Minutes of the "European Geogenic Radon Map (EGRM)" round-table discussions, held within the "11th International Workshop on the Geological Aspects of Radon Risk Mapping"

Date: Thursday, September 20th 2012, 9:00 – 13:00
Place: Prague, DAP hotel

Authors: Valeria Gruber and Tore Tollefsen, JRC

Participants:

See the list of participants in Annex 1.

General

In the frame of the "11th International Workshop on the Geological Aspects of Radon Risk Mapping" the organizers had scheduled round-table discussions for the "European Geogenic Radon Map (EGRM)". Started in 2008 and coordinated by the JRC in close cooperation with national experts, the EGRM project has held 4 expert group meetings since then. The round-table discussions at the Prague workshop marked the 5th expert group meeting, but the discussions were open to all workshop participants. The Agenda and Topics for the round-table were proposed by the JRC (REM group) in collaboration with the workshop organizers. On one hand, they aimed to address general issues for the EGRM, which are not only constrained to Europe, but will also be of importance to any others who may do a similar project, so as to give all participants the possibility to contribute with their comments. On the other hand we tried to include some specific technical questions/topics which are necessary to continue with the EGRM and define Action Items (AIs) for the experts.

As the work for the EGRM is not funded, it counts on the interest, motivation and availability of the experts in the field. Some experts remarked that even if the EGRM project has no funding, it would help if the project gains a more official character. To support the experts in this endeavour, and to motivate the institutions to allocate a regular working time to the experts devoted to the EGRM, the JRC proposed to prepare a letter of intent to the national authorities. This letter should inform them about the importance of the EGRM within the "European Atlas of Natural Radiation" project, and how it could help the Member States to identify radon-prone areas for their radon action plans (which will be mandatory under the new Euratom Basic Safety Standards Directive) ($\rightarrow$ **AI No. 13**).

Agenda

In general the discussions followed the proposed agenda, even if the topics, being strongly related, were not strictly discussed in the order listed in the Agenda.
For the detailed Agenda, see Annex 2.

The Agenda, these Minutes and the material prepared for discussions can be downloaded from the restricted REM webpage:
https://rem.jrc.ec.europa.eu/RemWeb/REmDbRestricted/Browse.aspx?path=\Geogenic%20Radon\Radon%20Workshop%20Prague%202012

Session 1: Geological classification – general (approx. 9:00-11:00)

Tore Tollefsen (chair), JRC, introduced the aim of the round-table discussions and presented the topics planned for discussion, which were accepted by the participants.

(a): Advantages and Disadvantages of only geology classification and "risk" classification:

The "geological" and "radiological" classification approaches were briefly introduced by *Peter Bossew*.

Several speakers (*Ivan Barnet, Matej Neznal, Harry Friedmann, Luis Neves, François Tondeur*) mentioned that the idea of a geogenic map is to exclude anthropogenic factors, which is not the case for the radiological approach, and was considered to be too similar to the indoor radon map. But in the end a risk map will be interesting, and transfer models are needed (*Peter Bossew*).

Proposal from *Boris Dehandschutter / Harry Friedmann / Luis Neves*: Since transfer models are country- or region-specific (due to the regional variability of the anthropogenic factors which enter the transfer model), countries or regions should be free to establish their transfer models, allowing a region-specific interpretation of the "geo"-classes. But there could possibly be a problem with inconsistency across borders in case that a geo-unit crosses a border but different transfer models are being applied on either side (*Peter Bossew*).

(b) How to define class limits?

No answers could be found at the moment for this question/topic.

(c) OneGeology as basis for EGRM

We should continue to use it, because we do not have an alternative. Countries which do not participate to the OneGeology project should contact their national geological survey, try to obtain an electronic map with polygons, and then adapt it to OneGeology. (For more details see Session 2.)

(d)/(e): How can classification of geo-units be done?

Boris Dehandschutter mentioned that classifying a geo-unit by soil gas only can be done by maybe 3 countries (Germany, Czech Republic, some parts of Belgium) which appear to have enough data. *Marc Smethurst* pointed out that in most cases (like Norway) not enough data are available to classify geology, and then we have to learn about geology by comparing with indoor data (which means the radiological approach).

Transfer models are available for some pairs of quantities or variables (*Peter Bossew*), and the countries should find a way to define transfer models from their data to RP, which should be the target variable (→ **AI No. 1**). *Tore Tollefsen* reminded participants that some time ago we started to compile lists of data available in the countries and whether transfer models are available (see the restricted REM-webpage and update for your country if necessary (→ **AI No. 2**)).

Boris Dehandschutter and *Valeria Gruber* mentioned that using transfer models in a scheme of Rn classes is what was discussed as "classification approach" in a next step on the way to the EGRM, and is not the first step of "only geological classified trail map" anymore. The geogenic database (see later) should be used for collecting all available and relevant data and then classifying the units based on the data.

For the problem of variability within geological units, e.g. granites, the OneGeology classification is not sufficiently detailed. But there is the possibility to take into account special geological features in the geogenic database (*Harry Friedmann*). *Peter Bossew* asked in case variability within units appears unacceptably high for the purpose of using the geology units as predictors, should we then better abandon the geogenic Radon map which is purely based on geology? *Matej Neznal* pointed out that the geology-based map is only a first step and has to be refined in any case to become a geogenic map. *Boris Dehandschutter* proposed as an Action Item, that it is the task of the countries to take the polygons of the OneGeology database and classify them (→ **AI No. 3**), see also Session 2.

Contribution by non-European countries:
Ryoko Fujiyoshi: In Japan no real radon problem exists, so mapping is therefore not an issue.
Khalid A. Bankher from Saudi Arabia informed that geological information is used as a first step, but geological units are classified based on radiometric survey and geochemistry.

Conclusions from Session 1:
There seems to be a kind of consensus that the "geological" classification concept is preferable for the geogenic map, but participants should try to link it to a risk-related quantity. The problem of within-unit variability is still a point of discussion and not solved, and clearly limits the power of using geology (classified by standard geology legends) alone as a RP predictor.
Therefore, in parallel the geogenic database should be filled with specific data for classification (see Session 3). Countries have to develop their own transfer models to estimate the Neznal RP target variable from their data (→ **AIs No. 1, 2**)
OneGeology should be used as a basis for the EGRM because we have no alternative. Countries which are not part of the OneGeology project have to use the geology maps available in electronic format and adapt the geological units to OneGeology (→ **AIs No. 4, 5, 6, 7**)

Terminology:
In his proposal, *Peter Bossew* used the term "geology units" for polygons and "geology type" for a set of units with the same attribute. After some discussion it was decided to use:
Polygons – every single geo-referenced closed area in the database/map;
Geology units – set of polygons with the same geological attribute, also if not connected

Session 2: Geological Classification – Homework (approx. 11:15-12:00)

OneGeology:
Countries which are not part of the OneGeology project should contact the national geological survey and try to get an electronic map with polygons. *Suggestion:* If needed, the national experts could contact their geological survey with the help of JRC (→ **AI No. 4**). *Ivan Barnet* mentioned that a geological map for Switzerland is downloadable from the internet. *Georg Kropat* will check it and otherwise try to find out, if a map is available and the responsible for it (→ **AI No. 5**). *Harry Friedmann* mentioned that an electronic geological map of Austria is available in different projections, and that he will work on it (→ **AI No. 6**). The national geological maps should then be adapted to OneGeology classification/terminology (→ **AI No. 7**).

Krista Täth-Kok: For Estonia, no bedrock data are available from the OneGeology classification , only "quaternary", so for radon classification national geological maps will also have to be used.

Proposal: The base for classification should be (where available) the OneGeology polygons; where necessary other classification (e.g. Kemski classification for Germany) can be used on top of it, but should also be based on OneGeology polygons to have a clear database/mapping basis.

To link the geogenic radon database (see Session 3) to the OneGeology shp-files, a clear code/name has to be assigned to all polygons in the shp files; therefore the shp-files have to be modified (→ **AI No. 8,** see also Session 3). These modified shp-files should be made available to the experts for further use, e.g. uploaded to the restricted REM webpage (→ **AI No. 9**).

Question: If the countries have data/maps available in more detail than the 1:1Mio OneGeology scale, should they downscale them? Conclusion: In principle yes, but if more detailed maps are provided, that is ok too.

Geo-unit classification:
Suggestion *Boris Dehandschutter*: Countries should have their own 4 classes for classification (based on whatever data they have) and then compare with the ones which where proposed in the geo-unit list provided/discussed by *Peter Bossew* and *Valeria Gruber* in session 1 (a) (downloadable from restricted REM webpage). If pairs of classes differ between the national classification and the geo-unit list, the experts should have a detailed look at them, and explain why they are not the same (make a "conversion" table).
Objection/discussion point: How to define the classes then?

Discussion for first step: The experts should have a look at the radon-classified geo-units based on the OneGeology classification, and calibrated with the German data (method explained by by Peter Bossew during the workshop, with presentation and paper downloadable from the restricted REM webpage) and check the plausibility. If necessary, they should improve it and classify the geological units not already classified, in order to have an improved and more complete "first trial geogenic map", based on geology only (→ **AI No. 10**).
In parallel the experts should start to fill the geogenic database with their available data, based on the OneGeology polygons (see Session 3 and AIs No. 8 and 9 above) (→ **AI No. 11).**

Session 3: Geogenic radon database – multivariate classification approach (approx. 12:00-12:45)

Valeria Gruber demonstrated the template for the Geogenic radon database.
For discussion: Every polygon needs a unique code (e.g. BE1) for all polygons which belong to one unit (code still has to be defined (→ **AI No. 8)).** If some polygons need to be treated differently (e.g. faults, special geological features), they can be included in the database with modified code (e.g. BE1_1) and characterized in detail.

The experts should still check the template and database, and whether the proposed fields are sufficient and whether the template is useable. Comments should be given to the JRC (→ **AI No. 12**).

Question: If a database with all the data already exists in a country (e.g. Norway), is it still necessary to use the template? How can data be transferred to the geogenic database in the most efficient way? – Solution/suggestion: The experts should check this case-by-case with the JRC informatics colleagues responsible for the development of the geogenic radon

Action items

No.	What	Who	Deadline (TBC)
1	Define Transfer models from countries data to Radon Potential (RP) for classification and continuous approach	Experts of the Countries	-
2	Update list of available variables/data in countries and inform JRC about available transfer models	Experts of the Countries	Mid December 2012
3	Classify OneGeology Polygons in a simple way according to "First Trial Map proposal"	Experts of the Countries	Mid December 2012
4	Organise an electronic version of a geology map (e.g. contact their geological survey, Internet, etc.)	Experts of the non-OneGeology countries, if necessary with help from JRC	December 2012
5	Check availability of Swiss geological map	Georg Kropat/Switzerland, with help of Ivan Barnet if needed	December 2012
6	Check availability of Austrian geological map, if necessary reproject/adapt it	Harry Friedmann	December 2012
7	Adapt national geology maps to OneGeology classification/terminology	Experts of the Non-OneGeology countries	February 2013
8	Define clearly unique code how to name the polygons in OneGeology database which belong to one unit to connect it clearly with the radon database and insert it in the shp-files	JRC, together with the experts (Boris Dehandschutter, Harry Friedmann)	November 2012
9	Make the modified shp-files available to the experts	JRC	End of November 2012
10	Check radon classification based on Peter Bossew's method and improve/complete the OneGeology-geo units for your country	Experts of the Countries	November 2012

11	Fill Geogenic Radon database with available data based on OneGeology polygons/classification for your country (see AIs No. 8, 9)	Experts of the Countries	From 2013 onwards
12	Check Geogenic radon database template for usability and completeness of database fields	Experts of the Countries	November 2012
13	Letter of intent to national authorities about EGRM project	JRC	End of 2012

Annex 1

List of participants

Last name	First name	Affiliation	Country	E-mail
Aït-Ziane	Mounir	Centre de Recherche Nucléaire d'Alger	Algeria	aitzianemounir@yahoo.fr
Alashy	Ehab A.	Saudi Geological Survey	Saudi Arabia	ashy.ea@sgs.org.sa
Baixeras	Carmen	Universitat Autonòma Barcelona	Spain	carmen.baixeras@uab.cat
Bankher	Khalid A.	Saudi Geological Survey	Saudi Arabia	bankher.ka@sgs.org.sa
Barnet	Ivan	Czech Geological Survey	Czech Republic	ivan.barnet@geology.cz
Bossew	Peter	Bundesamt für Strahlenschutz	Germany	pbossew@bfs.de
Buompane	Raffaele	Seconda Università di Napoli	Italy	raffaele.buompane@unina2.it
Burghele	Bety-Denissa	Babes-Bolyai University, Cluj	Romania	burghele.bety@ubbcluj.ro
Chmill	Valery	University of Insubria	Italy	chmill@albanova.se
Cinelli	Giorgia	University of Bologna	Italy	giorgiacinelli@gmail.com
Cosma	Constantin	Babes-Bolyai University, Cluj	Romania	constantin.cosma@ubbcluj.ro
Cryer	Scott	CARST	Canada	scryer@pinchin.com
Dehandschutter	Boris	FANC	Belgium	boris.dehandschutter@fanc.fgov.be
Dody	Avraham	Ben Gurion University	Israel	dodik@post.bgu.ac.il
Finne	Ingvild E.	Norwegian Radiation Protection Authority	Norway	ingvild.finne@nrpa.no
Font	Lluis	Universitat Autonòma Barcelona	Spain	lluis.font@uab.cat
Friedmann	Harry	University of Vienna	Austria	harry.friedmann@univie.ac.at
Fujiyoshi	Ryoko	Hokkaido University	Japan	fuji@eng.hokudai.ac.jp
Ganerød	Guri	Geological Survey of Norway	Norway	guri.ganerod@ngu.no
Gregorič	Asta	Jožef Stefan Institute	Slovenia	asta.gregoric@ijs.si
Gruber	Valeria	European Commission	Italy	valeria.gruber@jrc.ec.europa.eu
Guillevic	Jerome	IRSN	France	jerome.guillevic@irsn.fr
Ielsch	Geraldine	IRSN	France	geraldine.ielsch@irsn.fr

Last name	First name	Affiliation	Country	E-mail
Kaltz	Andrea	LfULG, Saxony	Germany	andrea.kaltz@smul.sachsen.de
Kozak	Krzysztof	Institute of Nuclear Physics PAN	Poland	krzysztof.kozak@ifj.edu.pl
Kropat	Georg	IRA-Lausanne	Switzerland	georg.kropat@unil.ch
Licour	Caroline	ISIB, Brussels	Belgium	licour@isib.be
Matolin	Milan	Charles University of Prague	Czech Republic	matolin@natur.cuni.cz
Mattone	Cristina	Istituto Nazionale di Fisico Nucleare	Italy	mattone@na.infn.it
Mazur	Jadwiga	Institute of Nuclear Physics PAN	Poland	jadwiga.mazur@ifj.edu.pl
Moldovan	Mircea	Babes-Bolyai University, Cluj	Romania	mircea.moldovan@ubbcluj.ro
Nakajima	Tomo	University of Tsukuba	Japan	s1120062@u.tsukuba.ac.jp
Neves	Luis	University of Coimbra	Portugal	luisneves@dct.uc.pt
Neznal	Matej	RADON v.o.s	Czech Republic	radon@comp.cz
Niida	Takafumi	University of Tsukuba	Japan	s1030089@u.tsukuba.ac.jp
Nocchi	Gianni	Student observer	Italy	gianni_nocchi@yahoo.it
Papp	Botond	Babes-Bolyai University, Cluj	Romania	papp.botond@ubbcluj.ro
Quindós-Poncela	Luis Santiago	University of Cantabria	Spain	quindosl@unican.es
Roca	Vincenzo	Istituto Nazionale di Fisico Nucleare	Italy	roca@na.infn.it
Sabbarese	Carlo	Seconda Università di Napoli	Italy	carlo.sabbarese@unina2.it
Smethurst	Mark	University of Exeter	United Kingdom	m.a.smethurst@exeter.ac.uk
Täht-Kok	Krista	Geological Survey of Estonia	Estonia	krista@egk.ee
Tollefsen	Tore	European Commission	Italy	tore.tollefsen@jrc.ec.europa.eu
Tommasino	Luigi	Consultant	Italy	ltommasino@gmail.com
Tondeur	Francois	ISIB, Brussels	Belgium	tondeur@isib.be
Vaupotič	Janja	Jožef Stefan Institute	Slovenia	janja.vaupotic@ijs.si
Wåhlin	Erik	Swedish Radiation Safety Authority	Sweden	erik.wahlin@ssm.se
Wurm	Gernot	AGES	Austria	gernot.wurm@ages.at

Round table discussion – European Geogenic Radon Map - Agenda
Thursday, September 20th
9:00 – 14:00, including coffee break

9:00-11:00
Geological classification - general
(based on the presentations on this topic - Tuesday morning session)

- (a) Given the approach of a geogenic Rn map, based only on geology: Advantages / Disadvantages of only geological classification and "risk" classification (based on example for Trial EGRM and Germany); here we propose to discuss whether the *classification logic* is reasonable, i.e. how classes are defined conceptually; or which alternatives may exist.

- (b) Once a logic is chosen, one has to define the *class limits* numerically.

- (c) OneGeology as a basis for EGRM– useable for our purpose, or how can we adapt it for better usability. What could be alternatives to use?

- (d) Proposal of classifying geo-types (according to presentation by Peter) – useable? Practical? Feasible? How to improve?.

- (e) How to "calibrate" geo-types? Here we propose to discuss the *method*, or algorithm, how to assign data into defined classes. This topic should identify ways, how available data can be used to do the job of assigning a certain class level to a geo-type. (The classes were defined in (b), the types in (c+d).)

Remark: these topics are not constrained to the European project; the same questions will appear wherever a geology-based geogenic Rn map shall be produced. The above list pretends to show the logical order of the questions but does not mean that the issues must necessarily be discussed in that order.

11:00-12:00
Geological classification – Homeworks

- If stay with OneGeology – what about non-participants? – How can these countries contribute without participating in OneGeology? Identify countries and experts who could work on it

- Homework for the experts: Identify geo-type with the ones which have already been classified (=currently mainly DE types); geo-types not yet included must be calibrated.

- Homework: countries which have no RP data but other datasets: must develop transfer models.

Remark: this section is somewhat more specific, because here probably European peculiarities will be given especial attention.

12:00-14:00
Geogenic radon database – multivariate classification approach
(discussions mainly about the template/draft for the European geogenic radon database)

- General - are fields for database sufficient and is template usable?

- More detailed clarification how to define some of the fields (e.g. special geological features %, quality measures,…(to be defined). A particular question which has so far resisted to be solved is how to include tectonic features such as fault line, into defining a local (which in European scale still means a relative large area) measure of the radon potential.

- How should the "geological units" be clearly named (e.g. country code + geology unit +?) to be a clear "primary code" in the database and for processing. How can the data/units clearly be linked to the OneGeology polygons or in another way geo-referenced?

- Homework: Which countries/experts could fill it already (for testing and improving)?

- Processing/using of the data in the database – possible to adopt for other countries with no/less data?