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**Towards Better Protecting Citizens against Disaster Risks:
Strengthening Early Warning Systems in Europe**

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1. BACKGROUND AND SCOPE OF THIS PAPER

This paper should be considered as a reflection paper to stimulate the discussion on steps that the EU can take to advance on the establishment of a detection and early-warning system for tsunamis in the Mediterranean and the Atlantic Ocean.

The Council expressed the wish that the Commission submit proposals on the establishment of a detection and early-warning system for the Indian Ocean, as well as for the Mediterranean and the Atlantic¹. Since then, both the Commission experts and an interservice working group has been created. Also, in July of this year the Presidency organised a seminar on early warning systems. This document takes stock of the on-going debates in these fora, where a growing consensus on how the work can be taken forward has arisen.

It gives specific emphasis to the presentation of ideas that can be implemented without requiring additional budgetary or human resources at Commission level.

The needs identified in this paper, thus, either concern measures falling into the remit of Member States (e.g. improved land use planning), or measures that are already covered by ongoing or foreseen Community programmes / actions, which are included in the official financial programming 2007 – 2013 of the Commission² (e.g. Civil Protection Work Programme 2008). Other ideas simply concern organisational or structural improvements at no-cost basis (e.g. data and information sharing).

By closely involving the existing capacities of various Commission services in a more structured way into the drafting process of this paper, it has also been possible to establish a comprehensive overview of ongoing activities in the area of early warning systems and thus to identify potential synergies between various Commission programmes. This enhanced cooperation across Commission services may contribute to an overall strengthening of the Commission's response capacities during emergencies and lead to more coherence of Commission action.

2. THE CHANGING NATURE OF RISKS

Throughout history, disasters have been a constant source of human suffering. Since the early 20th century natural disasters have claimed some 37 million lives worldwide³ and caused huge

¹ See point 10 of addendum to draft minutes of 2788th meeting of the Council of the European Union (GAERC), held in Brussels on 5 March 2007. 7017/07 Add 1.

² Statement of estimates of the Commission for 2008 – Document V - Financial programming 2008 – 2013 (SEC (2007) 500, May 2007).

³ Main causes: droughts, epidemics, floods. Source: Centre for the Epidemiology of Disasters (CRED).

economic damage, estimated at some 50 bn € per year⁴. Although major disasters like the Indian Ocean tsunami remain exceptional, earthquakes, tsunamis, hurricanes, floods, wild fires, landslides, but also man-made disasters claim lives and property every year.

With a death toll of 230.000 persons, the Indian Ocean tsunami dramatically highlighted the need for effective early warning systems. Had such systems been in place at the time of the event, many lives could have been saved and economic losses reduced.

In the wake of that catastrophe early warning has become more prominent on the political agenda. Concerns were raised about how well Europe would be prepared facing a similar disaster. Natural disasters occur indeed frequently in many European countries, e.g. storms, floods, seismic events and simultaneous forest fires affected several European countries this year, testing the limits of their response capabilities.

Furthermore, as a result of the increased mobility in modern societies, hundreds of thousands of people from dozens of countries are exposed to risks unknown in and geographically far away from their country of origin. From the estimated 9.000 tourists present in the affected Indian Ocean regions at the time of the tsunami, 1385 EU-citizens were killed or missing. The majority of those victims were from Sweden, Finland, Germany, the UK, Austria and Denmark⁵, none of which a tsunami prone country in itself.

One need not travel as far as the Indian Ocean to experience this globalization of risks. 70% of the tourist population along the Portuguese Algarve coast is composed of foreign nationals during the summer period. A similar event there or near any other Mediterranean coastline would inevitably impact citizens and economic assets from many European and Mediterranean countries, given the millions of tourists and local residents in this densely populated region, with large urban agglomerations along its shorelines.

This change in the nature of risks calls for enhanced international cooperation to better protect citizens through timely warnings. Early warning systems will ultimately remain within national responsibility, but they will need to take this complementary European dimension into account.

A recent survey⁶ undertaken by the Civil Protection Unit of the European Commission reveals that all countries in Europe have established warning systems on their territory and thus are able to provide at least a basic layer of protection to their citizens against the most common hazards, including man-made hazards (e.g. radiological). However, the survey also identifies gaps and shortcomings: specific hazards may not be covered, delays for alerts, warning signals may not reach or may not be understood by all persons at risk.

The key gap identified in this process has been the lack of an operational early warning system for tsunamis in the North Eastern Atlantic and Mediterranean area. Therefore, this document gives particular attention to ideas that contribute to the closing of this specific gap. By doing so, it will also complement the activities described in the progress report on the EU Action Plan of January 2005 on earthquakes and tsunamis. The large majority of activities financed by the Commission in this Action Plan had focused on the Indian Ocean, leaving the

⁴ Average 2000-2004. Source: CRED: Annual Disaster Statistical Review: Numbers and Trends 2006,37.

⁵ Eurostat: http://ec.europa.eu/health/ph_information/dissemination/unexpected/tsunami1.pdf

⁶ See: Annex 2

Commission open to criticism for not addressing risks along coastlines in Europe and its neighbours.

An operational tsunami warning system for the Mediterranean and Atlantic regions is still lacking, in spite of their densely populated and highly industrialised coastlines and considerable seismic activity making them highly vulnerable to tsunamis.

Europe lags behind when compared to other tsunami-prone regions, notably Japan or the Pacific Ocean, where warning systems have already been put in place since the 1980s. So far, the EC has not provided a visible or coherent contribution to the ongoing work of UNESCO's Intergovernmental Oceanographic Commission (IOC) to establish such a system⁷. The lack of a tsunami warning system is the single most important element missing to achieve a full multi-hazard coverage of natural hazards in the European early warning systems⁸. This document presents reflexions on how this gap can be closed.

Many of the ideas brought forward should also contribute to a strengthening of early warning systems in a more general sense. Measures for better information sharing, more powerful and rapid communication tools etc. are not only beneficial for tsunami warning systems, but should, if applied systematically, contribute to strengthen other warning systems as well.

3. NATURAL DISASTER RISKS IN EUROPE AND ITS NEIGHBOURHOOD

This assessment is supported by the analysis of the predominant natural disaster risks in Europe. Starting from the predominant natural hazards in Europe, i.e. floods, seismic hazards, wind storms, extreme temperatures, mass movement and forest fires, a survey undertaken by the Commission confirms that most Member States have established performing tools to pick up potentially disastrous events caused by those hazards and procedures to disseminate warnings to their populations.

Considerable progress has also been made in recent years to link those systems and to share available information at European level. Sharing such information is essential for quick and effective assistance, for instance in the context of the EU civil protection mechanism. The European Forest Fire Information System (EFFIS) is a good example for a state-of-the art tool, which provided important added value in the 2007 forest fire season. Information issued by European meteorological institutions through Meteoalarm is also of great use in this respect, arriving at pre-warning times of up to 48 hours. There is still room for improvement in the use of such pre-operational systems like the European Flood Alert System (EFAS). The latter aims at early flood warning between 48 hours and 10 days."

For the detection and alert phase, the situation regarding the coverage of the most frequent hazards in Europe can be considered satisfactory. However, a significant gap exists as regards tsunamis, 70% of which are caused by earthquakes.

Although being comparatively rare phenomena, tsunamis rank among the most life-threatening of all natural disasters. In the past 150 years, they claimed some 500.000 lives.

⁷ Cf. See the Implementation Plan of the UNESCO-IOC adopted at its third conference, 7-9 February 2007 in Bonn.

⁸ See: http://www.proteccaocivil.pt/EWS/index_uk.htm

10% of all tsunamis occur in the Mediterranean, Black and Red Seas and the north eastern Atlantic.

That region was affected by 98 observed tsunamis in recorded history⁹, mostly in the eastern Mediterranean, the most devastating being the 1908 Messina Strait quake in Southern Italy which claimed some 60.000 lives. In the western Mediterranean and in the eastern Atlantic, tsunamis are the result of the interactions between the Eurasian and African Plates. The biggest event in that area was the Lisbon earthquake and tsunami of 1755, which affected Portugal, Spain and other countries and killed an estimated 100.000 persons.

Moreover, the geographical characteristics of the Mediterranean poses important challenges to tsunami warning systems, mainly because of the short distances and travel times of tsunamis, which leave very little time from detection to the alert. In the Euro-Mediterranean seas, tsunamis typically reach the coasts within 40-50 minutes and in some cases in less than 10 minutes. At the same time, the coastlines are highly vulnerable, with some 140 million inhabitants living close to the shore, with metropolitan cities, major ports and industrial installations close to sea level. In addition, millions of tourists populate the beaches of the Mediterranean and Northern Atlantic in summer. Reinsurance experts estimate that a major seismic/tsunami event could cause damage of up to 30 bn €¹⁰. Yet, in a survey undertaken by the Commission only one country reported having established a (local) tsunami warning system (Italy, Stromboli Island).

Based on the above analysis, Commission services consider that further work on early warning systems, particularly towards the establishment of a tsunami warning system, is required.

4. REFLEXIONS FOR FURTHER WORK ON EWS IN EUROPE

These reflexions can lead to a future contribution to the Implementation Plan to establish a tsunami warning system in the North-eastern Atlantic and Mediterranean (NEAM) region adopted by UNESCO's Intergovernmental Oceanographic Commission in February 2007. Contributions of the EU should consider some basic requirements:

- Delays from detection to alerting the population need to be as short as possible, due to the short travel times for tsunamis in the Mediterranean. This requires real time data sharing, a significant amount of automatic procedures and awareness raising campaigns for populations and tourists e.g. to avoid panic in case of false alarms;
- The system needs to be financially sustainable and technically robust over a long period;
- The system needs to be cost-efficient, i.e. it should use and build upon the existing seismic network. Alert procedures and signals for tsunamis should fit into a multi-hazard approach to make efficient use of existing structures and procedures;
- The need to complement and build on existing efforts by Member States and the international community.

⁹ http://ioc.unesco.org/TsunamiTeacher/data/Resource/PDF/Tsunami_Teacher.pdf, p. 39

¹⁰ See contributions at: http://www.proteccaocivil.pt/EWS/index_uk.htm

The four key areas relevant for early warning systems, as outlined in the definition of the United Nations International Strategy for Disaster Reduction (UN-ISDR)¹¹ and reflected in the UNESCO-IOC activities, need to be addressed:

- To identify the tsunami hazards and risks;
- To improve detection systems and to develop appropriate alert tools;
- To disseminate alerts to decision-makers and the population;
- To enhance preparedness of the population and response capacity of civil protection authorities, including awareness raising measures for populations and public decision makers.

To ensure a coherent **cross-sectoral approach**, the implementation of the different ideas should be accompanied by a light coordination structure, at Member States level represented by the civil protection EWS expert group and the EWS inter-service group at Commission level, both chaired by the civil protection unit.

While focusing these specific reflexions on the tsunami warning system, Commission services remain committed to a **multi-hazard approach**. The development of a tsunami warning system will allow exploiting synergies for the existing early warning systems in Europe as well as in a more general perspective. For instance, by addressing, issues like multi-lingual warnings to reach foreign nationals or specific warnings for people aurally or visually impaired. Currently, warning signals considerably differ from one country to another, which makes them more difficult to understand to foreigners or tourists in case of disasters. Sea-level monitoring instruments cannot only be used for tsunami detection, but also to provide warnings against storm surges or for measuring long-term sea level changes related to climate change.

Last, but not least, the reflexions of this document can also be seen as fitting into the **long-term strategic objective** to improve the EU's capacity to prevent, prepare and react to disasters of all types, complementing specific legal instruments like the Directive on the Assessment and Management of Flood Risks¹²

The Floods Directive (2007/60/EC) is of a framework nature, requiring the Member States to make a preliminary flood risk assessment by 2011, to prepare hazard and risk maps and eventually to establish flood risk management plans across the EU, including in coastal areas¹³. In the long-term, the implementation of this Directive shall also contribute to the improvement of early warning systems, mainly through the identification of areas at risk.

4.1. Improving risk assessment

The main tsunami prone areas in the NEAM region have been broadly identified. Countries most exposed to tsunami risks in the Mediterranean basin are Greece, Italy, France and

¹¹ See: <http://www.unisdr.org/eng/library/lib-terminology-eng%20home.htm>

¹² See: Directive 2007/60/EC

¹³ Geographical baseline data acquired for calculating possible run-up levels of a tsunami in coastal areas, for instance, can equally be used for modelling run-ups for coastal storm surges, thus contributing to an overall improvement of coastal flood risk management

Turkey, as well as Portugal and Spain in the Atlantic. At sub-national level, some areas with elevated risk have been identified (e.g. Messina Strait, Gulf of Corinth, Balearic Islands). At more detailed geographical level, risk studies are being undertaken for selected high risk areas¹⁴ to acquire more knowledge but data gaps are still considerable.

It should be underlined that the Floods Directive will oblige Member States not only to establish flood hazard maps, but also to include extreme event scenarios like tsunamis. These maps will have to be established by 2013 at the latest. Member States will also be obliged to establish appropriate early warning systems, together with flood management plans by 2015.

Identified Needs:

- Identification of high risk areas for better targeting of measures. GMES (Global Monitoring for Environment and Security) initiative could support this effort. It can provide observation data and products required for run-up models and elaborating risk maps, focusing on the main areas of concern and supporting the Member States obligations for risk assessment. These datasets will be shared with the relevant stakeholders through the GMES process. The GMES initiative is currently funded through the 7th Framework Programme of the European Community for research, technological development and demonstration activities.
- A platform to share data and methodologies for risk assessment could be created by adapting existing initiatives like SEIS (Shared European Information Systems) for this purpose. Workshops and research to facilitate the elaboration of methodologies for risk assessment could also be useful.

4.2. Better detection systems

Tsunami detection systems are essentially based on a combination of seismic sensors for measuring the tsunami-generating earthquake, and on pressure / tide-gauges to monitor the sea-level.

The seismological network in the NEAM region is already quite dense. More than 1300 seismic stations are currently run by various national networks. They could form the backbone for a Tsunami Warning System (TWS) if they were all linked in real-time. For a rapid and reliable tsunami warning system, and for timely alerts on earthquakes, immediate, free and open distribution of raw data from the observing systems in real-time is an indispensable prerequisite.

To date, however, the various national networks share only a very limited amount of available data in real-time. This contributes to significant delays in warnings. The average dissemination time in Europe is 33 minutes¹⁵. Real-time data-sharing is the most efficient way to reduce these delays. Technically, it would be possible to issue warnings within 3-5 minutes, as is already standard in Japan¹⁶.

While national networks do exist in almost all of those countries, some of them do not share any data at all. In addition, full participation of Northern Africa is crucial for the

¹⁴ See Gerassimos at: http://www.proteccaocivil.pt/EWS/index_uk_ficheiros/Page432.htm

¹⁵ R. Bossu; EMSC Newsletter May 2007.

¹⁶ See Hasegawa at: http://www.proteccaocivil.pt/EWS/index_uk_ficheiros/Page432.htm

establishment of an efficient warning system. Moreover, some progress has been made recently with a Memorandum of Understanding elaborated within an EU-funded project. It foresees to share real-time data from one station per country. 11 countries in the Western Mediterranean region, including Morocco, Algeria and Tunisia, have signed up so far¹⁷.

Progress has also been made in terms of calculating tsunami threats. The JRC has established a methodology able to generate tsunami alerts and propagation times within 1-2 minutes after the signal of the event reaches JRC. Since February 2007 the tool can also calculate an estimate of the wave height, an important improvement to reduce false alerts. However, as long as seismic data is not shared in real-time, the efficiency of this tool remains limited.

Sea level monitoring systems allow validation whether a major earthquake generated a tsunami or not. However, data transmission and exchange in real-time with characteristics and data sampling rates required for a functioning TWS are rarely met in Europe today.

Identified needs:

- Promotion of real time data sharing of seismic and other information through research programmes, including expert meetings and funding appropriate scientific projects (e.g. EERWEM, NERIES, Global Earth Observation System of Systems GEO/GEOSS). The efficiency of tsunami early warning systems will be significantly improved by an improved capability to use of early warnings from such primary events;
- A common IT platform where such data can be posted and be made available to all stakeholders;
- Specific data-sharing processes between the civil protection mechanism and the Euromediterranean partnership;
- Enhancing dialogue and coordination on this issue with Mediterranean countries;
- Installation of additional detection systems in a concerted and coordinated way by the concerned countries (e.g. buoys, sea level gauges);
- Improving methodologies and tsunami modelling.

4.3. Disseminating alert signals

All EU-Member States have developed systems to disseminate general alerts to their population in response to the specific hazards they face. Most of these systems follow nationally standardized protocols and use redundant dissemination channels, i.e. combine sirens with TV spots or radio emissions. Several Member States are testing new dissemination technologies such as cell-broadcast. Issuing warnings is a competence of the national authorities.

At European or international level, tools have been developed to exchange such warning information in case of trans-national disaster risks. The Meteoalarm system is a good example

¹⁷ EERWEM, R. Bossu, EMSC newsletter May 2007.

for such cooperation, compiling and sharing information provided by the national services in a standardized way.

Each year, some 100 million citizens cross internal borders between the EU Member States. However, due to reasons related to language barriers or the absence of risk information, most of them experience a change, from one country to another, in alarm signs and signals as well as in emergency instructions. When European citizens travel, they should be able to understand given information, i.e. signals, signs and other ways of warning and informing. Natural reactions to emergencies can be wrong and may lead to more casualties

Guidelines need to be developed to establish common alarm signals which can be understood by all citizens regardless of their country of residence or their mother tongue. The initiative to establish a tsunami warning system in the NEAM provides an almost ideal opportunity to launch such a process:

- No operational tsunami warning system is in place;
- Experience and expertise can be drawn from regions which have already established such systems. Some international institutions (e.g. ISDR, UNESCO) have developed basic toolkits for tsunami alerts that would simply need to be adapted;
- The number of areas geographically located in the main tsunami risk zones is limited and the challenges they face are similar (e.g. foreign residents, large population agglomerations and economic hubs along shorelines) facilitates the identification of suitable solutions.

Identified Needs:

- A facility (portal), as a distinct component of CECIS (Common Emergency Communication and Information System), to incorporate existing and new alert tools from concerned international networks, in order to accelerate the dissemination of alerts between relevant contact points and to ensure a high level of situational awareness across European civil protection services;
- Upgrading the IT equipment of the Monitoring and Information Centre (MIC) to enable a more rapid dissemination and sharing of alert messages through the civil protection and other networks. Research aiming at improving the security and reliability of signals transmitted under extreme conditions;
- Enabling information sharing between the MIC and the RELEX Crisis Room, including common use of specific alert tools for natural disasters monitoring in order to better respond to crises in third countries;
- Participation of relevant experts from third countries, in particular from the EuroMed region in an alert dissemination network. To fully benefit from the system all countries should be required to share seismic data in real time;
- Further work to elaborate proposals for common tsunami warning signals, taking existing experience into consideration;

- Propose practical multi-national projects to address the issue of common tsunami warning signals (to be funded under existing instruments) to work on common warning signals for populations;
- Use of the opportunities provided by other Community instruments such as its regional policy programmes, particularly the European Territorial Cooperation programmes for the 2007-2013 period;
- Enhancing dialogue and coordination on this issue with Mediterranean countries.

5. ENHANCING PREPAREDNESS, EDUCATION AND AWARENESS RAISING

Timely warnings are only one element in an effective TWS. Coastal communities have to be prepared through appropriate education programmes. Even with near real-time warning systems short travel times of tsunamis require rapid reactions from potentially affected populations in order to prevent damage. It is therefore important that coastal communities be equipped with appropriate emergency response plans. These should include evacuation routes, regular drills and exercises to ensure that the population is aware of the risks and knows appropriate behaviours. Appropriate educational programmes may be integrated into school curricula and entertainment programmes for guests and especially children in hotels.

Identified needs:

- Continued support capacity building for civil protection authorities through its programmes within the civil protection financial instrument, on the basis of appropriate Member States proposals;
- Contacts with European tourism associations regarding educational programmes and contingency planning (e.g. establishment of guidelines, voluntary agreements);
- Education programmes for local communities in risk areas;
- Simulation exercises to test tsunami response mechanisms such as evacuation drills;
- Through the Monitoring and Information Centre, two CECIS command post exercises with tsunami scenarios will be organised in 2008;
- Improve of sustainable coastal management measures (building codes, land use planning, protective infrastructure);
- Introduction of appropriate disaster risk reduction measures into bilateral and regional cooperation programmes with Mediterranean countries (e.g. environment, education, tourism, health sector).

6. SUMMARY

The above analysis suggests that the lack of a specific tsunami warning system in the NEAM region poses significant risks for European citizens.

In view of the fact that early warning systems already exist for some of the main natural hazards in Europe, the lack of such systems for tsunamis is considered the main impediment against reaching a full multi-hazard coverage of risks in Europe.

Recent debates with Member States experts have allowed identifying a range of measures.

The priority issue to be addressed concerns the striking weakness in real-time sharing of seismic data.

Equally, the lack of common alert signals and protocols has been identified as an increasingly important concern in view of the growing mobility of citizens across Europe and third countries. This globalization of risks requires enhanced international coordination.

To establish an operational tsunami warning system in the NEAM region, therefore, both the Commission and Member States should strengthen their ties with the mandated international institution, UNESCO-IOC, as well as their neighbours in the Mediterranean. The dialogue between the civil protection authorities and the scientific experts participating in the UNESCO meetings needs to be enhanced nationally.

ANNEX I

1. INVENTORY OF EC ACTIVITIES IN THE AREA OF EARLY WARNING SYSTEMS WITH PARTICULAR EMPHASIS IN EARTHQUAKES AND TSUNAMIS

In order to implement the EU Action Plan to establish early warning systems for earthquakes and tsunamis of January 2005, the European Commission has launched a large number of initiatives and projects. For the Indian Ocean, the EU played a leading role in the overall international response, and pledged and deployed funds and resources quickly: €560 million for humanitarian assistance and €1.5 billion for medium and long-term reconstruction. The Commission alone has committed €123 million in humanitarian aid and €350 million in rehabilitation and reconstruction, 27 million € out of which for the financing of support for early warning systems, disaster preparedness, disaster recovery and environmental measures.¹⁸

As regards the total amounts devoted to the establishment of early warning systems in the NEAM region, exact figures are difficult to quantify, mainly due to the sometimes mixed nature of projects or programmes and due to the lack of a coherent strategic approach.

A more detailed account of Commission activities to support the establishment of a tsunami early warning system in the NEAM region is provided in the chapters below.

1.1. Research

The largest contribution to support tsunami early warning systems in the NEAM region was certainly made by the Commissions research departments. Research projects launched recently under the Sixth Framework programme and other Community sources of funding amount to 14 million €.

The Commission's research departments are financing a significant number of European research projects under the FP6. The key projects include:

The SAFER project (Seismic Early Warning for Europe): This project is aimed at fully exploiting the possibilities offered by real-time analysis of the signals coming from seismic networks. It involves actions focusing on automatic shut down of critical systems, damage scenario simulations and deployment of real-time structural control measures for immediate protection of endangered structures. Applications will be tested in a number of cities mainly in the Mediterranean area, including Istanbul, Athens, Napoli and Cairo. Budget 3.6 m€; duration 30 months, start date: 15/06/2006. Geoforschungszentrum Potsdam.

The SEAHELLARC project (Seismic and Tsunami Risk Assessment and Mitigation Scenarios in the Western Hellenic Arc): This project aims at establishing a realtime onshore/offshore network of seismic and tsunami observations focusing on the Hellenic Arc, western Peloponnes and to investigate possible early warning scenarios that might find application in sensitive areas of western Peloponnes. Budget: 1.295 m€; duration 36 months, start date: 01/06/2006. Hellenic Centre for Marine Research.

¹⁸ source: http://ec.europa.eu/world/tsunami/docs/2006_report_final.pdf

NEAREST project (Integrated Observations from Near Shore Sources of Tsunamis: toward an early warning system): Objective: identification and characterization of large potential tsunami sources located near the shore of the Gulf of Cadiz. Improvement of near real-time detection of signals by a multi-parametre seafloor observatory for a tsunami early warning prototype. Budget: 2.85 m€; duration 36 months; 01/10/2006; start date 01/10/2006. Consiglio Nazionale delle Ricerche.

TRANSFER project (Tsunami Risk and Strategies for the European Region): This project aims at contributing to our understanding of tsunami processes in the Euro-Mediterranean Region, to the tsunami hazard, vulnerability and risk assessment. Focus will be posed on the gaps and needs for the implementation of an efficient tsunami EWS in the Euro-Mediterranean area. Budget: 3.3 m€; duration 30 months, start date 01/09/2006. University of Bologna.

The Commission Joint Research Centre (JRC) has developed the Global Disaster Alert and Coordination System (GDACS) which is issuing rapid information about potential emergencies. GDACS is currently being complemented with a near real-time tsunami model which will allow assessing both, the travel time and the height of the tidal wave. Regarding the Mediterranean, the usefulness of such a system to protect people strongly depends on the delay with which the first information is received. In the Mediterranean data availability varies from a few minutes to 1 hour depending on the source and the calculation model. The calculation time could be reduced using faster computers or pre-calculating the events. The main benefit of the JRC system will be for far away places. Due to the short distances in the Mediterranean, reliable automatic processes would sometimes seem to be the only options to protect people, with all the possible limitations such automatic procedures would imply.

The Directorate-General for Information Society is financing the DEWS (Distant Early Warning System), a three year project that is expected to have the UNESCO-IOC in its advisory board. Although the principal application area in DEWS is in the Indian Ocean, and important part of the project foresees the evaluation of the transferability of the technology to the Mediterranean. This is ensured by the strong participation of Prof. Stefano Tinti (University of Bologna) who is also the president of the ICG-NEAMTWS. Aside from this project, there are others that could be highly relevant to a EWS approach in the Mediterranean that deal with one or more of the above mentioned topics. Although The Commission Directorate-General for Information Society promotes innovation and novel applications, it is not responsible for the eventual deployment of ICT solutions. Successful research projects, however, are able to influence the take-up or operationalisation of research results by submitting their specifications to standards bodies (i.e.: ISO, CEN, OGC, etc). An additional financial instrument is now available, called the CIP (Competitiveness and Innovation Programme) which will fund coordination networks and may fund large scale demonstrations/pilot projects in the future in order to help bridge the gap between research and policy support.

Through its GMES initiative the Commission supports the development of information services which could support early warning systems. The FP6 project PREVIEW which federates knowledge and capabilities of 58 partners from 15 countries across Europe, for example, focuses on the development of applications for earthquake and volcano monitoring, which are the major triggers of tsunamis. Another area addressed by PREVIEW is windstorm risk and forecast. In addition, a portfolio of so called “general services”, addressing primarily post-disaster part of emergency cycle, was developed as well. The general services pursue mainly assets mapping, disaster intensity assessment, and finally damage (rapid) mapping.

PREVIEW has supported the MED 2007 exercise (organized under umbrella of Bridge Programme) by providing simulations of earthquakes followed by tsunami events in the Mediterranean Sea. During this simulation exercise PREVIEW provided reference maps, assessment maps and distribution of population density.

In the framework of FP7, the initial service portfolios (developed by PREVIEW) will go through validation process in order to test the maturity/reliability of these applications and make them ready for operational phase of GMES.

In the framework of the In Situ infrastructure of the GMES Marine service, the contribution to the sustainability of the Early Warning Systems should be explored as well.

A significant contribution to the overall objectives of GMES initiative in the field of emergency events was also done through ESA GMES Service Element (GSE). Namely three main GSE projects (RISK-EOS, RESPOND and TERRAFIRMA) represent synergy of joint endeavour to reinforce the capacities of Europe to response to disasters and crisis, including weather-related events (e.g. storms) and geo-physical casualties related to tsunami imminence.

In addition, a new project SCHEMA, which shall start soon, will work specifically on improving the assessment of the vulnerability to tsunami (test areas on the coasts of the Mediterranean Sea, the Atlantic Ocean and the Black Sea). This work is connected to UNESCO IOC.

Europe is already active in the area of global disasters warning systems, in the frame of its participation to the **GEO Intergovernmental Group on Earth Observation**. This Group, triggered by the Heads of State of the Group of 8 in June 2003 in Evian, France, was established in February 2005 by the Third Earth Observation summit in Brussels. Co-chaired by European Commission, US, South Africa, and China, 71 countries plus the EC and 46 participating organisations (as of October 15th 2007) are working together to establish a **Global Earth Observation System of Systems (GEOSS)**. The **GEO** vision for **GEOSS** is to realize a future wherein decisions and actions for the benefit of humankind are informed via coordinated, comprehensive and sustained Earth observations and information. This vision is much larger than, but encompasses the Disasters area.

Early Achievements from European Member States and European Agencies on the GEO 10-Year Implementation Plan decided in 2005 includes but is not limited to: putting in place the GITEWS German Indonesian Tsunami Early-Warning System, or setting up the Network of Centers of the Italian Civil Protection System, or again, setting up the WISE (Water Information System for Europe) viewer by the European Environmental Agency.

1.2. External Action¹⁹

The Instrument for Stability (IfS) is a new financing/legal Instrument that allows the Community to rapidly undertake development cooperation measures, as well as financial, economic and technical cooperation measures with third countries (a) in situations of crisis or

¹⁹ Section encompasses all activities of External Relations Commission services covering the NEAM region, including DG External Relations, DG Humanitarian Aid, DG Enlargement and EuropeAid. This section will be further reviewed to ensure a continuity and coherence among the contributions of the various services.

emerging crisis, to contribute to stability by providing an effective response to help preserve, establish or re-establish the conditions essential to the proper implementation of the Community's development and cooperation policies; (b) in the context of stable conditions for the implementation of Community cooperation policies in third countries, to help build capacity both to address specific global and transregional threats having a destabilising effect and to ensure preparedness to address pre- and post-crisis situations. In particular in the context of pre- and post-crisis capacity building, the Instrument can support long-term measures aimed at building and strengthening the capacity of international, regional and sub-regional organisations, state and non-state actors. Measures include know-how transfer, the exchange of information, risk/threat assessment, research and analysis, early warning systems and training.

South-East Europe is prone to natural disasters (earthquakes, floods, forest fires...) which transcend borders or overwhelm the capacity of a single country to cope. Regional cooperation in this field does not exist to the extent necessary even though the need for a regional response to effectively coordinate the national disaster preparedness activities is acute. Providing a pragmatic preparedness and response framework is imperative to ensure standardisation in language, equipment, warning systems and border-crossing protocols.

In line with the Hyogo Framework for Action 2005-2015, the Multi-Beneficiary IPA (Instrument for Pre-Accession) Programme (2007-2009) has included a Disaster Risk Reduction initiative which aims at continuing the commitment taken by the international community towards this issue.

In the same region, the Stability Pact has developed a 'Disaster Preparedness and Prevention Initiative', which includes the provision of training to personnel involved in civil protection/disaster response management and specific regional disaster preparedness schemes. The Disaster Risk Reduction initiative identified under the Multi-Beneficiary IPA Programme (2007-2009) complements the activities of the Stability Pact by fostering regional cooperation and coordination in disaster preparedness and prevention.

The purpose of the programme is to strengthen the administrative capacity of the national authorities from the IPA beneficiaries to develop bilateral/multilateral protocols and sharing of best practices in the area of disaster preparedness.

An important contribution to improve EWS in the Mediterranean rim is the EUROMED Bridge Programme. The execution period of this project was extended until March 2008. It was launched in the framework of the Euro-Mediterranean Partnership under the aegis of France, Italy, Egypt and Algeria. Its objective is to strengthen the capacities of the beneficiary countries' Civil Protection Directorates in the field of natural and manmade disasters'

prevention and management. One of its specific objectives is to improve the coordination of the beneficiary countries authorities in emergency situations.

A new project will be funded in the southern Mediterranean region through the ENPI (European Neighbourhood Partnership Instrument) in 2008-2010 with a provisional budget of 4.4 million €. It has been approved by the ENPI Committee in July 2007 and its implementation will start in 2008. This new project should focus more on the prevention and preparation issues than the Bridge programme, and therefore involve other international organisations, NGOs and coordinate with other Commission's programmes. Apart from continuing the capacity building process for national civil protection authorities in non EU-

Mediterranean countries, the EUROMED Programme would thus be ideally placed to finance measures to better prepare populations for various risks, including earthquakes and tsunamis.

Concerning the ACP states, the Commission, at the request of the interested countries, has submitted for approval to the EDF November 2007 Committee a 12 million € programme called " ACP Disaster Facility" aiming to enhance disaster preparedness via selected regional organisations.

EC humanitarian aid is governed by Council Regulation (EC) No 1257/96 of 20 June 1996, which provides a clear mandate to ensure relief and protection to people facing humanitarian crises but calls also for action which improves preparedness for disasters among vulnerable populations with low coping capacities. Following the World Conference on Disaster Reduction held in Hyogo (Japan) in January 2005, there has been renewed international mobilisation to develop more effective strategies for disaster risk reduction and mitigation. The EC agrees to this priority and is shaping its aid approach accordingly. The role of DG Humanitarian Aid (ECHO) in disaster preparedness has so far been interpreted as 1) Advocacy; 2) Mainstreaming of disaster preparedness into humanitarian aid decisions and 3) implementation of a smaller portfolio of community-based demonstration projects within the DIPECHO programme that was established in 1996 alongside the Council Regulation spelling out ECHO's mandate. Among these activities, the DIPECHO programme is the most visible footprint ECHO contributions to Disaster Preparedness.

DIPECHO projects aims at addressing Disaster Preparedness in a regional framework, targeting the most natural disaster-prone regions in the world and the most vulnerable populations living there. DIPECHO has so far been implemented in 6 regions that are considered high risk and with low coping capacities: Andean Community/South America, Caribbean, Central America, Central Asia, South Asia and South East Asia. The programme is being gradually expanded and, although DG ECHO does not envisage a roll-out of DIPECHO activities in the NEAM region, ECHO offices based in North Africa and the Middle East can provide both expertise in assessing local response capacities, and rapid reaction expertise. This pool of knowledge could feed into specific aspects of the EWS to be developed, focusing on the need for mapping risk and raising public awareness on how to respond in disaster situations.

1.3. Regional Policy

Other Community policies have also been very actively supporting risk prevention projects, including early warning systems.

Regional policy significantly contributes to a better management and prevention of risks in relation to natural disasters. In the programming period 2007-2013, risk prevention is a reinforced priority of the European Regional Development Fund (ERDF) in programmes under all three objectives²⁰. Eligible activities cover a wide range of risk areas, such as floods, fires, droughts and desertification. Preliminary calculations for the 2007-2013 programmes indicate that more than € 5.8 billion (1, 7% of total Structural Funds budget) are planned for activities related to risk prevention.

²⁰ See Regulation (EC) No 1080/2006 of the European Parliament and of the Council of 5.7.2006, OJ L 210, 31.7.2006

Of special importance for risk management on a cross European scale are the ERDF programmes under the "European territorial cooperation objective" which focus their assistance on cross-border, trans-national and inter –regional cooperation. First evaluations of expenditure under the previous INTERREG III programmes in the 2000-2006 period suggest that more than € 145 million have been spent on direct risk prevention activities, in particular in the areas of floods and forest fires. The amount for the current programming period is expected to increase further.

The European Spatial Planning Observation Network (ESPON) conducted a study on the spatial effects and management of natural and technological risks²¹ The project, finalised in April 2006, aimed at identifying the spatial risk patterns of natural and technological hazards in administrative regions on NUTS 3 level.

1.4. Environment / Civil Protection

The Commission's Monitoring and Information Centre (MIC) for civil protection has taken an active role in promoting the use of suitable early warning systems within the network of the European Civil Protection national contact points. It has established expert groups, both at Commission level, and at Member State level in early 2007 to exchange best practice and to advance on the subject of early warning.

As a concrete outcome, for instance, the MIC has created and disseminated a list of links to the main global early warning systems and disseminated them amongst its network. This list includes existing tsunami EWS in the Pacific region. In principle, therefore, all 24/7 national contact points should be in a position to receive relevant warning messages in near-real time.

The MIC also organized a table top exercise in December 2005, simulating a tsunami in the Mediterranean, testing the new Joint Research Centre (JRC) tsunami assessment tool. Several Member States participated in this exercise. One Member State (Malta) used the event to organise a national exercise. In March 2007 the MIC participated in the tsunami exercise in the context of the Euromed group. The MIC also co-organized a workshop on early warning systems with DG Research in June 2006, involving researchers and civil protection experts. Another workshop was co-organized in July 2007 together with the Portuguese Presidency

The MIC seeks close cooperation with JRC on further improvements of existing early warning tools. In particular, two administrative arrangements between DG ENV and the Joint Research Centres have been concluded to foster the development of early warning systems against several hazards (European Flood Alert System, European Forest Fire information System). A third one is in preparation.

In relation to Directive 2007/60/EC on the assessment and management of floods, DG ENV is facilitating information exchange on different aspects of flood risk management in the context of an EU Flood Action programme, and relevant information exchange will be ensured on the actions foreseen in this Communication.²²

²¹ http://www.espon.eu/mmp/online/website/content/projects/259/655/index_EN.html

²² http://ec.europa.eu/environment/water/flood_risk/index.htm

ANNEX II

QUESTIONNAIRE ON EARLY WARNING SYSTEMS: A SURVEY OF THE STATE OF PLAY

Triggered by the need to present Council with a proposal regarding early warning systems for tsunamis in the North Atlantic and Mediterranean region, the European Commission launched a questionnaire to the participating countries of the Civil Protection Cooperation Mechanism in order to establish the state of play of early warning systems in their countries. In 2000 a similar survey had been done by Finland in the scope of a major project on information to the public. We felt it was time to up-date it with all the countries that have joined the EU and the technical updates available.

A questionnaire was distributed to the 30 Member States' civil protection authorities of the civil protection cooperation mechanism. The questionnaire was widely answered by a total of 27 countries, which represents 90% of replies.

Regarding the EWS all 27 countries have national systems and 70% of them local systems, most of the local systems functioning in a cascade system with different levels, according to their administrative organisation.

Countries were questioned about which hazards are covered by their early warning systems and most of them cover various hazards through their systems, the top ones being floods and severe weather. However, only one country indicated that it has established an EWS for Tsunamis: a local system for a specific situation and location (Stromboli Island, Italy).

Looking at the methods which are currently being used to disseminate alert signals, almost all the countries use sirens (25), radio (26) and TV (25). Most countries do have redundancy and various warning methods will be used at the same time. Some countries explore the newer infrastructures like internet (14) and cell phones (10). The sound signals are mostly base on a general warning sound, common to all hazards (16). In some countries specials signals for different situations are used, e.g. for all clear (9) floods (8), chemical hazards (7) or evacuation (3), only Stromboli Island has a special sound for a tsunami warning. The message that accompanies the signals issued by the EWS are in most cases associated with the message that people should confine or evacuate, depending on the situation, listen to the messages issued by authorities and follow instructions. In addition the questionnaire has shown that most countries do not complement their systems with visual warning methods (21).

An early warning system is of little use if the population is not properly informed about its meaning. The information and educational system in the participating countries differ. Most use the school curricula as a way to inform and educate children on the meaning of the sound and visual signs (12); others take advantage of the days(s) of testing the sirens to teach about their meaning (8). Leaflets (6) or the internet (3) are the other most common ways of relaying the information to the population.

The last part of the questionnaire addressed the adaptation of the EWS to people with special needs, such as visually and hearing impaired people as well as the question of informing tourists and foreigners, who might not speak the language of the affected country. 16 out of 27 countries do not have any particular alert method for people with special needs. When it comes to the need of alert messages for foreigners, 16 countries report that they do not provide alert messages in different languages whereas 11 do.

The positive conclusions that can be drawn from this questionnaire are that countries generally have a good national coverage of EWS covering the major hazards. It was also evident that similar methods and messages are already in use in most countries, making it easier for a common approach if it is ever desired by Member States.

The key gaps identified as a result of this questionnaire can be summarized as follows:

- Only one country has an EWS for tsunamis even though tsunamis pose an evident risk in some countries.
- Lack of visual signs and of methods to inform people with special needs as well as foreigners or tourists were also perceived gaps that sprung from this questionnaire.
- While many countries focus on education children it does appear that less attention is paid to the education of adults on such matters.