etc.) of HPP development planning, where consideration of energy aspect alone is insufficient;
- IOLR framework for SHPP development **has been significantly improved**. It is present and functional in all WB6 countries, but in some cases with **numerous gaps**.
- **Capacity of local municipalities is not sufficient** to facilitate growing demand and expectations for development of SHPP projects and RES-projects in general.
- Most of the existing **SHPP cadastres (registers) are outdated**.

Examples of IOLR flow diagrams

RS



BFiH



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## Special Attention to Resolve Numerous Transboundary Problems, a Prerequisite for Fostering Stalled, Promising, HPP Developments



1. Drini i Bardhe/White Drin/Beli Drim River System - HPP Zhur (KOS-ALB)
2. Trebišnjica Hydropower Scheme – HPP Dubrovnik 2 (CRO-BIH-MNE)
3. Vardar River System - HPP Lukovo Pole (ALB-MKD-GRE)
4. HPP Buk Bijela (BIH-MNE-SER)
5. Drina River Basin - HPP Koštanica (MNE-BIH-SER)
6. Čehotina River Basin - HPP Chain on the Čehotina River (MNE-BIH)
7. Drina River System - HPPs along Middle Drina River (SER-BIH)
8. Drini River System - HPP Skavica (ALB-MKD)
9. Vjosa River Basin - HPP Chain on Vjosa River (GRE-ALB)

# Searching for Suitable Support Platforms for Resolving Transboundary Issues

Envisaged platforms for assisting WB6 in resolving transboundary issues:

Transboundary issues in hydropower have two potential platforms, on the basis of which issue resolution is possible:

- 1) Legal act which provides regulation in a planning phase – i.e. **EU Water Framework Directive (WFD)**; and
- 2) Legal platform for resolving transboundary issues within Energy Community action, administered by the Energy Community Secretariat.

**European Commission should join forces with the Energy Community Secretariat and make a compelling offer to the WB6 countries and territories involved.**



*Locational Reference of the Planned HPPs Dubrovnik 2 and Risan, and of the Existing HPPs Dubrovnik 1, Trebinje 1 and Trebinje 2 and of the Existing RHPP Čapljina*

# Could Transmission and Distribution Networks Cause Obstacles to HPP Development in WB6?

**Transmission network capacities and facilities will never be a constraint** for HPP projects.

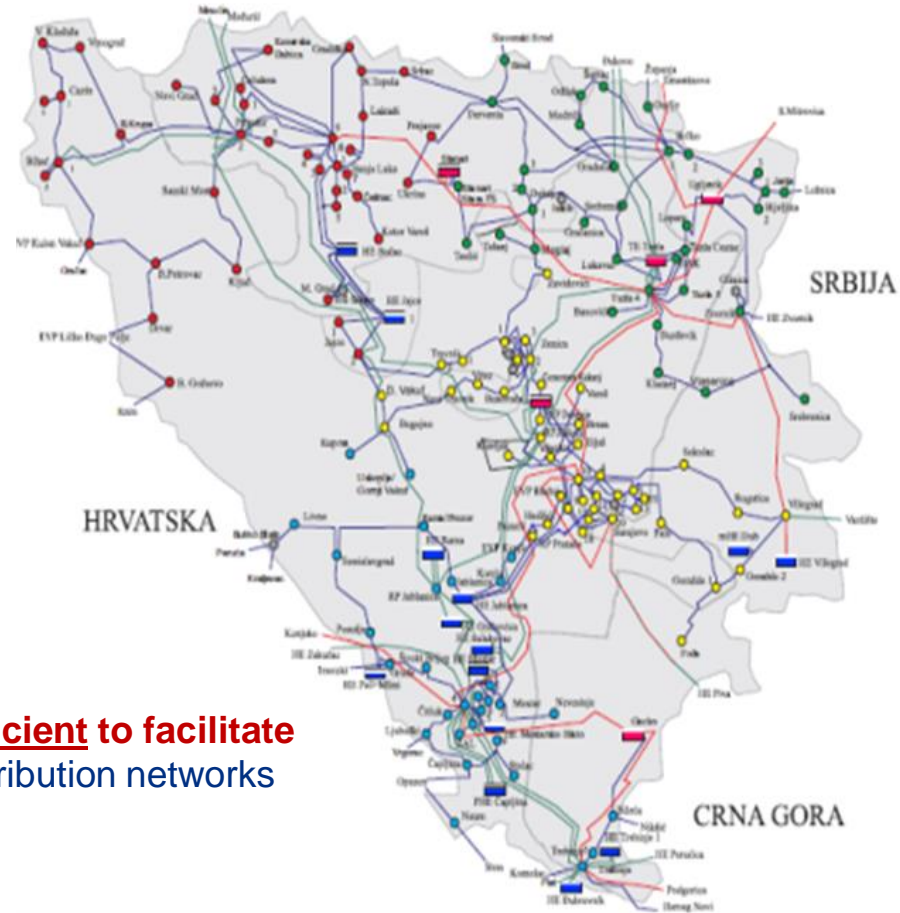
All new HPP projects connected to the transmission network:

- **increases overall stability** of the regional power system operations,
- **improve power system control** capacities, and
- **increase opportunities for integration of other RES** generation facilities, such as wind and solar PV generation.

**Distribution network capacity in the region is insufficient to facilitate growing demand for connection of small HPPs.** Distribution networks require **significant reinforcements** in:

- Network facilities
- Control facilities,
- Human resources

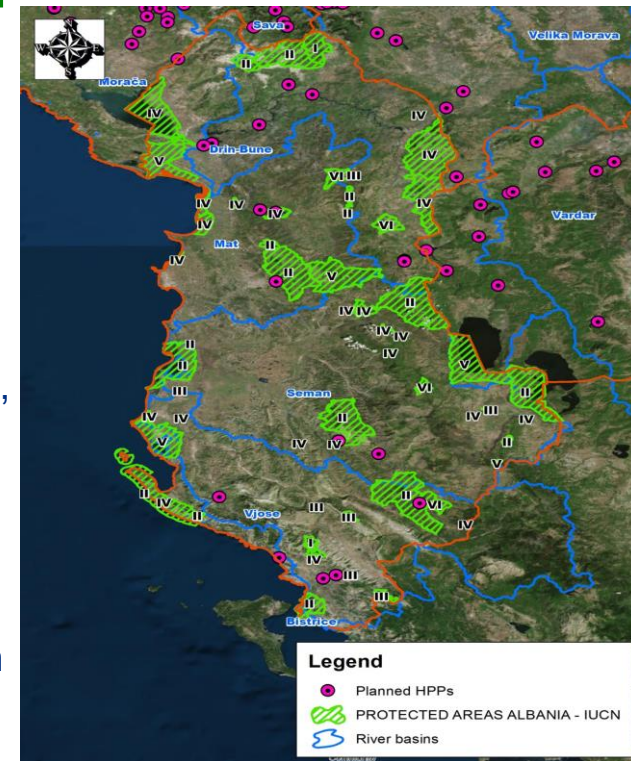
**Distribution Codes** are being improved, but are still far away from transmission levels of completeness



# Environment as Prerequisite for Sustainable HPP Development in WB6 Region

## Environment:

- **Analysis of national SEA/EIA legal procedures / practices** in WB6 countries,
- Description of **protected areas, HPP development guidelines – e.g. ICPDR, EBRD, IHA etc.**
- **Baseline description** of important features of chosen (25) river basins,
- **GIS data collected for environmental analysis:** protected areas, CORINE land cover, settlements, river basins,
- **Fish fauna inventory and residual flow legislation analysis,** GIS layers with species distribution,
- Clear **“River Basin Approach”** applied rather than “country” approach
- **Cumulative effects** (water discharge, EAF, fishes etc.) assessed in qualitative manner



*Spatial analysis – map example*

**Fish:** List of **threatened species** was prepared (41 species) – key species for the Study. By drainage basins:

- Black Sea (10 species),
- Adriatic Sea (29 species),
- Ionian Sea (2 species),
- Aegean Sea (6 species).

**WB6 region is insufficiently investigated to establish fish baseline data**

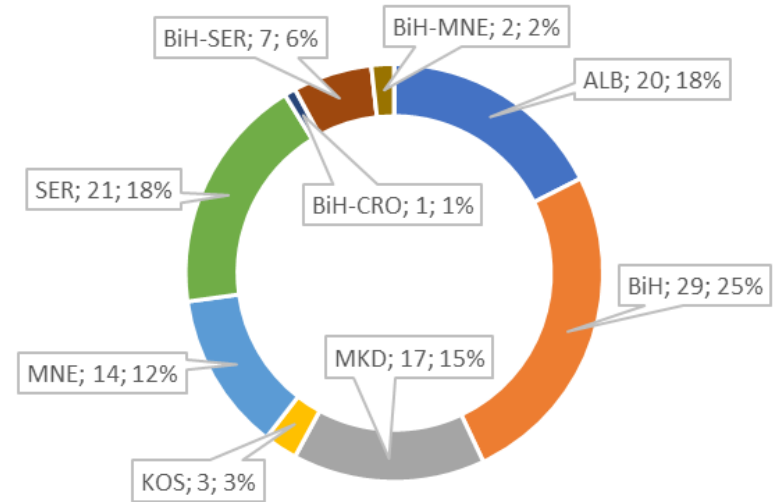


# Database of HPP projects and Initial Screening

HMP-DB developed for **greenfield HPP projects over 10MW** supported by web-GIS application: containing the following:

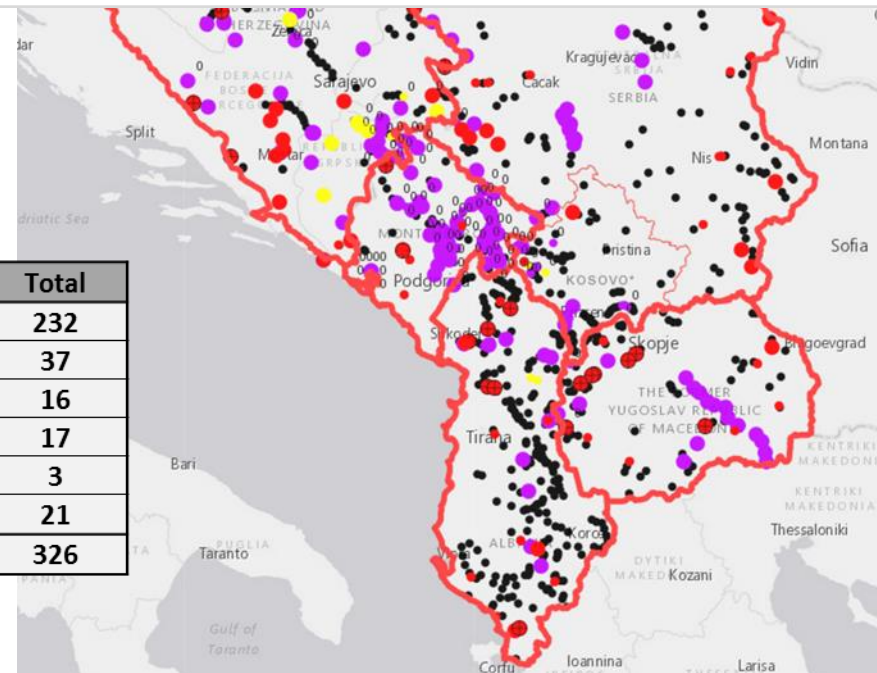
- general,
  - technical,
  - environmental & social,
  - hydrology & water management,
  - economic & financial,
  - maturity
- Total **480 projects** (total =100%) over 10 MW identified.
- 154 projects eliminated due to: i) insufficient data, ii) alternative projects -> **326 projects** remained (68% of total)
- **After “Screening”**, no more than **114 projects** (or 24%) remained for MCA (Level 1 and Level 2)

Screening Results (114 HPPs left)



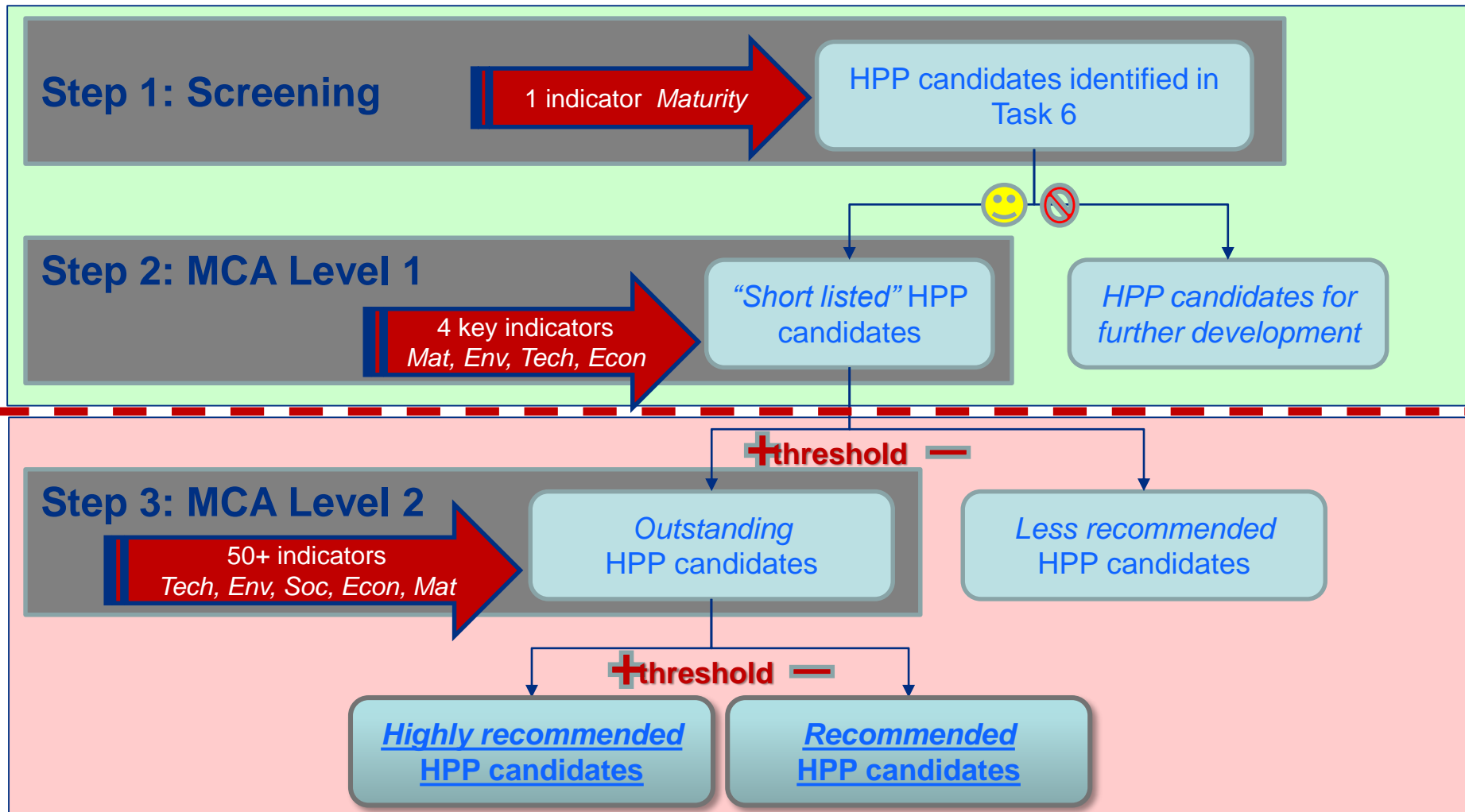
Number of HPPs	ROR	RES	REV	OTH	Total
ALB	54	28	0	150	<b>232</b>
BIH	16	18	3	0	<b>37</b>
MNE	1	15	0	0	<b>16</b>
MKD	11	5	1	0	<b>17</b>
KOS	0	2	1	0	<b>3</b>
SER	18	1	2	0	<b>21</b>
<b>Total</b>	<b>100</b>	<b>69</b>	<b>7</b>	<b>150</b>	<b>326</b>

Note: ROR (Run-off river), RES (Reservoir), REV (Reversible).



# Multi-Criteria Assessment (MCA) of greenfield HPP projects

Assessment Approach and Methodology (3-step, each next step more detailed and data intensive)



=>HPP candidates ranked into groups



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## WBIF-IPF 3 Consortium

Thank you for your attention!

<https://www.wbif.eu/wbif-projects/details?code=PRJ-MULTI-ENE-013>

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