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2021 DANUBE WATER CONFERENCE

ASSESSMENT OF RELIABILITY AND CLIMATE RESILIENCE OF WATER SUPPLY IN CROATIA COASTAL AREAS

18 OCTOBER, 12:30 – 13:30

CROATIA ADRIATIC COASTAL AREA

- This study was carried out on the Croatian Adriatic coast, including seven counties: Istria, Primorje-Gorski Kotar, Lika-Senj, Zadar, Šibenik-Knin, Split-Dalmatia and Dubrovnik-Neretva
- This region has total of 1,4 million inhabitants, which is 33% of the total population of Croatia.
- Adriatic Croatia is by far the most important Croatian tourist region in terms of both arrivals and overnight stays. 94.7% of all overnight stays and 86.5% of all tourist arrivals in Croatia were realized in coastal areas
- Annual generated foreign exchange revenues in the amount of EUR 9.5 billion, thus creating almost a fifth of the GDP.
- Although the COVID-19 crisis had major impacts on the sector in 2020, 2021 characterizes fast recover in terms of touristic results

CURRENT STATUS – WATER RESOURCES

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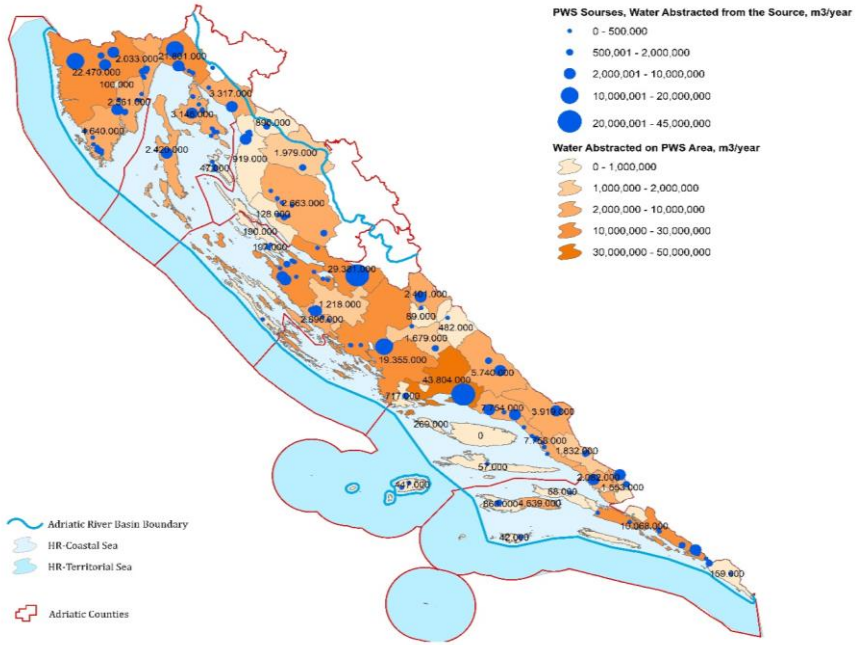
Resources

- 28 billion m3/year – total freshwater resources (14.2 billion internal renewable)
- 27 billion m3/year - renewable reserves of groundwater
- during the summer drought periods, low retention capacity of karstic areas results in a significant reduction in capacity of karst springs
- 18 designated groundwater water bodies, 16 in good ecological status, 2 in poor status, with saltwater intrusion being the main reason



Water sources

- 222 million m3 (2019) - the total volume of water abstracted for public water supply (around 159 m3 per capita)
- 120 active sources (20 sources provide 85% of total water abstracted, while the additional 100 sources provide water for smaller supply systems or supplement the larger systems when needed).
- while water abstracted is significantly lower than total average annual (sources) yields, in the summer and dry months, (available) yields often become equal to total pumping/abstraction volumes, as effect of availability of water in sources and significant seasonal increase in consumption

CURRENT STATUS – WATER SUPPLY SYSTEMS

DRINKING WATER QUALITY

Sources

- 25% of the total abstracted water is treated, 100% is disinfected before distribution to consumers to ensure the microbiological suitability of water
- elevated turbidity (after abundant rainfall), sodium and chloride concentrations are recorded at the sources

Distribution network

- 1,9 - 3,7% unsafe samples due to one or more indicators
- predominant cause of concern is elevated turbidity after precipitation
- coastal sources during droughts and intensified water demand shown higher levels of chlorides and sulphates

WATER SUPPLY SYSTEM

Connection

- high connection rate – average 95% (100% in more populated areas, 80% in low-density areas and quite below 80% in long-distance islands)

Status

- average age of main infrastructure is 40-50 years, lack of strong reinvestment in most of the systems
- hydraulic and transport capacity is mostly adequate for current needs, with the exception of a several areas where the system capacity needs to be upgraded
- water treatment should be considered due to increased turbidity
- water losses are a considerable issue for the majority of systems

PUBLIC WATER SUPPLIERS

Current

- 50 public water utilities (PWU)

Consolidation

- after years of preparation, a new Water Services Act (2019) provides the legal base for technical and organizational consolidation of PWUs.
- for the coastal area, it is proposed that the 50 existing PWS are aggregated into between 15 and 20 larger PWU.
- proposed consolidation provides good start for optimization, larger PWUs could generate more favorable results for service levels, more sustainable long-term maintenance and harmonization with increasing standards

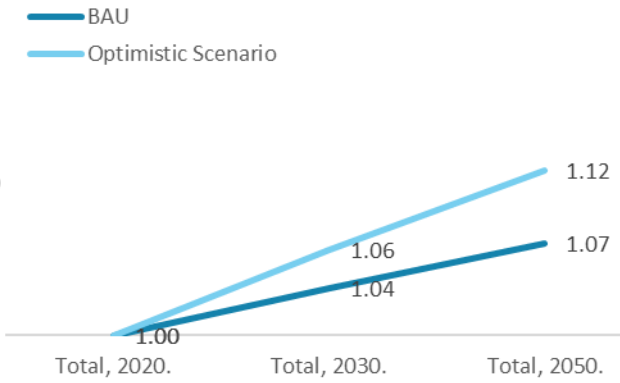
WATER DEMAND

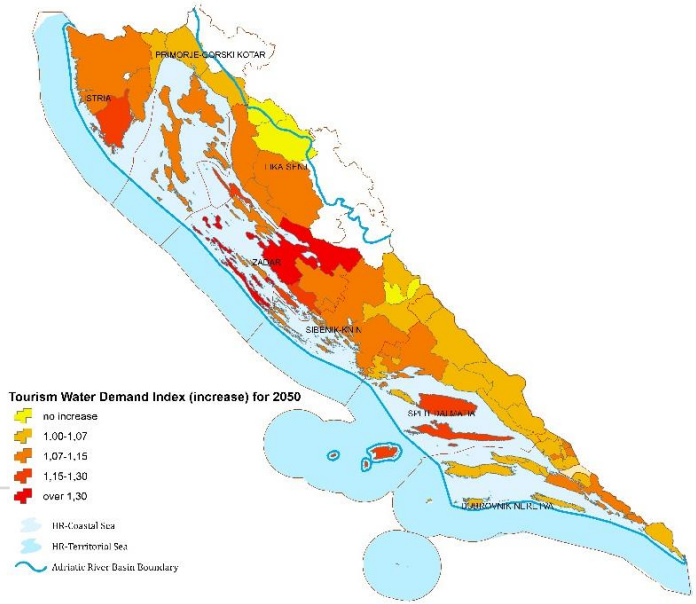
Current

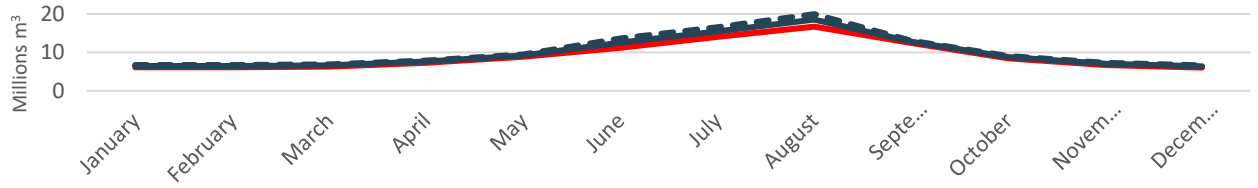
- 110.5 million m3 in 2019 - water delivered through the system (current water demand)
- significant seasonal character, summer consumption is up to five time higher than winter
- 30% covers the needs of the tourism sector (Istria county stands out with total 50% for tourism or 60-70% during season)

Projections

- two time periods were selected for projections, 10 years (mid-term period, 2030) and 30 years (long-term period, 2050.)
- two demand scenarios (Business as Usual and Optimistic)
- The BAU scenario for 2030. indicates total water demand growth of 4% by 2030 and 7% by 2050. (population, industry, tourism)
- Optimistic scenario for 2030. indicates water demand growth of 6%, and 12% by 2050.







Total water demand 2020. Baseline scenario 2050 Optimistic scenario 2050.

WATER BALANCE & NRW

Projections

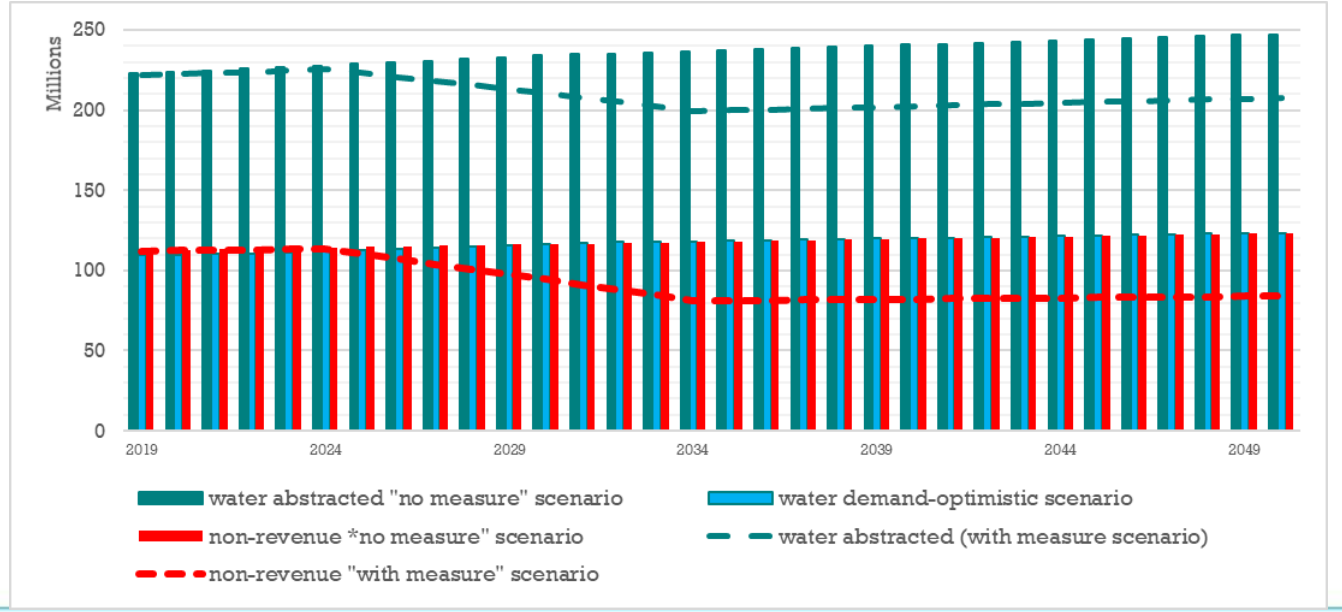
- on an annual basis water abstracted shows the moderate growth (up to 11%)
- due to the consumption seasonality, a total annual water abstraction increases almost double in the summer months

Current

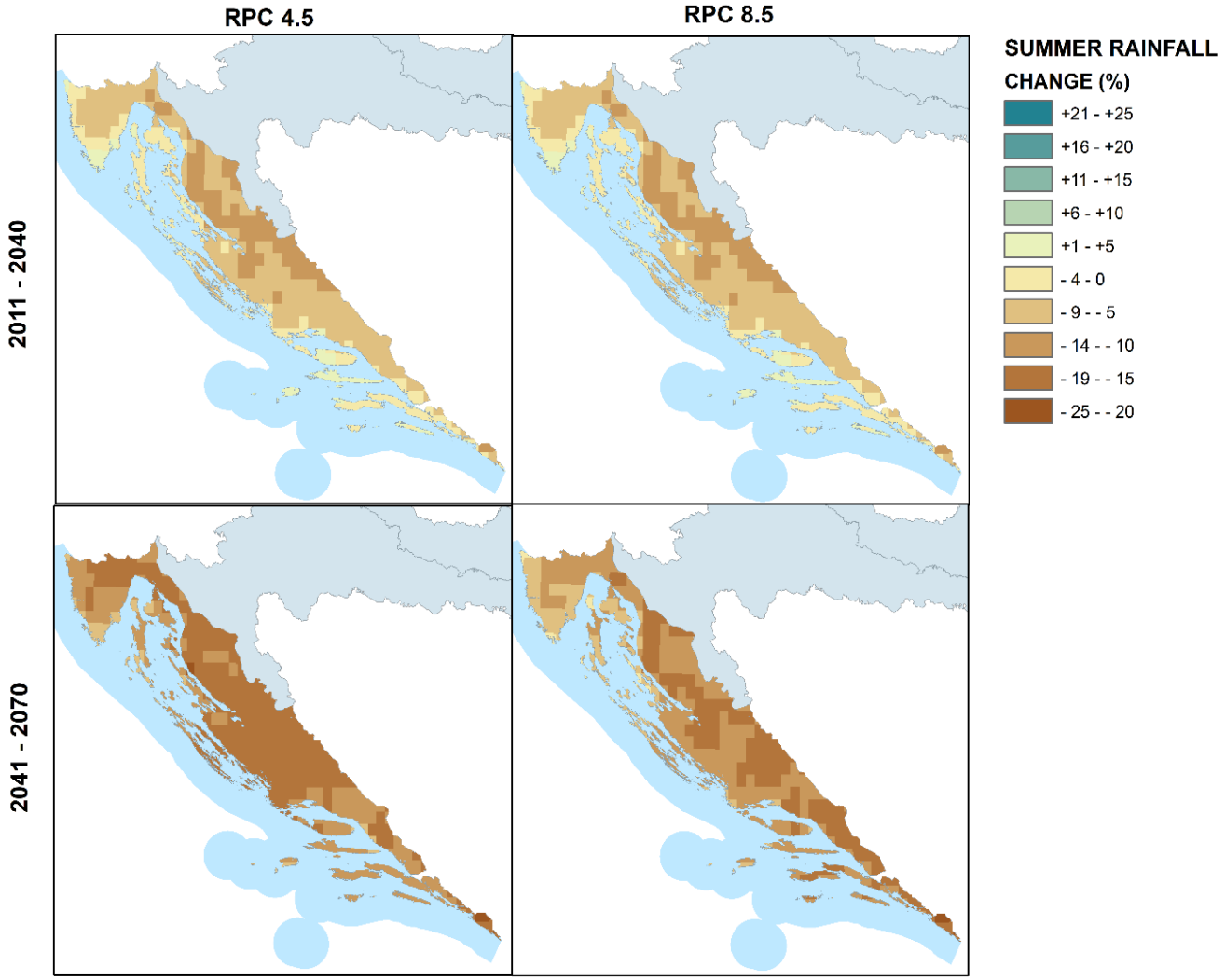
- in coastal area more than 50% (varies 29-66%) of water is lost as non-revenue water (NRW) (water abstracted less water delivered to the final users)

Calculation

- Estimated that loss reduction to a level of about 30% can be achieved by reasonable physical measures which, that would not exert undue financial risk on service providers. At the level of analysis undertaken in this study, a conservative estimate of a 10% reduction in NRW
- Loss reduction leaves room for expected demand growth (interannual or site specifics needs to be assessed at the project level as well as possible additional need for water losses reduction)



DESK REVIEW OF CLIMATE TRENDS



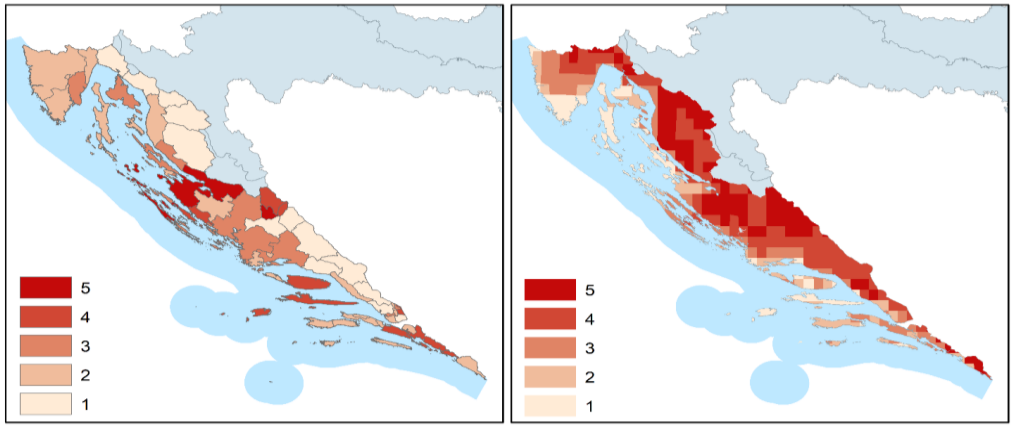
Rainfall:

- significant decrease of summer rainfall escalating over time
- the expected summer rainfall decrease, 14 mm (7%) in near and 28 mm (16%) in far future
- results are location specific, and in some locations, the decrease could be much higher (up to 25% of the reference rainfall)

Air temperature:

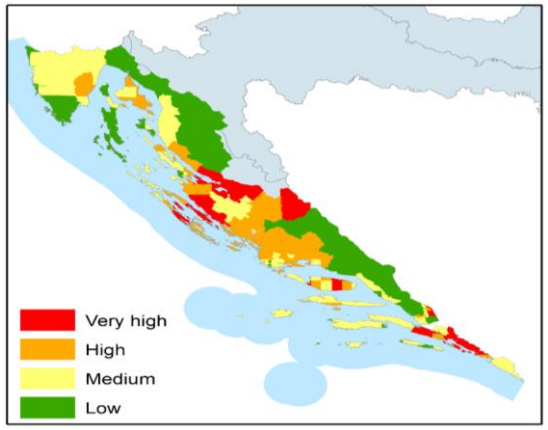
- a significant increase of average summer air temperature escalating over time
- the expected summer temperature increase will be is 1.3 °C in the near and 2.4 °C in the far future

EXPECTED IMPACT



Risk assesments indicators (Increasing demand and climate change severity (right), from 1 (low) to 5 (very high)

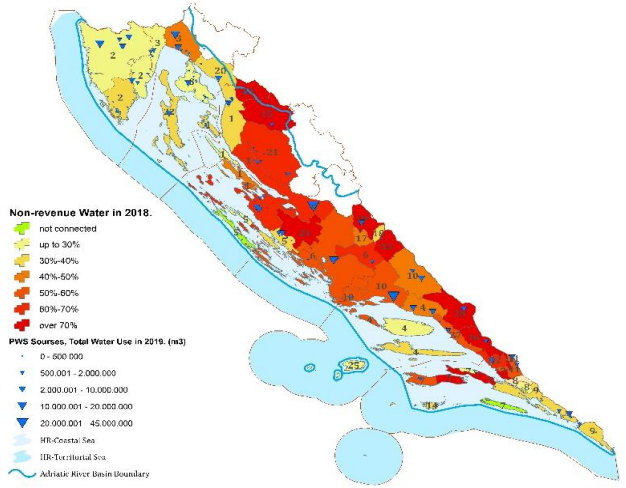
Estimated risk on the settlement level



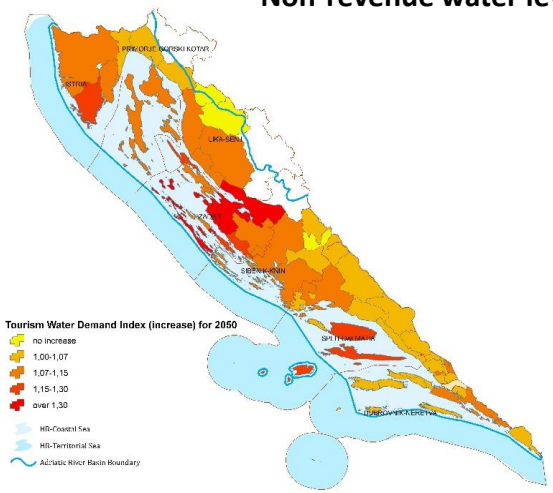
Assessment

- this report developed a climate change severity indicator (calculated as decrease in summer rainfall, 2040), around 42% of water is withdrawn within the very high or high climate change severity areas, 49% in the moderate severity area, and only 9% within low severity areas
- on average, climate change may lead, to loss of more than 15% of renewable reserves of water, which sue to hydrogeological diversity of the coast, certain water bodies will lose all renewable potential and more strain will be put on others,
- preliminary risk assessment shows localities with highest risk, stands out long distance islands in Zadar county and certain settlements on island Brac, along with Zadar coastal zone and Dubrovnik and nearby settlements

CONLUSIONS



Non-revenue water level



Water demand growth

1. Existing systems manage to meet current water demand. Investments are largely channelled to system expansion, while reconstruction and reliability has not been a major focus. Concern is elevated turbidity and higher levels of chlorides and sulphates.
2. Annual growth of water demand ap to 12% or 20% in summer months (BAU and optimistic scenario where tourism grows faster). Such demand requires additional abstraction.
3. Reduction of water losses (environmental benefits plus financial benefits to some extent) even for 10% would have a large positive impact on system resilience (room for keeping water abstraction at the same level)
4. On average, climate change may lead, to loss of more than 15% of renewable reserves of water. Also, due to significantly decreased water availability, the achievement of good quantitative status of water bodies might at risk. Due to hydrogeological diversity of the Croatian coast, impact would strongly vary.
5. To increase security, resilience and adaptive capacity, interventions in the water supply sector (investments and/or soft measures) should be directed to areas that are under highest risk.

MEASURES

INVESTMENTS MEASURES

- Water treatment plants (WTP) - To deal with the issue of water quality problems in the distribution network
- Water losses mitigation measures - to bring NRW to a reasonable level achieved by reasonable physical measures which
- Capacity improvement (mains, water tanks, PS) - to deal with capacity or hydraulic issues and network extension
- Investigation work/monitoring - when a shortage of water quantity is occurred, development of models with the aim of sources adaptive capacity evaluation

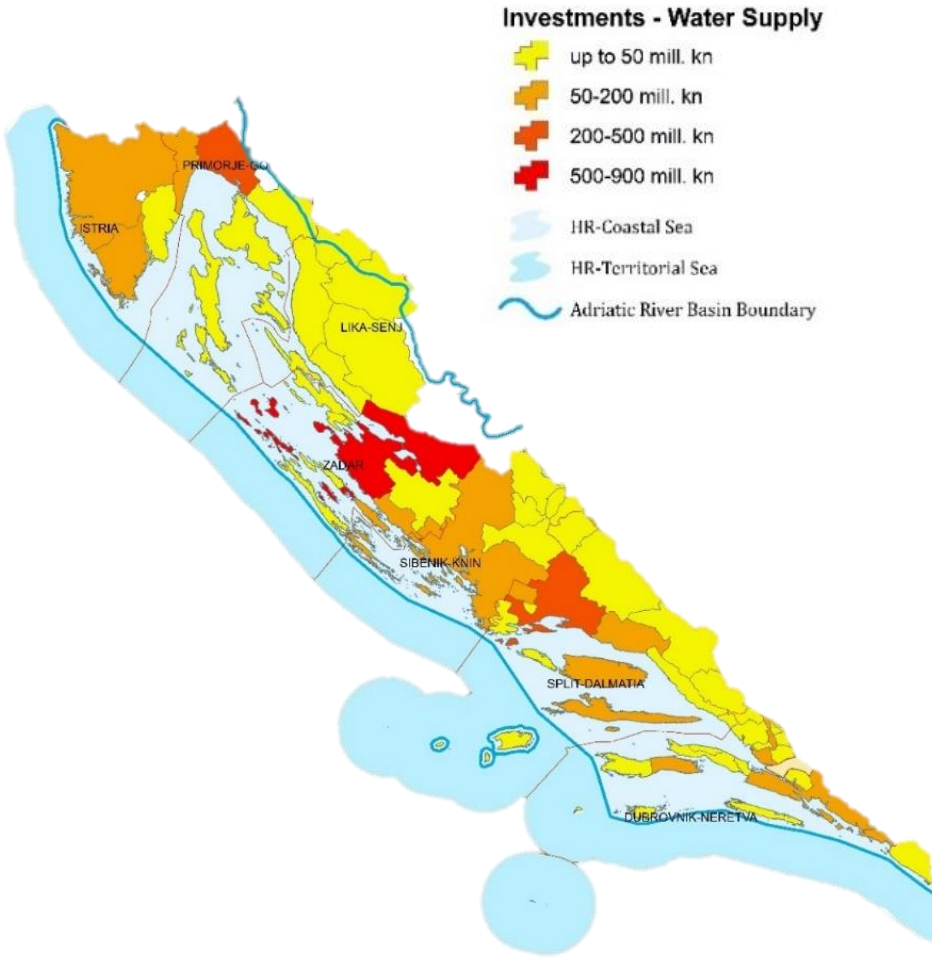
SOFT MEASURES

- Improved risk assessment
  - Improved climate risk assessment – to provide better information for decision making such as climate change projection
  - Methodology for measure development – to provide framework/methodology for the development of each water supply system, including the balancing of demand with resource status,
  - Risk assessment on PWU level or source level to elaborate risk assessments of water sources, water bodies, and water distribution systems (focus on new DWD specifics) PWUs consolidation process
  - larger consolidated PWUs could provide regional or sub-regional approach, where planning and managing of the system bring more favourable results and resilience, for both levels of service and resilience of public water supply systems.

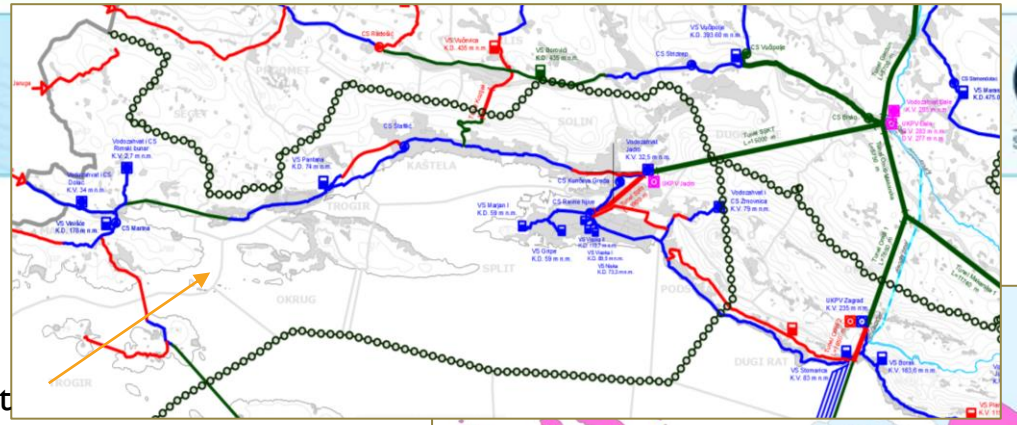
COSTS OF MEASURES

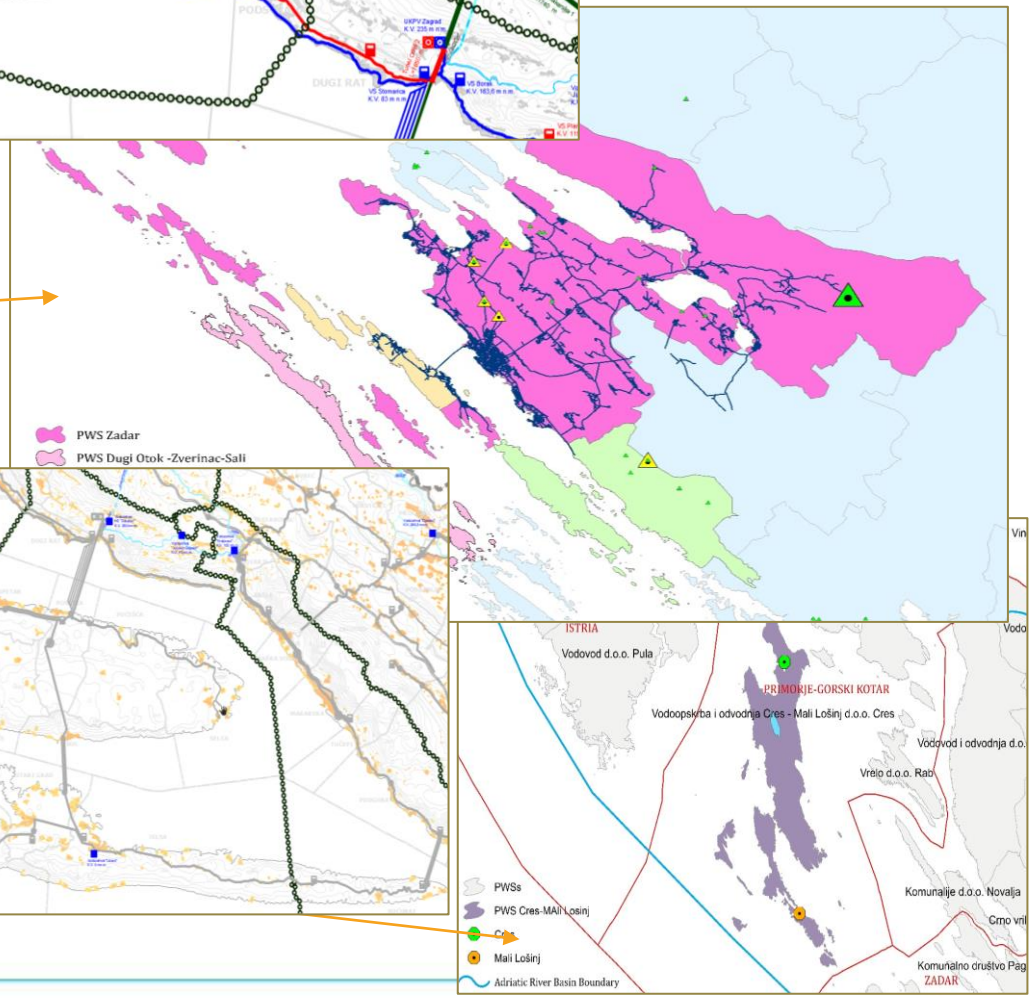
- ✓ Within this study total costs of investment measures are estimated to **EUR 465 million.**

County	Water treatment		Water losses		Mains & other		Investments total		Projects in pipeline	
	(.000 HRK)	(.000 EUR)	(.000 HRK)	(.000 EUR)	(.000 HRK)	(.000 EUR)	(.000 HRK)	(.000 EUR)	(.000 HRK)	(.000 EUR)
ISTRIA			60.000	7.900	160.000	21.100	220.000	29.000		
PRIMORJE-GORSKI KOTAR	200.000	26.400	150.000	19.800	90.000	11.900	440.000	57.900	110.000	14.500
LIKA-SENJ			84.000	11.100	31.000	4.100	115.000	15.200		
ZADAR	140.000	18.500	400.000	52.700	555.000	73.100	1.095.000	144.100	100.000	13.200
SIBENIK-KNIN			150.000	19.800	65.000	8.600	215.000	28.300		
SPLIT-DALMATIA	290.000	38.200	415.000	54.700	310.000	40.800	1.015.000	133.600	50.000	6.600
DUBROVNIK-NERETVA	60.000	7.900	247.000	32.500	122.500	16.200	429.500	56.600	80.000	10.600
Grand total	**690.000**	**91.000**	**1.506.000**	**198.200**	**1.333.500**	**175.800**	**3.529.500**	**464.700**	**340.000**	**44.900**



CASE STUDIES





4 cases are selected to express key messages:

- **<u>Water supply system Split-Solin-Kastela-Trogir</u>**, largest one in Coastal area Key message: urgent supply source constraints (issue already, but future trends exacerbating)
- **<u>Water supply system Zadar</u>,** spatially very demanding area
  Key message: complicated case study, with urgent pressures
- **<u>Regional water supply system Omis-Brac-Hvar-Solta</u>**, typical regional system
  Key message: capacity of main water transport infrastructure is an issue (not water source capacity) and requires urgent intervention
- **<u>Individual water supply system Cres-Mali Lošinj</u>,**
  Key message: not urgent demand/supply pressures, but monitoring of climate change indicators and (possible) long run pressures require interventions to manage

THANK YOU FOR YOUR ATTENTION

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