

**PRESIDIUM OF FIRE AND RESCUE SERVICE OF THE
SLOVAK REPUBLIC**



**DISASTERS RISK MANAGEMENT
IN SLOVAKIA**

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Disaster Management 2015 (Katasztrófavédelem 2015)

Disasters in Slovakia

- **Floods**
- **Landslides (water erosion)**
- **Wildland fires**
- **Wind disasters**
- **Avalanches**
- **Industrial accidents**

Floods

- Problem mostly of the last 3-4 years, occurring every year – upper part of Nitra region, east part of Slovakia, area along the Ipeľ river.
- Climate change consequence – torrential rains
- During the flood, the flow rate is often more than Q_{100} .
- In the mountainous regions, the location of flood occurrence is not possible to predict
- In the south part of Slovakia, around the Danube river, there are problems with inundation, caused by underground water

Floods in Slovakia



Landslides

- Mostly occur as a consequence of flood events.
- The problem is mostly in the area of Krupina town and in the east part of Slovakia (Nizna Mysla, Presov) as well as in the region around Handlova town (mining activity).

Landslides

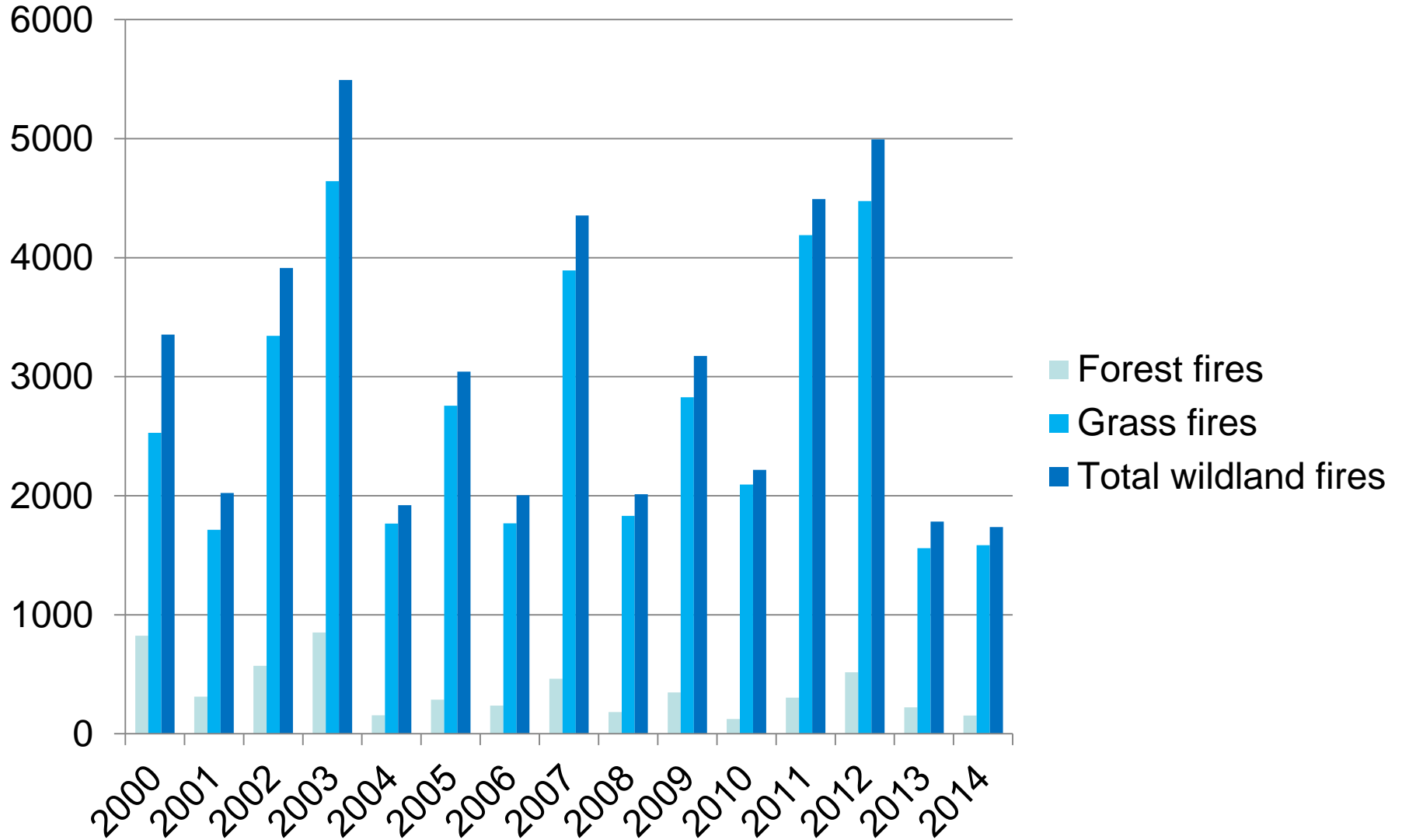
Najviac rizikové územia z hľadiska zosuvov



Wildland fires

- Occur every year during spring and summer season.
- During spring, there are mostly the fires caused by grass burning.
- Forest fires occur mostly as a consequence of human activity.
- Now, the most dangerous region is the High Tatras Mts. territory, because of the wind disaster disturbance in 2004 and bark beetle disturbance.

Wildland fires (2000 – 2014)



Wind disasters

- During the last 15 years the forests of Slovakia were disturbed by 2 wind disaster disturbances.
- In 1996, there occurred wind disaster disturbance in Osrbliie territory, belonging into the Upper Hron river region, where 1.5 mil. m³ of timber fell to the ground.
- The largest wind disaster disturbance occurred in November 2004 and 5.4 mil. m³ of timber fell to the ground. Mostly, there were affected the High Tatras Mts., Low Tatras Mts. Orava, Kysuce regions.

Industrial accidents

- **Not so often occurring, the stress is given to the prevention.**
- In the period 2005 – 2012, there occurred only 6 accidents in Slovakia:
 - 28.09.2005 Novacke chemicke zavody, Novaky, explosion followed by a fire
 - 16.11.2006 U.S. Steel, Kosice, release of blast furnace oil
 - 14.04.2009 Elektrarne Vojany (power plant), Vojany, fire
 - 17.01.2010 Slovnaft, Bratislava, fire
 - 24.07.2010 Duslo Sala, Sala, explosion followed a fire
 - 20.08.2011 Chemko Strazske, Strazske, explosion with a rapid change of a substance state

Industrial accidents

**Directive “SEVESO III” – implemented to the
Slovak legislation in 2013**

Information System of Prevention of Major Industrial Accidents

Basic registers:

- Register of enterprises
- Register of authorized persons
- Register of qualified persons
- Register of accidents
- Register of control
- Modul of webmaps
- Register of security information

enviroportál

Podniky 1, Autorizované osoby 2, Odborne spôsobilé osoby 3, Havárie 4, Kontroly 5, Mapa 6, Bezpečnostné informácie 7

Podniky

Register podniky:
je zameraný na zberanie informácií o podnikoch spadajúcich pod zákon o prevencii závažných priemyselných havárií. Umožňuje získať informácie o podnikoch a ich okolí, o činnostiach, o vybraných nebezpečných látkach, ktoré sú prítomné v podnikoch, o prevádzkovateľoch, o ich zaradení (kategóriách) podľa zákona o prevencii závažných priemyselných havárií.

Výber podľa:

Názvu podniku | Administratívneho členenia | Vybranej nebezpečnej látky

Uveďte časť názvu podniku: Hľadať

A B C Č D E F H I J K L M N O P R S T U V Z Ž

Pomoc:
* Ak hľadáte časť názvu podniku (prevádzky), napr. "slo", zadajte hľadaný výraz "slo" do poľa a kliknite na hľadať. Nájdu sa všetky záznamy, kde sa hľadaný výraz "slo" vyskytuje napr. "Duslo" ale aj "Slovnaft".
* Ak chcete nájsť podnik (prevádzku), ktorej názov sa začína konkrétnym písmenom tak kliknite na zvolené písmeno.

Zobrazí 10 záznamov na stránke

Počet záznamov : 112

	Názov podniku	Katégoria	Adresa	Kraj, Okres, Obec
Detail	Agility Logistics, s.r.o.	A	Diaľničná cesta 5, Senec	<ul style="list-style-type: none"> Bratislavský Senec Senec
Detail	AIR LIQUIDE SLOVAKIA, s.r.o.	A	Strojársená (areál Johns Menville Slovakia) 1, Trnava	<ul style="list-style-type: none"> Trnavský Trnava Trnava
Detail	Aquachemia, s.r.o.	VYRADENÝ	M.R. Štefánika 71, Žilina	<ul style="list-style-type: none"> Žilinský Žilina Žilina

Information System of Prevention of Major Industrial Accidents

Webmaps – continuous vector map 1:50 000

Geografická poloha podnikov

Webové mapy:

obsahujú priestorové informácie o podnikoch, ktoré spadajú pod zákon o prevencii závažných priemyselných havárií a ich okolí. Ako základ pre geopriestorové zobrazenie je použité digitálne mapové dielo SVM 50. Zobrazovanie priestorovej informácie je dynamické v podobe interaktívnej mapy, získanej pomocou jednoduchých GIS nástrojov.

Pomoc:

- ***Identifikácia prvkov na mape:** ak potrebujete získať informácie o podniku na mape, kliknite kurzorom myši na vybraný podnik. Zobrazí sa okno s výpisom základných informácií o podniku. V prípade, že na vybranom mieste s nachádza viac podnikov, v okne sa zobrazí zoznam všetkých identifikovaných podnikov. K podnikom zoznamu sa prelistujete kliknutím na ukazovatele "nasledujúci" a "predchádzajúci" prvok.
- ***Priblíženie:** Na lište nástrojov, kliknite na nástroj "priblíženie". Následne kliknite na mapu, nakreslite obdĺžnik a pustite tlačidlo myši. Mapa sa priblíži do oblasti obdĺžnika. Rotovaním kolieska myši dopredu, mapu priblížite. Rotovaním kolieska myši dozadu, mapu oddialite.
- ***Posun:** Presuňte sa po mape pomocou nástroja "posun". Tento nástroj je štandardne aktívovaný pri každom spustení aplikácie.

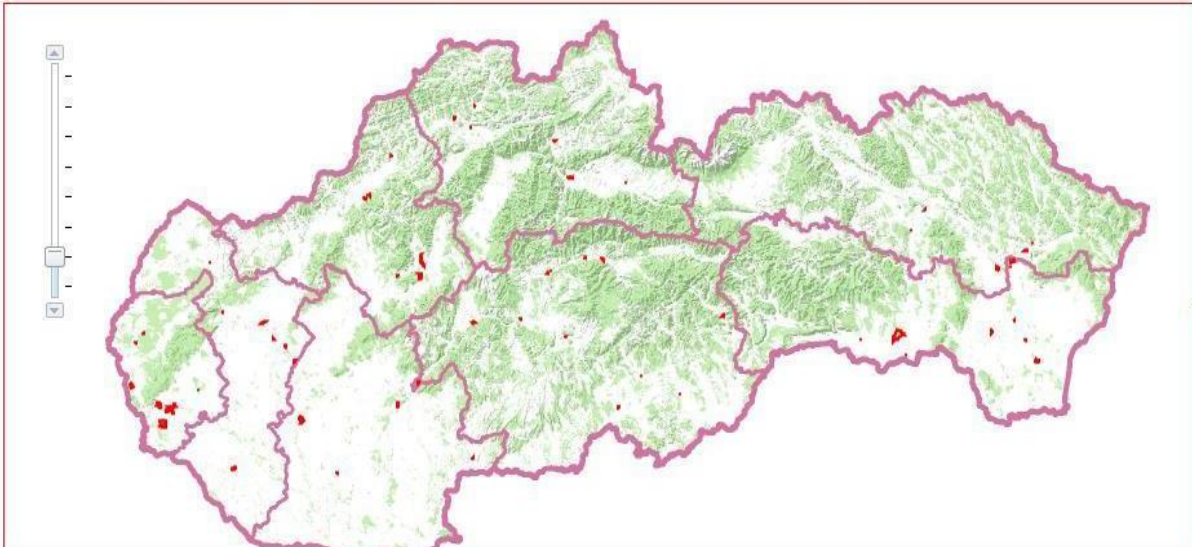
Vyber podnik

1

2

3

Priblíženie Oddialenie Celá mapa Predošlý pohľad Nasledujúci pohľad Posun



Information System of Prevention of Major Industrial Accidents

Webmaps – Nováky enterprises

The screenshot displays the 'enviroportál' webmap interface. The top navigation bar includes 'enviroportál' and 'SEVESO'. Below the navigation bar, there are search filters: 'Vyhľadavanie: Podniky Citlivé body Repr. scenáre Indiv. riziká'. The main map area shows an aerial view of an industrial site in Nováky, with various colored overlays representing different data layers. A detailed information popup is open over a specific area, providing the following data:

Novácke chemické závody, a.s. v konkurze	
Názov obce	Nováky
Názov podniku	Novácke chemické závody, a.s. v konkurze
Kategória	B
SPIRS (činnosť)	Chemické prevádzky/zariadenia - chlór
OKEČ	Výroba plastov v primárnej forme
SK NACE Rev.2	
sekcia	Sekcia c - priemyselná výroba
divízia	Výroba chemikálií a chemických produktov
OÚŽP	OÚŽP Prievidza, Dlhá 3, Prievidza

The left sidebar contains search results and map layers. The search results show 'Podniky B (1)' with a checked box for 'Novácke chemické závody, a.s.'. The map layers section includes 'Seveso' (Citlivé body, Repräsentatívne scenáre, SEVESO) and 'Podklad' (Popisy, Hranica štátu, Hranice krajov, Hranice okresov, Hranice obcí, Železničné objekty, Železnice).

Disasters risk assessment in Slovakia

General information on disasters risk is provided by the Civil Protection – „Analysis of a district territory according to the occurrence of possible emergencies“.

Natural disasters

- Academic or scientific institutions

Industrial accidents – emergency plans, fire protection projects elaborated by :

- Industrial accidents specialist
- Fire protection specialist

Flood risk management

- **Susceptibility** (urban or natural environment)
- **Vulnerability** (hydrodynamic modelling – MIKE II, HEC-RAS)
- **Resilience** (flood protection plans of safeguarding and rescue works)
- **Forecasting** – Slovak Hydrometeorological Institute

Flood susceptibility



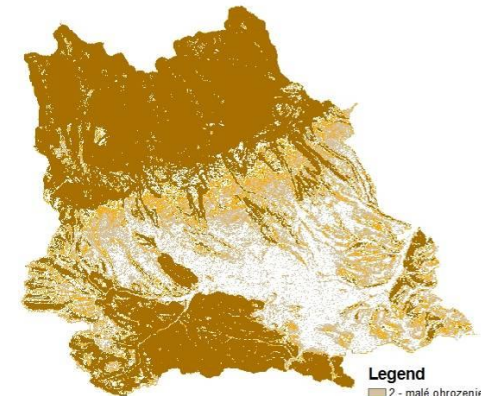
Legend
náchylnost R-faktor
VALUE
no data
3 - stredné ohrozenie
4 - veľké ohrozenie

factor of torrential rain
erosion effect



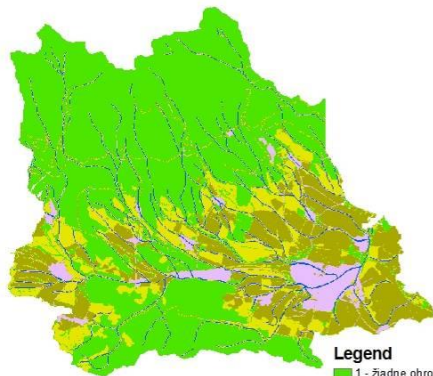
Legend
povodie
1 - malé ohrozenie

eroded soil
volume



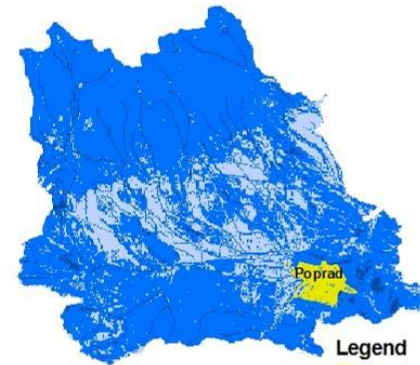
Legend
2 - malé ohrozenie
3 - stredné ohrozenie
5 - vysoké ohrozenie

terrain morphology
parameters



Legend
1 - žiadne ohrozenie
2 - malé ohrozenie
3 - stredné ohrozenie
4 - veľké ohrozenie
5 - vysoké ohrozenie

land use



Legend
Poprad
2 - slabé ohrozenie
3 - stredné ohrozenie
4 - veľké ohrozenie

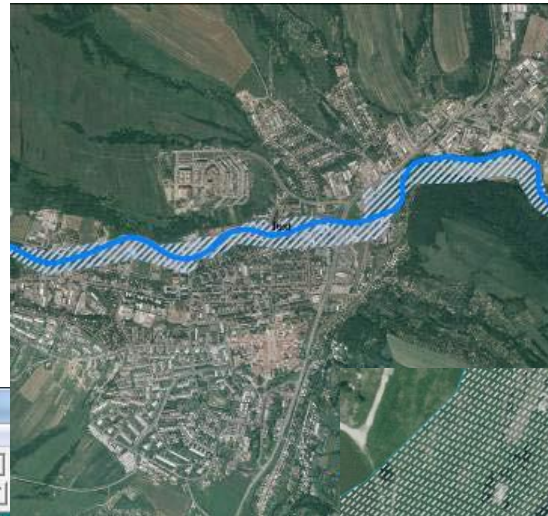
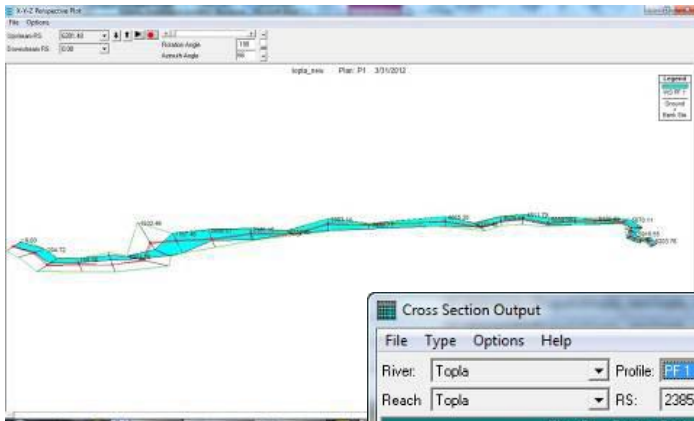
overall flood susceptibility

Flood vulnerability assessment by UNU-EHS

	Exposure	Susceptibility	Resilience
Social	Population number, population in inundated area, population in poverty, % urban area, industrial population, cultural heritage and values, % rate of young and old generation, areas of poverty	Education, preparedness, awareness, industrial population, trust in institutions, hospitals, population with hygiene, population with drinking water, water quality, quality of energy resources, population growth, urban planning	Warning system, evacuation routes, institutional capacities, rescue services, shelters
Economical	Land use, distance from the water body, closeness to the inundation area, % of urbanized area, degraded area, not settled area, vegetation types, the rate of forest land change, the level of underground water	Unemployment rate, salaries, quality of infrastructure, average age of population, urban growth, urban planning, regional GDP/investment capital	Investment to the branches measures, infrastructure management, storages capacity, dams and dykes capacity, flood insurance, reconstruction time, previous experiences, dams and flood protection dykes
Environmental		Natural reservations, average age of population, quality of infrastructure, health state of population, urban growth	Restoration time, environmental interest
Physical	Topography (slope), geography, geology, torrential rains, duration of flood, flood frequency, distance from the water body, soil moisture, evaporation rate, temperature (annual average), flow rate of the water body, water volume during a flood, the height of water level during a flood, sediments layer	Use of buildings	Storage capacity, capacity of dams, existence of roads, dams and flood protection dykes

Flood vulnerability

- Hydrodynamic modelling in MIKE (commercial sphere) or HEC-RAS (academic, scientific sphere) environments.



Cross Section Output

File Type Options Help

River: Topla Profile: FF 1

Reach: Topla RS: 2385.18

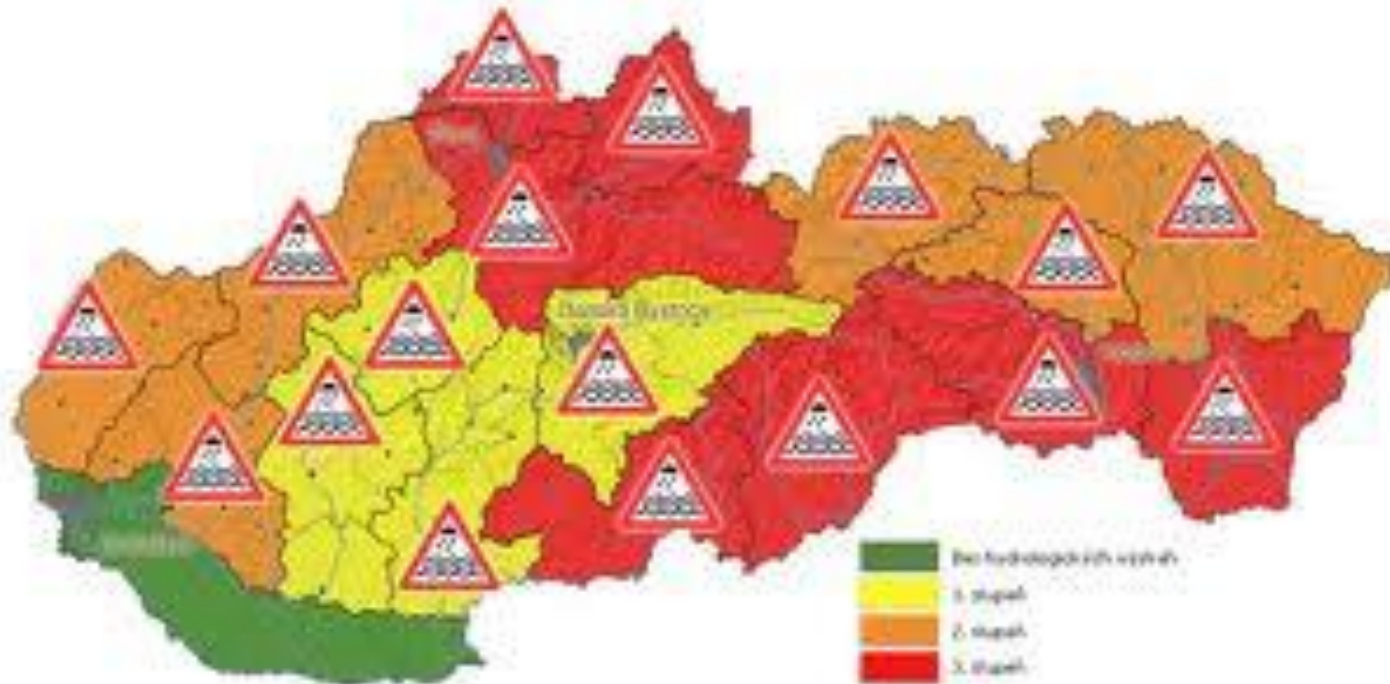
Plan: P1		Topla		Topla RS: 2385.18		Profile: FF 1	
		Element	Left OB	Channel	Right OB		
E.G. Elev (m)	269.05						
Vel Head (m)	0.38	Wt. n-Val.	0.050	0.035	0.050		
W.S. Elev (m)	268.67	Reach Len. (m)	198.90	328.61	198.90		
Crit W.S. (m)	268.67	Flow Area (m ²)	82.30	15.52	35.17		
E.G. Slope (m/m)	0.017042	Area (m ²)	82.30	15.52	35.17		
Q Total (m ³ /s)	330.00	Flow (m ³ /s)	232.77	50.11	47.12		
Top Width (m)	186.53	Top Width (m)	71.56	19.28	95.69		
Vel Total (m/s)	2.48	Avg. Vel. (m/s)	2.83	3.23	1.34		
Max Chl Dpth (m)	1.42	Hydr. Depth (m)	1.15	0.81	0.37		
Conv. Total (m ³ /s)	2527.9	Conv. (m ³ /s)	1783.0	383.8	361.0		
Length/Wid. (m)	209.47	Wetted Per. (m)	72.99	19.28	95.69		
Min Ch El (m)	267.79	Shear (N/m ²)	188.44	134.55	61.43		
Alpha	1.22	Stream Power (N/m s)	532.98	434.34	82.30		
Frictn Loss (m)	3.73	Cum Volume (1000 m ³)	246.39	6.36	66.43		
C & E Loss (m)	0.09	Cum SA (1000 m ²)	244.18	18.62	135.34		

Errors, Warnings and Notes



Flood warning (prognosis)

- Slovak Hydrometeorological Institute
- Aladin model data are used for prognoses production.
- Alerts are published for every day.

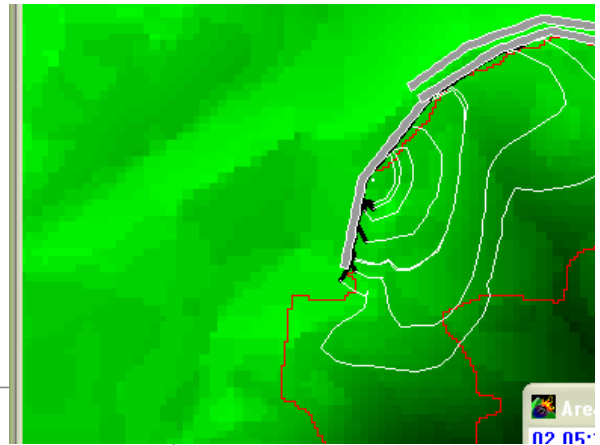
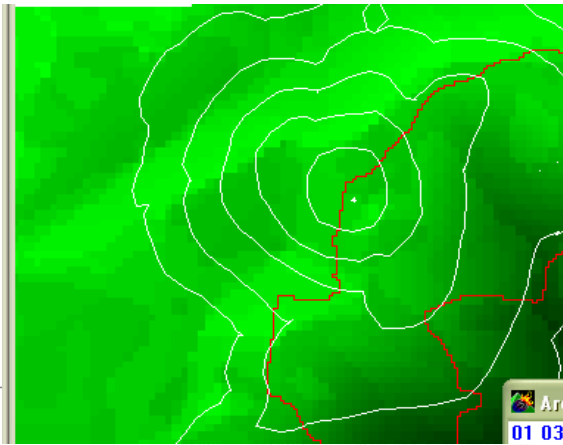
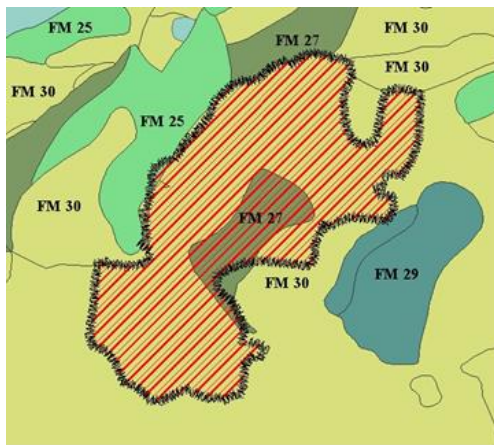


Wildland fire risk management

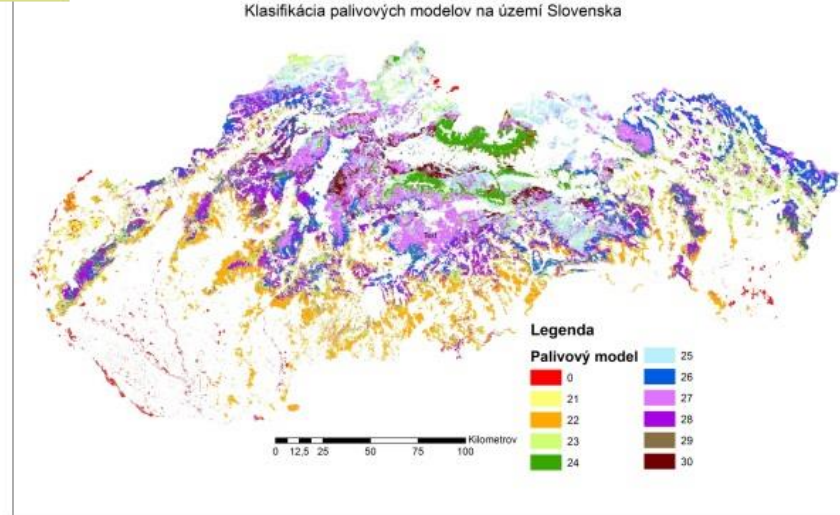
- **Susceptibility** (mostly the social aspect)
- **Vulnerability** (fire behaviour modelling in FARSITE environment)
- **Resilience** (fire prevention legislation, fire monitoring – ground and aerial)
- **Forecasting** – Slovak Hydrometeorological Institute (fire weather indices)

Fire vulnerability

- Fire behaviour modelling in FARSITE environment



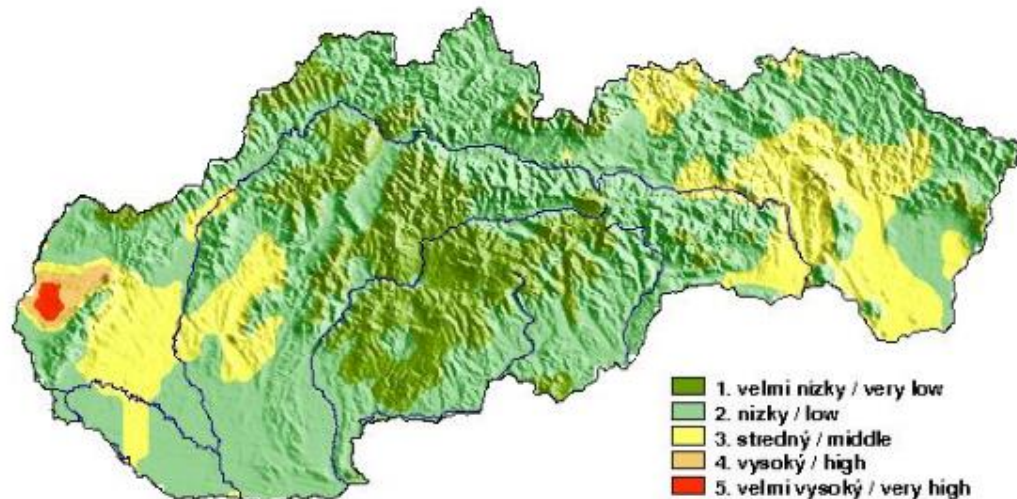
Klasifikácia palivových modelov na území Slovenska



Fire alerting (prognosis)

- Slovak Hydrometeorological Institute
- Fire weather indices (Baumgartner fire index)
- There are published maps of fire danger daily, since April until the end of September

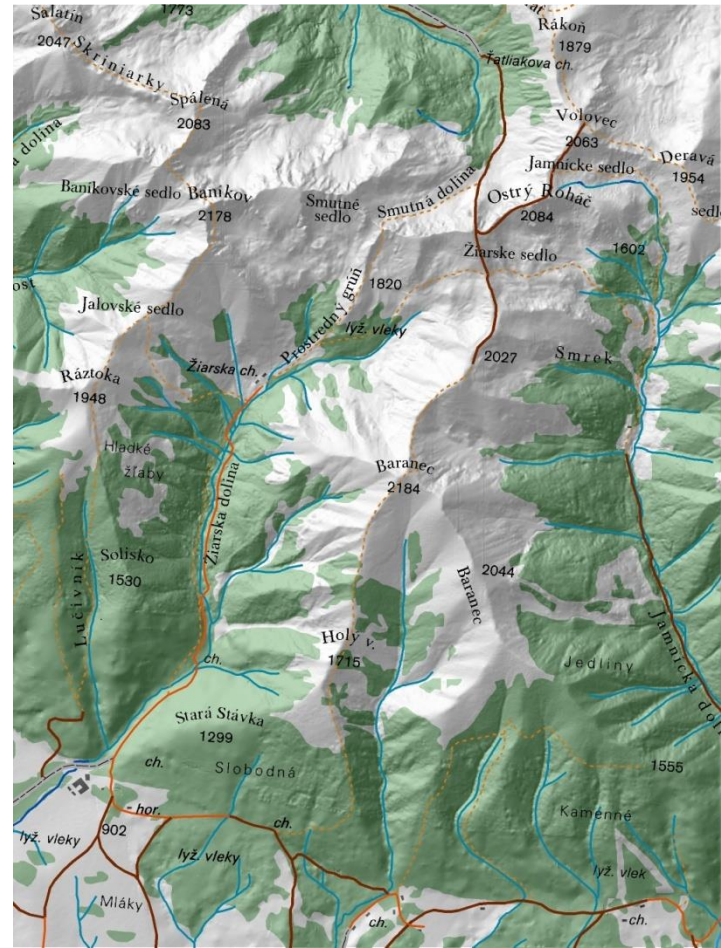
Predpoveď indexu požiarneho nebezpečenstva v lesoch dňa 21.05.2013
Forecast of forest fire risk index in 21.05.2013



Avalanches

Prediction of avalanche danger

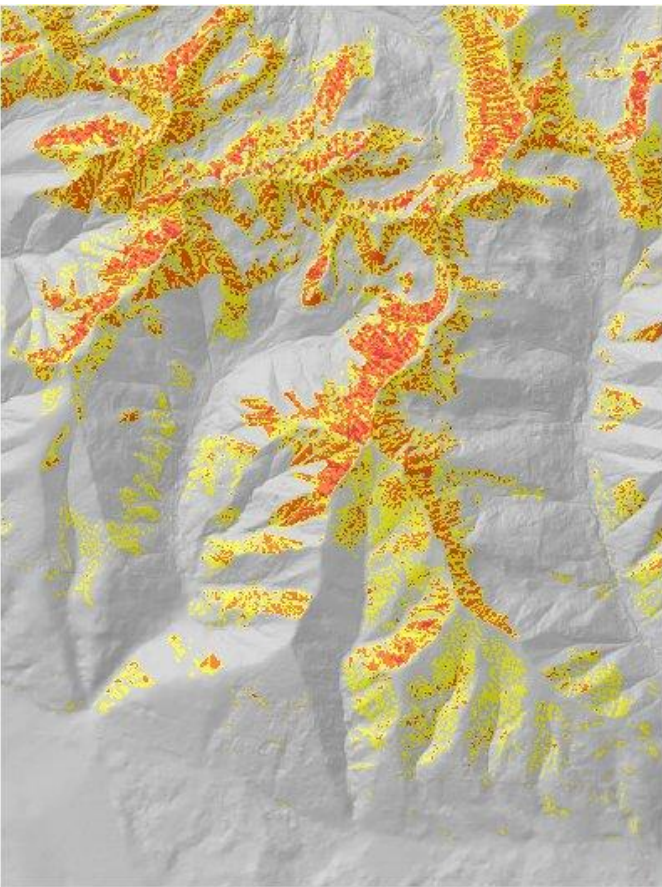
Žiarska valley, West Tatras



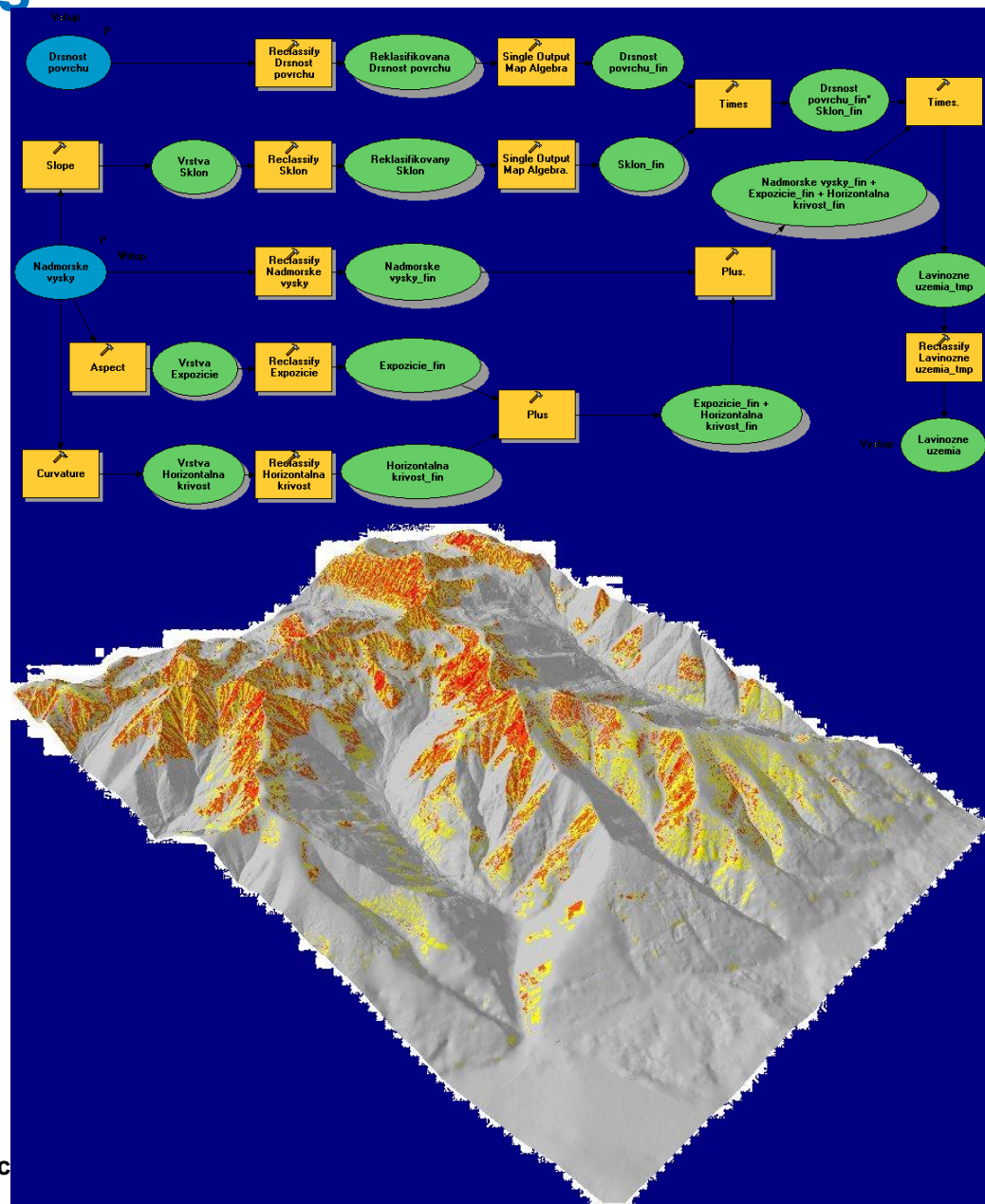
Prediction of avalanche danger

$$Av = (AI + Ex + Fx) * S * Rg$$

Map of avalanche areas



- Low
- Medium
- Great
- Catastrophic



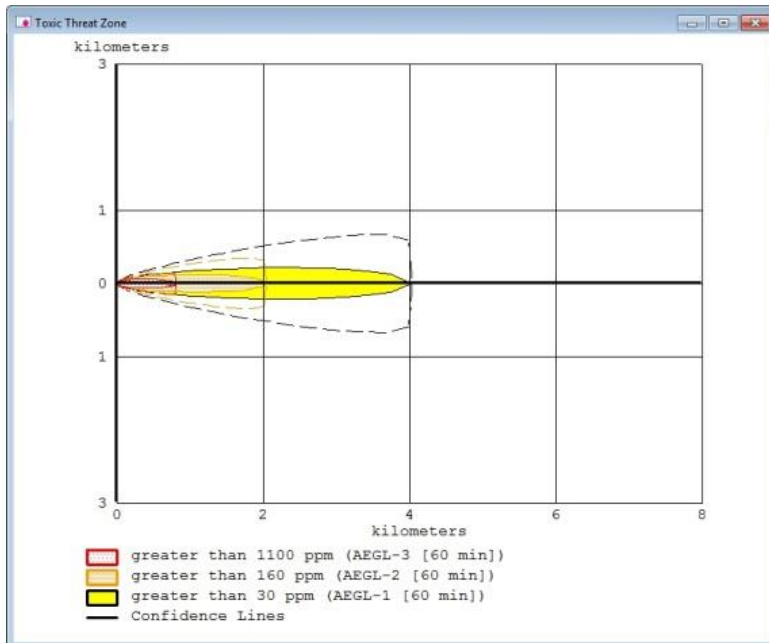
(Stopková Eva, Bachelor thesis)

Industrial accidents risk management

- Policy on the prevention of industrial accidents
- Risk analysis (also before building the factory) and risk monitoring
- Emergency scenarios, Emergency Planning
- Theoretical and practical trainings

Release of dangerous substances – vulnerability assessment

- Determination of danger and safety zones using modelling in ALOHA, visualization in Google Earth



References

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Thank you for your attention

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