



SETOF

Soil Erosion and TOrrential Flood
Prevention: Curriculum Development at the
Universities of Western Balkan Countries

Analysis of soil erosion state and torrential floods in Western Balkan Countries

Deliverable 1.2

University of Sarajevo
University of Banja Luka

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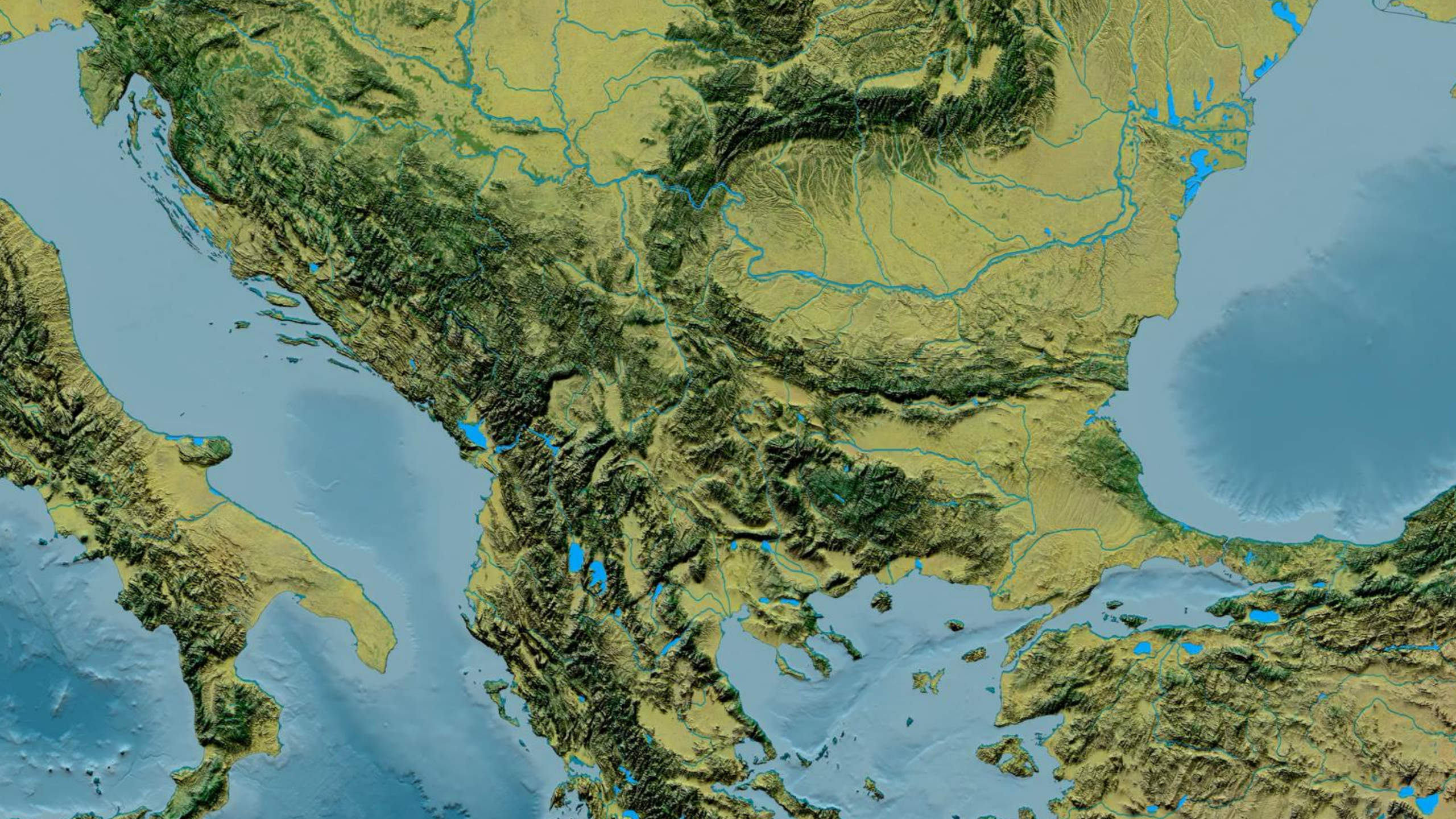
Federal Ministry of Agriculture, Water Management and Forestry

(Suad Skejović)

UNEP (UNDP)

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Status of the water resources



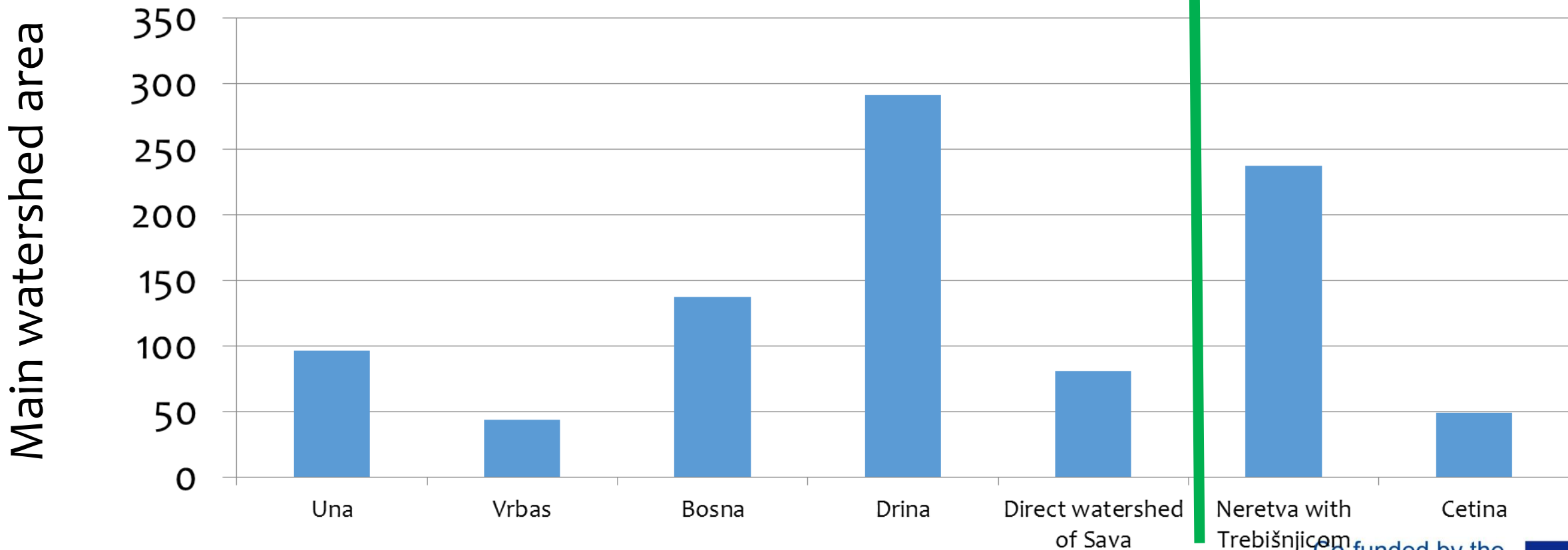
Figure 1. Main Basins in Bosnia and Herzegovina
(<https://www.fhmzbih.gov.ba/latinica/HIDRO/Hkarakteristike.php>)





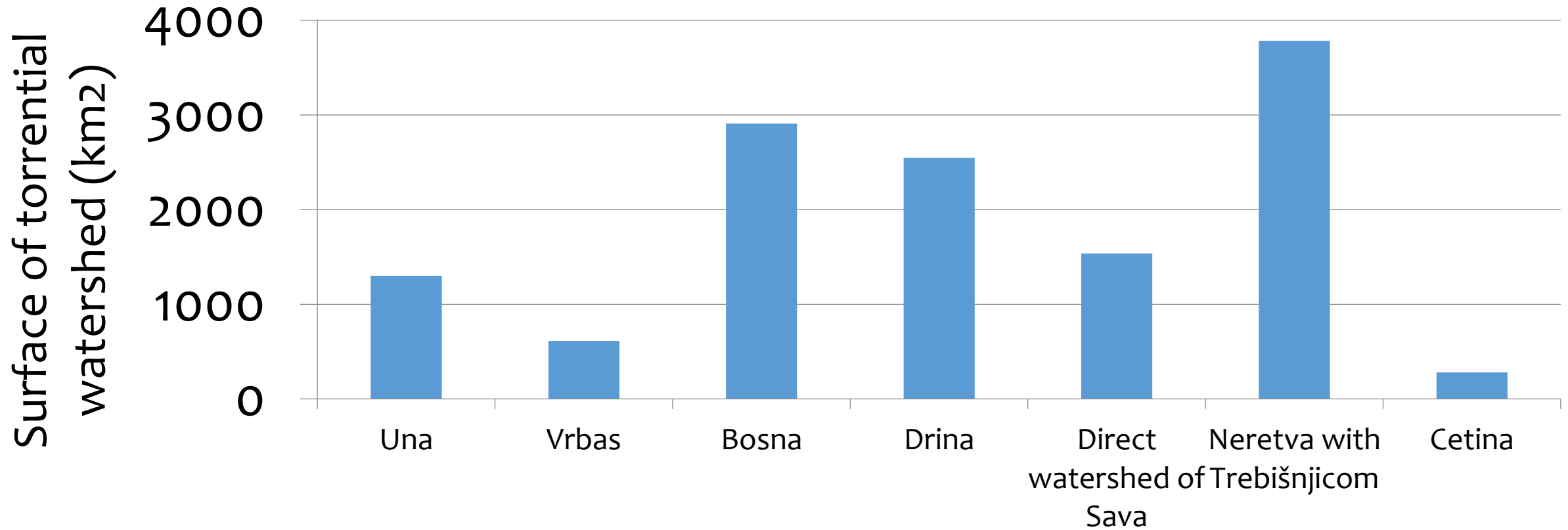
Status of the water resources

Torrential watercourses according to the data from the “Cadastre on torrential watercourses and erosion areas in Bosnia and Herzegovina”, from 1985.



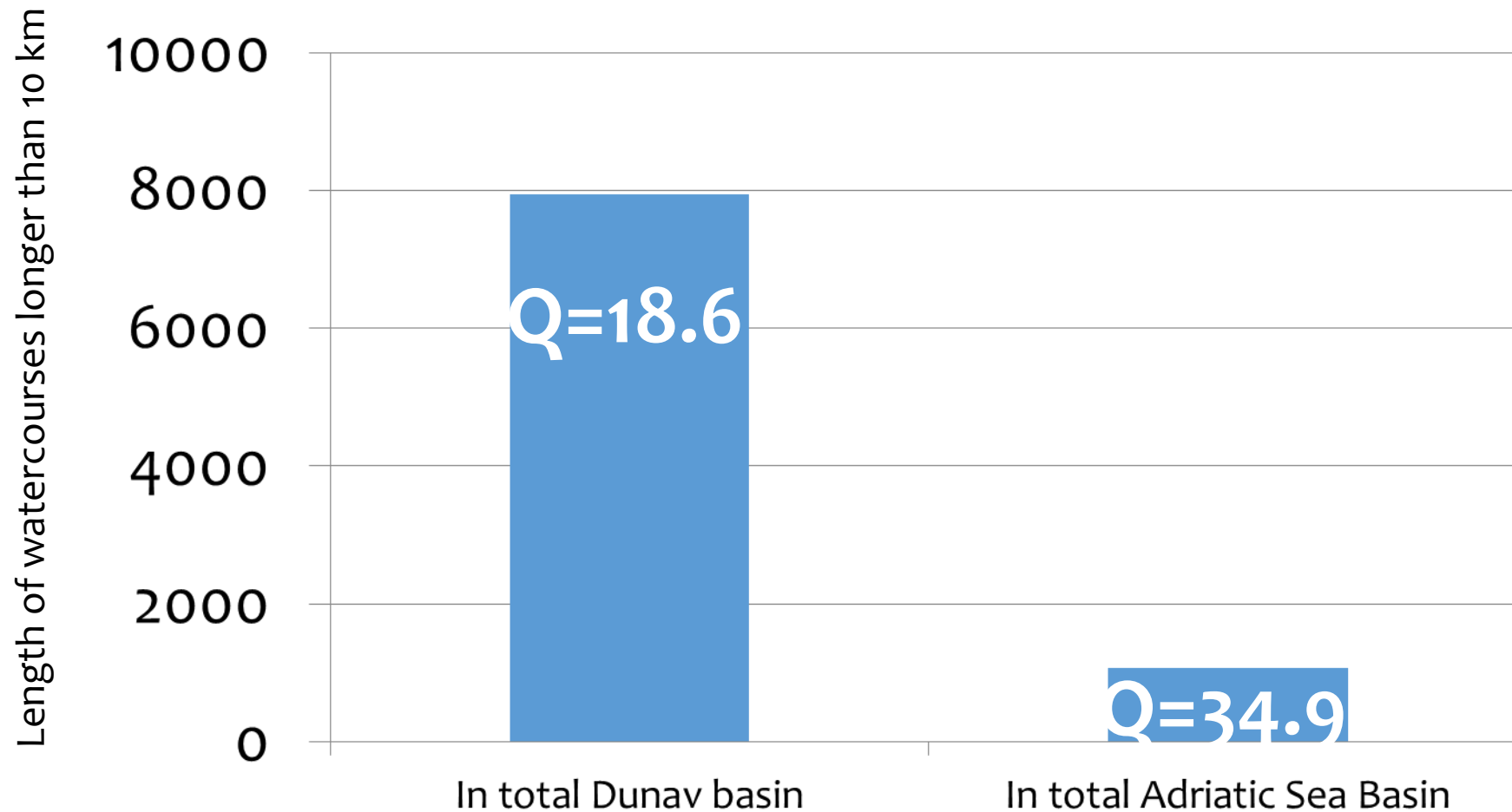


Status of the water resources





Status of the water resources





Status of the water resources

River watershed	Surface of a watershed (km ²)	Average flow Q_{sr} (m ³ /s)	Specific flow q (L/s/km ²)	Flow of small waters $Q_{min.mjes. 95\%}$
Direct River Sava watershed	5.506	63	11,4	1,5
Una watershed in B&H	9.103	240	26,3	41,9
Vrbas watershed	6.386	132	20,7	26,3
Bosne watershed	10.457	163	15,6	24,2
Drina watershed in B&H	7.240	124	17,1	24,1
Black Sea Basin	38.716	722	18,6	118,0
Neretva watershed	8.200	325	39,7	52,3
Trebišnjica watershed	1.630	85,6	52,5	4,2
Cetina watershed in B&H	2.300	31	13,5	1,8
In total Adriatic Sea Basin	12.410	433	34,9	58,3
B&H	51.129	1.155	22,6	176,3





Status of the water resources

Basin	Surface of the basin (km ²)	Population number (from 1991)	Medium runoff			Minimum runoff		
			m ³ /s	l/s/km ²	l/s/resi- dence	m ³ /s	l/s/km ²	l/s/resi- dence
Black Sea	38.719	4.012.266	722	18	0,18	118	3	0,03
Adriatic Sea	12.410	515.360	433	35	0,84	58	4,7	0,11
B&H	51.129	4.527.626	1.155	23	0,25	176	3,5	0,04





Evidence of floods in last five years

Date	Affected areas, municipalities	Extent of damage
Dec.2010	River Drina catchment, Municipalities of Bosanska Krupa, Domaljevac - Šamac, Orašje, Tuzla, Maglaj, Goražde, Foča - Ustikolina, Pale - Prača, Ravno, Čitluk, Čapljina, Stolac, Mostar, Trnovo, Ilidža, Novi Grad, Tomislavgrad, Drvar, Trebinje, Bileća, Nevesinje, Foča, Novo Goražde, Bratunac, Zvornik, Bijeljina	<ul style="list-style-type: none">• 20,000 people affected, 5,000 houses flooded,• 6,000 people evacuated
May 2014	Sava tributaries: Una, Sana, Vrbas, Vrbanja, Bosna and Drina and River Sava at Rača	<ul style="list-style-type: none">• Nearly 15% of GDP lost.• 13,200 km² flooded.• Over 1 million people in 46 municipalities affected.• 25 lives lost.
Aug.2014	Northern and Western BiH. All areas along the Sava, Sava tributaries: Una, Vrbas, Banja Luka, Gračanica, Tuzla, Foča, Višegrad, Zvornik, Žepče, Lukavac, Zenica	<ul style="list-style-type: none">• Some 200 homes evacuated.





Historical evidence of floods

- Analysis of Damage and Flood Destruction 2014 in B&H (Information from the Ministry of Security of B&H):
 - - 73 municipalities (50%) in B&H were affected by floods,
 - - 100,000 homes were damaged or destroyed,
 - - 230 schools and hospitals were damaged or destroyed,
 - - 66,080 persons were evacuated,
 - - 7.176 landslides were activated.
 - - total damage was estimated at EUR 2 billion.





Preventions measures for torrential floods

Table 6. Summary of the performed anti-erosion measures in the watersheds at the territory of B&H
(Republic of Srpska Water Framework Development Plan - Annex 3)

No.	Watershed	Implemented anti-erosion measures				
		River-bed (m ³)	Afforestation (ha)	Grassing (ha)	Terracing (ha)	Other biological measures (ha)
	Sava - direct watershed	5.332	-	-	-	-
	Kupa	-	-	-	-	-
	Una	3.364	5	-	-	-
	Vrbas	7.977	3	-	-	-
	Ukrina	-	-	-	-	-
	Bosna	19.565	278	-	-	-
	Drina	25.982	109	-	-	-
	Krka	11.362	111	-	-	-
	Cetina	980	-	-	-	-
	Neretva	75.049	1.786	321	246	517
	Adriatic basin	7.402	-	-	-	-
	Total	157.013	2.292	321	246	517





Flood Risk Management Plans

Total estimated funds for the implementation of the Action Plan amounted to 303,2 million EUR.

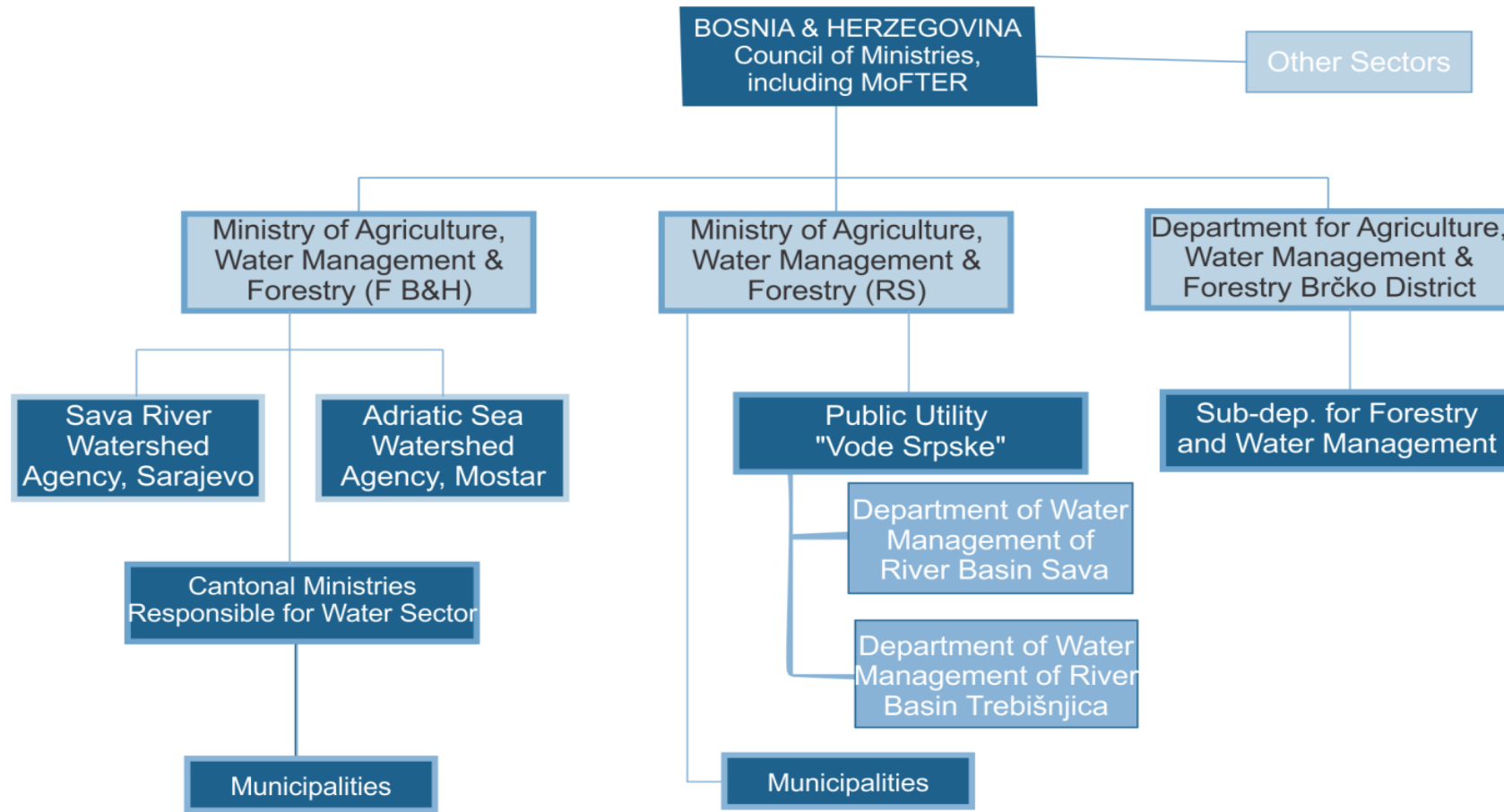
The measures implied:

- 1) **Reparation** of flood, erosion and torrential damage in 2014 on existing watercourses, river basins and canals in affected areas;
- 2) **Harmonization of flood protection system in BiH** with **EU Directive 2007/60 / EC** on flood risk assessment and management;
- 3) **Development of technical solutions** for flood protection, erosion and torrents for settlements and cities;
- 4) Establishment of hydrological forecasting system in BiH;
- 5) Strengthening the capacities of the institutions;
- 6) Water management.





Institutional and legal framework in the field of erosion and torrent control





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Institutional and legal framework in the field of erosion and torrent control

Water Framework Directive (WFD) is jurisdiction of the Entities and BD

FBiH: Watercourses in II categories under the Water Act are within the competence of the Canton. The **Law on Waters of the FB&H** ("Official Gazette of FBiH", No. 70/06) regulates the issue of water management plans for the Sava River Basin and the Adriatic Sea Basin.

RS: The **Law on Waters of the RS** gives ("RS Official Gazette", No. 50/06, 92/09 and 121/12) the obligation to adopt management plans for the Sava River Basin and Trebišnjica River Basin. The RS Flood Defence Plan (RS Official Gazette, No. 6/14) was adopted by the RS Government and it is a basic document for coordinating and implementing activities of importance for the protection and rescue of floods.

BD: **The Water Law** (RS Official Gazette, No. 10/98) is applicable to the BD, as well as a series of bylaws required to implement the law. The Department of Agriculture, Forestry and Water Management of the BD Government authorizes registered and qualified companies to deal with flood protection

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Conclusions

- Developing maps of erosion and cadastre of torrent watercourses.
- Such maps should be followed by strategic - project documents erosion maps, population cadastre, general, idea and main projects for proofing works, cadastre of constructed structures for preventing the regulation of river watersheds;
- Perform repairs to damaged facilities and complete biological and biotechnical works as one of the first activities in the construction of protection systems,
- Construction of new facilities, technical, biotechnical and biological as a step to be followed by the repair of damaged and demolished anti-erosion facilities.





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