

**Redesastre: a contribution from Paraná to the management of disaster
risk in Brazil**

**PhD Eduardo Gomes Pinheiro, PhD Danyelle Stringari, Msc. Gislaine Cova,
Geographer Murilo Noli da Fonseca, Architect Lucas Frates Simiano,
University Center for Studies and Research on Disasters of Paraná (CEPED/PR),
Curitiba, Paraná, Brazil**

1. Context

The state of Paraná in the south of Brazil has recorded a significant increase in the number of disasters over the years, as well as the other Brazilian states, following an especially global trend. According to Pinheiro & Garcias (2014), data from the State Coordination of Protection and Civil Defense of Paraná (CEPDEC) revealed a recent increase of 38% in the number of disaster records in the state. The set of human, economic, environmental and other losses experienced today, due to disasters, has evidenced the growing need, more than timely and essential, for the concentration of integrated and proactive efforts by states, cities, the private sector and other segments of society for disaster risk management (DRM), with immediate focus on disaster risk reduction (DRR).

Since 2012, with the implementation of the National Protection and Civil Defense Policy (PNPDC), Law 12,608/2012, Brazil has a national DRM and DRR strategy that includes the integration of institutional, scientific and technical efforts. This initiative resulted from the Brazilian adhesion to global DRR efforts, reduced vulnerabilities and increased resilience of nations and communities when it became a signatory to the Hyogo Framework for Action (2005-2015). Currently, the country is a signatory of the Sendai Framework for Disaster Risk Reduction (2015-2030) and is committed to achieving the priorities and targets set for this cycle.

The Sendai Framework establishes four priority areas for action, including priority 1 – Understanding disaster risk. The following is inserted in the set of important national and local context actions to be carried out:

(h) To promote and improve dialogue and cooperation among scientific and technological communities, other relevant stakeholders and policymakers in order to facilitate a science-policy interface for effective decision-making in disaster risk management;

(j) To strengthen technical and scientific capacity to capitalize on and consolidate existing knowledge and to develop and apply methodologies and models to assess disaster risks, vulnerabilities and exposure to all hazards; (UNISDR, 2015).

And in the global and regional context, it stands out:

(g) To enhance the scientific and technical work on disaster risk reduction and its mobilization through the coordination of existing networks and scientific research institutions at all levels and in all regions [...] (UNISDR, 2015).

In order for these actions to be truly feasible and to have effective results in the society, the focus and the concentration of efforts for a closer approximation and involvement of the academic community and research

institutions with the local reality of cities in relation to vulnerabilities and exposure to disaster risks as a contribution to DRR are a must. The responsibility to produce applied and extensive scientific knowledge to the needs and reality of the society is not always or eventually assumed by the scientific community, despite legal predictability and its recognized importance.

Moreover, considering that the institutions that have a relationship with the protection and civil defense of the Brazilian states and cities have played a key role in disaster management, that is, in the post-disaster phases (response and recovery), (qualitative and quantitative) scientific output is needed to fill the gaps in knowledge needed to make daily decisions and to take strategic actions to prevent, mitigate and prepare for disasters, making the society less vulnerable and therefore safer and resilient.

Capitalizing the wealth of existing scientific knowledge to improve the accessibility and acceptance of research results for operational and practical activities, especially for a multidisciplinary, multi-sectoral and international field such as DRR, requires mechanisms to share innovations and increase acceptance. They include: creating innovative forms of collaboration; conceptualize risk; create, store and share data; as well as co-design and co-produce research with stakeholders. Knowledge centers, strictly designed to gather research results, to translate them into actionable information and to build networks among disciplines, are essential tools for the science-policy interface (Aitsi-Selmi et al., 2016).

The scientific community and other sectors of society have shared responsibility with governments, acting as stakeholders in DRR. According to Marco de Sendai, regarding stakeholder responsibilities, we have:

(b) Academy, scientific and research entities and networks to focus on the disaster risk factors and scenarios, including emerging disaster risks, in the medium and long term; increase research for regional, national and local application; support action by local communities and authorities; and support the interface between policy and science for decision-making (UNISDR, 2015).

The first international conference for the post-2015 UN agreements, held in early 2016, discussed the role of science and technology in the implementation of the Sendai Framework. The Science and Technology Conference of the United Nations Office on Disaster Risk Reduction (UNISDR) on the Implementation of the Sendai Framework for DRR (2015-2030) aimed at discussing and endorsing plans that maximize the contribution of science to reducing the risks and losses of disasters in the next 15 years and bring together the diversity of stakeholders.

In Brazil, based on compliance with the Sendai Framework and other guidelines of international milestones, PNPDC establishes:

XI - to encourage the deployment of teaching and research university centers on disasters and multidisciplinary centers of permanent and distance teaching, for the research, extension and training of human resources, with a view to the management and execution of activities of protection and civil defense (BRAZIL, 2012).

Redesastre emerges in this context. It is the first thematic network officially created in Brazil with the purpose of promoting cooperation and scientific and technological exchange on DRR in Paraná. This pioneering and unprecedented initiative started in 2014 and represents a contribution of the state to the management and DRR in the country.

2. The Emergence of Redesastre

The State Network for Research, Education, Extension and Technological Innovation focused on risk reduction and disaster in the state of Paraná, Redesastre, was established by State Decree 12,445, dated October 24, 2014. The purpose of the network is the cooperation and scientific and technological exchange aimed at DRR in the state. Its emergence occurred as a consequence of the creation of the University Center for Studies and Research on Disasters of Paraná (CEPED/PR), since it, from its conception, has as an idiosyncrasy the network action with teaching and research institutions.

CEPED/PR, headquartered in Curitiba, capital of the state of Paraná, was established by State Decree 9,557, dated December 6, 2013. It is a joint body between the State University of Paraná (Unespar) and the coordination of the State System of Protection and Civil Defense. This partnership made it possible to preserve the original characteristics of the other CEPEDs in Brazil, that is, to be linked to higher education and research institutions, but not only that, it allowed direct interaction with CEPDEC, also working as an advisory body of this institution.

To be able to take advantage of the scientific potential of other state, federal and private higher education institutions as a way of establishing a joint action, a cooperation mechanism with related institutions was incorporated into the CEPED/PR regiment, which, upon signing a term, they would be committed to the objectives of CEPED/PR, while at the same time would create a type of CEPED in their structures, as if it were an integral part of a larger network.

Since the design of this setting pointed to that, while universities sought CEPED/PR for joint action, why not create a network? This is how Redesastre came about. That is, CEPED/PR seeks to identify institutions interested in and operating in DRG or receives their proposals to participate in the network. Then, a term of cooperation integrating it to Redesastre is signed, managed by CEPED/PR.

The networking proposal of CEPED/PR, and therefore Redesastre, seeks to locate, encourage and mobilize researchers wherever they are so they can contribute to DRR in Paraná and in the national territory. Researchers often do not consider the needs of potential users in policies and practices when conducting research and do not systematically produce directly usable risk information, and likewise, decision makers do not always use the most appropriate scientific information available to make policy decisions (Weichselgartner & Pigeon, 2015). For example, the domains of DRR, knowledge management and social learning are intertwined and the understanding of these connections can help to improve DRR actions (Glantz & Baudoin, 2014; Renn, 2015; UNISDR 2015; Briceño 2015).

In this way, the network does not have a limit regarding action and cooperation, since all the contribution is welcome for the production of the scientific knowledge and, consequently, its dissemination among the local public managers, to provide better foundation in their decisions. The signature of the term of technical cooperation and the consequent entry to Redesastre are prerequisites that accredit the institution to prepare, in conjunction with CEPED/PR, projects aimed at DRR.

CEPED/PR, as a managing body of Redesastre, in the first years of operation, raised funds and obtained funding from Paraná Sanitation Company (Sanepar) and Araucaria Foundation for Scientific and Technological Development Support of the State of Paraná, providing participation and integration of the participating institutions of Redesastre, to encourage them to present projects for the themes considered a priority, selecting the proposals through a public announcement.

In addition, the decree that created Redesastre allows CEPED/PR to present projects considered relevant to state funds that have adherence to the theme of disasters (environment, water resources, public safety, social assistance, education, among others), individually or jointly with their cooperatives to obtain funds for their actions. Currently, 23 institutions have joined Redesastre. In parallel to this, CEPED/PR has trained hundreds of professionals related to city public management, state sectoral agencies and universities and institutions involved, using distance education (EaD) and on-site courses funded by these financial resources obtained until now.

3. Redesastre - results achieved so far

With its creation in 2013, CEPED/PR concentrated its efforts on the preparation of draft terms of cooperation and started contact with the first universities. In 2015, the first cooperation agreement was signed with State University of the Western Center of Paraná (Unicentro). This was the starting point for the consolidation of the network, which currently has 23 cooperative institutions, distributed throughout Paraná and some beyond its administrative limits.

The following are the main results achieved by Redesastre so far.

3.1 Terms of Cooperation

Redesastre has cooperation with 23 public and private teaching and research institutions at the state, federal and international levels (Table 1). The terms of cooperation are valid for five years from the date of signature and may be renewed while maintaining the interests of both parties.

Cooperative Institutions	
State University of Paraná (UNESPAR)	Federal Technological University of Paraná (UTFPR)
State University of the Western Center of Paraná (UNICENTRO)	State University of North Parana (UENP)
State University of Londrina (UEL)	Sanitation Company of Paraná (SANEPAR)
Pontifical Catholic University of Paraná (PUC-PR)	Federal University of Paraná (UFPR)
State University of Western Paraná (UNIOESTE)	National Centre for Monitoring and Early. Warnings of Natural Disasters (CEMADEN)
Meteorological System of Paraná (SIMEPAR)	Agricultural Defense Agency of Paraná (ADAPAR)
State University of Ponta Grossa (UEPG)	Foundation of Social Studies of Paraná (FESP)
Institute of Technology for Development (LACTEC)	Higher Institute of Administration and Economics (ISAE)
Positive University (UP)	Regional Council of Psychology 8th Region (CRP-08)

Institute of Research and Education in Telecommunications (IPET)	Regional Council of Veterinary Medicine of Paraná (CRMV-PR)
State University of Maringá (UEM)	Université Paris-Est Marne-la-Vallée (UPEM)
United Nations International Strategy for Disaster Reduction (UNISDR)	

Table 1. Institutions cooperating with Redesastre.

As the network expands its efforts and increases its range of action, more institutions have showed interest in creating a partnership, so that 10 other institutions are now under cooperation agreement processes.

3.2 Research Projects

Among the three thematic areas of activity of Redesastre is research, teaching and extension and technological innovation. The interaction with the cooperative institutions is not limited to the production and exchange of knowledge, but also includes the provision of financial resources to fund research projects in DRR. In total, a project to develop DRR capacity in the state of Paraná, coordinated by CEPED/PR and 14 projects executed by the network institutions are underway. They were initiated in 2017 and their completion is scheduled for 2019.

3.2.1 Projects of the Sanepar/Redesastre Public Announcement

On January 20, 2016, a cooperation agreement with Sanepar was signed in the amount of US\$ 395,147.59¹ with the objective of creating a network research program for DRR in Paraná in CEPED/PR. This program encompasses research, development, training and human resources training, absorption and transfer of technologies, educational research and extension services, through the transfer of financial resources for investment in DRR actions (natural/technological), in the themes of interest to CEPDEC, which integrate areas that are relevant to CEPED/PR planning.

According to the proposed schedule, CEPED/PR issued a Public Call 01/2016 – Redesastre/Sanepar, and invited higher education institutions and public research institutes, with headquarters and CNPJ in Paraná, and members of Redesastre, to submit offers in accordance with the terms set forth in the invitation to tender and the term of cooperation. The program is intended to provide research grants for the development of scientific research

¹US Dollar exchange rate on 08/08/2018: R\$ 3.80.

and technological innovation projects, developed in a network (three or more institutions), focused on DRR in Paraná and that meet Sanepar's expectations in terms of production of knowledge about risks and disasters in river basins and sources of public supply.

As a result of the public call, 14 projects were approved and selected, involving 14 faculty researchers and 30 fellows (Table 2). The researches deal with various themes and permeate several areas of knowledge such as Human Sciences, Health Sciences, Engineering, Exact and Earth Sciences.

Table 2. Projects resulting from the cooperation agreement with Sanepar.

Project	Proponent Institution	Participating Institution
1. Sidesol Paraná – Paraná Soil Landslide Monitoring System	IPET	CEPED/PR
2. Adaptation of the HAZUS-MH Flood Module for the Creation of Vulnerability and Risk Maps in Curitiba - PR	PUC/PR	CEPED;IPPUC ² ; PARANACIDADE;FEMA ³
3. Structuring of Disaster Preparedness Indicator in Cities (IPDC)	PUC/PR	CEPED/PR
4. Determination of Critical Rainfall Indexes for the Generation of Disaster Alerts	SIMEPAR	ITCG, CEPDEC Águas Paraná
5. Climatic Forecast and Identification of Areas Subject to Extreme Events in Paraná	UEL	UNIOESTE
6. Interactions of Environmental Risks with Collective Health, related to the Distribution of Fluorides in Public Supply Waters of the Londrina Health Region	UEL	UTFPR

²Institute of Research and Urban Planning of Curitiba

³State Environmental Fund

7. Inventory of the Scientific Production on Disaster Risks with the Institutions Integrating Redesastre	UNESPAR	CEPED/PR
8. Use of Agroenvironmental Index to Evaluate the Impact of the Use of Agrochemicals in the Areas of Superficial Public Supply Waterfalls of the HB of the Tibagi River	UTFPR	CEPED/PR
9. Vulnerability of the Springs at the Margins of BR 277 Between the Cities of Guaraniaçu and Foz do Iguaçu - PR	UNIOESTE	4° GB ⁴ ; AMOP ⁵ ; ECOCATARATAS
10. Development of an Alert System Based on the Marrecas River Flood Spot for the City of Francisco Beltrão-PR	UNIOESTE	UTFPR
11. Development of a Watershed Monitoring System	UTFPR	UFPR
12. Mom, can I play outside? Child Perception Analysis on Flood and Flood Risks	UNICENTRO	CEPED/PR
13. Bibliometric and Sociometric Analysis in National and International Periodicals	UNIOESTE	-
14. Contribution of the Knowledge Network for the Reduction of Flood Disaster Risk	UNICENTRO	CEPED/PR

For example, the project “Structuring of Disaster Preparedness Indicators in Cities” (IPDC) aims at structuring an indicator that allows the measurement of the city structure and its actions aimed at disaster preparedness capacity, to be used by city governments as a provider of subsidies for city management (Figure 1).

⁴4th Group of Firemen

⁵Association of Municipalities of Western Paraná

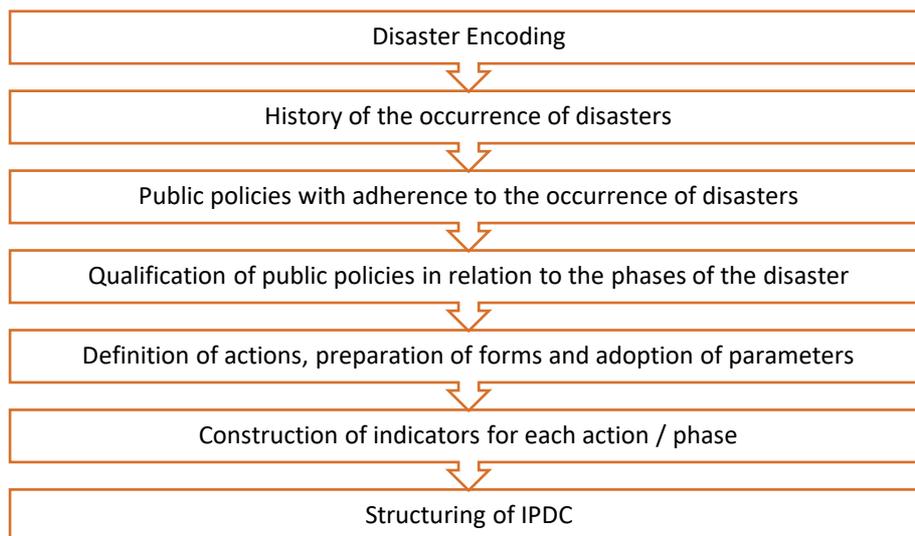


Figure 1. Methodological flow for IPDC structuring.

The research project “Inventory of the Scientific Production on Disaster Risks with the Institutions Integrating Redesastre” was designed to diagnose the scientific production related to the risk of disasters in Paraná. The total academic works already produced by the institutions that make up Redesastre are vast and many are still unknown. The works considered and analyzed in the inventory were defined in four established categories, namely: completion course works, monographs of specialization, dissertations and theses.

To diagnose them visits to the institutions that are part of Redesastre are carried out. At that time, they were 12. Consultation to the virtually available collections to research works are also carried out. They have the terms risk, disaster, civil defense, water resources, forest fires, contamination, scarcity, risks to public health, water and sewage treatment, water sources, water conservation as keywords or in their summaries, as well as other typological titles of the Brazilian Code of Disaster (COBRADE) and Codification of Disasters Threats and Risks (CODAR) (Figure 2).

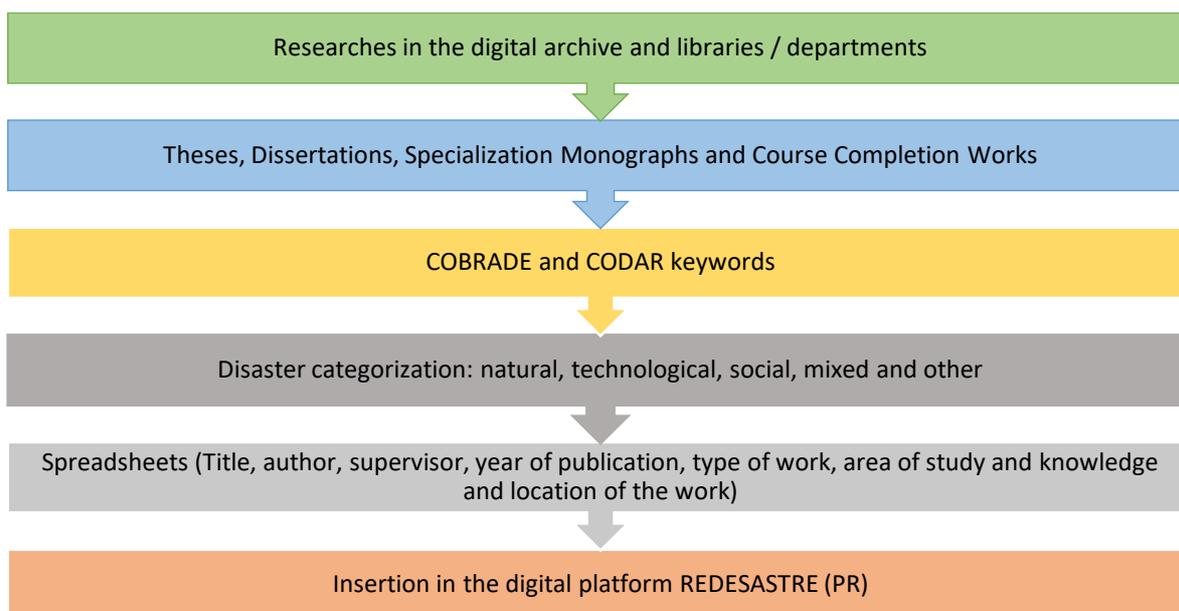


Figure 2. Methodological flow for the creation of the inventory.

After the collection and analysis phase, the data will be incorporated into a virtual platform (currently being finalized - also created and developed from a CEPED/PR project), which will be accessible to the academic community, society in general and bodies of the Civil Protection and Defense System. This thematic database on disasters, DRR and DRM will be the first in Brazil with these characteristics and will allow research to contribute to the prevention of the occurrence of disasters in Paraná, through the results they present.

3.2.1.1 Partial Results

On November 7 and 8, 2017, a scientific event was held, “First Workshop to Present the Partial Results of the Research Approved by the Public Call 01/2016 - Redesastre/Sanepar”, to share the partial results of each research project. The first results of the Redesastre - Sanepar cooperation cover multiple fields of knowledge, mainly to DRR, and, on the other hand, induce the emergence of questions related to water management, population awareness, etc. (Table 3).

Table 3. Synthesis of the results of the projects contemplated by the Public Call 01/2016 - Redesastre/Sanepar, presented in the Workshop.

Project N°.	Partial Results
1	<ul style="list-style-type: none"> • Development of equipment and acquisition of assembly components; • Development of geological information processing software;

	<ul style="list-style-type: none"> • Design and development of database and user interface.
2	<ul style="list-style-type: none"> • Creation of a database used in the simulations of flood risk scenarios; • Initiation of adaptation to the uses of the HAZUS-MH flood module in Brazil; • Previous realization of flood risk scenarios created by HAZUS-MH.
3	<ul style="list-style-type: none"> • Presentation of indicator systems, identification of variables and interrelationships; • Definition of a method to create indicators and the dimensions used in structuring; • Structuring of the indicator system: definition of IPDC.
4	<ul style="list-style-type: none"> • Obtaining data and information relevant to the project and data awareness; • Generation of maps of the region of interest and identification of priority areas.
5	<ul style="list-style-type: none"> • Generation of 117 maps of annual rainfall variability in Paraná (1977-2016); • Creation of maps of climatology (1981 to 2010) and anomalies of surface temperature, rainfall and sea surface temperature variables.
6	<ul style="list-style-type: none"> • Surveys on the geographical constraints of the 17th PR Health Region; • Generation of data from the health system with ANVISA.
7	<ul style="list-style-type: none"> • Trips to Redesastre institutions contemplated in the project; • Analysis of scientific production, data collection and results analyzed and summarized in summary inscribed and presented in II CBRRD 2017 (Rio de Janeiro, Brazil); • Creation (final phase) of the Redesastre digital platform for network integration.
8	<ul style="list-style-type: none"> • List of data from the 53 cities of the HB and application/ measurement of indicators.
9	<ul style="list-style-type: none"> • Analysis of disaster data on BR-277 highway; • Creation of a fast assessment protocol applied to BR-277 in the Cascavel city portion.
10	<ul style="list-style-type: none"> • Definition of the locations and installation of control equipment at the level of the Marrecas river and its affluents, and the points where the linimetric rules will be installed; • Definition of the sites and installation of equipment to control the volume of rainfall of the

	<p>Marrecas river and its main affluents, as well as the linimetric rules;</p> <ul style="list-style-type: none"> • Definition of flood spot through topography and occurrence history; • Survey of affected households (368, with about 1,472 people, 1,000).
11	<ul style="list-style-type: none"> • Sensor production and encapsulation: Bragg networks were successfully produced; • Production of sufficient networks for testing (destructive and non-destructive); • Complete encapsulation system and encapsulation of remote sensing in progress.
12	<ul style="list-style-type: none"> • Data collection tools (qualitative: creation of the pictures with research script, and quantitative: questionnaire): process analyzed by ethics committee; • Pre-test developed at Luiz Vianey Pereira School, in the city of Cascavel/PR, with a class of 1st and one of the 4th grade of Elementary School.
13	<ul style="list-style-type: none"> • Survey of articles according to the Qualis Capes and tabulation of the data.
14	<ul style="list-style-type: none"> • Increased knowledge of flood data; • Production of academic and dissemination materials; • Discussion for the formulation and implementation of public policies, especially those related to floods.

3.2.2. Project “Determination of Critical Pluviometric Indexes for the Occurrence of Gravitational Mass Movements in the South-Southwest Region in the State of Paraná”.

In the Public Call 014/2016, Araucaria Foundation for Scientific and Technological Development Support of the State of Paraná, a private organization of public interest and one of the 26 state foundations of support to research in Brazil, convened public nature state higher education institutions, without profit and public utilities to submit proposals in the “Network Research Support Program for Disaster Risk Reduction in Paraná under the terms established”.

Based on this, the “Determination of Critical Pluviometric Indexes for the Occurrence of Gravitational Mass Movements in the South-Southwest Region in the State of Paraná” project was carried out by five institutions. Unespar (proposing institution) executes it in partnership with Meteorological System of Paraná (Simepar), Institute of Lands, Cartography and Geology (ITCG), CEPED/PR and CEPDEC.

The project aims to conduct a study for the definition of a methodology in the identification of critical rainfall indexes associated with the occurrence of mass gravitational movements (MGM) in the southwestern region of Paraná. The work focuses on the analysis of historical rainfall series for the identification of extreme events and comparison with the MGM records of the region, namely in the cities of Francisco Beltrão, Pato Branco and Coronel Vivida.

In order to do so, it is focused on the consolidation and compatibility of the databases available in Paraná institutions dedicated to support the civil defense management, referring to historical series collected by meteorological radar, surface stations, MGM inventories, among others. The historical series of pluviometric data are analyzed and correlated with MGM to understand the relationship between the rainfall distribution characteristics (persistence and intensity) and the occurrence of MGM. Rainfall series are obtained based on the meteorological monitoring network of Simepar and National Institute of Meteorology (INMET).

These data are statistically treated for mathematical modeling of the relationship between accumulated rainfall indexes (daily, weekly and monthly) and rainfall intensities (mm/h) and the incidence of MGM. The models are compared with others in use in the south-southeast regions of the country, and perhaps in other countries with similar geographic conditions, for the measurement of statistical significance, reliability and robustness.

Due to the irregularity of the spatial distribution of the convective systems, the data of the surface meteorological stations do not adequately represent the actual volume of rainfall in a given area. To minimize this problem, in addition to the rainfall data, radar and satellite data are used in the composition of the rainfall estimation in the regions of interest.

Based on the rainfall series obtained, the accumulated rainfall of 24, 48, 72 and 96 hours is estimated to allow the analysis of extreme events with different duration periods. Then extreme values are chosen for distribution adjustment. The peak limit is determined based on the Series Dispersion Index (SDI) with the Pareto variation, which will be estimated by the maximum likelihood method.

The results will be submitted to the participating institutions of the Paraná System of Information for the Management of Risks to Natural Disasters (SIGRisco), created by State Decree 9,941/2014, and to researchers interested in the subject, for criticism and adoption of criteria for protection decisions and civil defense. With its accomplishment, it is hoped that the compatibility of data in the Paraná institutions dedicated to the management of protection and civil defense is obtained, as well as the definition of critical rainfall thresholds that will indicate a greater probability of occurrence of landslides that can generate risks to the population and damages to the

infrastructure. These indexes will be used as subsidies for the creation of a Preventive Protection and Civil Defense Plan for the area of study.

The proposal also aims to make a bibliographic inventory of the academic-scientific production in Paraná in the area of disaster risk reduction, especially the articles, for 16 months. The selection of these articles is carried out in repositories, such as Capes Newspaper Portal, which is a virtual library that gathers and makes available to teaching and research institutions in Brazil the best of international scientific production, among others. The search for articles was based on keywords selected from COBRADE and CODAR. The selected articles are organized in spreadsheets containing information such as journal, institution, title, year of publication, area of study, area of knowledge, keywords, type of disaster and impact factor.

3.2.2.1 Partial Results

As a partial result of the project related to the bibliographic inventory, 585 articles have been raised so far. Among them, the “Ambiência Journal” was the one that had the greatest amount of work related to disasters, totaling 39 articles. Federal University of Paraná (UFPR) was the institution with the most published papers on the subject, with 183 articles, or 30.65% of the total. From the temporal point of view, the first publication was registered in 1970, and 2012 was the year with the highest number of publications, with a total of 52.

The partial results indicate that the geographic area of study most researched was the state of Paraná, with 65 publications, without reference of minor spatial clipping. Regarding the areas of knowledge, “Health Sciences” was the one that presented the largest number of articles, with 170 articles, representing approximately 29% of the total. And the disaster typology that most totaled scientific works was “biological”, with 322 articles, accounting for about 55% of the total.

3.3 Organization and Conduct of the First Brazilian Convention on Disaster Risk Reduction

Brazil has suffered extremely significant losses with the occurrence of disasters, directly affecting its development. It is necessary to establish a discussion process on disaster risk associated with development. Disaster, and consequently the risk that allows and provides for its existence, is not in a specific category of knowledge, but rather it is multidisciplinary, complex and systemic and, as such, requires a similar treatment by the academy. This is one of the main challenges for researchers and institutions: to promote the mobilization of professionals from the most diverse areas that need to meet together for the required discussion. As a signatory of the Sendai Framework, Brazil must promote in its most diverse spheres the dissemination of the lines of action that compose it, dialoguing with the strategic sectors for its implementation.

Based on this circumstance, on the attempt to organize a group of researchers and on the need to disseminate the four priorities of the Sendai Framework, the first edition of the Brazilian Convention on Disaster Risk Reduction (I CBRRD) was held. This was a joint initiative from teaching and research institutions and Brazilian researchers, headed by CEPED/PR, Unespar and counting on the direct involvement and support of Positive University, a private IES in Curitiba.⁶

The I CBRRD: “Integrated Management in Disaster Risk Reduction in Brazil and the Sendai Framework for Disaster Risk Reduction 2015-2030” aimed at promoting networking, exchange of information and exchange of experiences among public and private institutions, universities and research institutions, private companies and governmental bodies in related areas, among others, through lectures, workshops and presentation of scientific works, in addition to the launch of Redesastre. For that, the event had six thematic axes that could be submitted (Figure 3).



Figure 3. Thematic axes of the ICBRRD.

The event was held from October 12 to 15, 2016 in Curitiba. It was attended by 823 participants from several Brazilian cities and had 40 speakers and 4 moderators, and during the two days of its accomplishment several scientific papers were presented. Pre-convention mini-courses were held (Figure 4) involving several themes, 15 in total, which brought together 244 participants. In all, the scientific committee of the convention

⁶ Understanding disaster risk, strengthening disaster risk governance for management, investing in disaster risk reduction for resilience, and improving disaster preparedness to provide effective response and to better rebuild recovery and rehabilitation.

received 263 scientific papers on various topics related to DRR, resulting in the annals of the event in 2017 (CEPED/PR, 2017).

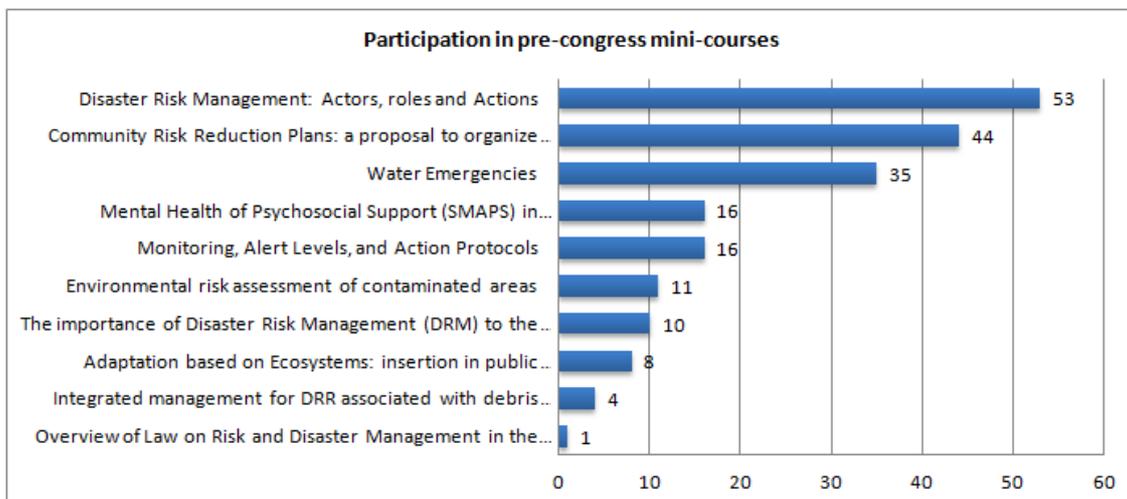


Figure 4. Participation in the mini-courses of the ICBRRD. Source: CEPDEC/PR (2016).

The I CBRRD, including the network of centers, sites and research groups involved in DRR research and teaching, was held in Curitiba for two reasons: the city hosts the first Brazilian CEPED with a plural format that congregates and configures a network of public and private cooperative institutions around the necessary actions for DRR, being one of the results of the restructuring of the State System of Protection and Civil Defense, which was updated by State Decree 9,557, dated December 6, 2013. The network created fulfills, therefore, the challenges of working in a network at the state level. The second reason is due to the fact that the I CBRRD represented the challenge for structuring and formalizing a research and teaching network that can work cooperatively at the national level.

3.4 Organization and Conduct of the First Seminar on Disaster Risk Reduction

The first edition of the Paraná Seminar on Research in Disaster Reduction - I SEREDE 2018, will be held in Curitiba/PR from November 07 to 09, 2018, organized by CEPED/PR with the support of the Pontifical PUC/PR, Sanepar and Coordination for the Improvement of Higher Level Personnel (CAPES). In academic terms, the disaster theme, as well as the risk that allows and provides its existence, has a multidisciplinary, complex and systemic characteristic, not falling into a specific category of knowledge, and as such, requires similar treatment by the academy. The mobilization of professionals from the most diverse areas working together is one of the main current challenges for the academy and society in general, in relation to GRD.

In this sense the event is meritorious, since it represents a unique and current opportunity, from a state context, for the integration of researchers from various areas of knowledge, from the presentation and discussion of important themes and the recently produced scientific works of concentrated form and sparse in the state. In addition, another rationale for supporting the event is based on the opportunity to strengthen Redesastre as an initiative aimed at integrating the institutions to generate knowledge for DRR.

The I SEREDE will count on the participation of professors and undergraduate and graduate students from various universities, authorities, CEPDEC members, as well as interested people in general. It is part of the actions established in the CEPED/PR cooperation agreement with Sanepar and aims to present to the scientific community and society in general the final results of the surveys contemplated by the Public Call 01/2006 - Redesastre/Sanepar, as well as to open the discussion on the theme for the state sphere, in the search to increase the joint efforts for a more resilient state and with less disasters.

3.5 Strengthening the Risk and Disaster Management Culture

Within the thematic area of action of Redesastre, related to teaching, CEPED/PR has constantly carried out a set of actions aimed at strengthening the culture of risk and disaster management. Being responsible for teaching protection and civil defense in Paraná, CEPED/PR has repeatedly sought solutions to train the highest number of people with quality and in a sustainable way, while consolidating a system of continuous and financially viable education.

To reach this goal, distance education is a highly pertinent tool before the current challenges, so that it allows access to the most remote places in the national territory with Internet access. Another important factor concerns the flexibility of course completion, a factor of great relevance especially for public agents, because while the student can access the content and perform the activities according to the availability of the schedule, there is no need to depart leave their city and daily activities.

Therefore, investing and consolidating the distance education of CEPED/PR, increasing the range of courses to be made available, and using professional-level mechanisms aimed at the management and supply of inputs to students, became more than necessary to achieve broad, robust and effective results. To this end, efforts were concentrated on the creation, development and maintenance of the EaD portal for the management of the CEPED/PR moodle platform, aiming at the integration and customization of information and evolution in the management of EaD teaching in CEPED/PR (Figure 5). The portal was launched at Unespar, which now has its own EaD platform, representing an innovation within the institution.



Figure 5: Portal of distance education of CEPED/PR.

With regard to training, more than five thousand people have been trained in 32 EaD courses offered by the CEPED/PR teaching system, such as the “Essentials on City Protection and Civil Defense to Civil Defense and Protection City Managers” which aims to provide an essential training to the city protection and civil defense manager to act in periods of abnormality. With new mayors taking office in 2017, many Municipal Protection and Civil Defense Coordination (COMPDEC) have been restructured, consisting of public officers that require training. In this way, it was necessary to train them, as well as to update those who remained in the current management.

CEPED also taught a course aimed at Sanepar, “Course of Incident Command System”, with the purpose of training managers and institutions for the application of the Incident Command System (ICS). ICS is a world-known emergency management tool adopted by CEPDEC. This tool has also been adopted by the public security bodies, through National Secretariat of Public Security. However, Civil Defense events extrapolate the participation of public security agencies involving several institutions. Public utilities that provide essential services, such as Sanepar, should have knowledge on how to use ICS to effectively integrate it into disaster response.

In addition to the above results, CEPED/PR is preparing its space for the structuring of a recording studio of video-classes offered in the EaD courses, with resources from the World Bank, enabling the state of Paraná to have a physical and technological structure capable of producing large-scale courses (Figure 6).



Figure 6. Representative image of the future CEPED/PR recording studio.

3.5 Thematic Sub-Networks

Reasoning within the meaning of the word network and, mainly, in its dimensions, compared with what was presented as a partial result of Redesastre, we notice the formation of a kind of interconnected web in which the nodals would be the cooperative institutions and the ties would correspond to existing or potentially achievable relationship between these members through projects and activities carried out in partnerships - permanent or non-permanent.

However, considering the multidisciplinary nature of risk composition and the consequences of disasters, and inspired by the need for permanent teams to engage with specific activities in specific areas of knowledge, there was an idea to proposing another form of non-parallel organization, neither substitutive, but complementary to the initial result of the institutional arrangement: a proposal for teachers and researchers with a noticeable prominence in their relationship with the subject to integrate themselves.

The outbreak of this idea sought a pilot project that started from conversations and recent events at the time, proposed by professionals from different places of the state and who were not known until then. An invitation was made at a meeting at the CEPED/PR headquarters so that an offer was presented as a challenge: the first dedicated thematic network came about, in this case, to the relationship between psychology and disasters.

CEPED/PR prepared a resolution on thematic networks, focusing on autonomy from its inception, elective definition of its members for the occupation of offices and planning, restricting itself to propose to the group the development of actions related to the priorities presented by the civil defense as, for example, what was called psychological first aid.

3.5.1 Psychology Sub-Network

Adding Regional Council of Psychology of Paraná (CRP) to the group of researchers from several institutions such as UNIOESTE and UFPR of the area of psychology in disasters, as well as professionals from the Fire Department and Military Police with training in the area, the creation of the Thematic Sub-Network of Psychology focused on Psychosocial Attention and Mental Health in Disasters occurred in December 21, 2016.

As a result of this action, in 2017 the “Disaster Mental Health and Intervention” course was carried out in the cities of Curitiba, Cascavel, Londrina and Maringá in the state of Paraná (Figure 7). It aimed to train psychology professionals to work in GRD. It was also held in the semipresential mode, with 30 hours, 10 in EaD mode and 20 in presential mode.



Figure 7. Course of Disaster Mental Health and Intervention - Londrina and Maringá Classes.

In relation to this initiative, autonomy is provided so that the coordination of thematic networks develops structuring actions to achieve their objectives, which consist of developing studies, skills and events focused on the theme, in addition to providing support in the moments before, during and after the occurrence of disasters along the territory of Paraná.

3.6 Capacity Building: “Building Resilient Cities – My City Is Getting Ready”

Another important action carried out by CEPED/PR is the cooperation agreement signed with UNISDR, in which we are working to provide local public managers and stakeholders in areas such as health, education, protection and civil defense, housing, environment, social assistance, in cities that have joined the campaign “Building Resilient Cities: My City is Getting Ready”, a strategy for capacity building. Based on EaD, the goal is to provide facilitated and qualified access to these managers and actors, enabling them effectively and for the campaign to effectively take place in the cities.

From the material provided by the United Nations (UN), CEPED/PR Education Section members began the process of adapting content to the Brazilian reality and structuring the video-lessons (Figure 8). Drills and assessments were also prepared for students. The classes will be available in videos and written material on the portal <<http://www.ensino.ceped.pr.gov.br>>. The goal is to serve the cities that have joined the campaign. Currently, Paraná is the Brazilian state with the highest relative number of cities that joined it, totaling 321 cities out of the 399 existing ones, which represents about 80.4% of the total.



Figure 8. Adaptation of the course material and its EaD space, in addition to the certificate of completion issued by CEPED/PR with UNISDR and the Secretaria Nacional de Defesa Civil.

To add to the content, the CEPED/PR team decided to innovate the course “Developing capacities to make cities more resilient”, in which the webseries called “Wise up resilience” was developed as a way of making the process of understanding simpler and more didactic (Figure 9). There are 16 episodes recorded in cooperation with the cinema course of Unespar and its actors are members of CEPED/PR and Civil Defense. For the first time there is a message from the head of the UNISDR Americas Office directly to the Brazilian cities. The course also includes a message from the promoter of the campaign in Brazil.



Figure 9. Webseries “Wise up resilience”.

In addition to the course itself, a Portuguese language translation of the “Campaign Guide: Building Resilient Cities” and the campaign's self-assessment tool, the *Scorecard*, was done. This tool has been applied, to date, in three cities in Paraná: Campo Largo, Curitiba and União da Vitória. The first two cities are in the final phase of the structuring process: the creation of the Strategic Plan of Resilience. Although the expected results for this moment are well below average, this initiative is influencing other cities to more actively participate in the actions to become resilient cities.

3.7 State Protection and Civil Defense Plan

The State Protection and Civil Defense Plan (PEPDC) is one of the results of the project for Strengthening Disaster Risk Management (SDRM), which was partially funded by the World Bank. Under the State Policy on Protection and Civil Defense, in 2015, the methodology and timetable developed by CEPED/PR was presented to the State Council for Civil Protection and Defense (CEPRODEC), which approved it. CEPED/PR has issued three publications to support managers with the Civil Defense and Protection Planning Guidelines (state, regional and sectoral). These guides, distributed to those responsible for planning at these levels, should provide conditions for the outcome of the planning to meet the goal of the SEPDEC of Paraná: disaster reduction.

4. Redesastre: Future actions, Perspectives and Challenges

Despite the many results achieved, Redesastre does not stop. Its management needs to be steps ahead of the events, after all, there is much to be done and developed. CEPED/PR has invested a great deal of time, establishing guidelines and exploring opportunities and gaps to be filled and used. Its pioneering spirit, based on personal detachment and the liberation of the vanities traditionally impregnated in some sectors of the academy

and the technical institutions, conferred the plurality as main brand, with the purpose of guaranteeing the inclusiveness character to the network.

In this sense, a need to confer the broadening of the usefulness and importance of the network for those actors who can trust in it arises, establishing relationships of positive dependence. It may be explained: a specific group, composed of sectoral agencies and agencies responsible for inputs, has been created by means of a state decree so that they can be carried out, from the proper planning of the ground in the planning of the cities to the unprecedented issue of a disaster alert produced in the state itself. CEPDEC is responsible for developing the conduction of the works and, as it deals with the production of knowledge predominantly through research, CEPED/PR, as a body belonging to the coordination, must carry out coordination in the area of science and technology in this process. It will enable the Redesastre institutions to support the sectoral bodies by developing partnership projects with the scientific coordination of universities and research institutes under the technical supervision of members of those agencies, resulting in the enhancement of human and financial resources.

In this way, the financial sustainability of Redesastre, in order to allow constant financial flow, has direct dependence on this mentioned insertion. The network needs to develop tools of cooperation by inserting technical institutions as participants, at a differentiated level, constituting one of the bases of interinstitutional interactivity - the applicant, funder and receiver of results to contribute with the exercise of its competence with the system of protection and civil defense.

Funds from financial funds set up to provide for the implementation of actions in the most diverse areas of operation of these technical institutions should include forecasts for the costing and investment of research and extension activities, teaching and technological innovation - provided in the area of DRR by Redesastre and CEPED/PR.

Although obvious, CEPED/PR and Redesastre's relationship with CEPDEC, the state's only protection and civil defense management structure, needs to be constantly worked on to evolve. The strangeness initially manifested with regards to the role that CEPED/PR develops within the State System of Protection and Civil Defense needs to be replaced by partnership and trust. The common actions developed, when detected that they depend on previously unavailable knowledge or studies that need to be performed, need to include the activation of CEPED/PR for its conduct.

In the area of education, courses to provide capacity building for public managers, technicians from the various areas of knowledge, are among the priorities. CEPED/PR, by stimulating and propagating the principles of

resilience, needs to make vacancies available to public out of the usual role of those who need and will continue to need to take courses on an ongoing basis - the city protection and defense coordinators. The expansion of the portfolio of courses also needs to extrapolate, in terms of level, extension, adding to the specialization and insertion of elective courses in the graduate courses of the cooperative institutions, even though adopting, for this purpose, as an alternative to provide the required permeability.

Another front of work turns to the creation of a Radio, TV and producer. It is the establishment of a structure capable of spreading useful information to all who need it. The maintenance of life, goods, the guarantee of the quest for sustainability, development, and resilience go through this strategy that needs to be conducted by CEPED/PR. One of the decisive partnerships for the outbreak came with the provision of funds partially financed by the World Bank for the acquisition of state-of-the-art materials that will equip a physical space located adjacent to the headquarters of CEPED/PR. The UNESPAR Cinema Course will be a partner and the organization of the thematic network of communication of risks, disasters and resilience will be fundamental for the organization of this goal. Within it, students and teachers can be involved and support the process throughout, feeding the specific channels on social networks and producing community service pieces for radios and open TVs, available free of charge by CEPED/PR throughout the country.

Redesastre is always open to receive new contributions, new participants and institutions. It is necessary to mobilize the thinking mass in universities, to produce and propagate useful knowledge for decision-making from the public power to the simplest and least educated representative of the population - who may be the next victim. The mission of integration has been fulfilled, but the pursuit to evolution continues.

References

- Aitsi-Selmi, A.; Murray, V.; Wannous, C.; Dickinson, C.; Johnston, D.; Kawasaki, A.; Stevance, A.S. and Yeung, T. 2016. *Reflections on a Science and Technology Agenda for 21st Century Disaster Risk Reduction. International Journal Disaster Risk Science*, Vol. 7:1–29.
- BRAZIL. Chamber of Deputies. Legislation Law no. 12,608, April 10, 2012. Establishes the National Policy for Protection and Civil Defense - PNPDEC. It deals with the National System of Protection and Civil Defense - SINPDEC and the National Council of Protection and Civil Defense - CONPDEC. Authorizes the creation of information system and monitoring of disasters. Available in: <http://www.planalto.gov.br/ccivil_03/_Ato2011-2014/2012/Lei/L12608.htm> Accessed in: 15 Jul 2018.
- Briceño, S. 2015. *Looking back and beyond Sendai: 25 years of international policy experience on disaster risk reduction. International Journal of Disaster Risk Science*, Vol. 6, Issue 1: 1–7.
- State Coordination of Protection and Civil Defense of Paraná (CEPDEC). 2016. *Yearbook of the Civil Defense of Paraná: actions developed in 2016*. Curitiba, Paraná, Brasil. Foundation for Development Support of the State Faculty of Philosophy, Sciences and Literature of Paranaguá and the State University of Paraná (Funespar). 70p.
- Glantz, M.H. and M.A. Baudoin. 2014. *Hydro-meteorological disaster risk reduction: A survey of lessons learned for resilient adaptation to a changing climate*. Boulder, USA. Consortium for Capacity Building.
- Pinheiro, E.G. and Garcias, C.M. 2014. Disasters: perception of comparative financial and economic impact on the Parana State in 2012. *Paranaense Development Journal*, Vol. 35, Issue: 207-222.
- Renn, O. 2015. *Stakeholder and public involvement in risk governance. International Journal of Disaster Risk Science*, Vol. 6, Issue 1: 8–20.
- UNISDR (United Nations International Strategy for Disaster Reduction). 2015. *Sendai framework for disaster risk reduction 2015–2030*. Available in: <<http://www.wcdrr.org/preparatory/post2015>>. Accessed in: 15 Jul 2018.
- Weichselgartner, J. and Pigeon, P. 2015. *The Role of Knowledge in Disaster Risk Reduction*, *International Journal of Disaster Risk Science*, Vol. 6, Issue 2: 107-116.