

TERRITORIES Library Database TLD (D9.59)

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Introduction

The purpose of the TLD is to provide a repository for measurements of environmental activity concentrations and dose rates that have been made at sites contaminated with radioactive material. The intention is to use these measurements to investigate the effectiveness of different monitoring strategies for characterising the contamination at a site and if possible to show the impact of any attempted remediation. In addition, the data held in the TLD can be used to validate models and to investigate the improvements in predictive power obtained through model development.

The TLD will be made available as a resource to future studies beyond the lifetime of the TERRITORIES project both as a source of existing data and as a repository for new data. Details of how the current data can be accessed and how new data can be added are provided in the accompanying report (Smith, 2019).

Database design

The TLD was created using the Firebird open source database developer software and a user interface to facilitate data entry was written using Delphi™. When designing the TLD a number of factors were considered:

- Intended use of the data
- Convenience of data entry
- Transparent and repeatable process for data entry
- Segregation of data eg by site and survey
- Convenience of data extraction
- Security of data
- Version control

Datasets included in TLD:

The method for entering data into the TLD was designed to be convenient and, where possible, automated to reduce effort and the chance of introducing errors (Figure 1).

The datasets currently include:

- NORM site, Belgium (SCK•CEN)
- Fukushima forests, Japan (IRSN)
- Fukushima airborne gamma ray surveys, Japan (IRSN)
- Fen site, Norway (NRPA)
- Radioactive particles on beaches near to the Sellafield site, UK (PHE)
- Sellafield routine monitoring, UK (PHE)
- Rontok Lake, Poland (IRSN)

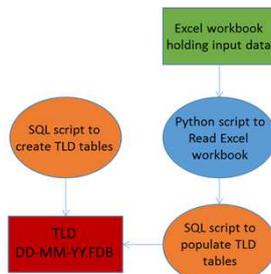


Figure 1 : Schematic of process for entering data into the TLD.

Results

A selection of results from the TLD is presented below. In some cases the TLD data have been loaded into a geographical information system to display them on a map.

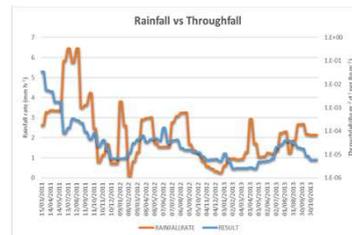
Belgian NORM site

Installed a monitoring station at a pine forest sited atop a CaF₂ sludge from the phosphate industry. Seasonal campaigns to measure ²¹⁰Pb, ²¹⁰Po, ²²⁶Ra and ²³⁸U in soil and tree parts. Instrumented trees measuring light, sap flow, rainfall and temperature. Scenario for model testing and validation.



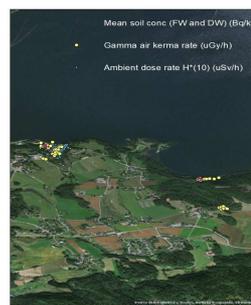
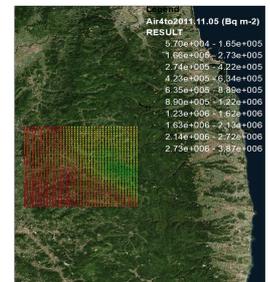
Fukushima forests

Radiocaesium contamination data acquired in Japanese forests contaminated by atmospheric fallout from the Fukushima Daiichi nuclear accident. Dataset includes site averaged activity concentrations in trees and soils and depuration rates. These data have been used to validate the TREE4 model. A database query has been used to extract the throughfall (precipitation penetrating through the canopy and reaches the soil) and rainfall rate for the same time period.



Fukushima deposition survey

Radiocaesium deposition onto the ground was measured during airborne gamma-ray surveys. These were performed periodically following the accident up to a distance of 80 km from the FDNPP. A database query has been used here to extract deposition measurements for Test site T1, Survey 4 on 5 Nov 2011.



Norwegian fen site

External dose rates and activity concentrations in biota and soil were taken from several studies. This map shows all the soil concentrations and external dose rates held in the TLD. Further database queries were refined to identify where external dose rates and soil concentrations are co-located for input to the model validation process.

Radioactive particles on beaches near to the Sellafield site

This database query shows the location and activity of 'beta-rich' finds along Sellafield coast. Beta-rich indicates that ¹³⁷Cs activity is greater than the ²⁴¹Am activity. These data were used in the validation of the AMIS marine dispersion model.



Summary

Measurement data characterising the radioactive contamination at several sites has been entered into the TLD. This data has been used in the TERRITORIES project to give a practical demonstration of how model performance can be assessed. Details of the model validation process are given in Brown (2019).

References

- Smith J., et al. D9.59 - Radiological state database of sites, TERRITORIES Deliverable. <https://territories.eu/publications>
Brown J., et al. D9.61 - Guidance to select level of complexity, TERRITORIES Deliverable. <https://territories.eu/publications>

Database user interface:

Quick links to measurement details eg sample type, measurement technique, quantities measured

SAMPLEREFERENCE	LATITUDE	LONGITUDE	SAMPLEDATE	SAMPLENAME	ALTITUDE_1
S_X_6	59.28165	9.2861	01/07/2010	Ambient	
S_V_10	59.2819	9.286417	01/07/2010	Ambient	
S_V_13	59.28185	9.286567	01/07/2010	Ambient	
S_X00_12	59.28178	9.286917	01/07/2010	Ambient	
S_X0_11	59.2817	9.2863	01/07/2010	Ambient	
Ss_3_9	59.28127	9.287617	01/07/2010	Ambient	
Ss_1_7	59.28088	9.287467	01/07/2010	Ambient	
Sm_1_4	59.28062	9.28715	01/07/2010	Ambient	
Sm_2_5	59.28038	9.287333	01/07/2010	Ambient	
Ss_2_8	59.28078	9.287633	01/07/2010	Ambient	

Output for chosen Site-Survey-Survey Data or for SQL query entered