



# Work on local-national cooperation with regard to post-accident rehabilitation in Spain

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## First Steps

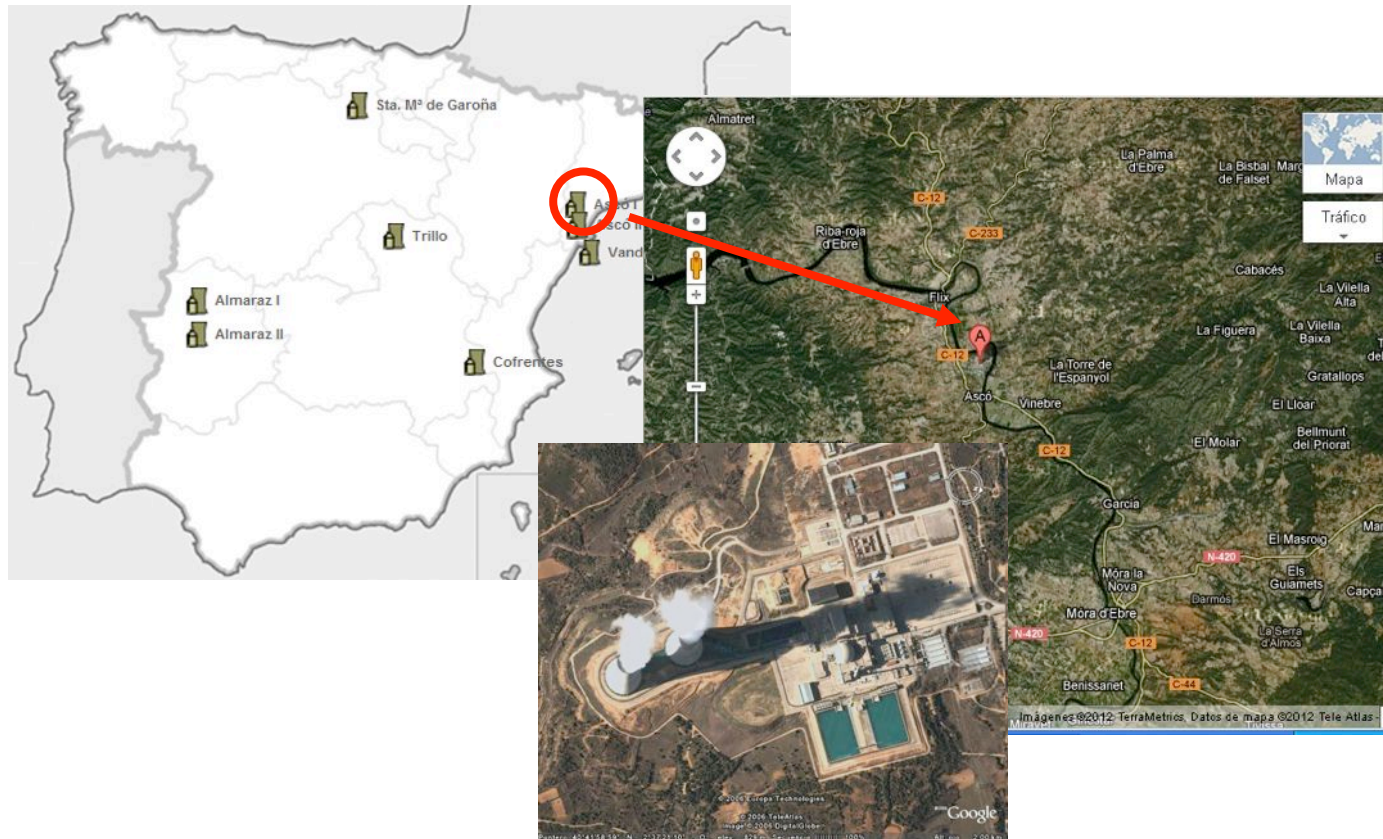
- **Selecting the territories** in which the pilot methodology on emergency and post-emergency preparedness will be implemented
- **Contact with the different participants**
- Decision with regard to the kind of **scenarios to be developed**. >> **Development of the Scenarios**

## Intermediate Steps

- Organise **thematic sessions** with the engaged actors
  - To show the available tools (European and national tools)
  - To discuss and select the questions at stake: legal framework, roles and responsibilities, with emphasis in the rehabilitation phase; food supply safety; protection to the local economic sectors; long-term follow-up; etc.
- **Adapt / customise the existing tools** to the local level and the peculiarities of Spain
- **Two or more table-top exercises**, one-two days duration, hosted by CSN

## Final Steps

- To **adapt / improve tools and methodology** for engagement of the local actors as identified during the exercises.
- A proposal of **action guide** for the local preparedness in the country is foreseen to be produced.
- A **final open workshop** will be organised to disseminate the conclusions and the guidance produced to the rest of nuclear areas of Spain.



- The **zone around Ascó NPP** has been selected as territory impacted by a **severe accident in the nuclear power plant**
- It is included in the **Nuclear Emergency Plan of Tarragona province – Catalonia region**



In order to select and define the scenarios the following aspects are considered:

- I. **Threat assessment** – what are possible scenarios that could cause radioactive contamination of our municipality/local territory?
- II. **Sensitivity analysis** – what parts of the local community would be most heavily affected by a contamination situation?
- III. **Evaluating mitigating actions** – what are the choices? Can they be implemented in our community? What are the national recommendations?

Once the points I, II and III will be fully developed for the selected areas, the result will be complete scenarios on which the full exercises could be developed.

### Final Objective of the tabletop exercise

- Complete analysis and discussion of the threats (I), sensitivity of the area (II), mitigating alternatives and their feasibility and effectiveness (III), as well as the involvement of local, regional and national actors (IV).
- The conclusions of the exercise should **help to better clarify the roles and responsibilities at each level** and to identify the need for improvement with regard to cooperation along the chain **national ↔ regional ↔ municipality/local**.




- **Preparatory meetings**

- **13 June 2011** at CSN : decision to support the proposed activities and to implicate different departments at CSN. Emergencies and Environmental Radiation protection General Subd.
- **6 July 2012** at CSN : decision to focus on the long-term rehabilitation post nuclear accident. The legal framework for the rehabilitation phase is a pending issue that needs to be addressed in the coming revision of the nuclear emergency regulations in Spain. The exercise could greatly help
- **25 September 2012** at the Government Sub delegation in Tarragona: CSN gets the interest from the Director of the Nuclear Emergency Plan in Tarragona (highest Central Government authority in the province)
- **15 October 2012** at the Government Sub delegation in Tarragona: ad-hoc meeting to discuss about the NERIS platform, the NERIS-TP project, the available tools, and the objectives and the way to develop the exercise:
  - Director of the Nuclear Emergency Plan of Tarragona
  - General Subdirector of Emergencies, CSN
  - Representatives of the General Direction of Civil Protection (Central Gov. and Tarragona)
  - Representatives of the Autonomous Community Government (Catalonia)
  - Representatives from the Municipalities of the selected area (local authorities) and their Association (AMAC)
  - Nuclear Power Plant representative





- **General agreement on the interest of the exercise and full support from the Director of the Nuclear Emergency Plan of Tarragona**
- **Selection of territories: Ascó – Tarragona and surrounding provinces**
- **Decision with regard to the kind of scenarios to be developed:**
  - Severe accident at the NPP
  - Focus on the long-term rehabilitation post nuclear accident
- **Development of the Scenarios** 



### Next steps in the coming months:

- Final agreement on the programme for the exercise (by e-mail)
  - **Preparatory workshop** (January 2012):
    - Thematic sessions on the tools
    - Final discussion on the scenario
    - Final selection of observers and partners to participate in the exercise
    - Fixing a date to perform the exercise
  - Finalisation of the scenario with the zonification of vulnerable areas susceptible for intervention, selection of potential countermeasures. Final customisation of tools.
- Development of the **Toptable exercise**. (around February – March 2013)

**Year 2:** Thematic sessions (month 23)

First table-top exercise completed (month 25)

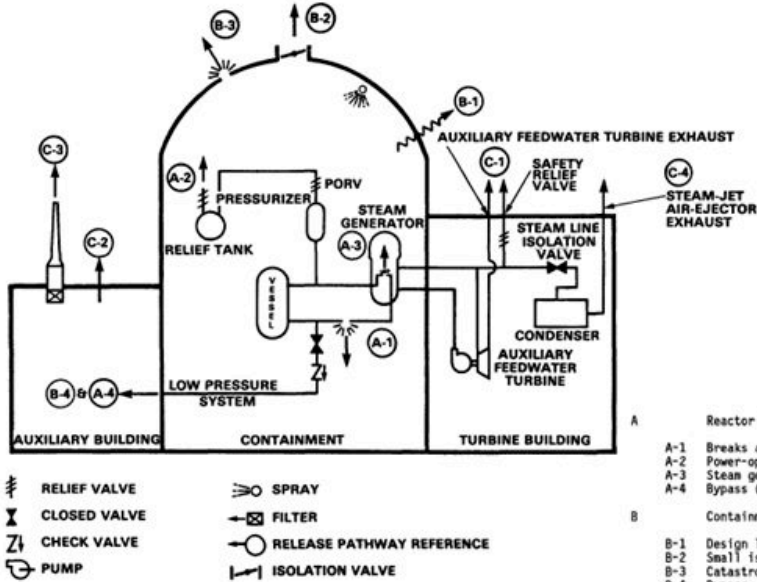
- **Year 3:** Second table-top exercise (month 31)
  - Tools adapted or improved as identified in the exercises (month 34)
  - Analysis / Guidance / Recommendations for development of planning the long-term rehabilitation phase issued (month 34)
  - Final national workshop (month 36)





The steps in developing the scenario for use in the tabletop exercise:

- Selecting the accident scenario
  - Source Term
  - Meteorological conditions
  - Regional Data (Population, Land cover, Agricultural Production, Dietary Habits)
- Modelling consequences of the accident
  - Using JRODOS
- Testing intervention strategies
  - Selection of vulnerable zones regarding response to radiological impact.
  - Selection of potential countermeasures from Handbooks for rural and urban management



Bases used to estimate source term (radionuclide release) from a severe nuclear power plant accident (core damage): **Level 2 PSA (Probabilistic Safety Assessments) for Ascó NPP.**

Selection of the corresponding Release pathways:

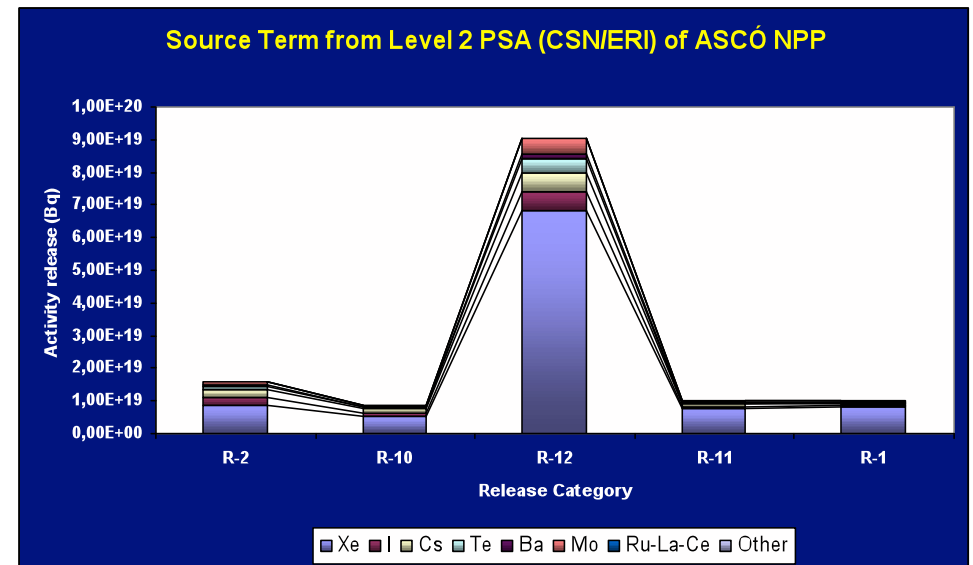
- Containment leakage
- Containment bypass
- Steam generator tube rupture (SGTR)

**PWR dry containment simplified release pathways (Type of Ascó).**  
Source: NUREG-1228

Ranking the corresponding Release Categories by:

- Total Activity Released
- Activity of released particulates (I + Cs)
  - Very large ( > 15%)
  - Large (5 - 15%)

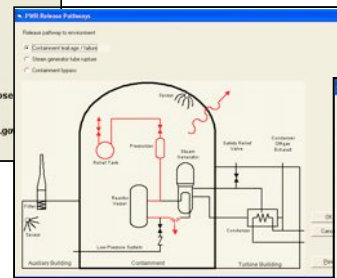
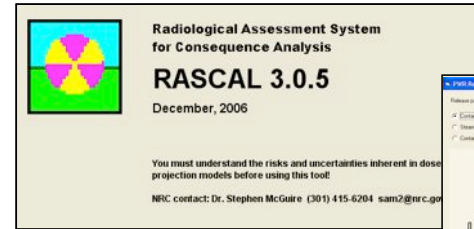
**Our first selection: Bypass accident, interfacing LOCA or an event V (R12).**



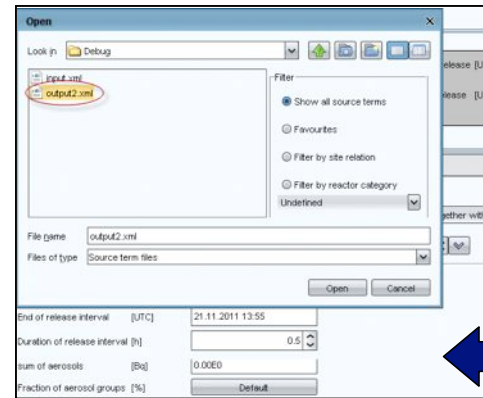
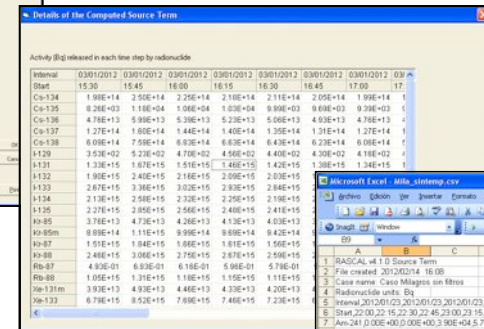
## RASCAL CODE (Radiological Assessment System for Consequence Analysis)

The Source Term module calculates a time-dependent source term for a wide variety of accident conditions for many different facility types.

### CHAIN OF STEPS



Generation of source term with RASCAL



Loading the generated file in J RODOS

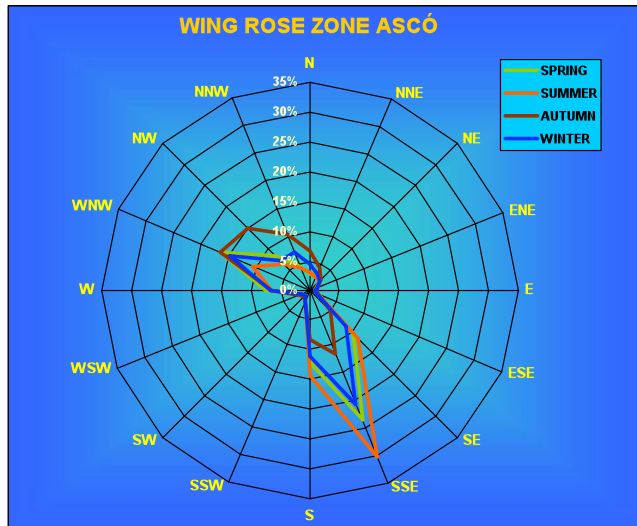
Code Rascal to RODOS



Nombre	Tamaño	Tipo	Fecha de modificación
rascal_rodos.exe	409 KB	Application	07/04/2011 13:06
RASCAL.csv	21 KB	Archivo de valores ...	25/02/2011 9:16
rascal_rodos.obj	33 KB	Archivo OBJ	07/04/2011 13:06
CF60.PCB	25 KB	Archivo PCB	07/04/2011 13:06
rascal_rodos.pdb	569 KB	Archivo PDB	07/04/2011 13:06
radonucle.bit	1 KB	Documento de texto	04/04/2011 11:33
input.xml	12 KB	Documento XML	29/03/2011 15:29
output2.xml	25 KB	Documento XML	21/11/2011 10:30

## Coupling "RASCAL to RODOS" (specific code developed by CIEMAT).

The code, in Fortran 90, acts as an interface to read the output file "csv" from RASCAL and generate a file "xml" conveniently formatted to make batch - input accordingly to the RODOS requirements.



From the **local meteorology studies** conducted in the safety evaluation of Ascó NPP the annual rose shows a strong directional influence of topography, prevailing winds clearly aligned with the direction of the valley, SSE and NNW:

- The highest frequency in the direction SSE (19.17%)
- Slightly lower frequency in the direction WNW (15.06%).

Seasonal characteristics:

- **Spring:** directional effect very pronounced, reaching the SSE at 23.44%.
- **Summer:** S and SSE frequency much higher than those of other directions (44%).
- **Autumn:** Greater homogeneity.
- **Winter:** the winds are dominant in the fourth quadrant, although the sector is more often the SSE, with 20,5%.

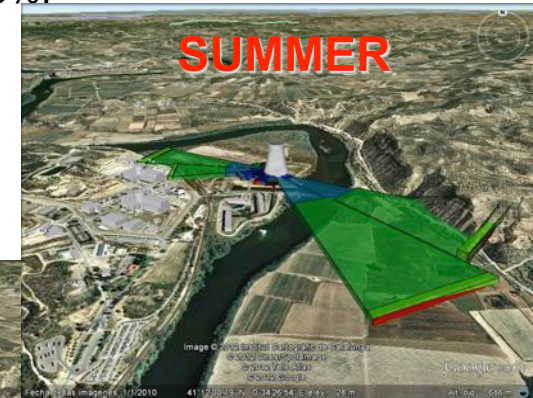
### Selection for study the characteristic meteorology:

- **Summer season (July):** wings from SSE (from sea to valley). Possible specific case with wings WNW to study consequences on the touristic towns in the coast.
- **Winter season (January):** wings from WNW (from valley to sea)

### Source of the Meteorological data:

- Numerical weather prediction data: Prognostic meteorological data taken from the national weather service (AEMET) in the format required by RODOS.

**Our selection: Winds from WNW in Winter.**



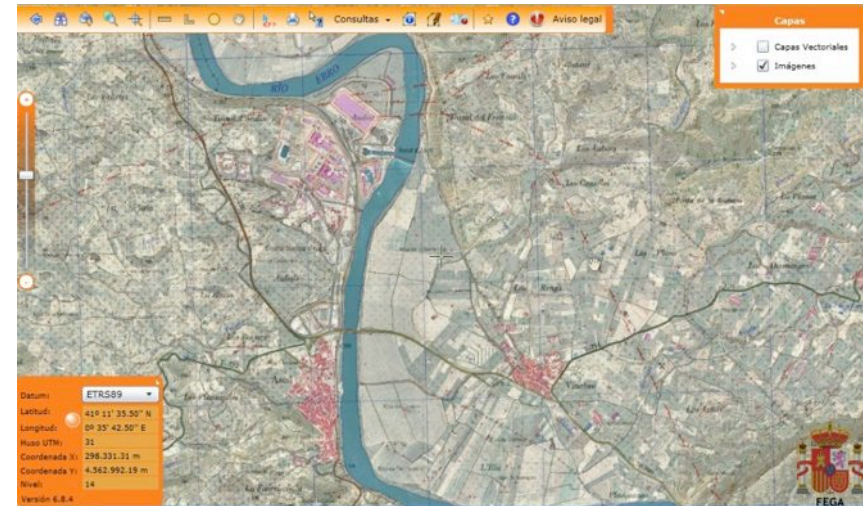
Wind speed direction (blowing from))



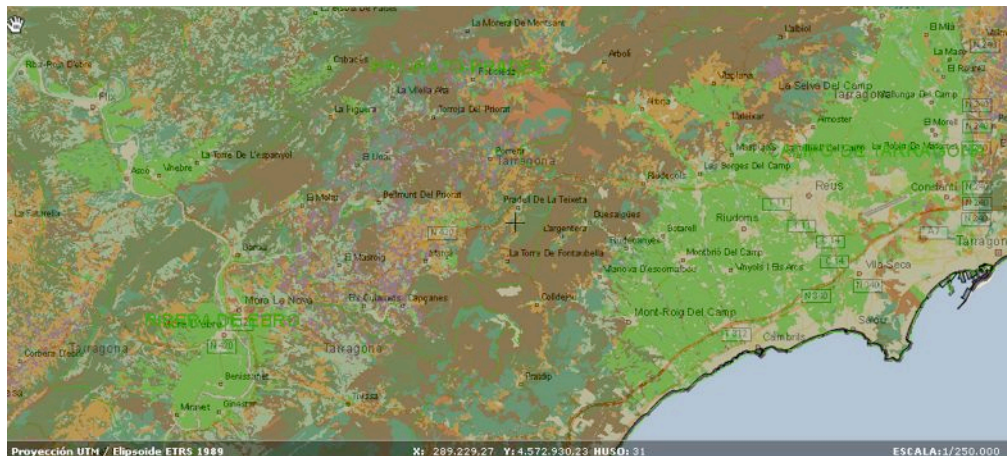


## Selection of Regional Data for the surrounding zone of Ascó

codine	Name	Population	Surface (km <sup>2</sup> )	Density
43019	Ascó	1634	74,32	21,99
43048	Corbera d'E bre	1171	53,47	21,90
43056	Fatarella (La)	1130	56,48	20,01
43058	Figuera (La)	135	18,67	7,23
43060	Flix	4061	115,98	35,01
43065	Garcia	594	52,05	11,41
43085	Molar (El)	297	22,97	12,93
43093	Móra d'E bre	5795	44,89	129,09
43094	Móra la Nova	3238	15,79	205,07
43099	Palma d'E bre	425	38,22	11,12
43125	Riba-roja d'E b	1336	99,48	13,43
43152	Torre de l'Esp	679	27,91	24,33
43177	Vinebre	459	26,42	17,37
<b>Zone I</b>	<b>TOTAL</b>	<b>20954</b>	<b>647</b>	<b>32,40</b>



**Map of urban zones**  
(Ministry of Agriculture, Fisheries and Food)



**Map of crop and land use 2000-2009**  
(Ministry of Agriculture, Fisheries and Food)

Land cover	Total	Percent (%)
Coniferous	30255,12	46,73
Olivar	11163,13	17,24
fruit	9428,89	14,56
Shrubland	5822,60	8,99
labor	2454,41	3,79
vineyard	2163,09	3,34
Rangeland and grassland	1172,58	1,81
water	1023,45	1,58
unproductive	1018,80	1,57
broadleaved	245,69	0,38
rice	0,00	0,00
<b>TOTAL SURFACE (Ha)</b>	<b>64747,76</b>	<b>100,00</b>

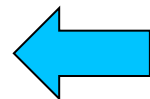
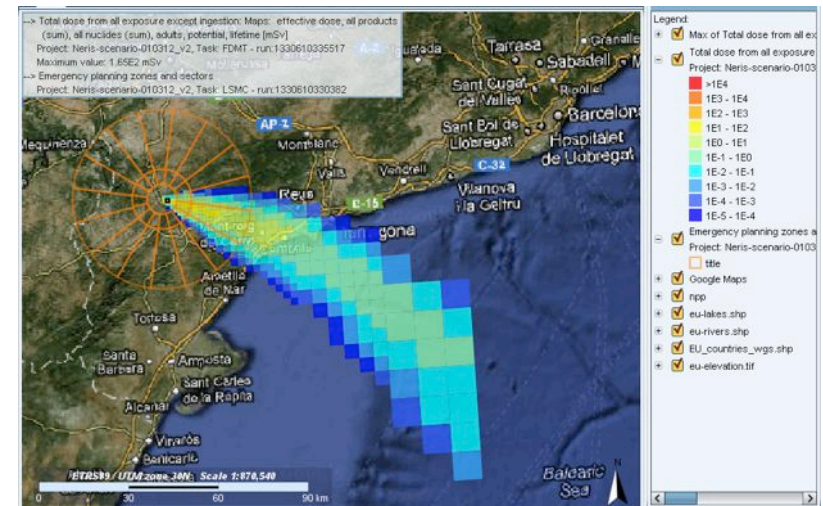
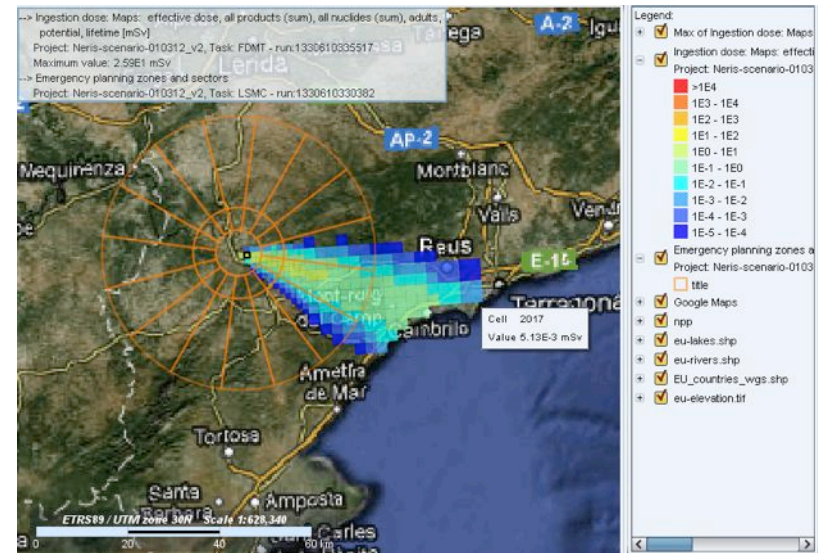


- Run data and options
  - Model chain: **LSMC+EMERSIM+DEPOM+FDMT**
  - Start and duration of release: **23.01.2012 08:00 [CEST]; 2 h**
  - Scope and calculation step: **24 h; 60 min**
  - Parameters for atmospheric dispersion (LSMC)
    - Dispersion Model: **RIMPUFF**
    - Height of release : **10 m**
    - Land use data: **RoGIS**
  - Source of meteorological data
    - Numerical weather predictions (NWP) from : **Actual data at 23.01.2012 06:00 [UTC] (servir for Ascó/Vandellós zone from AEMET)**
  - Calculation Nuclides: **From Source term estimated with RASCAL**
  - Calculation area
    - Radius: **40 km**
    - Inner width of the mesh cell of calculation: **500 m**



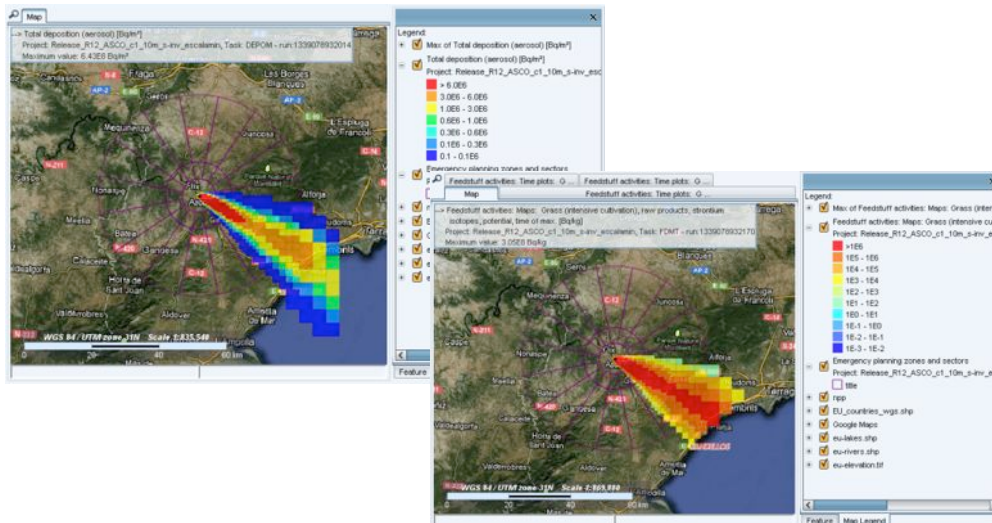
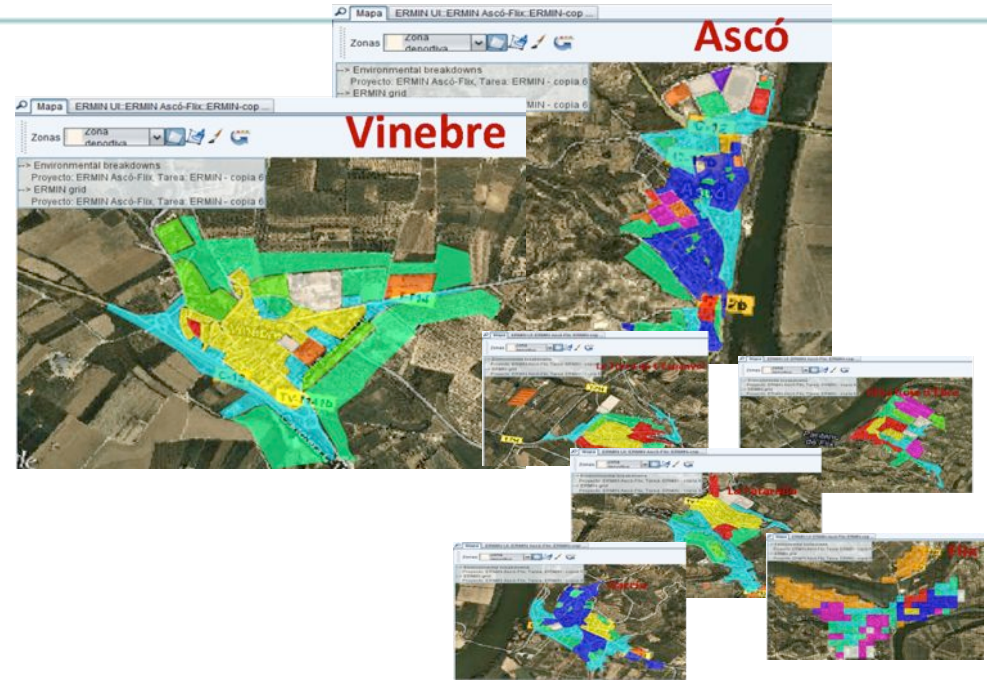
## Results

- Atmospheric dispersion
  - Instantaneous concentration in the air;
    - Time of passage of the cloud.
  - Integrated concentration in air;
- Soil deposition (Bq/m<sup>2</sup>)
- Radiological impact
  - Effective dose from external exposure and inhalation
  - Ingestion dose, lifetime, mSv
  - Total doses from all exposure except ingestion, lifetime, mSv
  - Zones for preventive actions and for long term interventions.





- Selection of vulnerable areas regarding response to radiological impact.
- Assessment of the possible actions to avoid and / or reduce the radiological impact on the population of the affected areas.



- Using:
- ERMIN model for urban areas
- AgriCP model for agricultural areas.

