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METHODOLOGY OF THE TEMPLATES DEVELOPMENT FOR A JOINT RESEARCH CENTRE TENDER TO BULGARIAN ACADEMY OF SCIENCES

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Key words*: Templates, natural hazards, measures/practices, risk reduction.*

Abstract: *The survey presents the results of the creation and development of the templates consisting of measures and practices of the risk reduction. These templates present the synthesized expert knowledge about the risk reduction measures and practices used in different countries. The target is to display in front of the public the efficient actions of the societies about the natural hazards risk prevention and mitigation.*

General considerations

The JRC tender about the natural hazards measures and practices for the reduction of the negative natural hazards effects was announces as a practice supporting the NEDIES hyperbase of data and information. Following the international cooperation and experience of the Japanese developed measures, the JRC action is focused more on the EU members and the new member states.

The suggested templates went trough the clarification process improving their formulated topics and content. Finally the expert decision was adopted to have separate templates about the interested natural hazards (earthquakes, landslides, floods and storms) and the implemented measures and practices for the decrease of the negative effects.

In the first general template (Hazard Template) several main topics are included:

- hazard name,
- impact elements (impact mechanism, impact effects),
- hazard measuring scales (units, ranges of impacts),
- destructive potential,
- time duration,
- impact area,
- potential of secondary negative impacts (types of secondary negative effects, potential of generating NATECH – natural hazards triggering technological)
- most important web sites containing the respective most essential information

The specific measures and practices template considers:

- the data and information about the type of the measure, description
- the source of information
- the positive and possible negative effects
- the availability and applicability of the measure/practice
- the technical specifications and implementation – know-how, prerequisites, costs, NATECH possibilities, cost/benefit ratio, etc.
- case studies
- the target groups (end-users)
- experts opinions and publications
- future development and international perspectives

The fulfilment is done by the experts in the different hazards fields. Both parts consist of tables, templates, explanatory texts, illustrations. The web based platforms including similar and/or more detailed information are incorporated at the respective positions on the template.

The templates information can be used by the decision makers, Civil Defence managers, local and governmental authorities in EU and world wide.

Examples

The each hazard template was developed focusing on the specific elements to the respective disaster. The text is like an explanatory note and considers the most important elements of the hazard. The template itself consists of synthesized information given at the explanatory text. Each considered hazard (they are four – earthquakes, floods, landslides and storms) has the same structure: Hazard part (text and template itself) and Measures/practices part (again constructed by the explanation text and templates themselves)

Below several examples of different hazards and measures/practices are presented as examples. The selection of the examples is made on the occasional principle and no specific requirements are considered. The measures/practices could be more instructive as well as more technical. This depends of the measure itself. Some of the measures present more graphical, others – more textual material. The grouping of the different parts in the templates is made on the principle of easy acceptance of the data by the end user. Some of the templates are constructed and fulfilled in the way permitting collection of similar data and information about the direct implementation and use.

This approach permits the easy information use by the implementing bodies, end users and application bodies as well as by the consultants and decision makers. The case studies presented show the internationally recognized recent practices/measures and their detail description and application. The references usually present the methodological parts as well as some case studies with the fundamental improvements.

Conclusion

The developed templates are the first step to the creation of a data and information hyperbase of the synthesized knowledge about the natural hazards and measures against their negative impacts. Some of the practices have more theoretical background, some measures – more technical and practical direction. The general idea is to perform fast and effective tool for information search about the preliminary orientation of the end users and in depth study, if some of them need to go deeper to the implementation practice.

The template of the seismic hazard example

SEISMIC HAZARD TEMPLATE	
1. Hazard Name	Seismic (earthquake)
2. The impact elements	Shaking (Vibrations), ruptures, liquefaction etc.
2a. Impact mechanism	P (primary), S (secondary) and (surface-L, R) seismic waves propagation - see explanatory text)
2b. Impact effects	Damages and collapse of building constructions, infrastructure elements - bridges, railways etc.; cut-offs of life-lines, breaking of water and power supplies, casualties etc.
3. Hazard Measuring Scales	Magnitude (Richter), Intensity (EMS-European), MSK (former East European countries and USSR), MM(US), Omory (Japan), etc.), Acceleration - see explanatory text
3a. Units	degrees (for intensity); m/s*2 (for acceleration); magnitude scale is dimensionless
3b. Hazardous Ranges of the Impacts	Intensity more than: V-VI(EMS)-light damages; VII-VIII - average damages; more than IX(EMS)-heavy damages. Acceleration: 0.05-0.1-light damages; 0.1-0.15-average damages, more then 0.15 - heavy damages. The magnitude scale is dimensionless.
4. Destructive potential – (low, medium, high)	Could be low-medium-high depending on the magnitude and on the hypocenter depth
5. Time duration (in min)	10*0-10*1 - depending on the magnitude of the strong seismic event
6. Impact Area (in km^2)	10*1-10*5 - depending on the magnitude
7. Potential of Secondary Negative Impacts	Yes
7a. Types of secondary effects	Aftershocks, Tsunamis, Landslides, Rockfalls, Avalanches, Liquefaction, Earth cracks.
7b. Potential to generate NATECH	Depends on the power of the earthquake, on the generated secondary effects and on the affected facilities. They could be: Contamination after destruction of specific industrial units, cut-offs of gas and oil pipe-lines; fires (blasts); floods etc.

The seismic zonation template example

Seismic zonation template	
A. Descriptive Part	
1. Title of measure	Seismic zonation
2. Type of measure	Preventive measure
3. Reference to hazard	Earthquake (Seismic)
4. Description	Mapping of the potentially dangerous seismic effects concerning Mmax, recurrence periods, geometry and location of the source zones, etc. The output is a map of the expected seismic acceleration (intensity) for a certain time period (see the text).

B. Technical Part	
1. Compiler	
1.1 Name & Organization	BAS, Boyko Ranguelov, GFI
1.2 Contact coordinates	boyko.ranguelov@geophys.bas.bg
2. Availability	
2.1 Copyrights & ownerships	Internationally recognized practice, [GSHAP Project (Global), EMSH Map (Europe and the Mediterranean)] - Regional - http://wija.ija.csic.es/gt/earthquakes/]
2.2 Costs [EURO]	100, IASPEI manual, http://www.gfz-potsdam.de/bib/nmsop_formular.html
2.3 Publications	[1], [2]*
2.4 Reference case studies	A regional example - Europe-Meditterranean region - seismic hazard map, http://wija.ija.csic.es/gt/earthquakes/, for local applications and examples - Romania [4]* - seismic hazard map (http://www.infp.ro/images/Fig5.gif), Greece - seismic hazard map -http://www.itsak.gr/englishstart.htm etc.
2.5 Future Development & Research	development of new methodologies about the megacities-http://www-megacities.physik.uni-karlsruhe.de/www-mega/div_index.php, incorporation of the new data about the risk reduction- http://www.emsc-csem.org/Html/JSOP_main.html etc.
3. Applicability	
3.1 Costs [EURO]	10*4-10*5
3.2 Know-how [needed]	Yes - the measure needs special knowledge
3.3 Training	Yes - the institutions, which put the measure into practice, must be trained
3.4 Context [when and where to use it]	In seismic prone areas on regional or local level
3.5 Side effects [undesired …]	only positive effects are; undesired effects are not observed and expected
3.6 Case studies [whether is already installed/tested]	Europe, Mediterranean Region - http://wija.ija.csic.es/gt/earthquakes/, Bulgaria, Italy - http://gndt.ingv.it/SAVE/SAVE_english_finale
3.7 Expert reports	For example - [3]*
4. Usability	
4.1 Effects Obtained	seismic hazard mitigation, appropriate land use planning, population and infrastructure protection
4.2 End users & target groups	Civil Defence, decision makers, building constructors and designers, official authorities, land use planers, population
4.3 Efficiency (cost/means ratio)	high - 1:10-1:10*3
4.4 Links to other measures	seismic microzonation, vulnerability and risk assessment, secondary effects assessment, population protection
4.5 Renewal & Revision Periods	Usually every 10-15 years
4.6 International perspective	Yes-large, to avoid discrepancies on the countries border regions
5. Implementation	
5.1 Technical prerequisites	It is strongly required to have data about seismic sources, seismotectonics, earthquake recurrence data, cadastre information. Specific software, etc.
5.2 Time [needed]	Months
5.3 Training	Yes - for the implementing organizations
5.4 Human resources [needed]	10-12 manmonths, if all the seismological and geology data is collected and processed
5.5 Performing body	Scientific institutions, laboratories, more rarely - private companies
5.6 Description of technical implementation	Mapping of expected ground acceleration (seismic intensity) and layering the obtained maps to different GIS layers, etc., Rules and codes for building designers (For the EUROCODE8 the reference time periods are 475 and 50 years respectively)
*[1] D. Giardini, M.-J. Jiménez and G. Grunthal, 2003, The ESC-SESAME Unified Hazard Model for the European-Mediterranean Region, EMSC/CSEM Newsletter, 19, 2-4.; [2] McGuire R., 1993, Computat. of seismic hazard., Ann. di Geofis., 36, p.153-168.; [3]. Giardini, M.-J. Jiménez and G. Grunthal, 2001., Unified seismic hazard modeling throughout the Mediterranean region, Boll. Geof. Teor. Appl., 42, 3-18,	

The landslides hazard template example

LANDSLIDES	
1. Hazard Name	Landslides - gravitational hazard (includes dry (rockfalls) and wet (mudflows) slides, demolitions, sinking of terrains, subsidence, etc.)
2. The impact elements	Transformations of the slopes, fissures, collapses, swamping etc.
2a. Impact mechanism	Mass movements of rock and soil formations
2b. Impact effects	Fission of the earth's surface, destruction of the infrastructure connections, etc
3. Hazard Measuring Scales	No unified scale – area, volumes and velocity of the movements are frequent in use
3a. Units	km^2 (about area coverage); m^3 (about mass moved)
3b. Hazardous Ranges of the Impacts	Light to heavy damages

4. Destructive potential – (low, medium, high)	Low-medium-high - depending on the area, volume, velocity intensity (magnitude) of the event
5. Time duration (in min)	1 - 1500
6. Impact Area (in m2)	10^1-10^5
7. Potential of Secondary Negative Impacts	Yes – strong
7a. Types of secondary effects	Slope formations movements, terrain falls, lowering of terrains, rock accumulations, swamping, peat-bog formations
7b. Potential to generate NATECH	Destruction of residential and industrial buildings, cultural and historical monuments etc.; cut-offs of roads and railways nets, water supply and sewer pipes, gas and oil pipes, electricity networks etc; human casualties and social tension, breaking of the foods, medications and water supply; environmental damages – water and soil pollutions, fires.

The measure of slopes stabilization template example

SLOPE STABILIZATION MEASURE	
A. Descriptive Part	
1. Title of measure	Slope stabilization
2. Type of measure	Preventive and protective practice
3. Reference to hazard	Landslide hazard
4. Description	Engineering-technical actions, hydrologic and hydrotechnical draining of surface and underground waters, building of barrages, anchors and supporting walls; Application of nets, cells, pilots and micro pilots; Construction of counter embankments, port's embankments, dikes, tetrapods, etc
B. Technical Part	
1. Compiler	
1.1 Name & Organization	Assoc.Prof. Georgi Alexiev, BAS, Institute of Geography
1.2 Contact coordinates	Alexievg@bas.bg
2. Availability	
2.1 Copyrights & ownerships	International recognized practice (for know-how - Assoc.Prof. Georgi Alexiev, BAS, Institute of Geography)
2.2 Costs[EURO]	10^4
2.3 Publications	[1],[4]*
2.4 Reference installations	There are many applications on the Bulgarian territory: Danube riverside – hydrological and hydrotechnical draining, port's embankments, supporting walls etc. Black sea costal area - hydrological and hydrotechnical draining, port's embankments, dikes, tetrapods, engineering – biological approach. Rock falls along the highways and railways – application of plastic net, cells, anchors, pilots etc.
2.5 Future Development & Research	New technological decisions, new materials, new arrangement and management of the territory etc.
3. Applicability	
3.1 Costs [EURO]	10^4 – 10^7 - Depends on the size and performed measures
3.2 Know-how [needed]	Yes – knowledge about new technologies and new materials
3.3 Training	No
3.4 Context [when and where to use it]	Instability of slopes near transport communications, residential and industrial buildings and installations threaten by landslides; Plans and programmes for management of territorial arrangement on national, regional or local level
3.5 Side effects [undesired …]	Mainly positive effects; there are some negative effects - undesirable changes of the environmental landscape view; water flow changes in locations sensitive to the performed measures etc.
3.6 Installations [whether this measure is already installed and tested]	Bulgarian territory - in the vicinity of roads, railways, coastal areas etc.
3.7 Expert reports	[2],[3],[4]*
4. Usability	
4.1 Effects Obtained	Mitigation of gravitational hazard – decreasing of the social – economical

	vulnerability of the society
4.2 End users & target groups	Ministry of regional development and public works, Ministry of state policy of disasters and accidences. regional and local authorities
4.3 Efficiency (cost/means ratio)	1:5
4.4 Links to other measures	Monitoring on the slope stability, vulnerability and risk assessment, secondary effects assessment stabilization of the slopes.
4.5 Renewal & Revision periods	Permanent measure, especially after an increase of landslide activity
4.6 International perspective	Yes - large, it is used frequently in other countries
5. Implementation	
5.1 Technical prerequisites	Engineering-technical activities, hydrological and hydrotechnical recovery and upgrade, monitoring on the slope stability, the level of the underground waters, physical and mechanical soil characteristics and properties, specific software, etc.
5.2 Time [needed]	Months
5.3 Human resources [needed]	about 80-100 man-month depending on the measure
5.4 Performing body	Ministry of state policy for disasters and accidents, Geoprotect, Civil Defence, regional and local authorities
5.5 Description of technical implementation	Stabilization of the slopes by walls, barrages, drainage boreholes etc., Moving of infrastructure elements, if necessary; Insurance and monitoring
1. Bruchev I. (editor) 1994. Geological hazard in Bulgaria – Map M 1:500 000 and explanatory text. BAS, CGMR, MTS 2. National Strategy for prediction, prevention and liquidation of the consequences of the landslide's processes in Bulgaria. 1999, MRDPD 3. Landslides processes of Republic of Bulgaria In: Proceedings of the National Scientific-Practical Conference, issued by NC/SCPDDAC, BAS, Sofia, 2000. 4. Protection and long-term stabilization of the slopes of the Black sea coast , BAS, S, 1998	

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