Reconstruction and Adjustment of Torrent Control Structures in Slovenia

(maintenance of torrents & water infrastructures)

M.Sc. Jože Papež

HIDROTEHNIK Water management, Slovenija

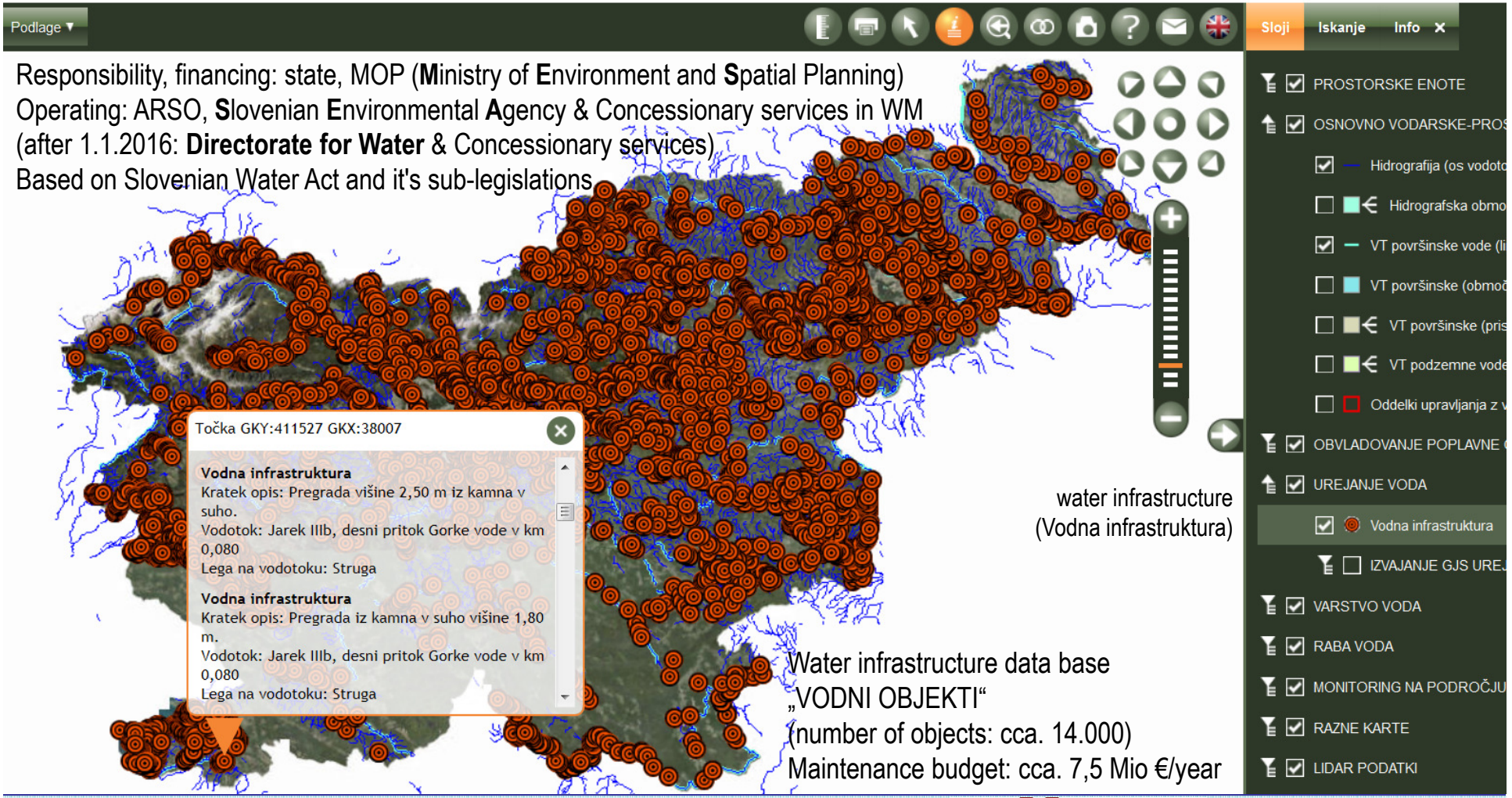
Member of Platform for Natural Hazards **PLANALP**,
Working group of Alpine Convention; (Slovene National Focal point of PLANALP:
Administration of the Republic of Slovenia for Civil Protection and Disaster Relief)

Slovenian „eWater Portal" – Atlas of Waters

AGENCIJA RS ZA OKOLJE
ATLAS VODA

http://gis.arso.gov.si/evode/profile.aspx?id=atlas_voda@Arso

Responsibility, financing: state, MOP (**M**inistry of **E**nvironment and **S**patial Planning)
Operating: ARSO, **S**lovenian **E**nvironmental **A**gency & Concessionary services in WM
(after 1.1.2016: **Directorate for Water** & Concessionary services)
Based on Slovenian Water Act and it's sub-legislations



water infrastructure
(Vodna infrastruktura)

Water infrastructure data base
„VODNI OBJEKTI"
(number of objects: cca. 14.000)
Maintenance budget: cca. 7,5 Mio €/year

Flood damages in Slovenia

- direct damages after larger floods in the last 25 years:
  - **1990** → cca **580** mio EUR,
  - **1998** → cca **180** mio EUR,
  - **2007** → cca **187** mio EUR,
  - **2009** → cca **25** mio EUR,
  - **2010** → cca **188** mio EUR and
  - **2012** → cca **311** mio EUR.

from 2007 to 2014
15 casualties
we can not replace

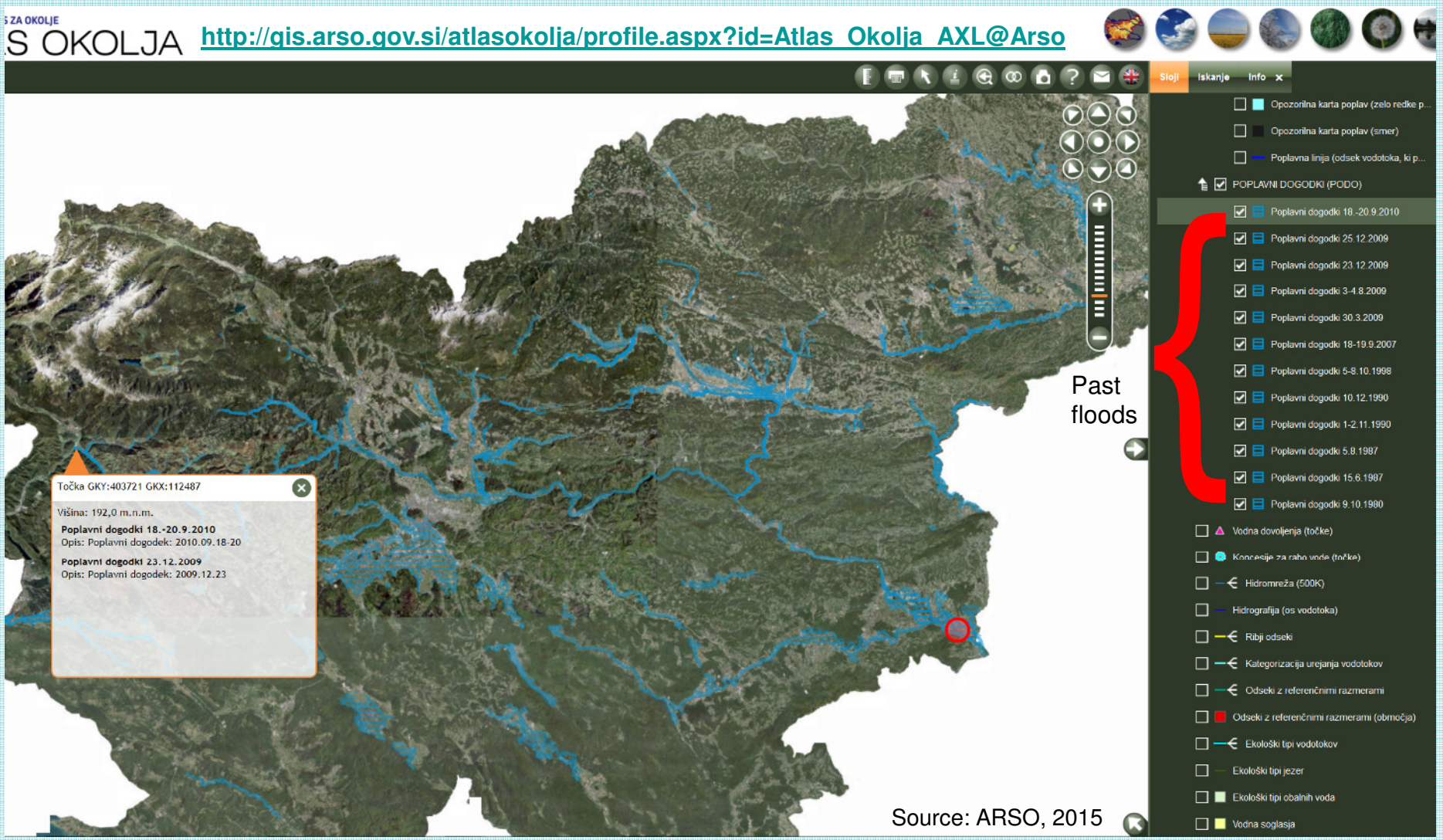
Source: MOP, 2014

- last **25** years → cca **1500** mio EUR (cca **1800** mio EUR);
- last **10** years → cca **730** mio EUR (cca **900** mio EUR):
- only direct damages included!
- quick estimation – **100 do 150 mio EUR** per year!

- SLEET & FLOODS in **2014**:
  - February 2014: **Sleet** → cca **214** mio EUR
  - damage by sleet and floods (Sep, Oct, Nov) was estimated at **657** million EUR
  - intervention costs were additional **45.5** million EUR

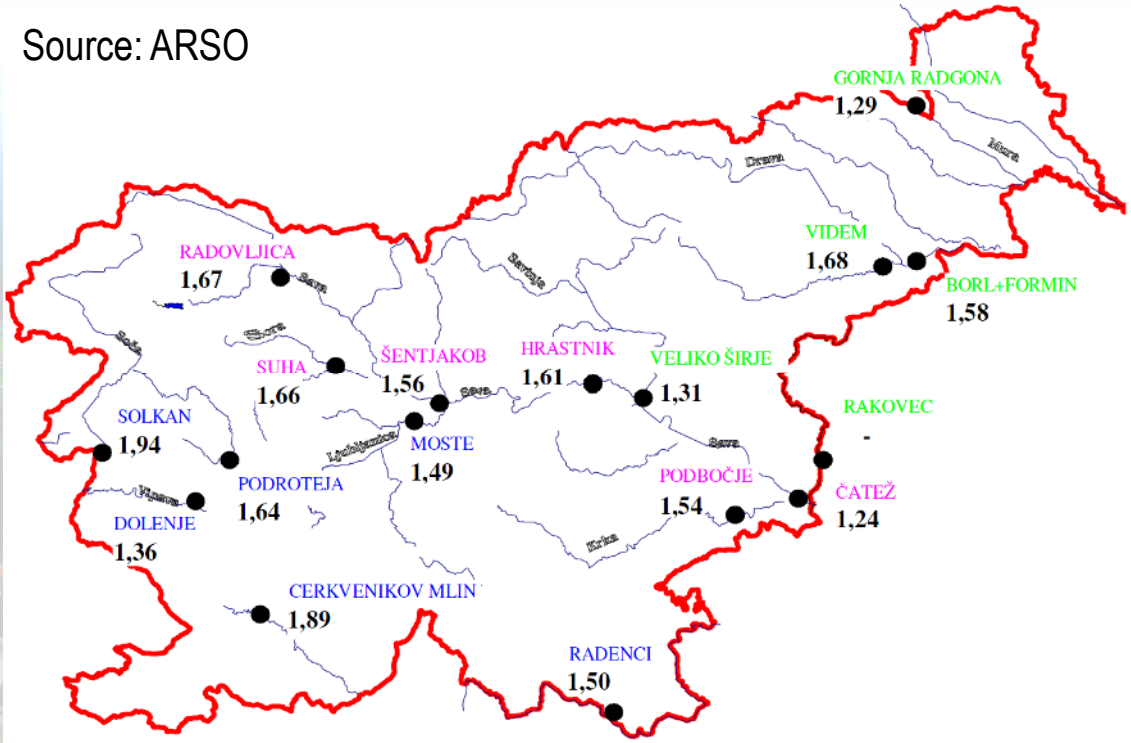
Slovenian „eWater Portal" - Water Management Atlas

http://gis.arso.gov.si/atlasokolja/profile.aspx?id=Atlas_Okolja_AXL@Arso



EXCEPTIONAL river water levels in 2014

Source: ARSO



REKA	POSTAJA	Qvk 2014		nQvk	sQvk 1971–2000	vQvk
		m^3/s	dan	m^3/s	m^3/s	m^3/s
MURA	G. RADGONA	**1327**	14.9.	273	735	1205
DRAVA	BORL+FORMIN	**1640**	7.11.	251	640	2292
DRAVINJA	VIDEM	**218**	13.9.	71,1	151	291
SAVINJA	VELIKO ŠIRJE	**781**	13.9.	278	717	1490
SOTLA	RAKOVEC	-	-	52,0	155	264
SAVA	RADOVLJICA	**512**	7.11.	208	411	687
SAVA	ŠENTJAKOB	**1183**	7.11.	442	861	1422
SAVA	HRASTNIK	**1585**	8.11.	786	1202	1668
SAVA	ČATEŽ	**2200**	8.11.	1005	2034	3267
SORA	SUHA	**581**	22.10.	147	329	687
KRKA	PODBOČJE	**450**	14.9.	217	289	356
KOLPA	RADENCI	**511**	23.12.	355	669	949
LJUBLJANICA	MOSTE	**295**	8.11.	206	282	405
SOČA	SOLKAN	**1461**	5.1.	747	1391	2066
VIPAVA	DOLENJE	**168**	5.1.	78,2	152	192
IDRIJCA	PODROTEJA	**170**	5.1.	96,0	184	304
REKA	C. MLIN	**249**	2.2.	83,3	182	305

The relationships between the middle river flows in 2014 and the average medium flow in the multiannual comparative period

After wet hydrologic 2013, in which the river stages were 25% higher than the 30-year comparative period 1971-2000, river discharges in 2014 were even greater = 56% higher than the long-term average.

Source: ARSO, 2015

The Action Plan 2014 of intervention activities due to flooding

Government of the Republic of Slovenia in 2014 adopted The Action Plan of intervention activities due to flooding (hereinafter: **Action Plan**):

SECTION 1 - SHORT-TERM ACTIVITIES (deadline: 6 months)

A set of critical intervention construction work („maintenance") on the Slovenian rivers and water infrastructure, which must be carried out within 6 months with a view to prevent further damage in case of recurrence of floods.

The estimated value of - **11.9 million €**

SECTION 2 - SHORT-TERM ACTIVITIES

Program public utility service of water management: this is the maintenance of watercourses, water infrastructure and water and coastal land for the year 2015.

The estimated needed value of - **25.0 million €** … *(increasing from 7,5 mio/year!)*

Important Explanation: „Lot 1+2 will not significantly contribute to the reduction of flood risk in Slovenia – BUT in the case of recurrence of flood events of similar intensity and extent, will prevent further damage."

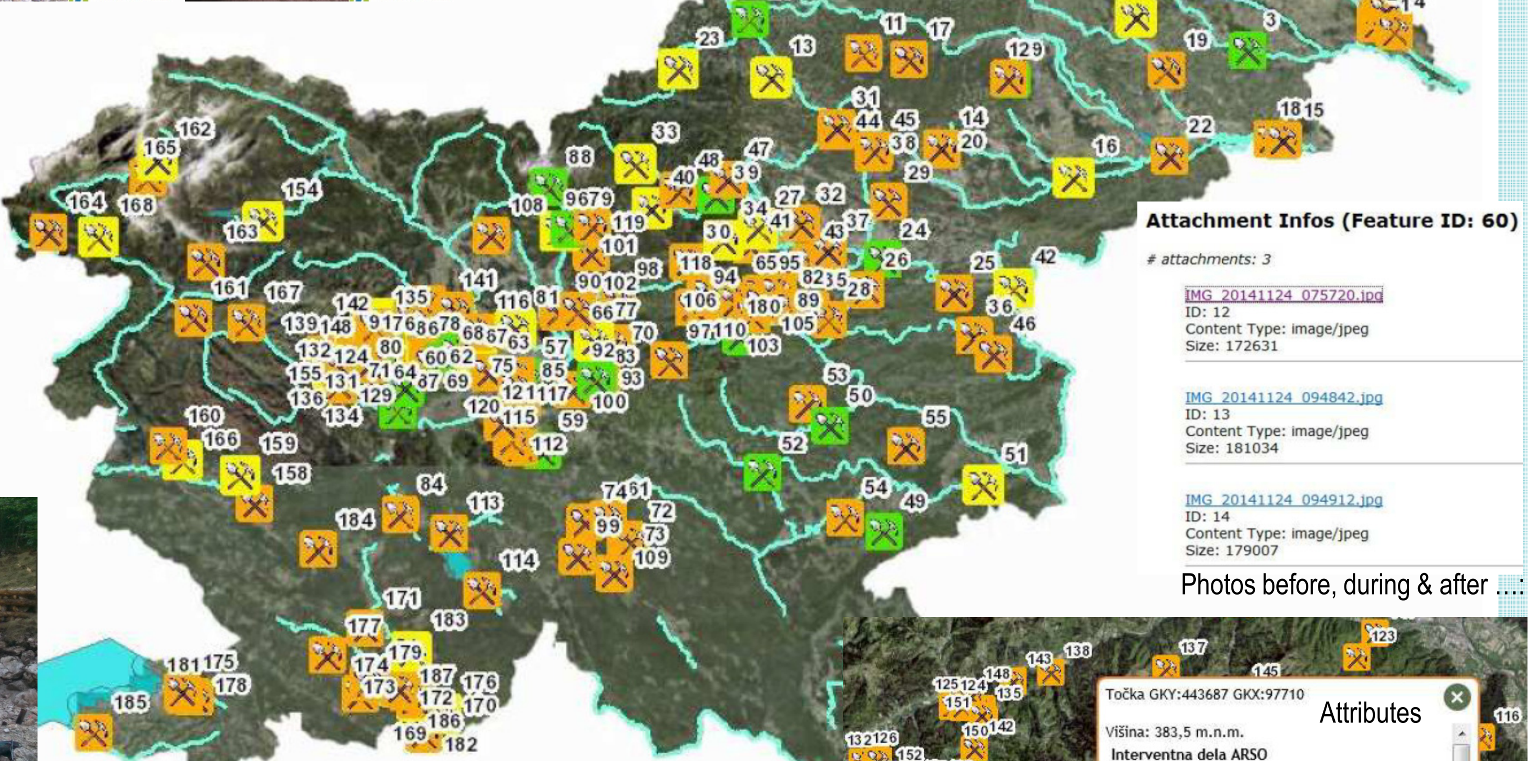
MAINTENANCE OF WATERCOURSES & WATER INFRASTRUCTURES Action plan 2014

implementation monitored by the public via the Internet.

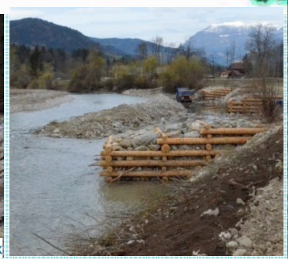
185 location with intervention measures.

June 2015 WORKS 100% REALIZED.

12 mio €



Photos before, during & after ...:



MAINTENANCE WATER INFRASTRUCTURES
retention structures & sediment depositions

Photo: Hidrotehnik

MAINTENANCE WATER INFRASTRUCTURES
Reconstruction of old concrete dams

One of the solutions to maintain the design functionality of decrepit old dams is the reinforcement with building of massive supporting stone construction in front of old structure, god anchored and connected with the existing one, that actually working like one object (two examples from torrents Mačkov graben and Prošca, realised by Hidrotehnik, Slovenia)

Torrent
Mačkov graben

Torrent
Prošca

Photos: Hidrotehnik

MAINTENANCE WATER INFRASTRUCTURES
Upgrading and adapting of stone dams

New boundary conditions demand upgrading of functionality of existing protection structure – a common measure is the raising of protection dams. On the photos are such a examples from the torrents Lučno and Lesni potok, with additional adapting of structure with manageable passage (closed with removable wooden trunks) for local owners who have to occasionally gathering the woods from the forested headwaters.
(realised by Hidrotehnik, 2014/2015)

Torrent Lučno

Torrent Lesni potok

Photos: Hidrotehnik

MAINTENANCE WATER INFRASTRUCTURES
drift wood management

Torrent NIKOVA (2014); (measures for driftwoods); realised by Hidrotehnik 2015

Photos: Hidrotehnik

MAINTENANCE WATER INFRASTRUCTURES
torrential check-dams (constructions in a system)

Torrent Črna; realised by Hidrotehnik 2015
Photos: HIDROTEHNIK

MAINTENANCE WATER INFRASTRUCTURES
torrential check-dams (constructions in a system)

Torrent Črna; realised by Hidrotehnik 2015
Photos: HIDROTEHNIK

MAINTENANCE WATER INFRASTRUCTURES
„open" torrential dam

Torrent Kostanjevec, realized by Hidrotehnik, 2015
Photo: HIDROTEHNIK

MAINTENANCE WATER INFRASTRUCTURES
flood & erosion protection in densely built-up area

Photos: Hidrotehnik

MAINTENANCE WATER INFRASTRUCTURES
wooden cribwalls (Krainerwand / Carniolan walls)

The building of wooden cribwalls (Krainerwand / Carniolan walls) is a construction technique used when regulating water courses and repair erosion damage, as well as stabilising hillslopes.

Torrent Blatnica / Bistričica, realised by Hidrotehnik 2015
Photos: HIDROTEHNIK


Photo: Hidrotehnik

MAINTENANCE WATER INFRASTRUCTURES
wooden cribwalls (Krainerwand / Carniolan walls)

cross-sectional object (stabilizing function, …)

Torrent Blatnica / Bistričica, realised by Hidrotehnik 2015
Photos: HIDROTEHNIK

MAINTENANCE WATER INFRASTRUCTURES
wooden cribwalls (Krainerwand / Carniolan walls)

longitudinal object (protection of banks, slopes and lanslides)





Torrent Blatnica / Bistričica, realised by Hidrotehnik 2015
Photos: HIDROTEHNIK

MAINTENANCE WATER INFRASTRUCTURES
wooden cribwalls (Krainerwand / Carniolan walls)

Photo: HIDROTEHNIK J. Papež

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Hidrotehnik Water Management, Ljubljana, jozc.papez@hidrotehnik.si

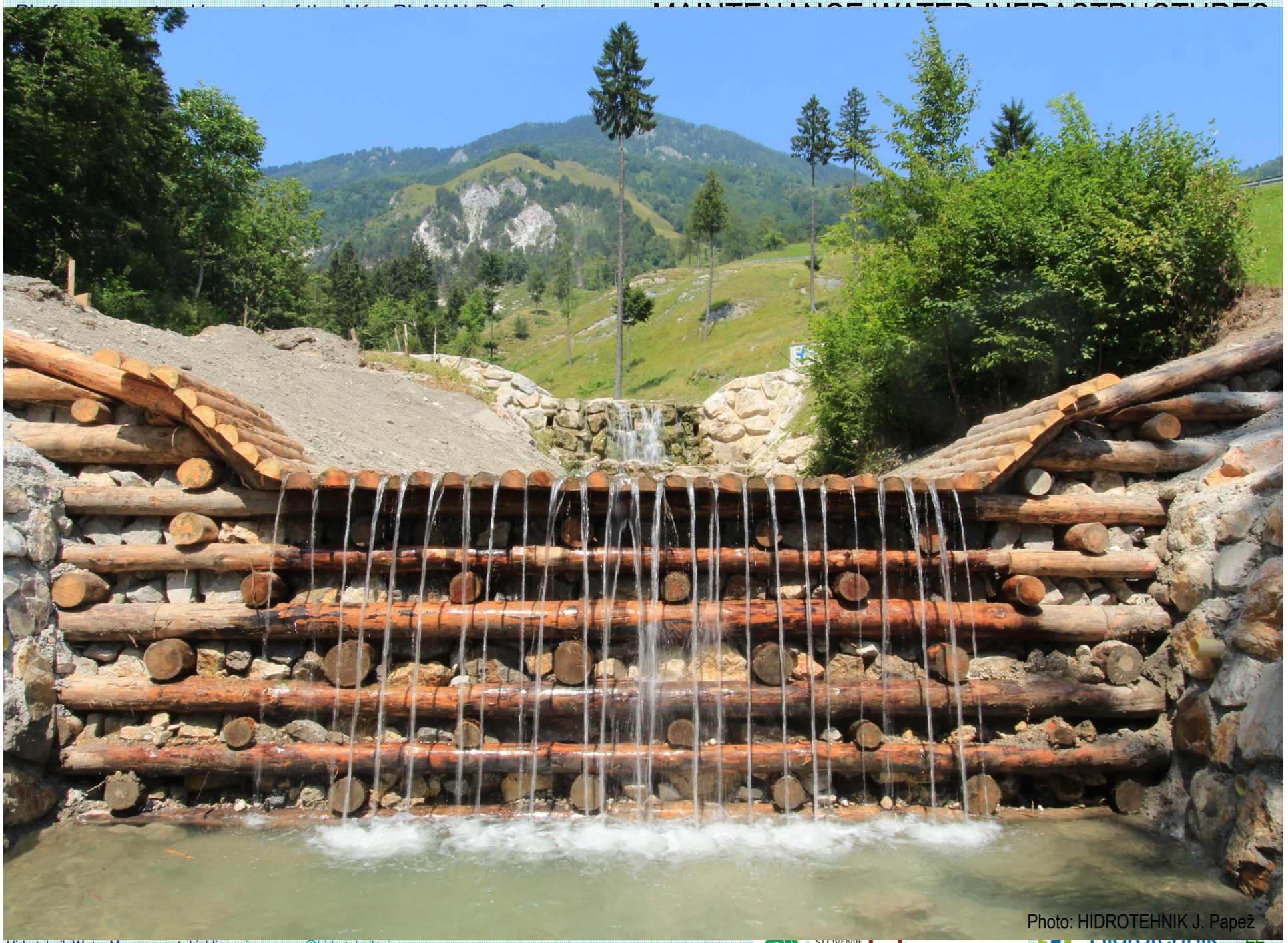
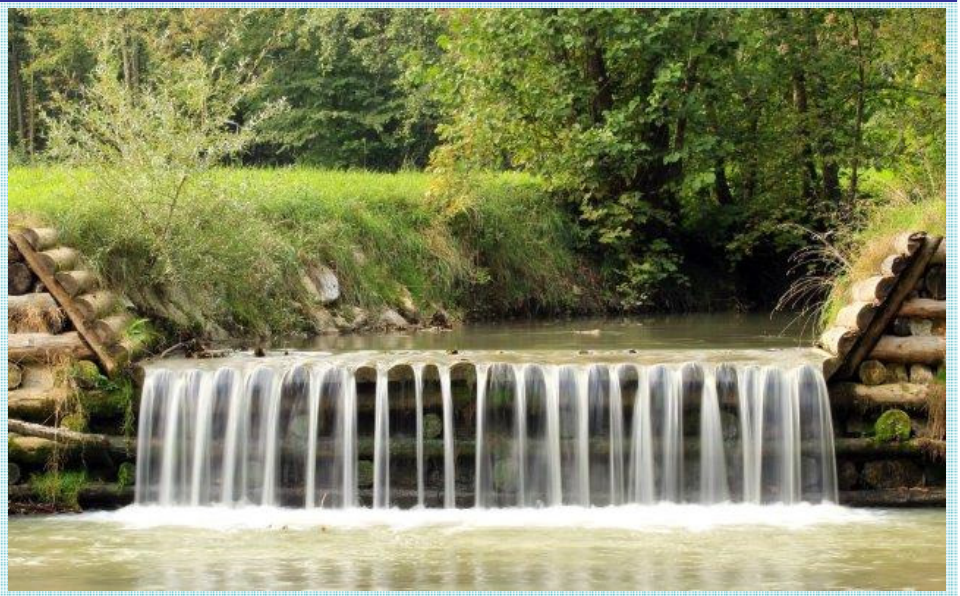


Photo: HIDROTEHNIK J. Papež

MAINTENANCE WATER INFRASTRUCTURES
wooden cribwalls (Krainerwand / Carniolan walls)

Torrent Suhi potok, realised by Hidrotehnik 2015
Photos: HIDROTEHNIK

MAINTENANCE WATER INFRASTRUCTURES
wooden cribwalls (Krainerwand / Carniolan walls)

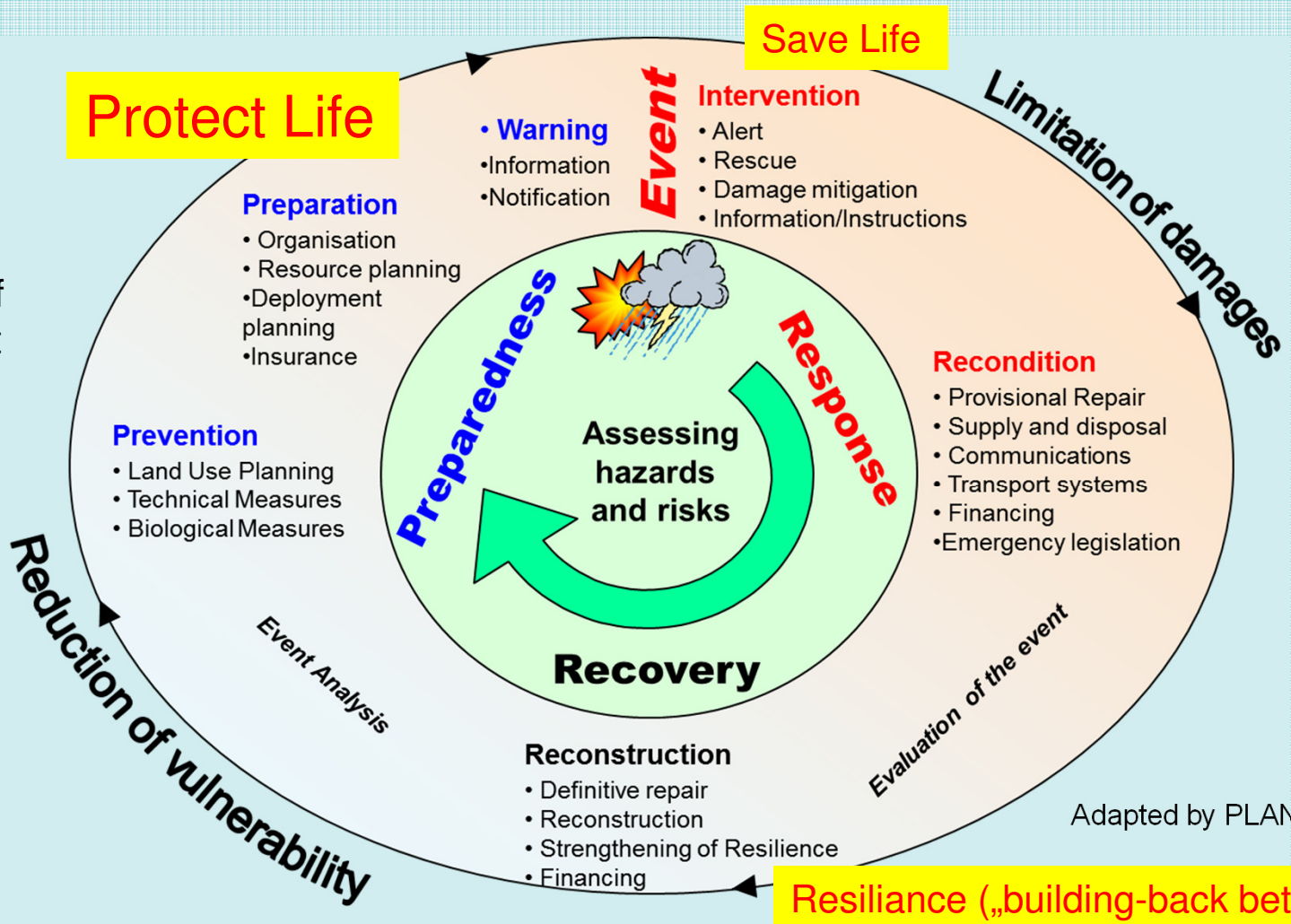


Photos: HIDROTEHNIK J. Papež

WAYS FORWARD – Implementation of Integral Risk Management

By investing in prevention and preparedness we achieve **several goals at once** - not only the greater security of the population but this including job opportunities, enhancing their competitive advantages, professional growth of local experts …

Decision makers has „to believe" in this and find and defend the founds.



Awareness raising about MAINTENANCE (PREVENTION) in Integral Risk Management

THANK YOU FOR YOUR ATTENTION

Additional informations:
Joze.Papez@hidrotehnik.si
www.hidrotehnik.si