



BRIGAIID

BRIDGING THE GAP FOR INNOVATIONS
IN DISASTER RESILIENCE

ACTION PLAN IN CASE OF ACCIDENT AT THE PROTECTION DIKES





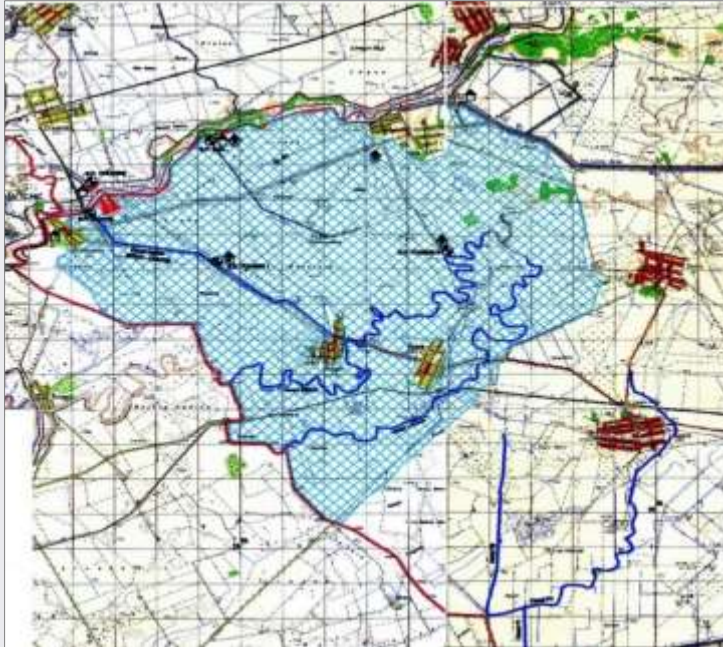
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Base of implementation of an alarming-
warning system of the floodable
objectives located inside of dyke
protected enclosures which are
exposed to failure risk during
exceptional floods.



Goals



- areas in the case of critical situations emergence on embankment works that protect certain areas
- The anticipation of a possible accident on dykes (using a sensors system integrated to the whole product)
- Content creation of a framework and procedural steps for an action plan in case of accidents on dykes.
- The project is intended for flood protection

FURTHER DEVELOPMENT

The action plan in case of accidents on dykes should contain:

- risks and assumptions for dyke failure;
- determination of the flooded areas in the event of failure;
- an alarm system warning in case of danger;
- actions to be taken during the preceding periods of dyke failure and damage control during the event itself.
- flood mitigation on the event;
- a program to educate the population at risk on flooding occurrence and behavior to be adopted during such events

DOC. PHASE

Study Needs - Presentation of Dike failures and Registered Damage

- Scope
- Analysis of the risk of failure
- Monitoring of structural behavior at national and international level
- Methods and equipment for monitoring the state of the dykes
- Simulation models for dyke defenses and wave propagation generated by dyke failure

CASE STUDY & TESTING

- Consultation of dyke administrators and location verification
- Collection of basic data (topo data, characteristic data for hydro works, hydrological data)
- Structural behavior model for structural integrity assessment
- Hydraulic simulation model construction
- Flood wave propagation generated by breakage of defense dyke
- Proposed system for tracking the behavior of defensive dikes
- Proposed content framework action plan in case of breaking of the defense dikes

Early warning

The project seeks to reduce damage by:
determining areas sensitive to the occurrence of critical situations in indigestion
early anticipation of a possible dyke accident (using the early warning provided)
making a framework content for an action plan in the event of an accident at the dams.

FLOODS

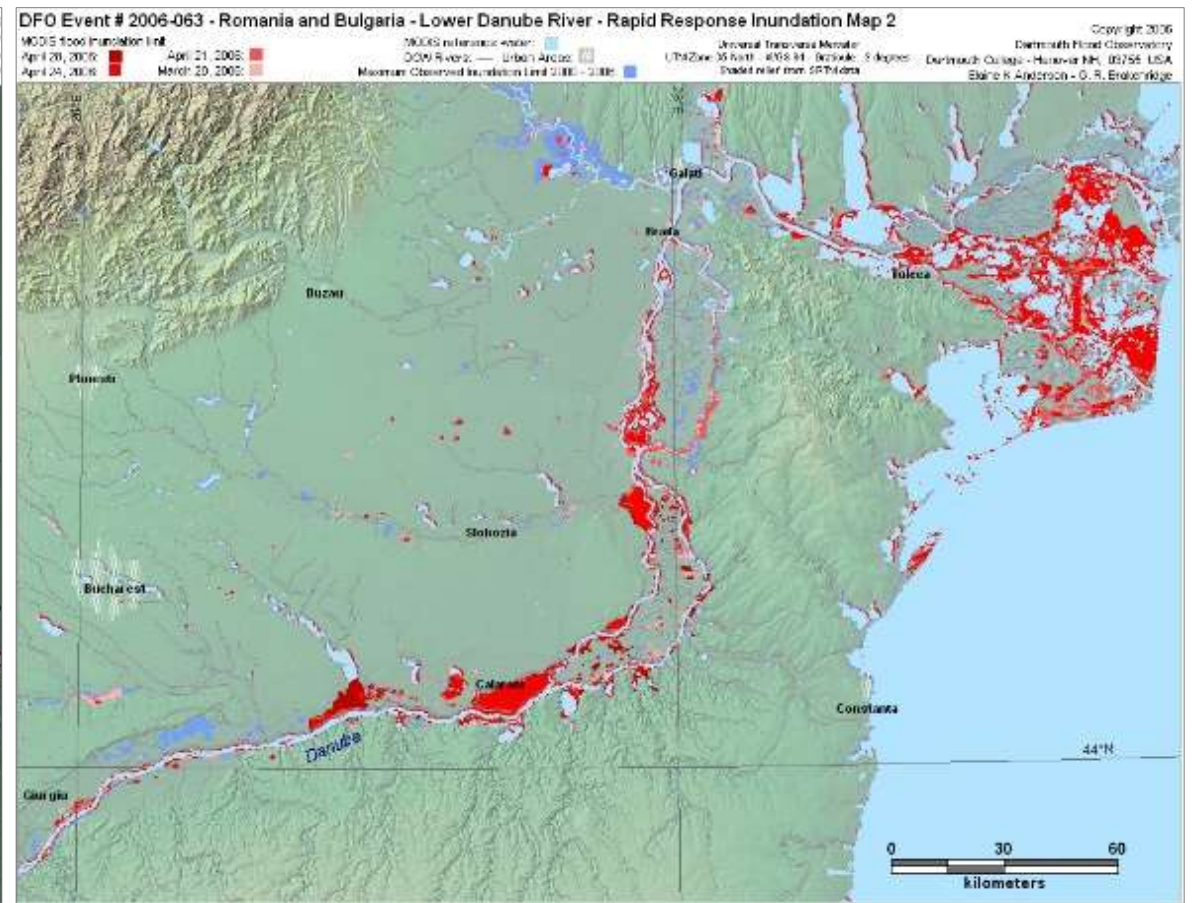
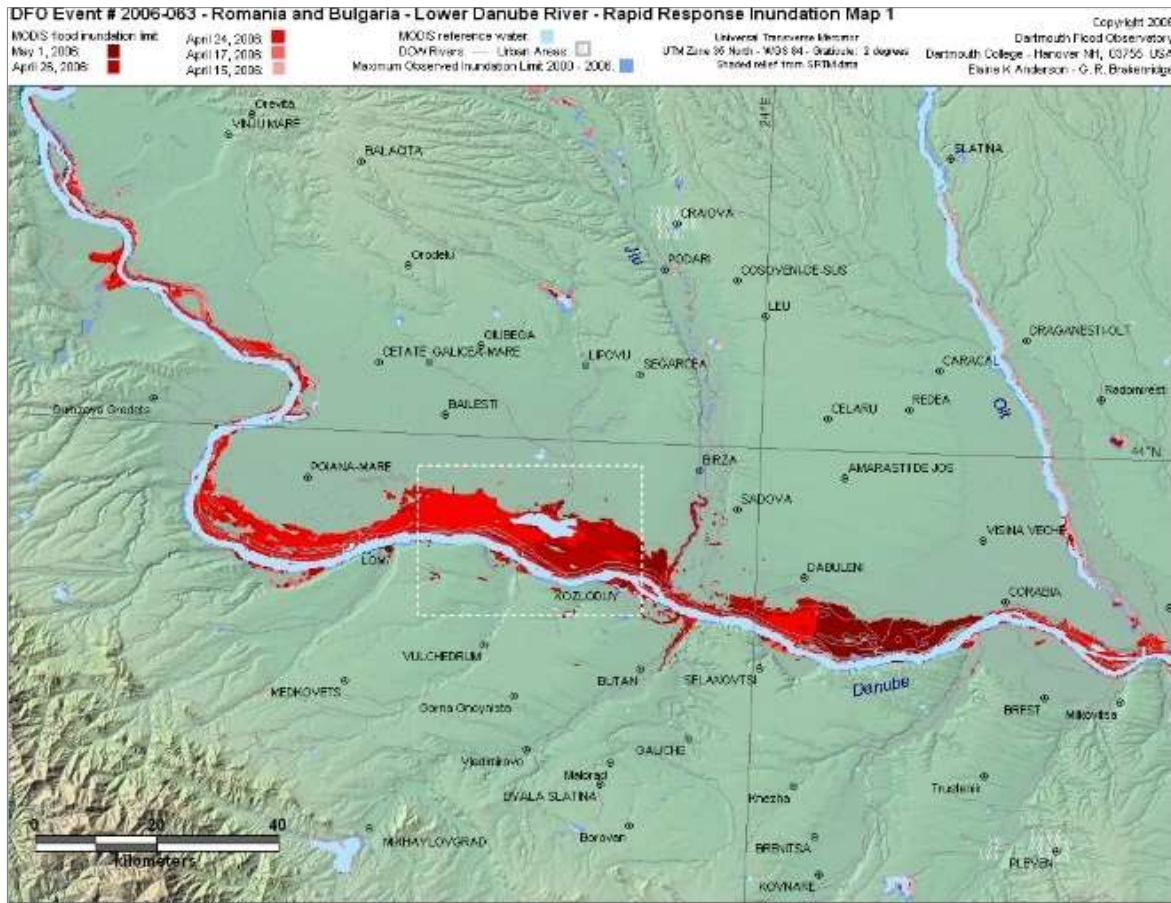
Determination of floodable areas in the event of failure;
A hazard warning alarm system;

EXTREME WEATHER

The actions to be carried out during the pre-crisis period during the production and propagation of the flood and after its cessation;

SOCIAL IMPACT

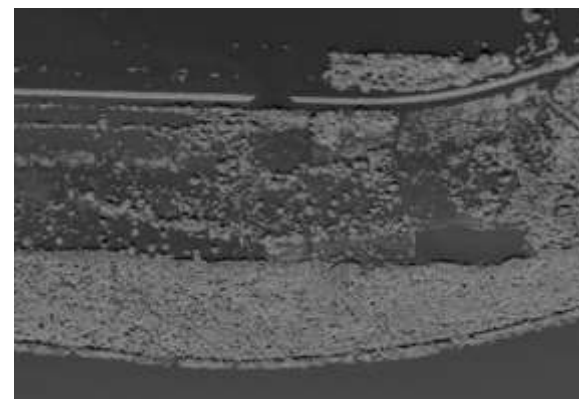
A program to educate the population at risk of flooding.



2006 Danube Flood



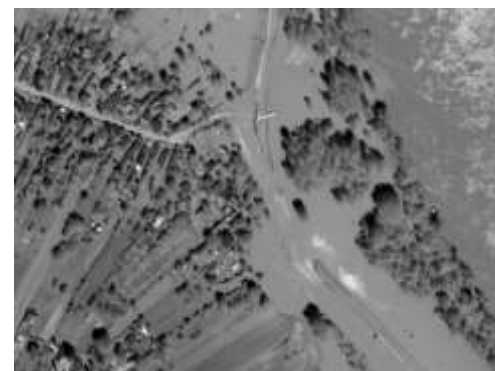
Floodable area in Serbia, Croatia si Bosnia si Mai 2014



Sava - Račinovci, Croatia – dike breach



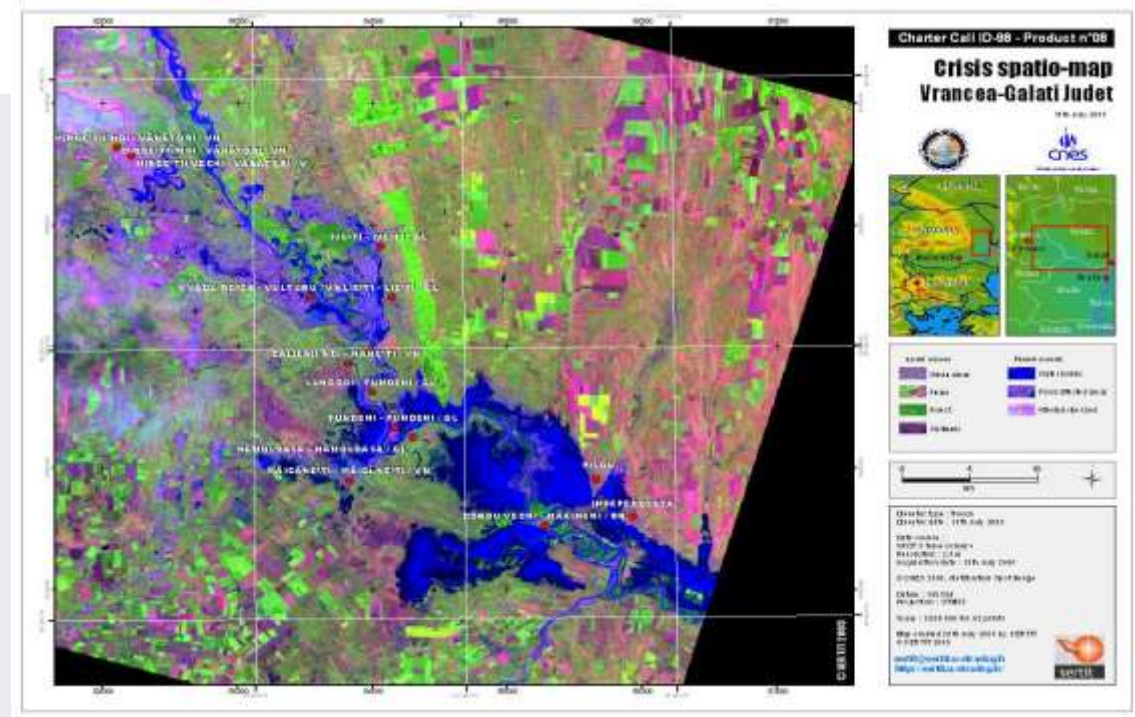
Sava - Batković, Bosnia si Hertegovina – dike breach



Raul Sava - Obrenovac, Serbia - bresa si zona inundata

2005 Siret Flood

The historic flood in 2005 reached maximum flow rates of 0.3% over Siret river tributaries, and the historical flows of 4650 m³ / s were recorded on the Siret river, corresponding to a probability of exceedance of 0.5%. The majority of dikes on Siret river was performed between 1970-1980 for a calculation rate corresponding to a probability of exceedance $\leq 1\%$ and have an average height of approx. 3 m. On the course of the Lower Siret, all the course is endiked



Flood of 50000 ha of land, 30 socio economical objectives. 3600 houses completely wiped.



Analizing the 1950-2015 disaster rate (fig 1) we conclude that 1990-1995 is relevant, comparative to the pre 1990 period that presents the data is scarce.

Potential client assesment

Years with the most extensive losses 1995-2016

year	occurrence	Total deaths	Total affected	Total damage mii \$
2011	155	6157	136445723	70757047
2013	148	9756	30075880	54782566
2010	184	8356	188794298	49137575
1998	57	6300	259599378	40758031
2014	127	3173	40346360	35708242
1995	57	7183	177870869	26728552
1996	64	6829	178310465	26115000
2012	136	3544	63962019	25790538
2007	192	8142	170570154	23728547
2003	149	3822	168967507	20791028
2008	155	3884	44806228	19617144
2005	182	5724	75003166	17932414
2000	86	5140	69552416	17639557
2015	103	2399	27846890	15251100
1999	68	32543	119905529	14405342
2002	137	3799	160691607	14334179
1997	61	5019	13858180	12035946
2004	126	6963	116970795	10383038
2006	151	3627	59734933	8003878
2009	5745	30274719	7805942	7805942
2001	105	4426	24553886	4486412



Countries with the most extensive flood damage between 1995-2015

country_name	occurrence	Total deaths	Total affected	Total damage mii \$
China	162	20936	1455831008	179088808
Thailand	46	2515	42982471	41998017
India	137	24948	319372647	39408779
United States of America (the)	91	610	11963146	38151330
United Kingdom of Great Britain and Northern Ireland	23	41	433843	21897230
Pakistan	51	7291	48427871	18707148
Korea (the Democratic People's Republic of)	18	1625	8521553	15342800
Germany	10	20	113000	13930000
Australia	35	99	264034	13123500
Italy	24	161	74173	12036000
Canada	25	35	170574	8104600
Bangladesh	36	4330	94014844	7728300
Poland	9	113	346250	7380000
France	18	146	62066	6710350
Indonesia	103	3635	5607386	6466463
Czech Republic (the)	12	100	1622217	5744112
Brazil	62	2496	6997142	4900870
Japan	14	220	221299	4864000
Austria	10	24	61616	4512000
Russian Federation (the)	39	561	1134538	3735575

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