



Stakeholders engagement and involvement in nuclear emergency preparedness – Slovak Republic experience in RODOS tools driven workshops

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NERIS-TP Dissemination workshop
22 - 24 January 2014
Oslo, Norway



- EVATECH project – first experience
- EURANOS project – further step forward
- NERIS-TP project – presentation and use of new RODOS tools
- Implementation and adaptation of JRODOS in Slovakia
- Scenario development for facilitated workshops/training courses/ exercises



EVATECH (STUK) - Information Requirements and Countermeasure Evaluation Techniques in Nuclear Emergency Management (2001 – 2005)

- the **method for stakeholder involvement in exercises and emergency planning was developed** and successfully applied in the Slovak Republic
- **development of methodologies to conduct scenario-focused decision making workshops** with participation of relevant stakeholders and **training on using available computer-aided techniques** (RODOS, Web-HIPRE) in decision analysis and **conducting facilitated decision-making panels/workshops**
- **First facilitated workshop: “Decision analysis of clean-up actions in inhabited areas in the Slovak Republic after an accidental release of radionuclides”**, November 19-20, 2003; 25 participants



Conclusions

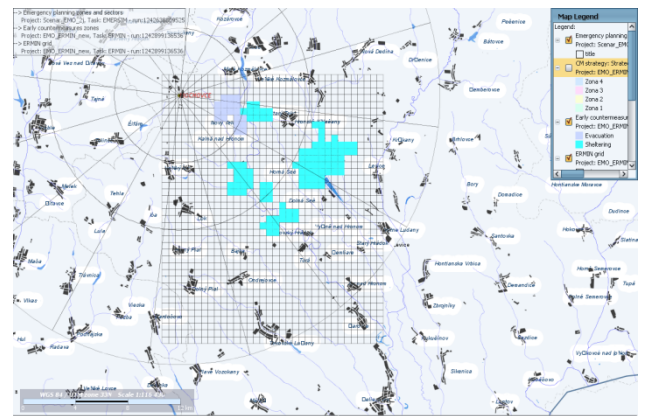
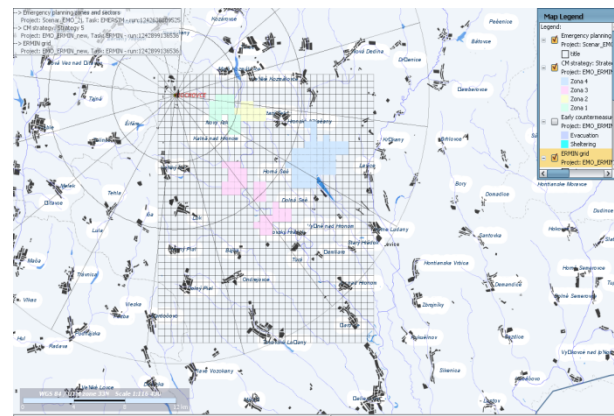
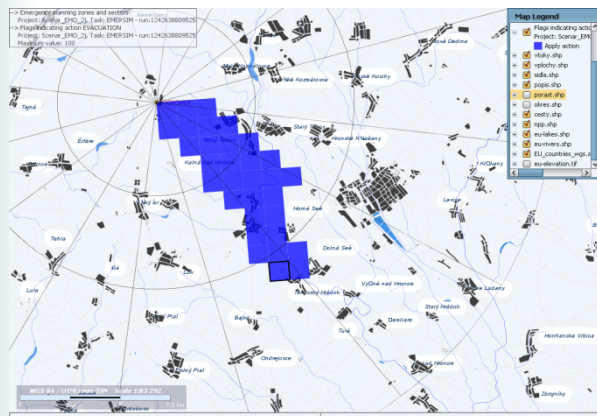
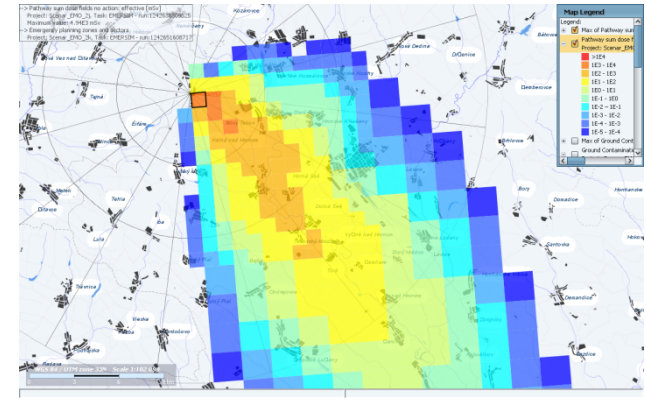
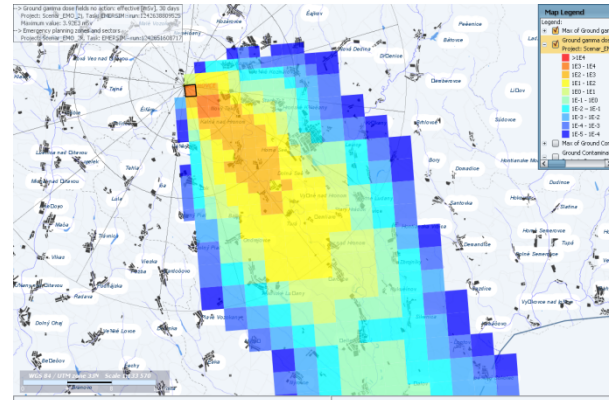
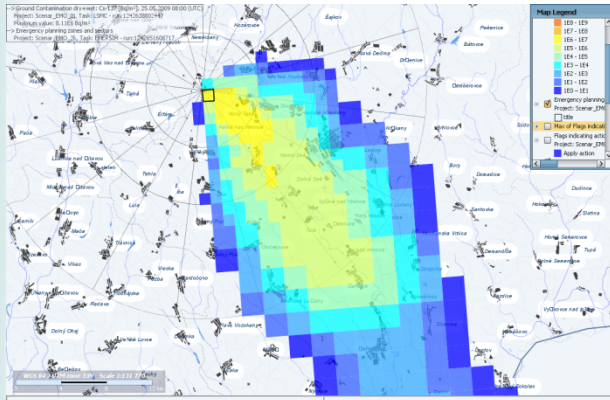
- Many of participants **appreciated the future possibility to use the RODOS system with Web-HIPRE software as a tool integrated or directly connected**
- Many of participants expressed **the need of similar workshops for training purpose with invitation of other specialists from different resorts** and focus not only on advisors but also on leaders who are the members of the emergency commissions at different levels and on residents who will (it is expected) execute some of the countermeasures.
- All participants agreed that **the countermeasures in inhabited areas have to be discussed again in more details** and thoroughly during some special workshop.



- The training courses form: **lectures, workshop sessions and facilitated discussions** to demonstrate, use and establish strategies for the implementation of decision support tools (mainly the RODOS) in the decision making process
 - Training Course **Decision Making in Emergency Management within the Project Strengthening of the Nuclear Emergency Preparedness – Sharing of New International Experience** (NSP/03-S2), February 14-16, 2005, NEA SR Bratislava, 21 participants, 8 lecturers
 - Training course: „**Evaluation tools and methods for supporting the emergency management team**“ developed and conducted by VUJE under the EURANOS Project (7FP) and national R&D project in VUJE facility Modra-Harmonia, 25.-27.5.2009, 19 participants, 2 lecturers
- **Nuclear Regulatory Authority of the Slovak Republic – coordinator** of the activities within **national research and development projects**
- **RODOS/JRODOS used for scenario preparation** including the results of LSMC, EMERSIM, ERMIN
- **Web-HIPRE used for decision analyses and thorough discussion of strategies** developed using the Generic Handbook for assisting in the management of contaminated inhabited areas



Accident scenario, zone selection





Presentation of possible late countermeasure strategies

Stratégia	Zone 1	Zone 2	Zone 3	Zone 4
No Action	-	-	-	-
Strategy 1	Grass cutting Vacuum sweeping paved	-	Grass cutting Vacuum sweeping paved	-
Strategy 2	Grass cutting Vacuum sweeping paved	Grass cutting Vacuum sweeping paved	Grass cutting Vacuum sweeping paved	Grass cutting Vacuum sweeping paved
Strategy 3	Grass cutting Vacuum sweeping paved Vacuum cleaning interior surfaces	Grass cutting Vacuum sweeping paved	Grass cutting Vacuum sweeping paved Vysávanie v interiéri Relocation	Grass cutting Vacuum sweeping paved
Strategy 4	Vacuum sweeping paved Rotovating (grass) Ploughing (plants)	Grass cutting Vacuum sweeping paved	Vacuum sweeping paved Rotovating (grass) Ploughing (plants)	Grass cutting Vacuum sweeping paved
Strategy 5	Relocation Vacuum sweeping paved Mech. top soil and turf or plant removal	Relocation Vacuum sweeping paved Rotovating (grass) Ploughing (plants)	Relocation Vacuum sweeping paved Mech. top soil and turf or plant removal	Vacuum sweeping paved Rotovating (grass) Ploughing (plants)

	No	Strategy 1	Strategy 2	Strategy 3	Strategy 4	Strategy 5
Total waste produced (kg)	0.0	678562.5	1386750.0	1433623.8	996937.5	3.0116476E7
Maximum beta/gamma emitting radionuclide concentration produced (Bq kg-1)	0.0	1.17250245E11	1.17250245E11	2.56797983E11	5.1474592E10	5.1474592E10
Maximum alpha emitting radionuclide concentration produced (Bq kg-1)	0.0	0.0	0.0	0.0	0.0	0.0
Average beta/gamma emitting radionuclide concentration produced (Bq kg-1) calculated from the total beta/gamma emitting radionuclide removed (Bq) divided by the total material removed (kg)	0.0	3.17746688E10	1.59420938E10	1.63337523E10	3.99480525E9	3.44185088E8
Average alpha emitting radionuclide concentration produced (Bq kg-1) calculated from the total beta/gamma emitting radionuclide removed (Bq) divided by the total material removed (kg)	0.0	0.0	0.0	0.0	0.0	0.0
The total man days that the population of the area of interest is outside the area of interest because of evacuation or relocation (man days)	0.0	4049.5	4049.5	12679.5	4049.5	61022.25
The maximum total area affected by evacuation and relocation (m2)	0.0	4750000.0	4750000.0	1.375E7	4750000.0	1.65E7
The total m2 days that are lost to evacuation and relocation (m2 days)	0.0	3.325E7	3.325E7	1.0525E8	3.325E7	4.815E8
The amount work required for implementing the countermeasure strategy in the area of interest (man days)	0.0	2439.336	2941.1353	12715.104	5377.4634	4776.21
The amount of personnel required for implementing the countermeasure strategy in the area of interest (man)	0.0	2300.0	2908.0	7749.0	3633.0	2174.0

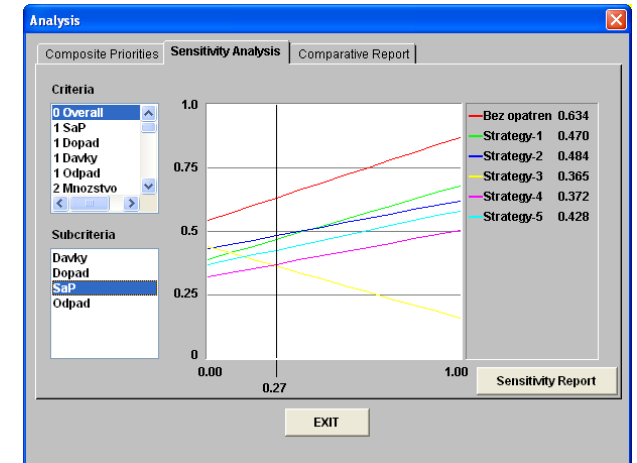
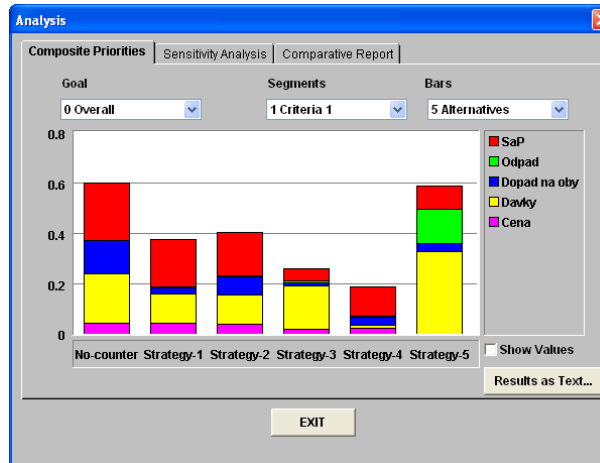
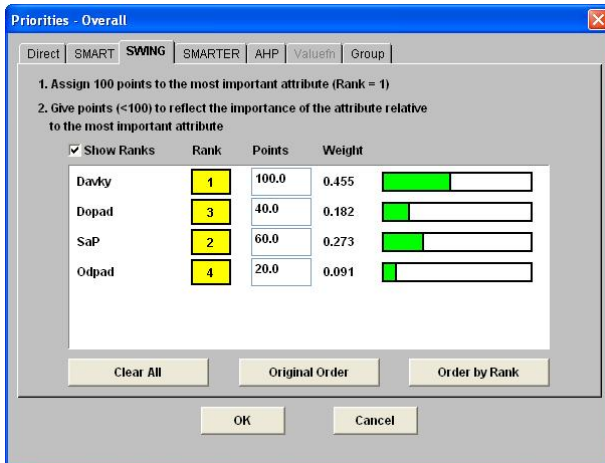
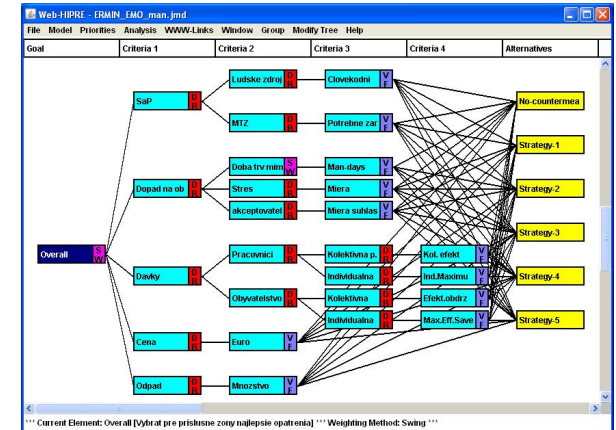
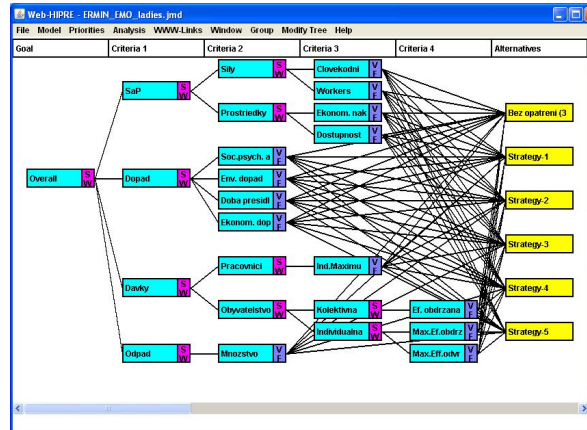
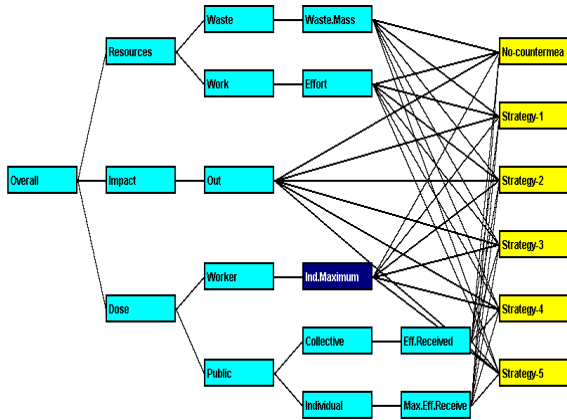
	Clovekodni	Workers	Ekonom. naklad	Dostupnost
Min Rating	0.0	0.0	0.0	0.0
Bez opatreni (0.0	0.0	0.0	0.0
Strategy-1	2439.0	2300.0	20.0	20.0
Strategy-2	2941.0	2908.0	40.0	40.0
Strategy-3	12720.0	7749.0	60.0	60.0
Strategy-4	5377.0	3633.0	80.0	80.0
Strategy-5	4776.0	2174.0	100.0	100.0
Max Rating	12720.0	7749.0	100.0	100.0
Unit	man days	man	body	body

Clear Decision table OK Cancel Import...

	No	Strategy 1	Strategy 2	Strategy 3	Strategy 4	Strategy 5
The maximum individual worker dose from any single countermeasure applied anywhere in the area of interest (Sv)	0.0	1.6217302	1.6217302	1.6217302	2.4357517	2.523154
The total collective workdose from all countermeasures applied in the area of interest (man Sv)	0.0	1306.5348	1324.287	1837.7614	2187.267	468.5404
The total public collective normal living effective dose (man Sv) in the area of interest over a defined integration period	2067.367	2090.3623	2094.9326	1617.9462	2281.5842	804.7566
The total collective public normal living skin dose in the area of interest over a defined integration period from external exposure to beta radiation (man Sv)	18661.57	20184.05	20334.086	15695.843	22223.475	8339.332
The maximum public individual normal living effective dose in the area of interest over a defined integration period (Sv). The sum of the dose from exposure to external irradiation over the period and committed effective dose from inhalation of radioactivity over the same period	3.5905538	3.532131	3.532131	3.7394311	3.6396005	0.9894453
The maximum saved public individual normal living effective dose in the area of interest over a defined integration period (Sv). The sum of the dose from exposure to external irradiation over the period and committed effective dose from inhalation of radioactivity over the same period	0.0	0.058422804	0.058422804	0.73293257	0.011553377	2.6011086
The maximum public individual normal living skin dose from exposure to external beta radiation in the area of interest over a defined integration period (Sv)	34.87741	34.51088	34.51088	36.685116	36.659657	12.035687
The maximum saved public individual normal living skin dose from exposure to external beta radiation in the area of interest over a defined integration period (Sv)	0.0	0.36653137	0.36653137	5.218129	0.0	22.841724



Value tree building, preference elicitation, sensitivity analyses





- **Activities within NERIS-TP WP3**
 - **Local-national forum** for improvement of both local and national capabilities in planning for nuclear and radiological emergency and recovery preparedness and response continued its work in Slovakia
 - introducing the existing tools (DSS RODOS, Handbooks, WebHIPRE)
 - adaptation of existing tools
 - testing adapted tools performed in conjunction with WP5
 - **Implementation and adaptation of JRODOS in Slovakia**
 - Site parameters, inventories of Slovak NPPs, source terms
 - Meteorological data for short and long distances
 - Regional data
 - population, land use, elevation, type of soil
 - radioecological regions, agricultural production, population dietary habits, animal feeding diets



• Site parameters

Operating mode

- Power operation
- Shutdown with power
- Fuel discharge

Block	Site	Longitude (°)	Latitude (°)	Close to Border	Country Code	Inventory	Sta
					SVK		
BOHUNICE-V2-B3	BOHUNICE	17.69	48.5	<input type="checkbox"/>	SVK	INVE.WVER440V213_1471MWth_Slovak	
BOHUNICE-V2-B3-R6	BOHUNICE	17.69	48.5	<input type="checkbox"/>	SVK	INVE.WVER440V213_1471_OTVR_EBO	
BOHUNICE-V2-B3-R7	BOHUNICE	17.69	48.5	<input type="checkbox"/>	SVK	INVE.WVER440V213_BSPV_EBO	
BOHUNICE-V2-B4							
BOHUNICE-V2-B4-R6							
BOHUNICE-V2-B4-R7							
MOCHOVCE-B1							
MOCHOVCE-B1-R6							
MOCHOVCE-B1-R7							
MOCHOVCE-B2							
MOCHOVCE-B2-R6							
MOCHOVCE-B2-R7	MOCHOVCE	18.46	48.20				

Map | RODOS-Lite::prepar:Emergency-run.Ma ... x

File Options Tools Help

Country | Site | Unit: Slovakia | BOHUNICE | BOHUNICE-V2-B3

Countermeasures for country: Slovakia

Run: LSMC+EMERSIM+FDMT

Site | Source term | Weather | Countermeasures | Food chain | Run | Summary

Site selection

Scenario

Nuclear power plant accident

Country

Slovakia

Close to border

Unspecified NPP

Other accident

Explosion of rad. dispersal device

Radiological accident with fire

Location

Site / Unit

BOHUNICE / BOHUNICE-V2-B3

BOHUNICE / BOHUNICE-V2-B3-R6

BOHUNICE / BOHUNICE-V2-B3-R7

BOHUNICE / BOHUNICE-V2-B4

BOHUNICE / BOHUNICE-V2-B4-R6

BOHUNICE / BOHUNICE-V2-B4-R7

MOCHOVCE / MOCHOVCE-B1

MOCHOVCE / MOCHOVCE-B1-R6

Information about the Site

Mashup

Block type

Operation time [day] 999

Thermal power [MW] 1471

Stack height [m] 125

Search the web

[Google Maps](#) [Wikipedia](#) [IAEA](#) [PP-World](#)

No additional information...

...on this site available. Please enable internet access or provide additionally information on this site in an separate HTML to achieve this.



- Site parameter
- **Inventories**
- Source terms
- Meteorological
- Regional data
 - population, la
 - radioecologic
 - animal feedin

Configure Inventories

Name
INVE.BWR_1381MWth_S_M_DE_GARONA
INVE.BWR_3014MWth_COFRENTES
INVE.BWR_3690MWth_KRUEMMEL
INVE.BWR_440MWe_FUKUSHIMA-I-1
INVE.LWRdefaultInventory
INVE.PHWR_2200MWth_CERNAVODA
INVE.RESEARCH_FRM-II
INVE.PWR_0480MWth_JOSE_CABRERA
INVE.PWR_2686MWth_ALMARAZ
INVE.PWR_2900MWth_Spain
INVE.PWR_3000MWth_TRILLO
INVE.PWR_3733MWth_Leitfaden95
INVE.PWR_3950MWth_Leitfaden04
INVE.RESEARCH_30MWth_swierkMARIA
INVE.RESEARCH_BER-II
INVE.VVER440V213_1375MWth_Slovak
INVE.VVER440V230_1375MWth_Slovak
INVE.WWR_1375MWth_WWR440
INVE.WWR_3000MWth_WWR1000
INVE.VVER440V213_1471_OTVR_EBO
INVE.VVER440V213_1471_OTVR_EMO
INVE.VVER440V213_1471_OTVR_Slovak

Name (INVE.*)

Thermal power [MW therm.]

Burn-up times [days]

Activity [Bq]

	999	
Kr-85	1.94E16	
Kr-87	8.09E17	
Kr-88	1.08E18	
Rb-86	2.89E15	
Rb-88	1.1E18	
Sr-89	1.5E18	
Sr-90	1.53E17	
Sr-91	1.9E18	
Sr-92	0.5E18	

Comments

- INVE.VVER440V213_1471_OTVR_EBO
- INVE.VVER440V213_1471_OTVR_EMO
- INVE.VVER440V213_1471MWth_Slovak**
- INVE.VVER440V213_BSVP_EBO
- INVE.VVER440V213_BSVP_EMO

Comments

Source: Inventory of the core at the average fuel burnup
 Databanka inventaru paliva Gd-2 pre stacionarnu kampan s
 nominalnym vykonom reaktora 1471 MW 6-ročne palivo, 6-BSP-001
 Bezpečnostna sprava JE V-2 02/11 || Version : 06.09.2011

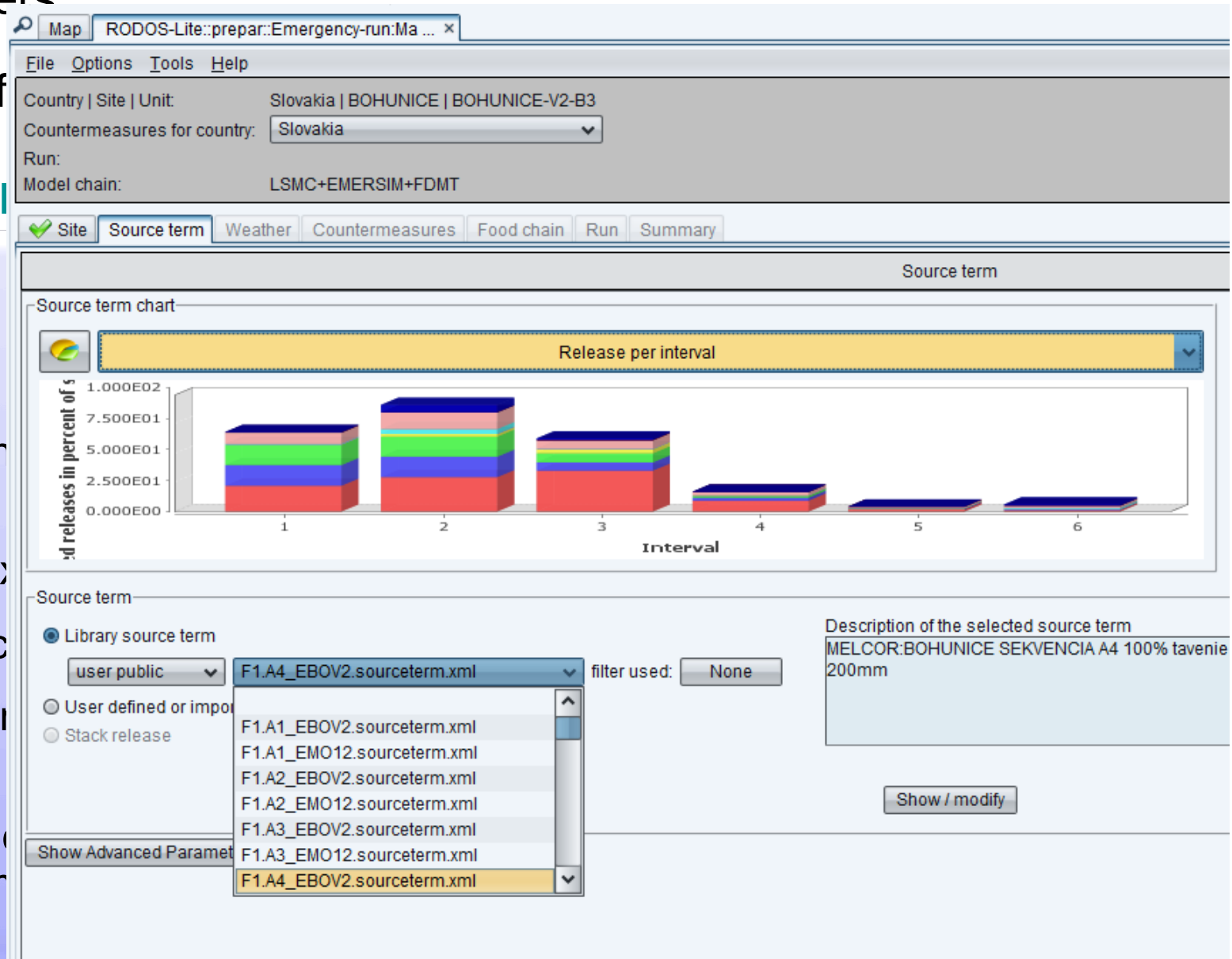


- Site parameters
- Inventories of
- **Source term**

DB of 34 source modes 1-5

The dominant core (VVER-440)

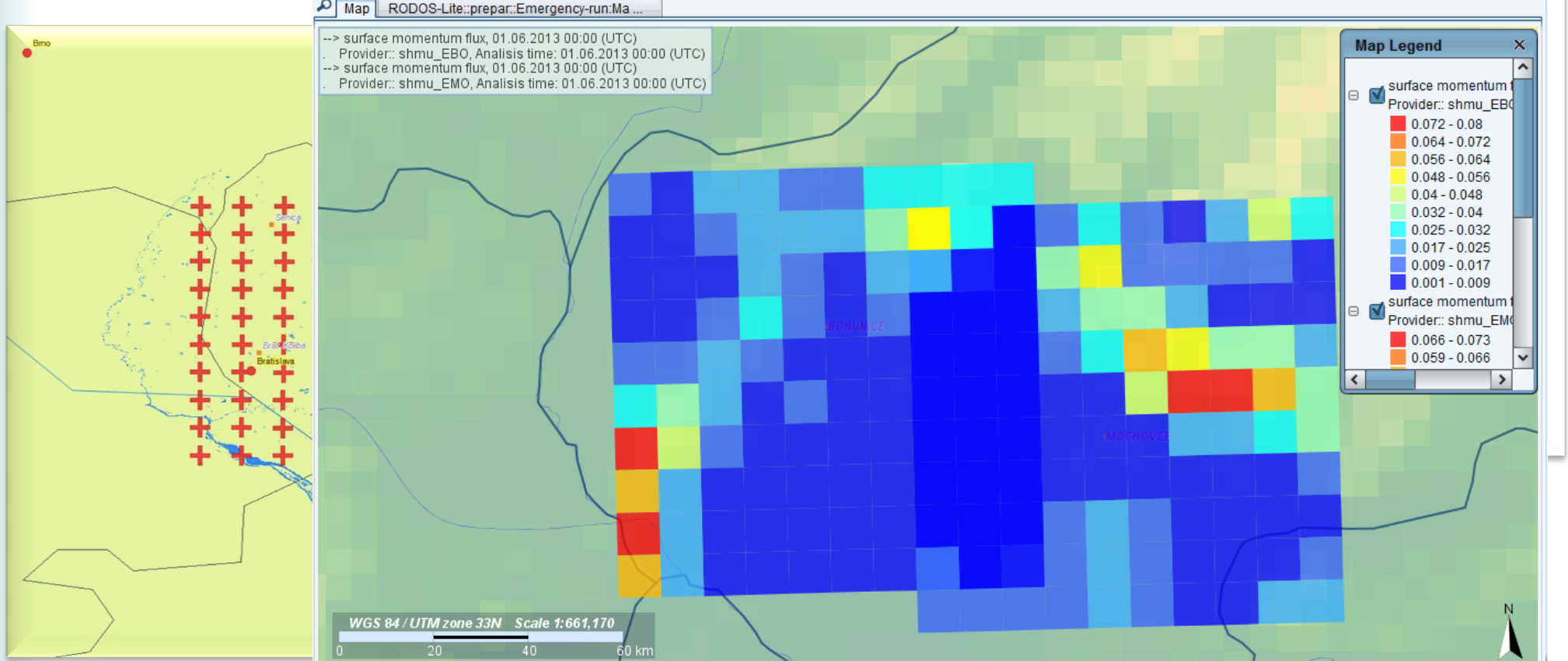
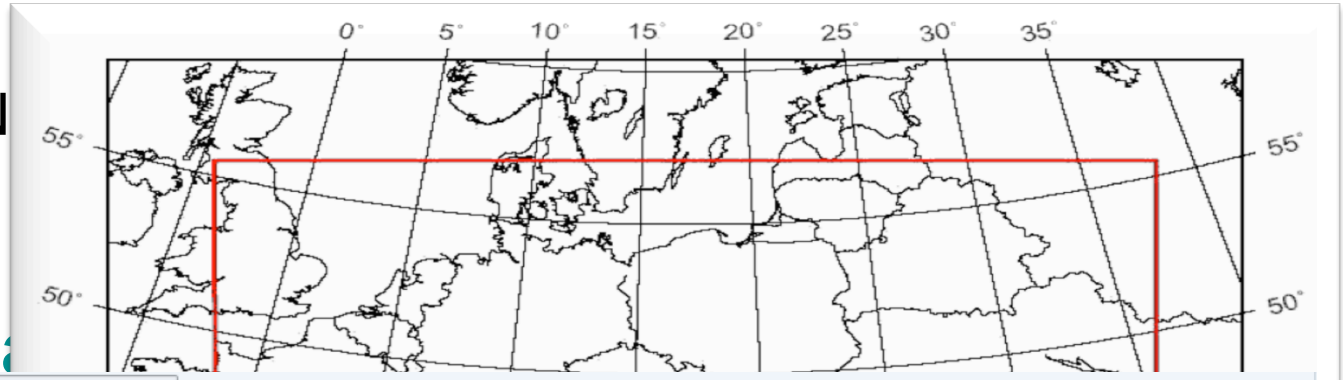
- (i) the degree (extent) of release
- (ii) fission product release
- (iii) containment integrity (e.g. break)
- (iv) availability of emergency cooling system





Implementation and adaptation of JRODOS in Slovakia

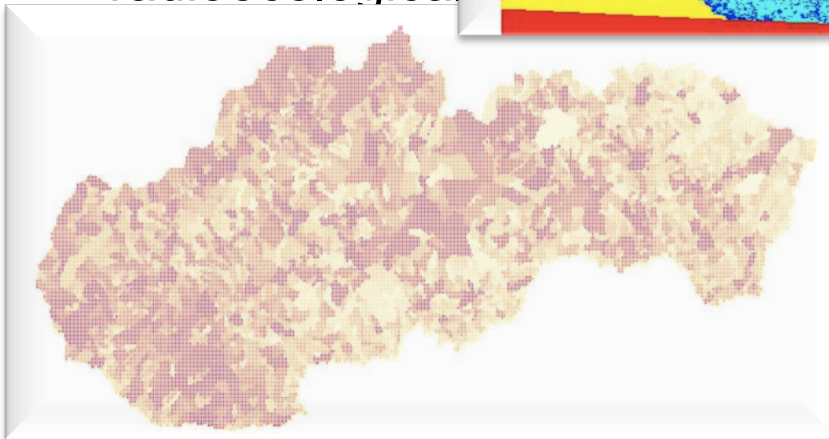
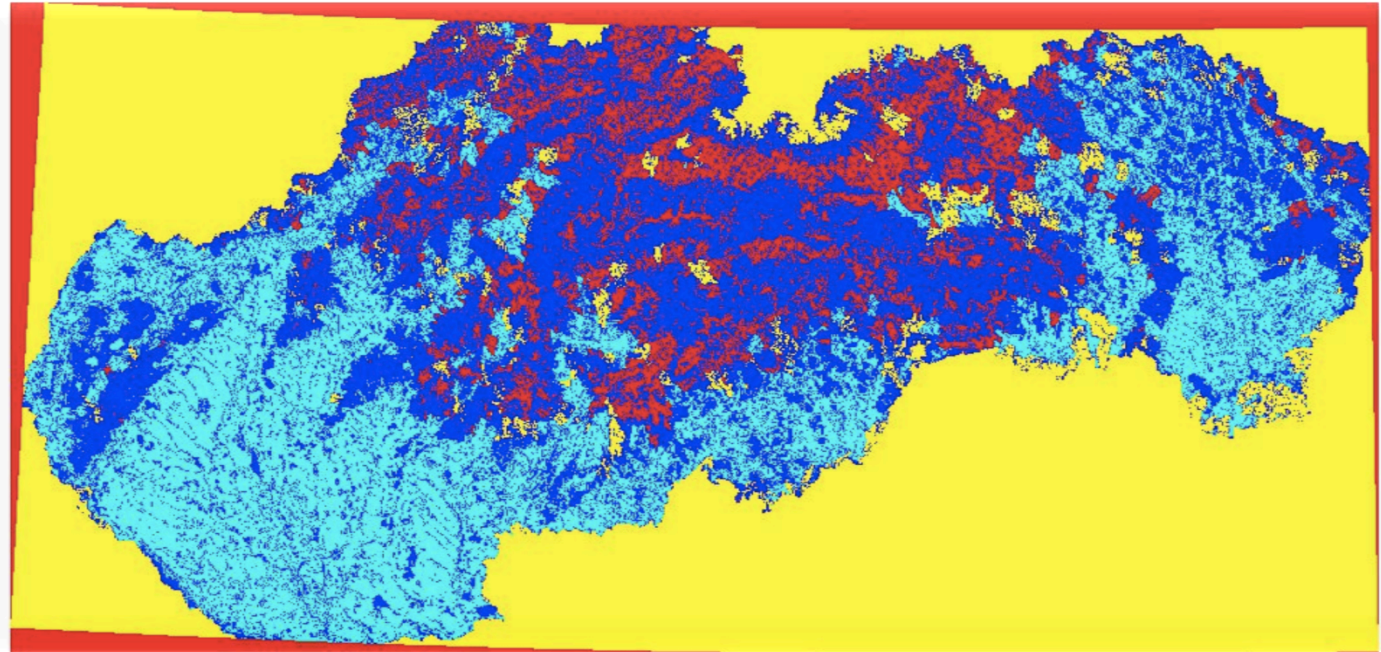
- Site parameters
- Inventories of Slovak N
- Source terms
- **Meteorological data**





- Site parameters
- Inventories of Slovakia
- Source terms
- Meteorological data
- **Regional data**
 - population, land use
 - radioecological

type of soil

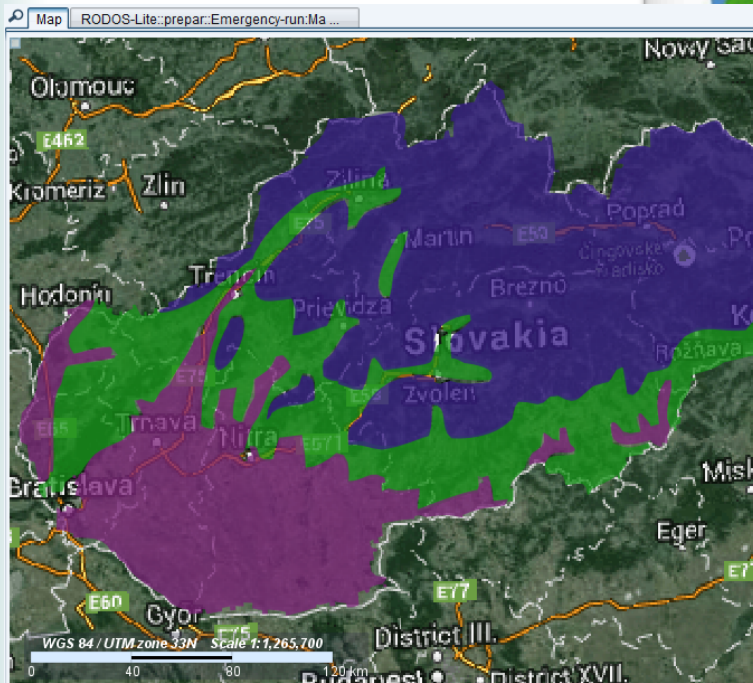


Population



- Site parameters
- Inventories of Slovak
- Source terms
- Meteorological data for
- **Regional data**

Tree Radioecological regions of Slovakia



Parameters for Region Central Europe

Feedstuff | **Foodstuff** | Nuclide Data | Nuclide Plant Data

Region | Animal Product | Plant/Surface | Yield/LAI/Growth Dilution Rate

Foodstuff Na...	Foodstuff Atom	Category
Wi-wheat wh.	fwww	
Wi-wheat fl.	fwwf	
Wi-wheat br.	fwwb	
Sp-wheat wh.	fsww	
Sp-wheat fl.	fswf	
Sp-wheat br.	fswb	
Rye whole	fryw	
Rye flour	fryf	
Rye bran	fryb	
Oats	foat	
Potatoes	fpot	
Leafy vegs.	fvel	
Root vegs.	fver	
Fruit vegs.	fvef	
Fruits	ffru	
Berries	fber	
Milk	fmlil	
Cond.Milk	fcom	

Data for foodstuff Sp-wheat fl.

Plant Name: Sp-wheat

Animal Product: [dropdown]

Food group: grain

Minimum time for storage and processing of foodstuff [Days]: 45

Kg of processed food obtained per kg of raw food: 0.7

Part of each raw food going into each process [%]: 90.0

Food consumption rates of average humans [g/d]

Group	Value
1 year	3.9
5 years	8.1
10 years	10
15 years	12
Adults	15

Food consumption rates of special groups [g/d]

Group	Value
Vegetarians	19
Hunters	15
Wild product collectors	15
Fishermen	15
Forest worker	15

Season dependent intake modification factor

Begin [Julian...]	End [Julian D...]	Factor

Add Remove

OK Cancel Help



- Activities within NERIS-TP WP3 (cont.)
 - **Seminar/Facilitated workshop driven by scenario „Recovery Management following a Radiological Incident“** was conducted on May 16-18, 2011, 34 participants
 - focused on the practical use of the Handbook for Assisting in the Management of Contaminated Inhabited Areas (translated and adapted to the Slovak conditions and legislation) following an accident at Mochovce NPP focused on the selection of countermeasures and strategy development based on **scenario developed using the RODOS Linux system, adapted to the Slovak Republic conditions**



- Activities within NERIS-TP WP3 (cont.)
 - **Workshop/Exercises: “Preparedness for nuclear and radiological emergency response and recovery”**, 6-7 November 2013 (20 participants), with objectives:
 - to demonstrate and use the new products of the decision support system JRodos at all levels of the crisis management in Slovakia
 - interactive use of the newest JRodos version including ICRP, ERMIN2 and AgriCP module on accident scenario applied to Mochovce NPP site attracted stakeholders to actively participate and discuss the urban and agricultural area aspects
 - to give feedback to developers on the user’s experience
 - to evaluate the process of stakeholders involvement and particular stakeholder workshops/seminars/trainings since 2003 in Slovakia
 - discuss the enhancement and sustainability of the process



- Activities within NERIS-TP WP5
 - **NERIS-TP Training course "Preparedness for nuclear and radiological emergency response and recovery: usage of the new products for supporting the management team"** (21-25 October 2013 at VUJE, Trnava, Slovak Republic, 22 participants + 10 training staff)
 - provided opportunity to train the participants (trainees) to use the new tools in order to their further active participation in technical exercises and use of the final products in the community
 - the demonstrations, practical sessions and exercises illustrated the new development using the developed common scenario
- Activities within national research and development projects
 - **JRodos Training course for Emergency response staff of the Nuclear Regulatory Authority Slovak Republic** (October 16-17, 2013, 16 participants)



1. Selecting the accident scenario

- a) **Selection of the territories:** the zone around the Mochovce NPP has been selected as territory for consideration of a severe accident in the nuclear power plant

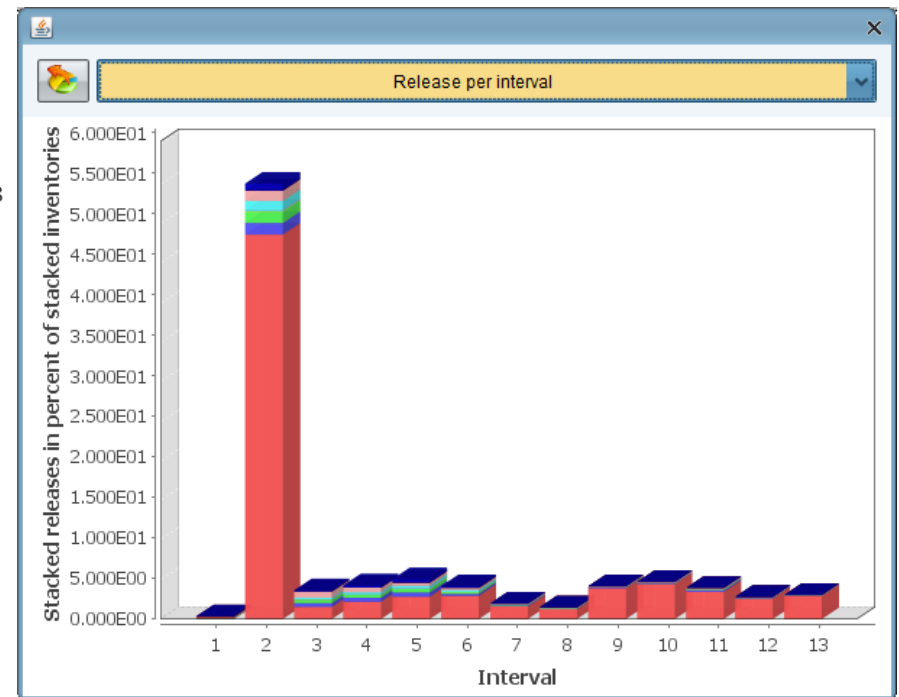
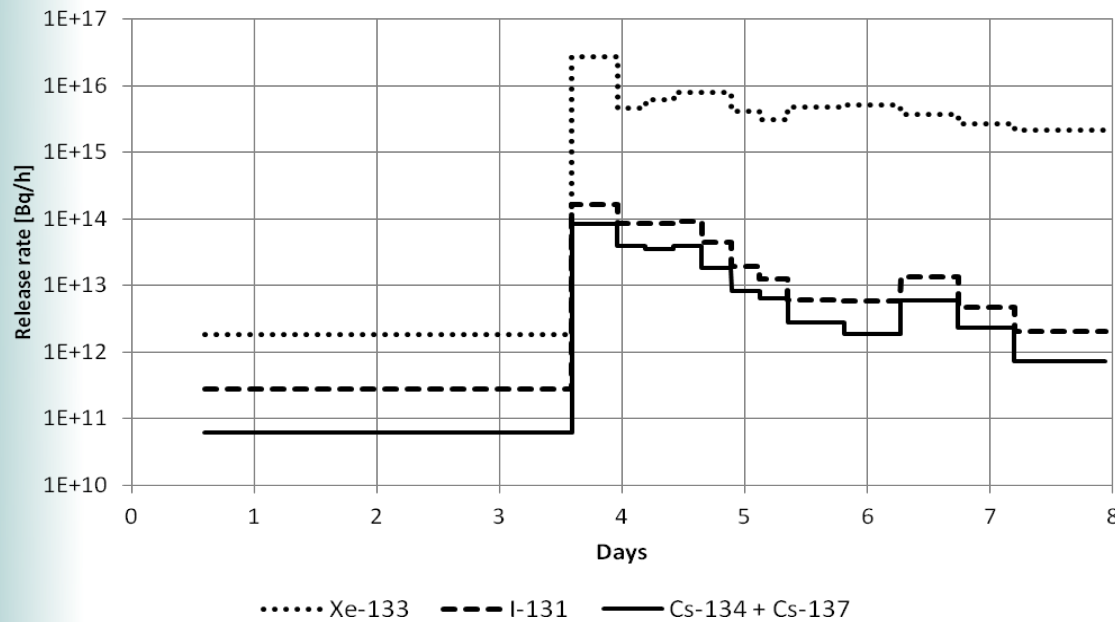


- Nuclear Power Plants
- Hydro Power Plants
- Thermo Power Plants



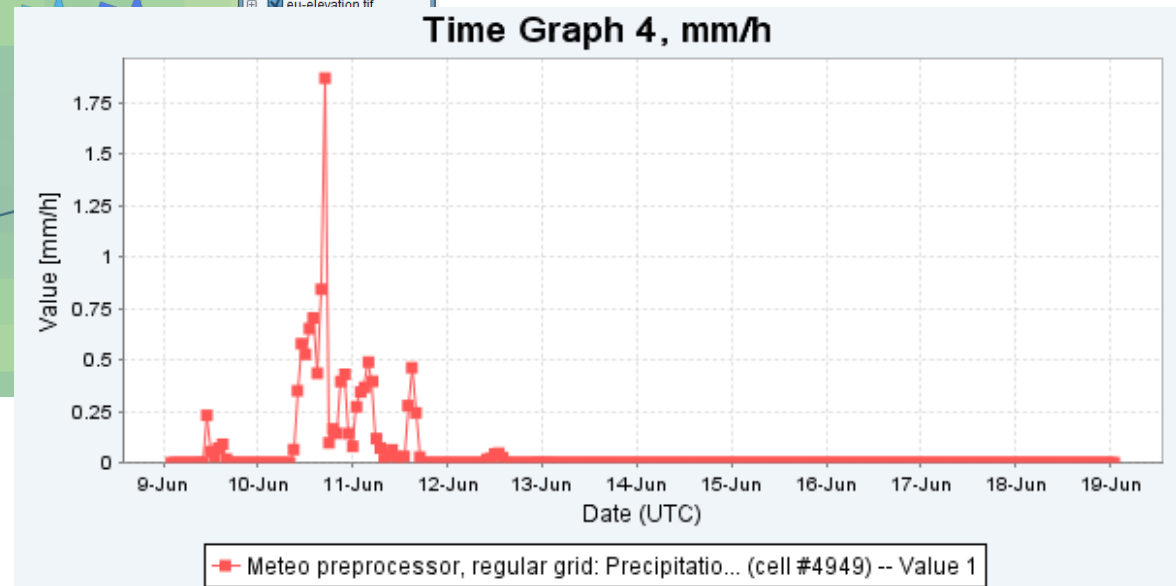
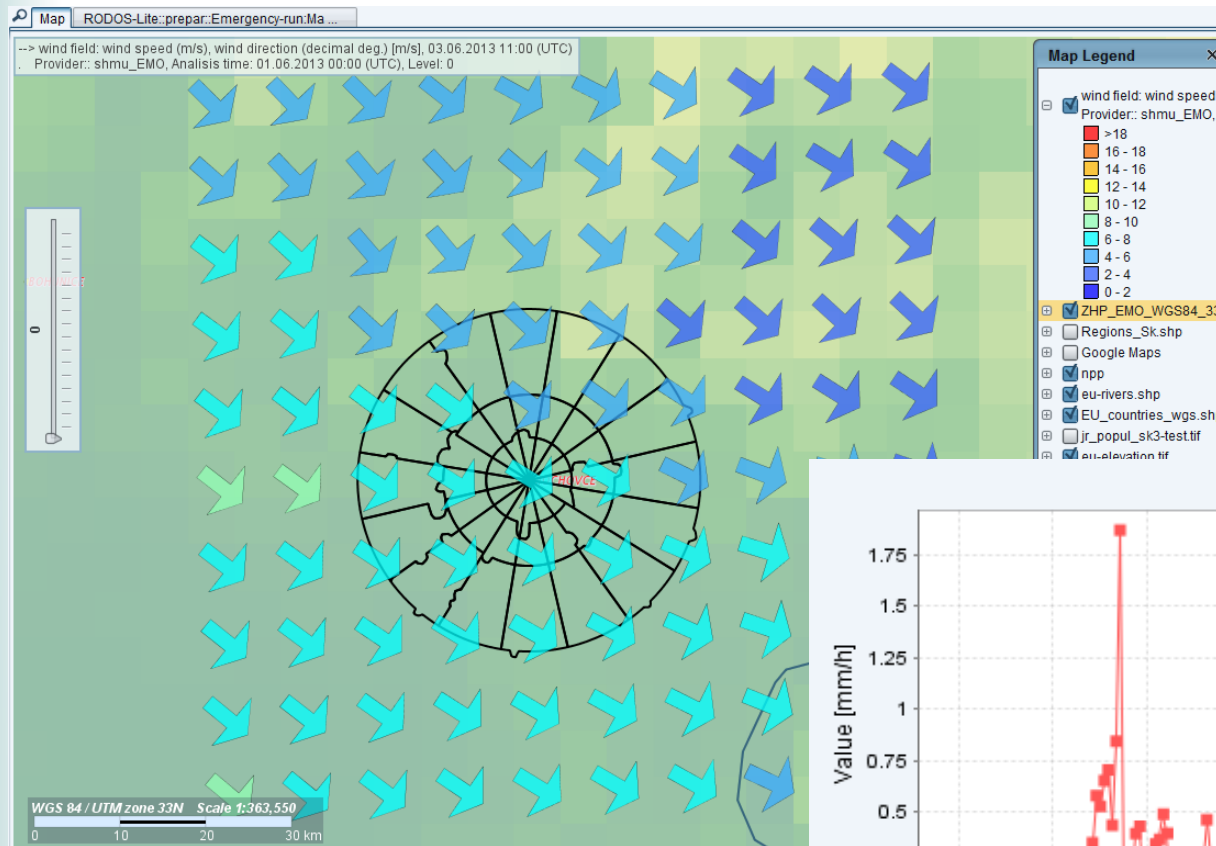


b) source term (the realistic emergency exercise scenario with the long lasting release for Mochovce NPP was artificially modified)





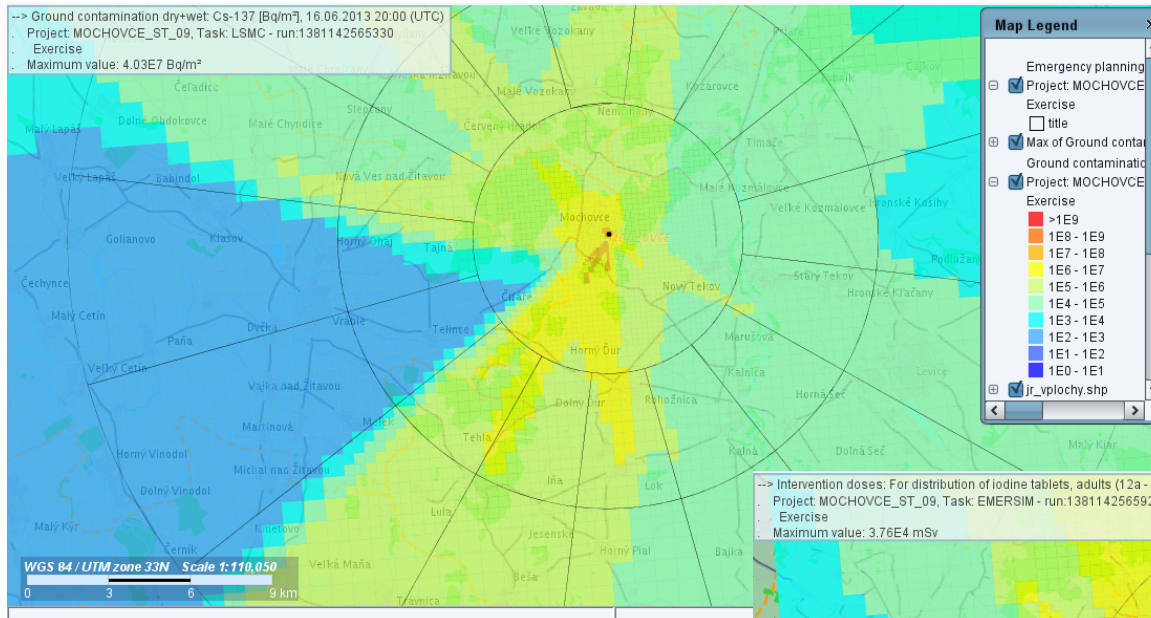
c) **the real meteorological situation (ALADIN/Slovakia)** was used for the radiological assessment with focus on urban contamination (June 2013)



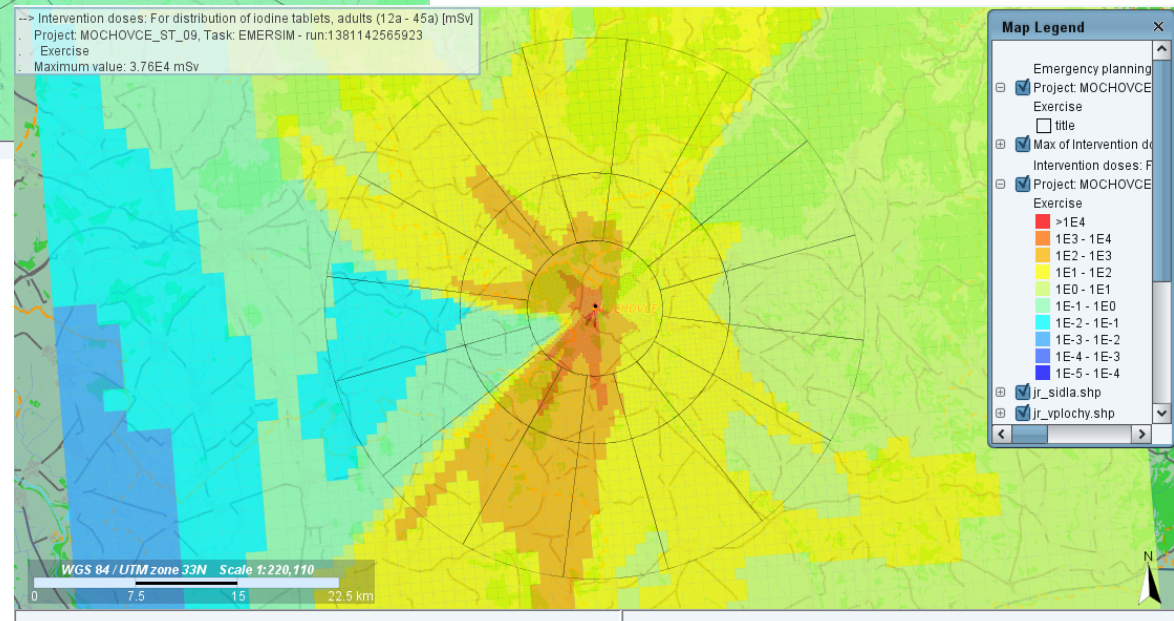


2) Modeling consequences of the accident

- using **JRODOS** (RIMPUFF, EMERSIM, ICRP 103 Screening Tool)



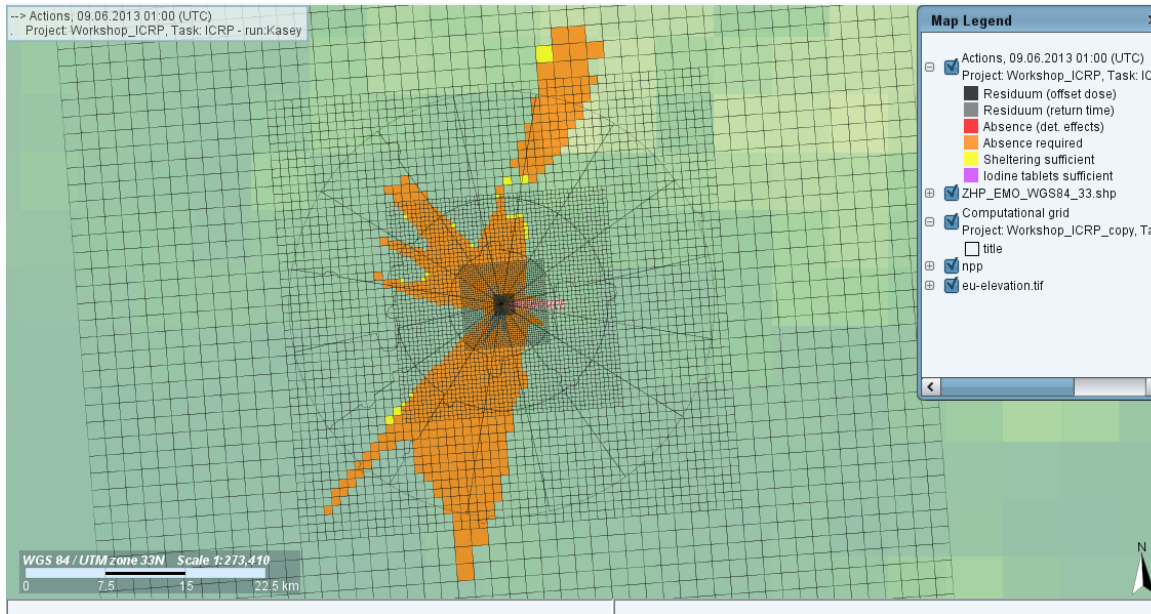
Left: **LSMC - Ground contamination – dry + wet, Cs-137 [Bq/m²], 16.6.2013, 20:00 – at the end of the accident scenario duration**



Right: **EMERSIM - Committed thyroid doses by inhalation of radioiodine from the cloud – adults [mSv]**

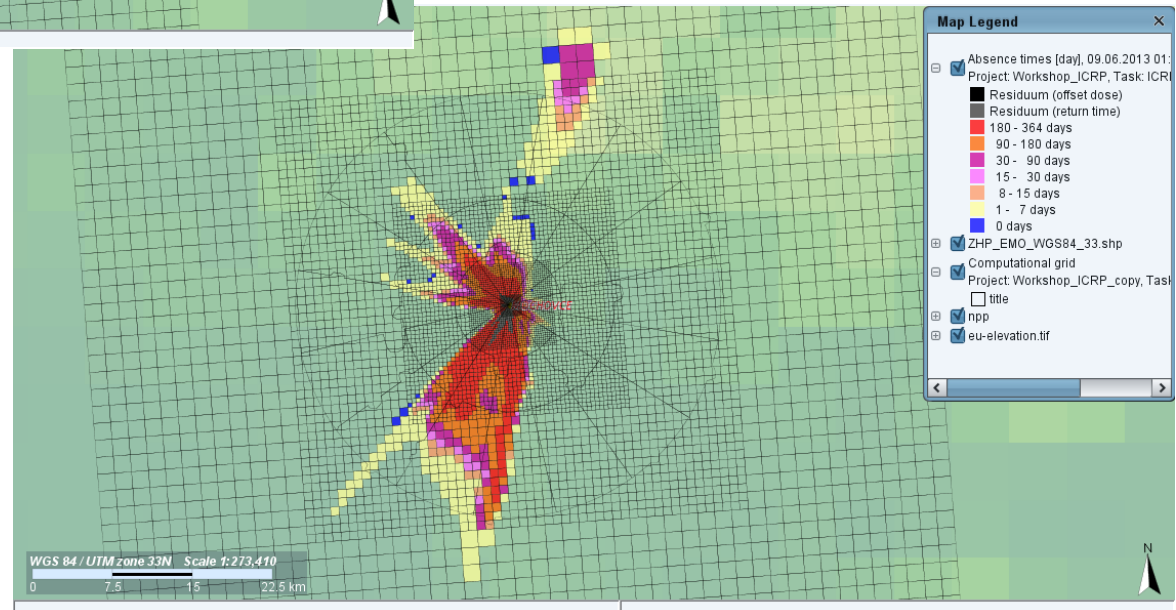


Main results of S-E-R+I screening analysis



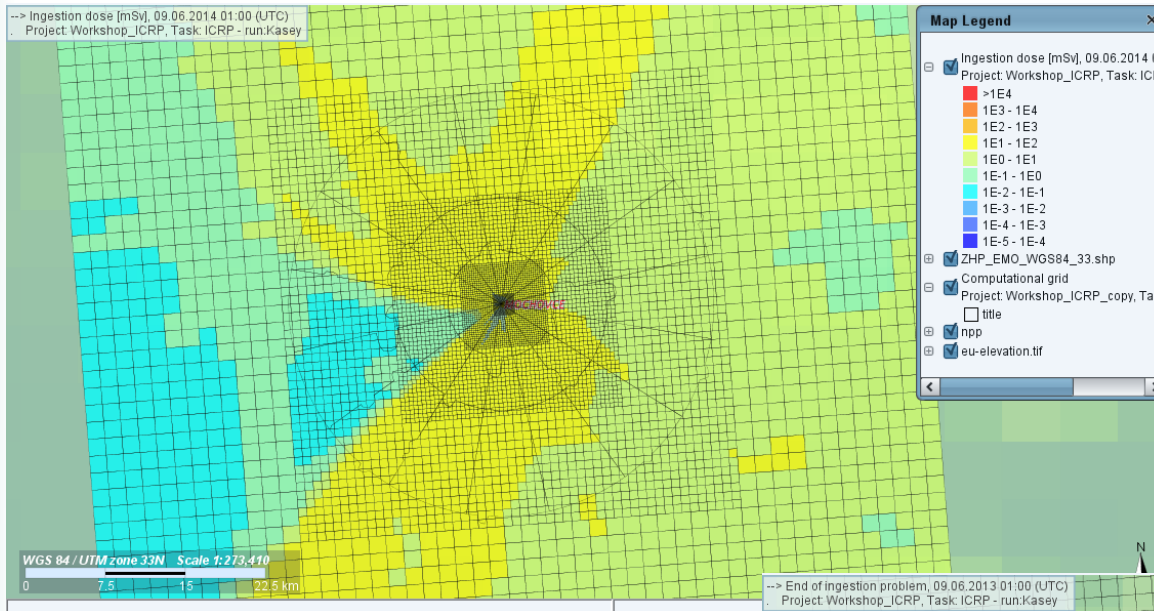
Left: ICRP - The set of actions that makes $CD < RL$

Right: ICRP - Absence times from area associated with above action set [days]



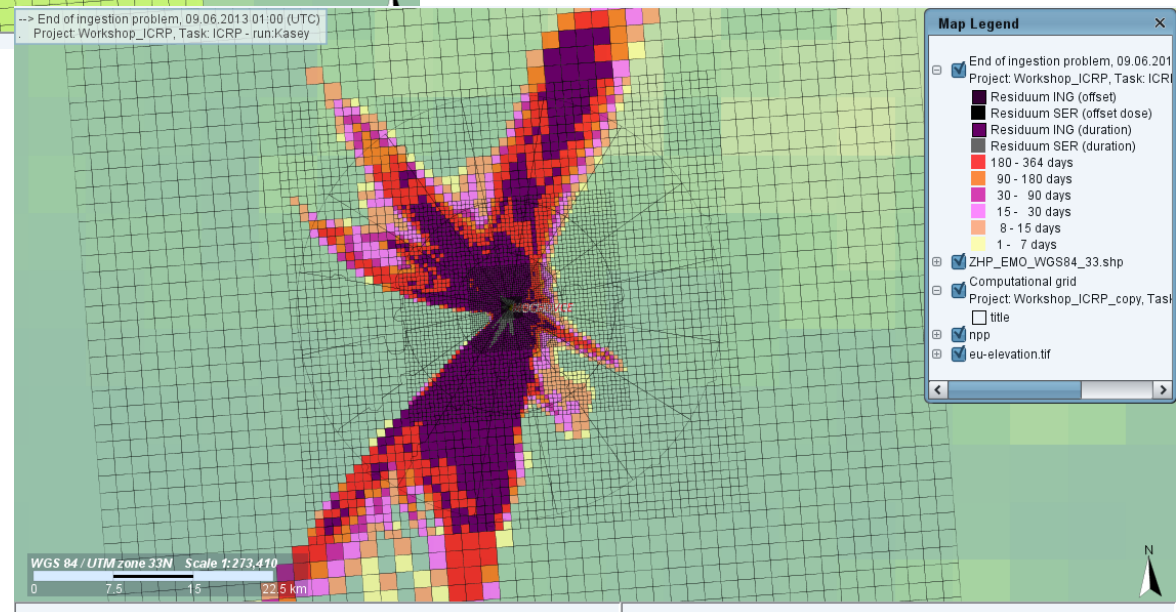


Main results of ingestion screening analysis



Left: **ICRP - Ingestion dose, food basket, to be compared with CD remainder => "Ingestion Criterion Dose"**

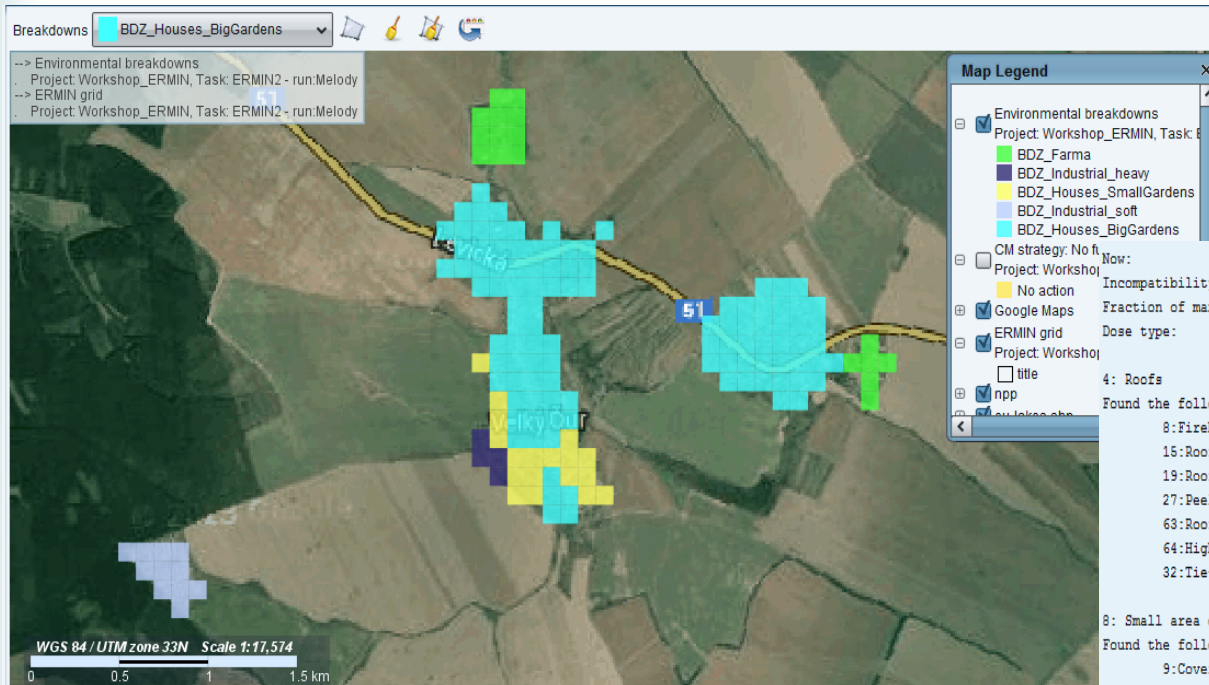
Right: **ICRP - Result of check if uncontaminated food replacement would bring the ingestion dose below CD remainder. If yes, day is recorded when there is no longer an ingestion problem for the grid cell under consideration until the end of the first year [days]**





3) **Establishing of strategies of intervention** (ERMIN2 and AgriCP for urban resp. agricultural countermeasure programs)

- selection of affected zones regarding response to radiological impact
- selection of potential countermeasures for inhabited areas management (ERMIN2 Wizard)
- evaluation the effectiveness of countermeasures on agricultural products



Left: ERMIN2 – Environmental breakdown, the definition of the environmental composition of the AOI

Right ERMIN2 – Countermeasure Wizard, The external knowledge wizard generates a set of one or more simple strategies for the whole AOI or sub-areas of the AOI

```

CM strategy: No fu Now: 0.0 day(s)
Project Workshop Incompatibility limit: 10.0%
Project Workshop Fraction of maximum: 10.0
Dose type: Normal living

4: Roofs 1E1 Sv
Found the following applicable recovery actions of 'constraints on application' type
8:Firehosing roofs; applicable after any deposition conditions; incompatibility value 0%
15:Roof brushing; incompatibility value 0%
19:Roof cleaning with pressurised hot water; incompatibility value 0%
27:Peelable coatings; incompatibility value 0%
63:Roof replacement; incompatibility value 0%
64:High pressure hosing roofs; incompatibility value 0%
32:Tie-down to buildings with vinacryl; incompatibility value 0%

8: Small area of grass 6.66E0 Sv
Found the following applicable recovery actions of 'generally applicable' type
9:Cover with clean soil; incompatibility value 0%
11:Rotovating; incompatibility value 0%
16:Cover with asphalt-small scale; incompatibility value 0%
33:Tie-down with water; incompatibility value 0%
39:Mechanical top soil and turf or plant removal and soil replacement; incompatibility value 0%
37:Mechanical top soil and turf or plant removal; incompatibility value 0%
41:Mechanical top soil and turf removal, soil replacement and return; incompatibility value 0%
43:Mechanical top soil and turf or plant removal, soil replacement and reseed; incompatibility value 0%
54:Grass cutting; best applied soon after dry deposition; incompatibility value 0%

11: Large area of grass 4.85E0 Sv
Found the following applicable recovery actions of 'generally applicable' type
9:Cover with clean soil; incompatibility value 0%
28:Ploughing; incompatibility value 0%
29:Deep ploughing; incompatibility value 0%
33:Tie-down with water; incompatibility value 0%
39:Mechanical top soil and turf or plant removal and soil replacement; incompatibility value 0%
37:Mechanical top soil and turf or plant removal; incompatibility value 0%
41:Mechanical top soil and turf removal, soil replacement and return; incompatibility value 0%
43:Mechanical top soil and turf or plant removal, soil replacement and reseed; incompatibility value 0%
54:Grass cutting; best applied soon after dry deposition; incompatibility value 0%

6: Internal surfaces 2.28E0 Sv
Found the following applicable recovery actions of 'generally applicable' type
22:Washing interior surfaces; applicable after any deposition conditions; incompatibility value 0%

```



Countermeasure Strategies

No further actions

VillageStrategy_soft

VillageStrategy_heavier

Add

Delete

Copy

Freeze

CM Strategy: VillageStrategy_soft

PlantActions

Roof+Interior

Relocation

Add

Delete

Draw

ERMIN2 – The specification of the area, type, and timing of recovery actions carried out in the AOI

Option	Surface	Start (day)	End (day)	PPE	Rel. Time (d...)	DF=1 (day)	Waste (kg/...	Cost (EUR...
54:Grass cutting	8:Small area of grass	8.0	12.0	<input type="checkbox"/>		∞	0.1	0.2
56:Plant removal	9:Small area of plants	8.0	12.0	<input type="checkbox"/>		∞	2.0	0.69
59:Tree removal and replacement	7:Trees and shrubs	8.0	12.0	<input type="checkbox"/>		∞	10.0	3.3

Option	Surface	Start (day)	End (day)	PPE	Rel. Time (d...)	DF=1 (day)	Waste (kg/...	Cost (EUR...
8:Firehosing roofs	4:Roof	12.0	20.0	<input type="checkbox"/>		28.0	50.0	0.6
22:Washing interior surfaces	6:Internal surfaces	20.0	30.0	<input type="checkbox"/>		42.0	0.0015	3.1

Countermeasures for Countermeasure Zone: Relocation

Add Delete Table No further actions <= 0.0 days <= Other strategies

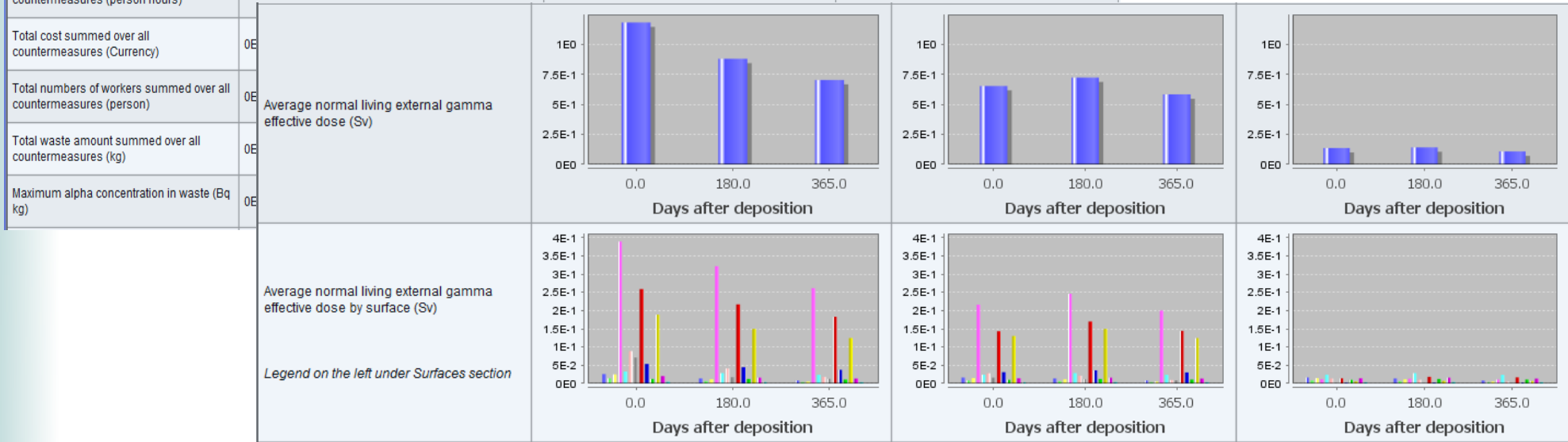
Option	Surface	Start (day)	End (day)	PPE	Rel. Time (d...)	DF=1 (day)	Waste (kg/...	Cost (EUR...
7:Relocation	0:No surface	1.0	90.0	<input type="checkbox"/>	1.0	-	0.0	0.0

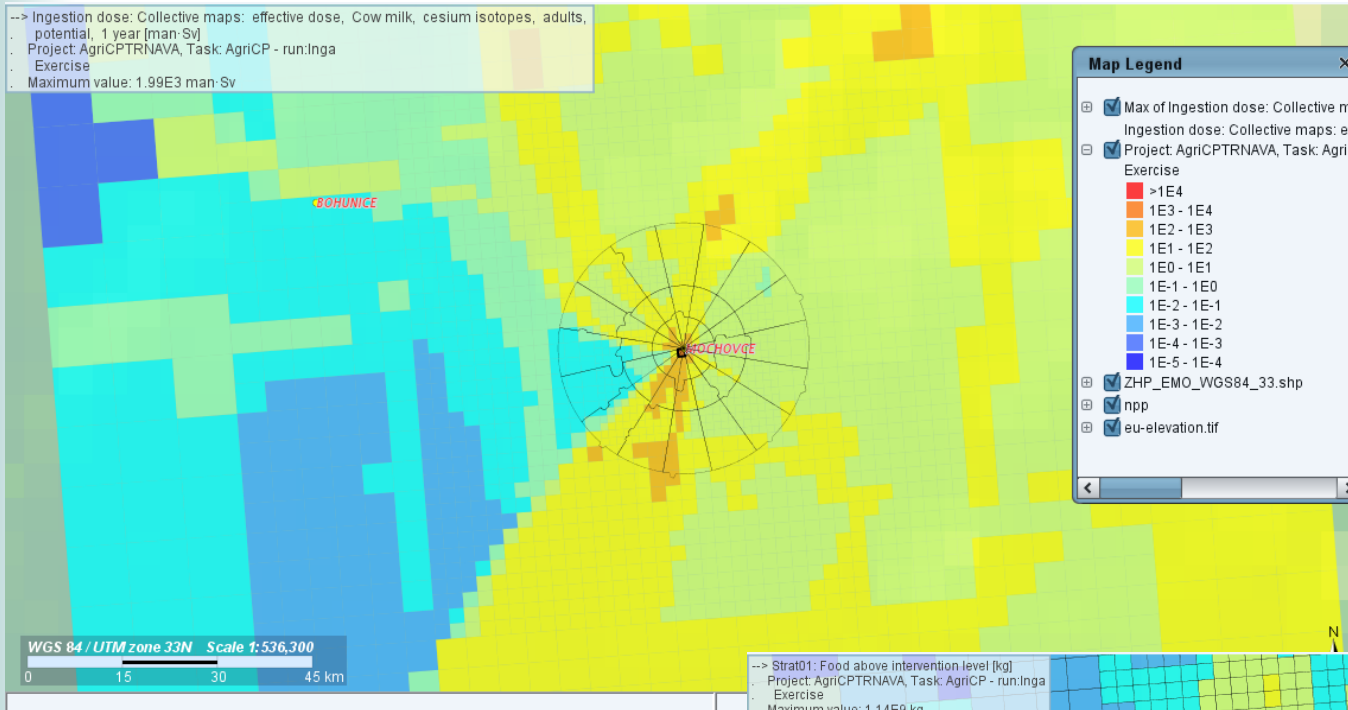


Result	No further actions	Village_strategy_Soft	Village_strategy_Havier
Maximum time which reference dose is exceeded (days)	0E0	0E0	2.25E2
Maximum reference dose (in first period) (Sv)	2.52E0	1.4E0	2.89E-1
Average reference dose (in first period) (Sv)	1.18E0	6.54E-1	1.36E-1
Maximum normal living total effective dose (sum of resuspension and external gamma) (in first period) (Sv)	2.52E0	1.4E0	2.89E-1
Average normal living total effective dose (sum of resuspension and external gamma) (in first period) (Sv)	1.18E0	6.54E-1	1.36E-1
Collective normal living total effective dose (in first period) (person Sv)	8.11E2	4.48E2	9.32E1
Maximum strategy period total effective dose over all countermeasures (Sv)	0E0	7.43E-1	2.18E-1
Average individual worker total effective dose over all countermeasures (Sv)	0E0	4.37E-2	8.08E-3
Collective individual worker total effective dose (Sv)	0E0	1.28E2	3.06E2
Total work summed over all countermeasures (person hours)	0E0	2.03E5	2.2E6

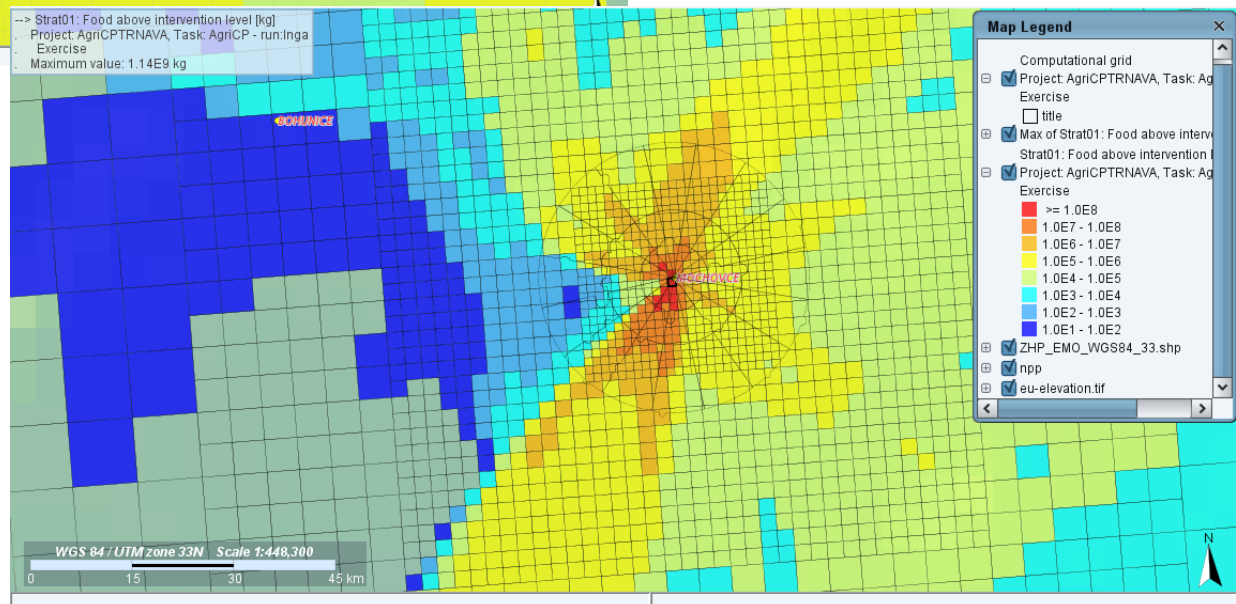
Up: **ERMIN2 – Summary table**

Down: **ERMIN2 – Summary graph, example – average normal living external gamma effective dose, *breakdown by output time and surface***





Left: AgriCP – Map of total dose from all pathways, effective dose, all products (sum), all nuclides, adults, 1 year [mSv]



Right: AgriCP – Food above intervention level [kg]



Working in the form of facilitated workshops with scenario developed using

- customized operational decision support tools (RODOS, RTARC)**
 - handbooks translated and adapted to the Slovak conditions and legislation**
 - MCDA tool Web-HIPRE**
-
- made work more efficient, with focus on possible real problem and on finding real solutions, especially by ICRP Screening tool, ERMIN2 and AgriCP, which are closely connected with handbooks**
 - communication between different stakeholders involved in the active work at facilitated workshops, seminars, workshops, training courses and exercises was found as very important to get a balanced view on various aspects of the issues at the national, regional or local level**
 - has shown, that this form is efficient, acceptable and suitable for all stakeholders at all levels (national, regional, local) and could be applied within the national policy in the area of emergency preparedness and response**