INPUT PAPER

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HIGHER EDUCATION CURRICULA AIMED AT TRAINING DISASTER RISK MANAGERS OF THE FUTURE

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1. Introduction

"Disasters are complex events with multifaceted causes and hence disaster management needs comprehensive, multidisciplinary training to deal with both complexity and change. Major shifts have occurred in the way in which disasters are considered, resulting from an increasing awareness of problems internationally along with an identified need for solutions. The importance of disaster risk reduction has continued to grow both within governmental and non-governmental organisations" (University of South Wales).

Civil protection, emergency, disaster risk management have been traditionally considered professions to be learnt on the ground, but even in this case, there is an increasing demand for more training, more skills in the field of organisational management, in juridical aspects connected with administrative responsibilities, economic elements related to the cost of prevention, lack of prevention and intervention during crises.

There is the need for educational and training skills to be developed also in university program, able to join practical aspects with rigorous methodologies and capacity to model and monitor complex realities, that are not only "natural" or "technical" but compound the interface between natural phenomena, complex technologies and complex societies. Whilst this has been widely recognised, there are still too few reflections regarding how an enhanced situation should be achieved.

The leading role on the issue seems to be led nowadays by the USA Federal Emergency management Agency (Fema, see: http://training.fema.gov/EMIWeb/edu/), that has established an entire program aimed at networking between collegies and universitites that are already offering or are planning to offer both graduate and post-graduate programs to educate and train disaster/risk/hazards/mergency managers. Elsewhere such programs do exist and are opening every year, however there is no leading or reference authority, national or international, providing room for discussing and evaluating the content and the teaching methods of old and new educational initiatives.

Creating opportunities and room for discussion would be highly beneficial so as to identify and agree as much as possible on the tools and key concepts that managers with responisiblities in drr and emergency management should acquire. First it has been highlighted that more advanced tools than those that have been available to them until now are required to tackle new and emerging complexities of natural and man made risks. Second, an all hazards approach has to be preferred to expertise too narrowly focused on one type of phenomena. And the awareness of enchained, cascading, domino effects that may entail natural events only or mixed natural and mand made (na-tech), needs to be raised to a much higher level than it has ben the case until recently. Third, a much deeper understanding of the science behind the hazards themesleves has to be provided. Hazard/disater/risk managers need to have a profound understanding of the phenomena they will be confronted with, of the technologies, models, that are available for forecasting the timing of a feared event and to mesure its magnitude and potential geographic extent. This will allow a better appreciation of the sometimes relevant uncertainties implied by models' predictions and the limits and interval of realiability of hazards estimates.

The human and societal dimensions of risks are as crucial as the natural/physical ones. This has several implications in terms of teaching and learning. Concepts like vulnerability and resilience have to be stressed in programs, as well as methods to assess them in concrete terms in a community or a region. A discussion of existing methods to combine vulnerability and resilience with hazards paramters to obtain either a probabilistic risk assessment or risk scenario is equally crucial. In fact, it is important that future emergency/drr managers appreciate how the vulnerability and resilience of exposed assets may contribute to the overall expected losses. Not only vulnerability ad resilience of physical assets have to be appraised, but also that of social groups, individuals, and of economic systems.

What has been sketched here very briefly is a sort of compendium of what is indicated by Thomas and Drabek (2003) as « core knowledge », comprising the fundamental concepts and standard terms that need to be known by anyone in the field of disaster risk reduction, emergency and crisis management. Yet, many obstacles are still in the way of those wishing to identify the key « standards » (Alexander, 2003) of this new/very recent profession.

It can be suggested that international organisations, such as Unisidr, do provide room and lead the discussion on the « core knowledge ». Such participatory effort should not be aimed at setting standards in a self referential mode, but rather at pushing the scientific and educators' community to agree on some basic aspects, that are already emerging from literature and international forums, but need some official recognition to become more operational and shared. What is emerging from the analysis of current academic programs (in section 2 and 3) is that a specialized expertise and a multidicsiplinary approach are both needed and crucial in the field of emergency and drr management. This may be seen as a contradictory statement, but it is only apparently so.

As mentioned by Woodbury (2005), specialized degrees in both physical/natural and human sciences are needed, particularly to provide future managers with the kind of deeper understanding that is fundamental in analysing the natural phenomena and their impact on the built environment on the one hand and to foresee the respone capacity of societies and economies. However in any program some time should be allocated to explore and understand a little of the other disciplines that complement each one's expertise. So, in this regard interdisciplinary work does not necessarily mean have a little of everything without any focus, but rather acquiring a capacity to dialogue and understand what other disciolines may offer to anyones's own knowledge and becoming open to accept solutions to risk problems will emerge from a collective rather than individual effort (Lelé and Noorgaard, 2005; Nicolson et al., 2002).

Depending on the scope, financial and technical capacity and availability of teachers, programs may range from very narrowly focused to rather large ones, providing a sort of general overview of disaster/risk related issues and then providing a specialized path in emergency management or risk reduction. Often such programs will be broad in their potential offer of different topics related to all phases of risk/disaster management, intended as mitigation, preparedness, intervention during emergencies, crisis management, recovery, reconstruction. A wide offer responds the obvious request to open rather than restrict post education job opportunities for those graduated.

In the meantime such an open perspective is coherent with the working condition of several future officials in agencies and public administrations, who will confront with the "temporal multiorganisaiton" that is typical of emergency situations (Menoni and Pugliano, 2013) and will have probably to shift during their working lifeltime from positions that are more crisis management oriented to others where the prevention and mitigation components will be the priority. Such shifts are common in the drr and emergency management fileds, as they depend on legislative initiatives, that may stress more one aspect or the other, and also on the financial, political, and situational contexts that are subject to a rather high dynamism, particularly in the last decades.

A discussion of the amplitude and the characteristics associated to each phase in the « disaster cycle » would also highlight what terms like emergency/risk managers, civil protection, hazard managers mean in different cultural and liguistic contexts. As for the definition of standards, the aim of the discussion should not be the creation of a glossary to set once forever a univocally determined definition for all terms. Rather, the objective should be to find valid conceptual « translations » from one cultural context to another so as to find parallelism and useful convergence of programs in different countries.

What constitute the "core knowledge" and what are the disciplines to be involved and how, are certainly important questions but they do not completely cover the types of expertise that is relevant for emergency/drr managers. It is clearly emphasized by some authors (Drabek, 2007; Woodbury, 2005; Thomas and Mileti, 2003) that the professional expertise that we aim to create cannot rely on thematical knowledge only. More complex and comprehensive skills have to be developed, providing the means to cope with stressful environments on the one hand and with the capacity to communicate with peers and with a variety of publics on the other.

One reason why such programs have started relatively late (they can be traced back to the Seventies and the Eighties) is certainly due to the lack of legitimacy (Neal, 2000) that both the academic and the practitioners community have granted to them. Academicians are not always sure about the correct disciplinary location of such programs. This argument brings back to the issue of interdisciplinary knowledge; risk related issues are transboundary and crossing lines between traditional disciplines, thus constituting sometimes a problem for narrowly defined departments or faculties. Furthermore, academics often have considered emergency managers more as technical practitioners, civil/military servants, who do not need high level of theoretical beckground. This argument is sometimes mirrored by practitioners' attitude towards theory and research as meaningless for the real action in the field.

These positions are deceptive in many regards. As convincingly shown by Neal (2000) the body of knowledge in disaster studies has been growing steadily and exponentially in the last fifty years. The development of learning curricula should critically follow the very rapid pace of innovation in drr related sceintific and technical domains.

It is exactly the ignorance regarding the huge body of knowledge developed over the last decades that make still some emergency managers convinced of since long enough fully demonstrated as false myths regarding people's behavior and societal response to calamities.

Still such myths shape and guide some practitioners in the field, with very disruptive consequences (Hubbard, 2010). Instead of creating noxious barriers between academia and practice, the relevance of research in many fields of drr, ranging from social sciences to Ict, should be clearly acknowledged by practitioners, whilst researchers can get significant advangtage of the real life experience and lessons learnt from the application of preapredness and mitigation measures that can be provided by practitioners only. Courses and programs should be therefore designed so as to favour the contributions of experienced professionals with varying roles in drr.

Risk management is confronted today with much more complex challenges than in the past, requiring better analytical capacity and scenario modelling skills. The latter imply creative knowledge, selecting critical information from past experience, spotting those differences between the present and the past that mark the line between trends of evolutionary nature and turning/catastrophic diversions from normal trends.

2. Overview of the offer of courses in universities worldwide

The analysis developed here is blending the list of programs provided by Preventionweb (http://www.preventionweb.net/english/professional/trainings-events/academics/), initiated in 2007, with an analsyis of programs conducted at the Politecnico di Milano at the time when the new CERM program (see below) was opened, that is in 2008, and updated to the current situation. 5 still active programs were added from the list of the Politecnico review: two in the USA, one in Finland, and two others in the UK.

The preventionweb list has been reviewed and reorganised in the following way. First a check has been carried out to verify whether or not listed programs are still active ; then those active have been grouped by university that offer them, as some offer more than one course. Then still available programs have been analysed by country, by the driving discipline and by type of released degree.

To check whether programs were still active we connected to the provided internet link ; in case of failure, a further attempt has been made through Google. The result is the following : out of 260, 40 are either non existing anymore or not real courses focusing on risk, but rather general environmental courses with some elements of risk assessment that cannot be considered though as their main core. 140 programs clearly still exist, are active and provide information on the website of the offering institutions. The remaining are either courses offered by civil protection and governmental institutions (few of them), institutions offering the possibility of internship or scholarhips but not real courses. In 13 cases we were unable to establish from internet sources whether the courses were still offered or not.

Most courses, in both lists, are rather new, with few exceptions of programs that have been existing for more than ten years (as the CERG_C certificate that will be presented later on). The significant rate of closure of courses suggest that there are difficulties in making such programs successful and self sustaining. Some programs in fact, particularly in Asia but not only, are clearly linked to ad hoc funding, and are not able to guarantee continuation after the expiration of the provided financial support. Also the ranking of universities offering such

courses is not at the top level, with few exceptions, particularly in Europe. A reason that can be provided is that civil protection and emergency management are still considered as too technical/practical, not as a profession requiring high level education. This comment is reinforced by the fact that only 10 out of all programs are at the PhD level (see Figure 1).

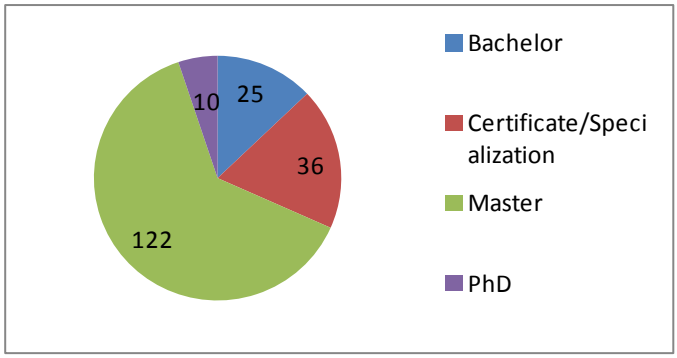

Figure 1. Distribution of courses by degree

Neal (2000) provides some recommendations to those wishing to open such educational programs based on his own experience in the USA. Whilst some recommendations are more related to the USA situation (in many European countries it would be simply impossible to open a university program without a minimal number of tenure staff sustaining it), his article sheds light on the difficulties that are inherent in the management of this type of programs.

One of the potential obstacles to offering such programs in prestigious private universities is that they do not open the floor for a very rewarding career at least from an economic point of view. But perhaps more compelling is the disciplinaty argument. In fact, no matter what is the core discipline within which a program is opened, it is characterized by a high degree of interdisciplinarity. In other ways, the opening statements presenting the different programs ALL point at the inter- and multidisciplinary nature of emergency management/disaster/risk management. This may be an obstacle as traditional staff would see those programs as potentially harmful for the academia, and also producing professional figures that cannot be easily labelled. Furthermore such academic closure is hampering the turnover of teachers and research staff at the offering educational institutions.

Regarding the connection between courses success and research, it is stated in many programs presentations that the content of classes will go much beyond the description of hazards and theories, to include ongoing research and involving actors in the field. The existence of a research centre or laboratory on risk related issues seems to be a key factor for many of the still ongoing programs and certainly characterizes unviersities that offer more than one course (a master and different certificates/diplomas).

As for the disciplinary distribution (Figure 2), 32% of programs are offered within a technical/engineering university/department/school, whilst 22% are hosted in department or university programs of social sciences, public policies. In the latter case, a focus on

humanitarian action is frequent. 11% are explicitly aimed at preparing professionals in the field of emergency management at military or police academic institutions. 14% are offered by medicine schools and are devoted either to form doctors and nurses or professionals in the public health field more in general.

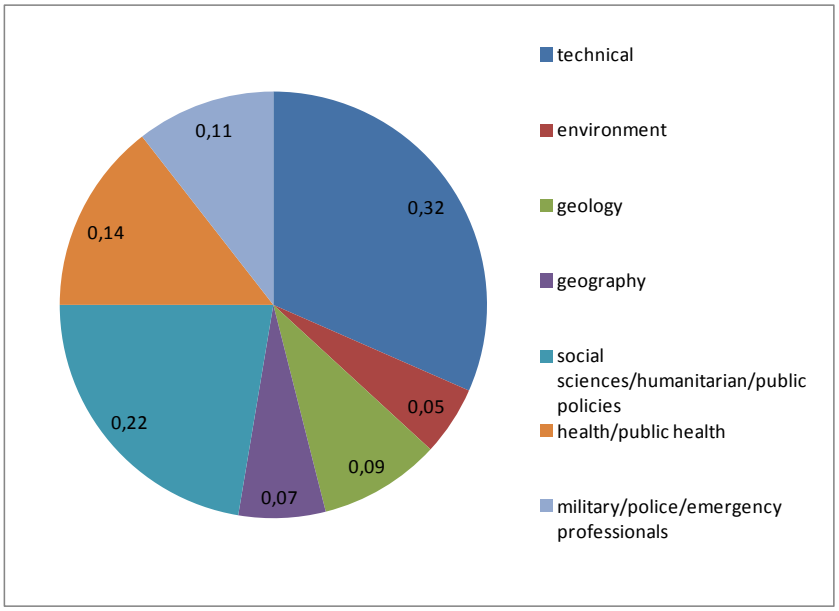

Figure 2. Programs distribution by "core" discipline

Less than expected (9% and 7% respectively) are provided in the context of geology or geography studies. Summing the more technical oriented fields, it can be seen that they outpace significantly those hosted in the social sciences domains, despite the large and relevant contributions the latter have granted to disaster studies.

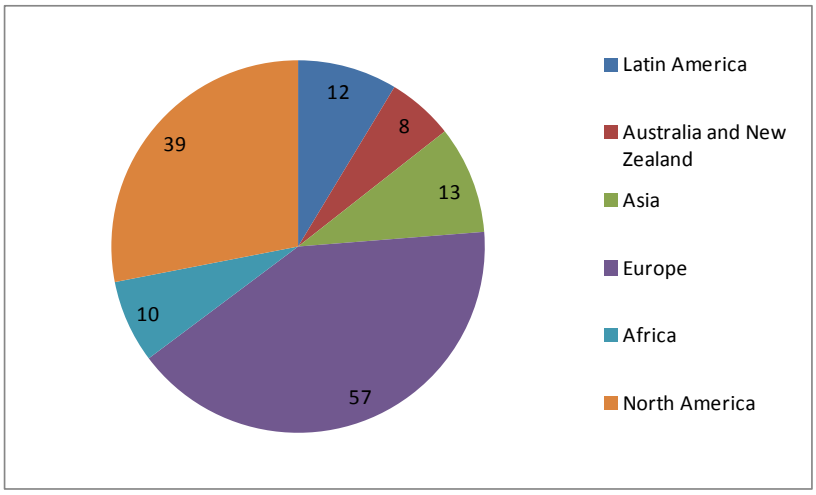

Figure 3. Programs distribution by continents

The distribution by continents (Figure 3) and countries contains some elements of surprise as well. Europe rank first with 57 still active programs. UK leads by far the list, with 21 offered courses in several universities. A small country like Switzerland offers 6 programs. The coming next in the list is North America, with 28 courses offered in the USA, where 10 universities offer more than one program, and 11 in Canada. Further down in the ranking come the 13 courses in Asia, 10 in Africa and only 8 divided between Australia and New Zealand.

3. Looking inside three programs.

3.1. The CERG_C at the University of Geneva

The specialisation certificate in the assessment and management of geological and climate related risk (CERG-C) is a short-training program offered at the University of Geneva since 1988. It has been created by Jean-Jacques Wagner and Michel Delaloye in 1987. At that time, the United Nations Organization adopted a resolution by which the 1990's were declared "International decade for the reduction of the effects of natural disasters" (IDNDR). Moreover some specific agencies were working on that topic in Geneva or in Switzerland, such as the Division of Humanitarian Aid of the Swiss Disaster Relief Unit (SDR) from the Ministry of Foreign Affairs, the Swiss Red Cross, the United Nations Organization DHA (former UNDRO), the UNEP-GRID, the World Meteorological Organization (WMO) and the World Health Organization (WHO). Representatives from UNDRO, UNISDR, SDC-SHA, UNEP-GRID, UNOSAT, have been giving thematic lectures in the training over the years as well as representatives from various Universities or research centers across the World. The original idea behind the development of this certificate was to develop an expertise in risk evaluation and its practical application in disaster prevention and reduction planning as an integral part of developmental and environmental planning, so that the impacts of future events could be minimized. The course has been open from the beginning to earth sciences practitioners or specialists who were dealing with disasters in their professional activities. The main themes were volcanic, seismic, landslide and flood hazards and components of risk management.

At the beginning, the course was given in French, then one year was in French and the year after in English, then French-English simultaneously and finally it is given in English only. Originally the duration of the training was 6 weeks; and participants could choose between volcanic hazard or landslide and flood hazards.

Since 2006, the direction of CERG-C was echoed by Costanza Bonadonna. From that year, the program has evolved and became a postgraduate specialized certificate, which includes new strategies of risk reduction and additional natural hazards, such as those linked to climate change. As a result, hazards and risks associated with seismic, landslides, floods, volcanic, and climate change phenomena are treated in detail. Nowadays the training lasts 9 weeks with the possibility to stay 3 more weeks to work on the personal research work. All participants have to follow all modules, to ensure that they develop a comprehensive view of natural risks.

The philosophy of the current format of the course is to train participants on how to incorporate risk science into their everyday working life in an attempt to reduce losses to an acceptable level. Key components include training participants on how to assess risk and how to communicate effectively with government agencies, media, public and private sectors before, during and after hazardous events.

In a nutshell, the CERG-C is composed of 5 thematic modules, covering risk management, volcanic, seismic, landslides, floods and climate related risks.

The risk management module integrates a multi-disciplinary team of experts representing fields such as social sciences, geography, law, land-use planning, statistics, media communication and economics. The main goal is to provide participants with tools they can use to assess vulnerability and risk and provide solutions to risk management issues in their own countries.

The volcanic risk module, focuses on the basic understanding of volcanic processes and their associated hazards and risks. It also integrates the process of risk mapping and decision making during volcanic crisis.

Seismology, the seismic vulnerability of buildings and infrastructures, earthquake risk reduction measures and earthquake loss modelisation are developd in the third module.

The landslide module addresses the causes and mechanisms of landslide phenomena, as well as mitigation strategies, such as engineering controls and land-use planning.

The last module discusses hydrological processes and the analysis of flood risk assessment. It also integrates climate related issues such as climate change and slow onset events (e.g. drought).

The course is open each year for 15-20 people selected on formal applications. Up to now, more than 330 participants coming from about 78 countries have been trained. The success of CERG-C after 27 years of existence demonstrates the importance of this approach.

Many former students having gone through the CERG-C program are working in the field of risk, whether in universities, national research centers, national organizations, observatories, NGOs or private companies.

The CERG-C is an enriching program for both trainers and trainees. Challenges and opportunities include a multi-cultural participation, diverse academic background (e.g. land planning, civil engineering, earth sciences and other fields linked with disaster risk reduction), diverse occupation (e.g. public and private companies, academic institutions, national or international organizations), a multidisciplinary training (i.e. trainers include more than 20 international experts coming from various fields of disaster risk reduction).

In 2012 a new crtificate of advanced studies (CAS) in disaster risk management was designed and launched in February 2013. It is offered by the Center for education and research in humanitarian action, entity linked with the University of Geneva and the Graduate institute of international and development studies. This new training has been developed with the underlying idea that if one wishes to reduce the dimension of future

disasters, actions should take place before, during and after a disaster and therefore also from the humanitarian field. It consists of a 7 week program directed towards national or international humanitarian actors willing to improve their skills in disaster risk management.

3.2. CERM (Polimi) : a master of science

In the academic year 2009/2010 a new program was opened at the Politecnico di Milano, titled Civil Engineering for Risk Mitigation. The first director was Francesco Ballio, followed by Marco Di Prisco, elected in 2013. The program is offered entirely in English in Lecco, one of the external campuses of the Politecnico, 50 km North to Milan. The program is part of the internationalization efforts of the Politecnico, thus attracting mainly and increasingly foreign students.

3.2.1. Motivation and rationale

The motivations for the rather innovative Cerm program are manifold, partly internal to the civil engineering discipline, partly external.

As for the former, a discussion has been held in the Politecnico regarding the future of role and tasks of civil engineers (see Politecnico di Milano, internal document, 2013). In developed countries, and particularly in Europe, it seems that the room for new and large infrastructural projects if not over has clearly shrinked over the last decades. The traditional form of individual professional designing local projects for local customers has been replaced by a new model with few large companies offering integrated services from desing to construction. In developing countries the situation is somehow different as some of those are growing and building very fast, however given the diffusion of softwares and hardwares that are able to provide fast responses to most of the standard structural problems, the need for high level expertise is restricted to a number of really exceptional and complex projects. Rethinking the role and the way of reasoning of engineers is somehow a more general issues, convincingly discussed by Hollnagel et al. (2006) in the « Resilience Engineering » book. Technicians with lower competencies in mathematical and physics will deal with the more standard tasks, whilst civil engineers will have to confront with much more complex problems, for which standard solutions do not exist. Risk prevention and management are certinaly among those tasks.

As for the external/context motivations, it is clear that Italy can be considered a hotspot of natural hazards (Dilley, 2005). Italy is exposed to both riverine and mountain floods, landsides, avalanches for most of its territory ; similarly all regions except one are exposed to seismic risk, even though with different levels of expected intensity. Ten active volcanoes, some of which explosive (the most famous being the Vesuvius, threatening a metropolitan area of four million inhabitans) are located in Central and Southern Italy. Forest fires, drought and other meteorological hazards have hit the country over the centuries ; since the industrial development, the country is exposed also to a significant technological hazard, particularly relevant in rather densely populated country, where large and medium size urban areas experience very high concentrations of population and assets.

The high hazard level implies that engineers are on the one hand asked to prevent damage when designing infrastructures and/or retrofitting buildings, on the other they work as consultants for public administrations, private companies, tribunals on issues related to damage provoked by natural (and man made) hazards.

Three main aspects have been considered as key concepts in structuring the master of science program:

- the need to form specialists able to shape their expertise within a wider cultural and social context;
- the recognition of the limits of instrumental knowledge and the need for reframing the latter within a more comprehensive relational knowledge, particularly in those arenas where peoples life and well being is at stake;
- to help future scientists and technical experts to advice and be part of complex governance processes, an ability that is crucial in fields like risk prevention and management.

3.2.2. The learning/teaching objectives

The proposed master program is grounded in the engineering tradition (civil, environmental, chemical, electronic and information technology), offering fundamental and advanced tools management to tackle a variety of natural and antrophic hazards. The classical engineering approach to such problems, typically comprehending hazard and vulnerability assessment, design of mitigation structures, technological systems for risk control, is coupled with a softer design oriented approach, provided by the land-use, urban and regional planning perspective on the one side and on the managerial expertise on the other. Both approaches can contribute by complementing the strictly technical and scientific part with more comprehensive tools that have been recognised as keys in risk prevention and mitigation.

3.2.3. Structure of the program

The program is developing over two years of full time attendance. The first year is devoted to civil engineering courses at a specialised level that are partly or totally focusing on a risk oriented approach. This means somehow reversing the traditional approach , according to which engineers should guarantee a « safety » coefficient or margin in any project or activity. The idea to focus on the residual or intrinsic risk is clearly changing the mindset of engineers, making them much more aware on the one hand of the uncertainties hidden in the models they use and on the other on the difficulties in implementing the results of models and of good design in the real world. A 7-CFU course is devoted to the fundamental of risk management, including basic legal issues and features of civil protection organizations. Besides the scope of providing a robust basis in civil engineering fields, the first year of general formation allows to fulfil the legal requirements for a Master of Science (Laurea Magistrale) in Italy.

Multi- and inter-disciplinarity is achieved in the second year by means of problem solving oriented modules where different competences (within a number of different disciplines) are organised comprehensively to tackle a given risk management problem.

10 CFU are devoted to the completion of a master thesis where students are confronted with a variety of case studies, and problems to be solved. Examples from past theses range from the development of emergency plans for a city, to the structural analysis of the collapse of the Students' Dormitory (Casa dello Studente) in the l'Aquila earthquake, to the incresing role of IT and social media in disaster management in Mexico, to the informational and economic challenges of introducing insurance coverage against natural calamities in Vietnam. Some master theses are either developed abroad in exchange programs with other universities or in the context of internships some students get within institutions and companies in Italy and elsewhere. An example is provided by an internship carried out within the ISDR office in Geneva that produced as an outcome the analysis and proposal of new indicators for the Disater Risk Index.

It is worthy to note that the program was designed in such a way that a one year specialization master can be taken ; in this case the disciplinary background of attendants can be much more varied, including professionals in the field of safety and security. In the case of students lacking a civil engineering background a more guided path is designed. They will get a blend of management and technical expertise withtout the requirement to have a deep knowledge in mathematics, physics, kinematics.

3.2.4. Students

Four years are clearly too short time to observe trends. However, it can be said from a qualitative point of view, that the composition of students has changed, with an increasing level of less young with some professional background students in the last two years, manifesting an explicit interest on the topic grounded on their professional experience over the quota of students who mainly aim at a civil engineering degree.
Some of the graduated found a job or paid internship within insurance, organisations and companies dealing with risk and hazard related issues in differnt countries, ranging from Australia to Vietnam, to Italy.

Students are mainly foreigners, particularly in the last two years, coming from a variety of countries, mainly Asian, such as Iran, Turkey, Vietnam, Indonesia, India, Bangla Desh, China. To a lesser extent from Latin America, mainly Colombia ; some from Africa, mainly Egypt and Etiopia. This clearly reflects the formal relationships that have been established insofar by the Politecnico in general with univerisities abroad. An increasing number of students is coming from European countries, like Bulgaria, Romania, Croatia, France, Sweden and others.
A clear minority is represented by Italian students, something that is considered a weakness, first because we would like to educate also future Italian civil protection officers and/or employees of public adminstrations with responsibilities in risk prevention and management. Second because many examples that we present in class of course are taken from the Italian context, which is a good one from which to pick examples as discussed earlier, and therefore

Italian students in class may help the others to overcome the language barrier and have a better grasp of the details of the examples.

3.3. The newest UNU program

In 2013 the United Nations University Institute for Environment and Human Security (UNU-EHS) together with the Department of Geography (GIUB), University of Bonn, has successfully launched a Joint Master of Science Programme in the "Geography of Environmental Risks and Human Security". The director of the course is Joerg Szarzynski.

The main purpose of the MSc Programme is to provide postgraduate students detailed knowledge, critical understanding, strategies and the tools required to take an interdisciplinary approach towards environmental risks and human security.

3.3.1. Specific objectives:

This program is offered as an international degree programme with a research-oriented profile. The two-year programme educates students in a interdisciplinary and trans-disciplinary manner on how to investigate and manage various resources related to environmental hazards by implementing science-based principles and methodologies to disaster risk management. It offers an in-depth introduction into both problem-oriented research methods, theory and concepts as well as real life challenges and problems that international and UN organizations are dealing with, deriving from research areas such as vulnerability assessment, resilience analysis, risk management and adaptation strategies within linked human–environment systems, global climate change, land desertification as well as environmentally induced internal displacement and transboundary migration.

Upon completion of their study, the students are expected to be able:

- to communicate their conclusions and the underpinning knowledge and rationale during an internship at an international organisation;
- to understand and analyze scientific inquiry in physical and human geography and related disciplines, focusing on vulnerability and environmental risk in developing countries;
- to understand and use appropriate methods for research design regarding data collection and analysis, particularly focused on contemporary qualitative and quantitative methods;
- to produce new research questions, which push at the boundaries of natural and social science disciplines;
- to conduct scientific writing, presentation, proposal writing, project management and other related competences.

4. Types of teaching and learning for the future.

Civil protection, emergency management, disaster risk reduction, risk mitigation and prevention are all activites requiring a multidisciplinary knowledge. This means that the teams need to be composed by people with different expertise and that each person needs

to have an understanding of the broader picture, even though providing a specific capacity and contributing to specialized tasks and fields. The courses that have been examined in section 2, and the three ones that have been described in depth in section 3, all share the recognition that the broader picture must be provided to all attendants, that a bridge between the hard analysis of hazards and vulnerability and the social aspects related to communication, perception, cultural aspects, social and economic vulnerabilities and resilience need to be created and proposed as vital to courses attendants.

The idea that knowledge can be transferred as an item from one social group to another or from one country to another has to abandoned to investigate instead how knowledge can be better shared, co-produced and maintained in our societies. Web based technologies allow a much broader and softer way of disseminating information and creating the conditions for collaboration among different social groups having different perspectives on risk related issues.

Learning in the field of DRR and CCA occurs among all social groups, everyone has to learn something from the others. Only this way interdisciplinarity can achieve the best results in terms of mitigation capacities. This is particularly true in advanced studies : academicians and researchers can learn from practitioners and vice versa; students in physical sciences can learn from students in social sciences and public policies. Therefore many of the educational initivatives developed insofar have been structured and organised to include seminars, workshops oportunities where learning from each other becomes possible.

Summarizing the initiatives described in the previous sections and looking at the future, the following four types of teaching and learning seem particularly relevant. Higher education in the field of drr and cca has to be: *open, focused, cross-cutting, shared*.

Open : the CERG_C course that has been presented, along with others of the Preventioweb list that we have analysed, provide a great opportunity to mix professionals with different expertise, both on the side of attendants and on the side of teachers. The latter should come from both academia and research on the one side and from practitioners on the other. Such courses can be easily hosted by universities, in the form of specialization courses and in the context of lifelong education. The view according to which practitioners know better by exertise is clearly challenged by the magnitude of some events that have been experienced also recently, by the uncertainties involved in expected changes in both the environment and society. This type of teching/learning can occur in different ways, including through distance e-learning. This way the audience of such programs can be enlarged, offering to many the possibility to confront with the most advanced research results, while feeding the latter with information regarding the problems and successes encountered by professionals in the field.

Focused : Most programs in the Preventionweb list, including the ones that were added and the ones that were further described, have been developed within a disciplinary track, even though with an ample interdisciplinary perspective. It seems still important to provide students with « core knowledge » in engineering, geology, geography, health, social sciences, public policies, in order to ensure that emergency management, disaster risk reduction, are not run in a vacuum but within a real world, where several social demands

have to be met, and therefore where safety and security has to be balanced against other equally relevant needs.

Cross-cutting : The fact that there is still the need to create a specific expertise, with an articulated set of compentencies that each is ensured by « traditional » disciplines does not contradict the requirement of providing some opportunities for a more transverse teaching and learning, which means two things. On the one hand there are some tools that most practitioners in the field will need to understand if not use, like GIS. On the other it is important to complement each disciplinary expertise with some understanding of how the other experts and practitioners see the issue of risk. So, for example, a person with a background in physical and natural sciences will need to know the fundamentals of social sciences in disaster research. On the other side, a person trained in public policies to become a volunteer in humanitarian actions need to acknowledge the cosntraints and the uncertainties involved in hazard and vulnerability assessments, to fully understand the physical context within which he/she will operate.

Shared : Co-learning seems a crucial aspect in most programs we analysed or we are carrying out. It is fundamental that both students and teachers from the academia be exposed to meetings and lessons offered by practitioners with a strong experience in the field of both emergency management and risk reduction and prevention. The two realities of theoretical understanding of risk and of practical dealing with them in communities and through the tools of governments and private companies need to meet and exchange crucial information and knowledge. Both are fundamental to the final preparation of the expertise required to manage such a difficult task as crisis and risk management. More « self reflexive » professionals are able to recognise the need for science to « frame » problems and solutions (Posner, 2009; Rynes et al., 2001) ; academics and reserachers with a better grasp of what is really relevant in the field are also needed to close the gap between what Sarewitz and Pielke (2007) labelled as the « demand and supply » of research. In this regard significant cross-fertilization can be achieved between programs offered in academia and courses that are organised within civil protection agencies at different governmental levels. A relevant example is provided by the German Academy Academy for Crisis Management, Emergency Planning, and Civil Protection hosted by The Federal Office of Civil Protection and Disaster Assistance (BBK), a higher federal authority within the remit of the Federal Ministry of the Interior. It´ is responsible among others for the education of high rank officers of the German civil protection system (fire brigades, rescue services, technical relief, armed forces and police). The aim of one two week course is to train command and control and decision making in groups under time pressure. The three table top exercises with different scenarios (earthquake, major flooding and major electricity black out) focus on special aspects of the theme. The exercises are interrupted by reflection phases. Each reflection phase is devided in a self-reflection phase and a discussion with the trainers. To show the consequences an IT simulation program is used.

Similarly, the Lombardia Region in Italy has established in 2003 a school of civil protection, that has organised several courses aimed at training public adminsitrations personnel and volunteers on a variety of topics. Just few weeks ago the new program for the coming three years has been officially published in the Legislative Journal of the Region, highlighting that

"a process of re evaluation and reflection has produced the new program, with the aim of responding to the new challenges ahead".

In this paper the term teaching has been often associated to research : disaster risk is a field that has been evolving very fast, not only with the introduction of new terms and concepts but also thanks to the analysis of what went well and wrong in large disasters in a world that has changed dramatically over the last fifty years. The challenges for emergency managers are only partially the same of those of our ancestors, most are new and require a new form of collaboration among scientists, technical experts, practitiones, students. Research is therfore vital ; perhaps in the future it will be possible to « stabilize » the disaster profession as wished by some authors. However the attempts carried out until now have not been so positive, perhaps because the goal itself is a bit misplaced.

A final word should be spent on the relationship between educational programs in the field of drr and emergency management, and sustainability. The latter is already a well established topic around which a variety of degrees have been created in several universities worldwide. Thomas and Mileti (2003) suggest that "hazard management should be couched in the concept of sustainable development/sustainability". However, as correctly put by Lorch (2005), "the existing concepts of sustainability and sustanable development by definition have a focus on the medium- and long- term processses but need revision to include the implications of extreme events, regardless of whether these are natural or anthropogenic." Later on Lorch, commenting that one of the major step forward achieved by HFA1 was the clear "recognition that an insufficient evidence base exists for policy development" concludes with the following question: "Will national research councils also create adequate levels of long term funding and encourage transdisciplinary research and longitudinal studies to create the required evidence base?". It can be suggested that the furhter development and improvement of currently offered courses to educate and train future emergency/drr/risk/hazards managers should be considered as a relevant contribution to answering this question and build, students and professors, the knowledge and the information that is needed.

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