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The Global Facility for Disaster
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# IMPROVING DISASTER RISK AND LOSS INFORMATION IN ALBANIA

## SUMMARY REPORT

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This technical summary report focusing on ways to improve the disaster risk and loss information in Albania was prepared by a technical Team comprising **Dr. Manya Deyanova** (Mott MacDonald Principal Structural Engineer, Technical lead and project management), **Mr. Emiljano Zhuleku** (Mott MacDonald Country Manager in Albania & Kosovo, Local Project Coordinator), **Ms. Odeta Lena** (Quantitative research analyst, local advisor in the field of statistical modelling, data analysis and local data management regulations), **Dr. Arbi Shehu** (GIS expert, local advisor in GIS and Geoscience), **Dr. Joao Travanca** (Mott MacDonald Senior Structural Analyst, risk analyst and data processing expert), **Dr. Krumka Kasapova** (Mott MacDonald Structural Engineer, in charge of data collection and review), **Ms. Maria Christoskova** (Mott MacDonald Senior Structural Engineer, data collection at the Inception phase). The report was prepared under the overall guidance of **Mr. Daniel Kull** (Senior Disaster Risk Management Specialist, Task Team Leader), **Mr. Darko Milutin** (Disaster Risk Management Specialist), **Mr. Oraz Sultanov** (Senior Operations Officer), **Ms. Tatiana Skalon** (Disaster Risk Finance Specialist), and **Mr. Keler Gjika** (Financial Sector Specialist). The report was designed by **Mr. Vladimir Mirzoyev.**

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# GLOSSARY AND TERMS

*This table contains a list of terms in English and Albanian and their definitions, as used in the project. The notations of the Albanian institutions, agencies, and authorities are used in the report as abbreviated in Albanian. The definitions of the terms used in the Risk Data Catalogue are provided in Appendix D.*

| In English / Në anglisht | | In Albanian / Në shqip | |
|---|---|---|---|
| **Terms & Definition** | **Notation** | **Termat & përkufizimet** | **Akronimeve** |
| Agricultural Technology Transfer Center-Fushë Krujë | | Qëndra e Transferimit të Teknologjive Bujqësore, Fushë – Krujë | **QTTB-Fushë Krujë** |
| Agency for Agricultural and Rural Development | | Agjencia për Zhvillimin Bujqësor dhe Rural | **AZHBR** |
| Agency for Support to Local Self-Government | | Agjencia për Mbështetjen e Vetëqeverisjes Vendore | **AMVV** |
| Albanian Geological Service | **AGS** | Shërbimi Gjeologjik Shqiptar | **SHGJSH** |
| Albanian Hydrographic Service | | Shërbimi Hidrografik Shqiptar | **SHHSH** |
| Albanian National Archive | **ANA** | Arkivi Kombëtar Shqiptar | **AKSH** |
| Albanian National Library | **ANL** | Biblioteka Kombëtare Shqiptare | **BKSH** |
| Albanian Power Corporation | | Korporata Elektroenergjitike Shqiptare | **KESH** |
| Albanian Power Distribution Operator | | Operator I Shpërndarjes së Energjisë Elektrike | **OSHEE** |
| Albanian Red Cross | | Kryqi i Kuq Shqiptar | **KKSH** |
| Albanian Road Authority | **ARA** | Autoriteti Rrugor Shqiptar | **ARrSh** |
| Archaeological Service Agency | | Agjencia e Shërbimit Arkeologjik | **ASHA** |
| Biological hazard epidemic and plague | | Rreziku biologjik epidemi dhe murtajë | |
| Board of Geospatial Information | **BGI** | Bordi për Informacionin Gjeohapësinor | **BIG** |
| Buildings | | Ndërtesat | |
| Central Technical Archive of Construction | **CTAC** | Arkivi Qendror Teknik i Ndërtimit | **AQTN** |
| CIMA Research Foundation Centro Internazionale in Monitoraggio Ambientale | **CIMA** | Fondacioni i Kërkimeve CIMA Qendra Ndërkombëtare për Monitorimin e Mjedisit | **CIMA** |
| Civil Protection Committee | | Komiteti i Mbrojtjes Civile | **KMC** |

| In English / Në anglisht | | In Albanian / Në shqip | |
|---|---|---|---|
| **Terms & Definition** | **Notation** | **Termat & përkufizimet** | **Akronimeve** |
| Cold wave | | Valë të ftohti | |
| Council of Ministers | | Këshilli i Ministrave | **KM** |
| County<br>*First level administrative division - 12 counties. Please note that previous administrative first level division consisted of 36 districts (Rrethe) and the term "district" is still used in the Risk Data Catalogue for old datasets* | | Qarku<br>*Ndarja administrative e nivelit të pare - 12 Qarqe* | |
| Damage | | Dëmtimi | |
| Damage and Loss Assessment | **DaLA** | Vlerësimi i Dëmit dhe Humbjes | **VDHu** |
| Decision of the Council of Ministers | **DCM** | | |
| Disaster Information System | **DIS** | | |
| Disaster Management System | **DBMS** | | |
| Digital Elevation Model | **DEM** | | |
| Digital Terrain Model | **DTM** | | |
| Directorate of Water Resources Policies, at Ministry of Environment | | Drejtoria e Politikave të Burimeve Ujore, pranë Ministrisë së Mjedisit | **DPBU** |
| Disaster Risk Management | **DRM** | | |
| Disaster Risk Reduction | **DRR** | | |
| Dwellings | | Banesat | |
| Earthquake | **EQ** | Tërmet | |
| Environmental and Territorial Management Institute | **ETMI** | Instituti per Menaxhimin e Mjedisit dhe Territorit | **ETMI** |
| Epidemic | | Epidemik | |
| European Commission | **EC** | | |
| European-Mediterranean Seismological Centre | **EMSC** | | |
| European Union Intelligence and Situation Centre | **INTCEN** | | |
| Fire and Rescue Service | | Policia e Mbrojtjes nga Zjarri dhe për Shpëtim | **PMNZSH** |
| Food and Agriculture Organisation of the United Nations | **FAO, UN** | Organizata e Ushqimit dhe Bujqësisë e Kombeve të Bashkuara | **FAO, UN** |

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| General Directorate for Civil Emergency | **GDCE** | Drejtoria e Përgjithshme e Emergjencave Civile | **DPEC** |
| General Directorate of Civil Status | **GDCS** | Drejtoria e Përgjithshme e Gjendjes Civile | **DPGjC** |
| Geographic Information System | **GIS** | Sistemi i Informacionit Gjeografik | |
| Global Facility for Disaster Reduction and Recovery, World Bank | **GFDRR** | Instrumenti Global për Reduktimin e Katastrofave dhe Rikuperimin, Banka Botërore, | **GFDRR** |
| Global Rapid post-disaster Damage Estimation | **GRADE** | Vlerësimi i Shpejtë Global i Dëmit pas katastrofës | **GRADE** |
| Gross Domestic Product | **GDP** | Prodhimi i Brendshëm Bruto | **PBB** |
| Gross Value Added | **GVA** | Vlera e Shtuar Bruto | **VSHB** |
| Graphical User Interface | **GUI** | | |
| Hazard | | Rrezik | |
| Household<br>*According to census, a household includes resident population in Albania usually considered part of the household and up to 4 persons who were temporarily present in the household at the moment of census questioner. Persons living abroad but who were household members before they moved abroad and would otherwise still be regarded as household members are not counted* | **HH** | Njësitë Ekonomike Familjare<br>*Sipas regjistrimit, një familje përfshin popullsinë rezidente në Shqipëri, që zakonisht konsiderohet pjesë e familjes deri në 4 persona, të cilët ishin përkohësisht të pranishëm në familje në momentin e plotësimit të pyetësorit të regjistrimit. Personat që jetojnë jashtë vendit (por që kanë qenë anëtarë të shtëpisë përpara se të shpërnguleshin, të cilët përndryshe do të konsideroheshin ende si anëtarë të familjes) nuk llogariten* | **NjEF** |
| Humanitarian OpenStreetMap | **HOTOSM** | Projekti Humanitar OpenStreetMap | **OSM** |
| Immovable Property Registration Office | | Zyra e Regjistrimit të Pasurive të Paluajtshme | **ZRPP** |
| Institute of Cultural Heritage | **ICH** | Instituti Kombëtar i Trashëgimisië Kulturore | **IKTK** |
| Institute of Cultural Monuments | | Instituti i Monumenteve te Kulturës | **IKM** |
| Institute of Geoscience Energy Water and Environment | **IGEWE** | Instituti i Gjeoshkencave, Energjise, Ujit dhe Mjedisit | **IGJEUM** |
| Institute of Geography & Military Infrastructure | | Instituti i Gjeografisë dhe Infrastrukturës Ushtarake | **IGJIU** |
| Institute of Public Health | | Instituti i  Shëndetit Publik | **ISHP** |
| Institution of Structural Engineers | **IStructE** | | |

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| Institute of Transport Studies | **ITS** | Instituti i Studimeve të Transportit | **IST** |
| Integrated Information and Statistics System of the Council of Ministers | | Sistemi I Integruar I Informacionit dhe Statistikës të Këshillit të Ministrave | **SIISKM** |
| Integrated Research on Disaster Risk | **IRDR** | | |
| International Red Cross Federation | **IFRC** | Federata Ndërkombëtare e Kryqit të Kuq | |
| International Steering Committee for Global Mapping | **ISCGM** | | |
| Joined Damage, Loss and Needs assessment | **JDLA** | | |
| Joint Research Centre | **JRC** | | |
| Military Meteorological Service | | Shërbimi Meteorologjik Ushtarak | **SHMSH** |
| Ministry of Agriculture and Rural Development | | Ministria e Bujqësisë dhe Zhvillimit Rural | **MBZHR** |
| Ministry of Finance and Economy | **MoFE** | Ministria e Financave dhe Ekonomisë | **MFE** |
| Ministry of Health | **MoH** | Ministria e Shëndetësisë | **MSH** |
| Ministry of Internal Affairs | **MoIA** | Ministria e Brendshme | **MB** |
| Ministry of Infrastructure and Energy | **MoIE** | Ministria e Infrastrukturës dhe Energjisë | **MIE** |
| Ministry of Tourism and Environment | **MoTE** | Ministria e Turizmit dhe Mjedisit | |
| Municipality<br>*Second level administrative division - basic territorial entities for local administration*<br>*61 municipalities in Albania* | | Bashkia<br>*Ndarja administrative e nivelit të dytë - entitetet themelore territoriale për administratën lokale*<br>*61 bashki në Shqipëri* | |
| Municipal units<br>*Third level administrative division*<br>*373 municipal units* | | Njësitë Administrative<br>*Ndarja administrative e nivelit të tretë*<br>*373 njësi administrative* | |
| National Agency for Information Society | | Agjencia Kombëtare e Shoqërisë së Informacionit | **AKSHI** |
| National Agency of Protected Areas | | Agjencia Kombëtare e Zonave te Mbrojtura | **AKZM** |
| National Civil Defence Agency (national Agency for Civil Protection) | | Agjencia Kombëtare e Mbrojtjes Ciovile | **AKMC** |
| National Energy Efficiency Action Plan | **NEEAP** | Plani Kombëtar i Veprimit për Efiçencën e Energjisë | **PKVEE** |
| National Environment Agency | **NEA** | Agjencia Kombëtare e Mjedisit | **AKM** |

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|---|---|---|---|
| **Terms & Definition** | **Notation** | **Termat & përkufizimet** | **Akronimeve** |
| National Institute of Statistics of Albania | | Instituti i Statistikave | **INSTAT** |
| National Natural Resources Agency | **NNRA** | Agjencia Kombëtare e Burimeve Natyrore | **AKBN** |
| National Operational Centre of the Ministry of Internal Affairs | | Qendra Operative e Ministrisë së Brendshme | |
| National Spatial Data Infrastructure | **NSDI** | Infrastrukturës Kombëtare të Informacionit Gjeohapësinor | |
| National Statistical System | **NSS** | Sistemi Kombëtar Statistikor | **SKS** |
| National Territorial Planning Agency | | Agjencia Kombëtare e Planifikimit tëTerritorit | **AKPT** |
| Naval Force Command | | Komanda e Forcës Detare | |
| Non-governmental Organization | **NGO** | Organizatë Jo-Qeveritare<br>Organizata Jo-Fitimprurese | **OJQ**<br>**OJF** |
| Open Data Kit | **ODK** | | |
| Open Data for Resilience Initiative | **OpenDRI** | | |
| Open Governance Policy | **OGP** | | |
| OpenStreetMap | **OSM** | OpenStreetMap | **OSM** |
| Post Disaster Needs Assessment | **PDNA** | | |
| Property Restitution and Compensation Agency | | Agjencisë së Kthimit dhe Kompensimit të Pronave | **AKKP** |
| Property Management Agency | | Agjencia e Trajtimit të Pronave | **ATP** |
| Regional Civil Protection Centres | | Qendrat e Mbrojtjes Civile ne Qark | **QMCQ** |
| Risk | | Rreziku | |
| Sendai Framework Monitor | **SFM** | | |
| Situation Operation Office | | Zyra Operacionale e Situatës | **ZOS** |
| Snowstorm | | Stuhi bore | |
| State Authority for Geospatial Information | **SAGI** | Autoriteti Shtetëror për Informacionin Gjeohapësinor | **ASIG** |
| State Cadastre Agency | **SCA** | Agjencia Shtetërore e Kadastrës | **ASHK** |
| Structure | | Struktura | |
| Technical Advisory Committee | **TAC** | Komisioni Teknik Këshillimor | **KTK** |

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|---|---|---|---|
| **Terms & Definition** | **Notation** | **Termat & përkufizimet** | **Akronimeve** |
| Technological hazards<br>*leak, structure, contamination, explosion, accident, fire* | | Rreziqet teknologjike<br>*rrjedhje, strukturë, ndotje, shpërthim, aksident, zjarr* | |
| Territorial Development Agency | | Agjencia e Zhvillimit tëTerritorit | **AZHT** |
| Terms of Reference | **ToR** | | |
| Transmission System Operator | | Operatori i Sistemit të Transmetimit | **OST** |
| The World Bank | **WB** | Banka Botërore | **BB** |
| United Nations | **UN** | Organizata e Kombeve të Bashkuara | **OKB** |
| United Nations Office for Disaster Risk Reduction | **UNDRR** | Zyra e Kombeve të Bashkuara për Reduktimin e Rrezikut nga Katastrofat | **UNDRR** |
| United States Geological Survey | **USGS** | | |
| Water Resource Management Agency | | Agjencia e Menaxhimit të Burimeve Ujore | **AMBU** |
| World Reference Base<br>*is a two-tier system of soil classification, with 32 major soil groups (the "Reference Base") and over 120 uniquely defined qualifiers for specific soil characteristics* | **WRB** | | |

# EXECUTIVE SUMMARY

Exposed to various natural hazards including earthquakes, floods, mudflows, landslides, forest fires and droughts, Albania faces one of the highest levels of disaster risk in Europe. Over the period 1995—2015, an average of 30,000 people were affected annually by natural disasters, and more than 95 percent of Albanian municipalities were affected by at least one disaster. In 2019, an earthquake of magnitude 6.4 hit the country, affecting over 200,000 people in 11 municipalities, including Tirana and Durrës. According to the Post-Disaster Needs Assessment (PDNA), the earthquake caused damages equal to 6.4 percent of the 2018 gross domestic product (GDP), and losses equal to an additional 1.1 percent. Left unchecked, the impacts of disasters could further increase as a result of the growing economy, and climate change may increase the severity and/or frequency of weather-related disasters, such as floods, wildfires and droughts.

In July 2019, Albania approved a new law on civil protection, which presents a modern and progressive approach to disaster risk management (DRM). Among many key actions, the law requires that risk assessments be carried out at the national, provincial and local levels at least every three years, that institutions and private entities provide data on disaster losses, and that a disaster loss database be established. While disaster risk assessment and loss data collection have been performed in Albania for many years, the obligations under the new law formalize the requirements and responsibilities of the involved parties, and aim to ensure that the resulting information is pro-actively used to prioritize, plan and implement DRM. This current report provides recommendations, based on a gap and needs assessment, on specific activities to put the requirements of the Law into practice, informed by global best practice.

This Summary Report is the last deliverable of the project *Improving Disaster Risk and Loss Information in Albania,* completed in March 2022. The project was led by Mott MacDonald team and was completed in collaboration with local experts. The ultimate goal of the project is to contribute to better informed disaster risk management DRM decision-making in Albania by supporting the Government of Albania to improve the national disaster risk and loss information, the availability and accessibility of multi-hazard risk information and the development of a national multi-hazard overview. The project was assigned as part of Pillar 2 under the World Bank *Strengthening Disaster Resilience in Albania* technical assistance (P172145) and was financed by the Japan-World Bank Program for Mainstreaming Disaster Risk Management in Developing Countries (managed by the Global Facility for Disaster Reduction and Recovery - GFDRR).

*The project activities were split in four main tasks:*

**Inception phase –** with the objectives to: identify relevant data sources and datasets; identify related national legislation; gain insight into the connection and collaboration between the involved agencies and government units, the path of disaster risk and loss information and the authority structure; propose priority sectors for loss assessment.

**Task 1 -** Develop a risk data catalogue of existing datasets relevant for the territory of Albania from local and international sources.

**Task 2 -** Suggest ways to improve the accessibility and application of existing information across different stakeholders related to DRM.

**Task 3 -** Develop recommendations for improving the collection, standardization, quality and inclusivity of disaster loss information, together with a methodology to be used in Albania for post-disaster damage and loss assessment.

**Consultation and Endorsement workshops,** with relevant institutions and governmental units were also held and the received feedback was considered in the execution of the task and incorporated in the deliverables. In addition, the team organised several other meetings with representatives from relevant institutions to share the project's main findings and discuss important aspects of the completed work.

As part of the execution of the project tasks, a comprehensive analysis was performed on the current practice and related legislation in Albania for risk-related data collection and management, and post-disaster damage and loss assessment. This included:

- Review of institutions' responsibilities, capacity and the flow of information.
- Identification of related acts, bylaws and ordinances.
- Analysis of the functionality and use of the National Geoportal maintained by the State Authority for Geospatial Information (ASIG)
- Review of the *DesInventar Sendai system and its use in Albania*.
- *Extensive search for risk-related data relevant for Albania*.
- *Review of the past practice in post-disaster damage and loss assessment*.
- *Review of databases for risk and disaster data currently maintained in Albania*.

An extensive review and analysis of international data platforms for relevant information and best international practice in disaster data collection and analysis were also performed and reported.

The main outcomes of the project are:

- Risk Data Catalogue with hundreds of relevant datasets organised in a clear structure and described with a set of predefined data attributes.
- Methodology for post-disaster data collection and analysis for consistent application in Albania, developed in compliance with the current local legislation and best international practice, and illustrated with three examples of past natural disasters.
- Gap analysis to identify the challenges still faced in Albania in collection and management of risk data and application of the recent Law 45/2019 On Civil Protection.
- A list of 39 recommendations in 7 categories for the improvement of the accessibility and completeness of risk-related information, the quality and breadth of post-disaster loss assessment and loss information.

## Risk Data Catalogue

The main objectives of the Risk Data Catalogue were: 1) collection and review to some extent of a wide range of sources and datasets relevant to hazard and risk assessment for Albania and 2) building a risk data taxonomy with clear definitions and structure for consistent application in the future, compatible with commonly used international data classifications. The second was considered extremely import-

ant and was given careful consideration. One of the key advantages of the catalogue is its structure and definitions. The structure is easy to use, flexible for modification, compliant with national and international data sources and clearly defined. The proposed structure and definitions could be used as the basis for the development of a national standardised taxonomy for risk data, supported by the corresponding legal framework, together with instructions for the correlation between the definitions of the catalogue and those already used by DesInventar Sendai system, current legislation and the specifications set up by ASIG as the local standard for spatial datasets and services.

The scope of the catalogue is data related to risk assessment due to natural hazards and only if applicable for the case of Albania. Anthropogenic hazards are outside the scope, but such can be easily included in the future, without conceptual change of the structure. Risk-related data includes both data directly related to the risk or data that is needed for direct or indirect application to risk assessment. Unreliable data or data not relevant for Albania is excluded. The catalogue considers both local and international sources. Hundreds of datasets are included and described by means of predefined attributes. It was not feasible to perform a full check and verification of every dataset. Still, the applicability of some of the datasets were rated based on experience and a high-level review.

The Catalogue was prepared in a simple machine-readable format. It is an Excel table, where information can be easily filtered and searched for. It can be also easily exported to other file formats, as well as read by variety of other software types and routines.

## Methodology for post-disaster data collection and analysis

**The proposed methodology combines different approaches and can be used for different types of disasters by adjusting the scope and the steps based on the specifics of the hazardous event. It was compiled based on an extensive review of the best international practice, current practice in Albania and challenges faced by the involved teams and institutions.**

The different steps of the methodology are structured along a timeline from the moment a catastrophic event occurs  to the completion of the recovery strategy. The methodology workflow follows 21 parameters split in four groups: Hazard identification and characterization; Identification of the affected area; Preliminary post-disaster assessment and loss estimation; and Full-scope post-disaster assessment and loss estimation. Whether all parameters will be needed and whether some of the activities will be ignored or merged depends on the case, the scale of the disaster, the objectives of the assessment, the available resources to complete the assessment process and other factors.

The sequence of steps starts with analytical predictive analyses in the first few days after a hazardous event based on the available data before the disaster, and/or digital data retrieved shortly after the disaster (recordings, monitored parameters, satellite images). It continues with regular verification, filling and updating of the estimations based on on-site observations and survey data. If the survey process is slowed down or cannot be fully executed due to specific conditions, the assessment could be based predominantly on the analytical analysis by increasing its complexity and detail. If the surveys are promptly and efficiently organised and on-site data is retrieved shortly after the disaster, the analytical analysis could be used only to provide an overall understanding of the scale of the disaster and the most affected sectors to guide the emergency and relief activities and to facilitate the planning of the survey. In any case, the processing and the analysis of the data continues throughout the assessment. If the formal Post Disaster Needs Assessment (PDNA) process is requested and initiated by the

Government, the result of the assessment could be a full-scope PDNA report prepared with the joined efforts of international and local teams.

At the core of the proposed methodology is the idea that the post-disaster assessment process can be greatly supported by maintaining significant relevant information prior to the event as part of a well-maintained and continuously updated national risk-related database. This applies not only to the availability and reliability of the baseline data, which appears to be one of the most common problems faced in past assessments in Albania, but also to risk models which can significantly help in the preliminary rapid assessment in the first few days after a disaster.

Post-disaster data collection is split in two parts: 1) "desktop" search for data sources and gathering data from remote sensors and satellites; and 2) on-site surveys and reconnaissance. The "desktop" data collection can start immediately after the disaster and helps the immediate response. The on-site surveys, however, usually start after the initial search and rescue phase. This of course depends on the scale of the impact but, in any case, some time will be needed for mobilisation and planning of the survey activities. The preparation and execution of surveys were not covered in detail in the proposed methodology. While key principles are addressed and useful sources for preparation of questionnaires are suggested, the elaboration of a step-by-step approach for the execution of on-site surveys was considered outside the scope of the project.

## Gap analysis

The gap analysis considered several aspects related to risk data management and disaster damage and loss assessment process in Albania. It was observed that almost three years after the enactment of the Law 45/2019 On Civil Protection many of the prescribed reforms and initiatives have not occurred yet and local authorities and national institutions still face several challenges in meeting their responsibilities defined by the Law. Expertise and tools are spread across different institutions, who do not seem to be in efficient collaboration, consolidated by the governmental units that should oversee the data collection process and the maintenance of databases for damage and loss after natural or man-made hazardous events. Municipalities' capacity is also insufficient for the key role they are expected to play in the risk assessment, in drafting local emergency plans, in the post-disaster data collection and loss assessment, in the development of investment plans for disaster prevention, protection and rehabilitation, in managing monitoring and early-warning systems and similar. What is more, through the prefectures (qarks), they are responsible for generating risk and loss related data to be provided to the National Civil Protection Agency (AKMC), who shall establish and operate the National Disaster Losses Database. According to the Law, risk and disaster loss data shall exist in three levels - municipalities, prefectures, ministries and central institutions - and shall be managed on a national level by AKMC.

In practice, an integrated national digital database for risk-related and post-disaster data with a clearly defined structure, standards and IT infrastructure for *collection and processing of data is not available*. *The National Geoportal*[1], developed and operated by ASIG, is currently the digital database for georeferenced information but it still seems to be in its initial phase of structuring and harmonization, with a rather limited number of datasets and functionality that needs improvement. The Geoportal contains datasets useful for hazard and risk assessments, but the data is still insufficient for the development of risk models and completion of full-scope multi-hazard risk assessments. As for the disaster data, the only unified database currently used in Albania is *DesInventar Sendai, which contains summaries of the conse-*

1 Kryefaqe | ASIG Geoportal [https://geoportal.asig.gov.al/]

*quences after events. The use of DesInventar, however, is not regulated by Law 45/2019 or related legislation, thus the rules for update and data entries are not defined.* Separate disaster reports are occasionally prepared, communicated and stored by municipalities and prefectures but they are not systematically collected and managed across all municipalities. There are also useful datasets regularly compiled by different institutions which have not reached the Geoportal, or simply have never been intended to be uploaded on the ASIG platform. In summary, a common well-structured national database to compile, unify and administer all available datasets and the creation of new ones has not been created yet.

Despite the large number of datasets in the Risk Data Catalogue listed as useful for risk assessments in Albania, the information would not be sufficient for reliable risk assessment. Important datasets are missing, many are not ready for direct application, some are not georeferenced, and still others need to be crosschecked and verified before application. Some of the main gaps identified during the data review are: georeferenced data with a sufficient resolution about the location and size of different assets across Albania and their exposed value; information for application in hazard analysis for hazard types other than earthquakes and floods; vulnerability models developed for the specifics of the assets in the country; information relevant for the analysis of the DRM and DRR capacity.

As for disaster loss and damage assessment, a comprehensive national methodology for consistent application across Albania is not available. This would include: a broader standardisation of terms, definitions and data structure to be followed by everyone involved in the process; practical guidelines for data collection and planning the assessment process; exemplary field investigation forms per sector and tools for data collection to use by municipalities and prefectures. Review of past disaster loss and needs assessments performed in Albania shows that in most cases simplified estimations with a limited scope have been performed, predominantly for indemnification purposes and often substantially underestimating the overall losses. There are only two assessments carried out based on the PDNA methodology – after the flood in November 2015 and after the November earthquake in 2019. Deficiencies were identified also with the organisation and management of the assessment process. In many cases the coordination was inefficient, the involved people did not have the needed training, nor experience, ministries were not prepared, the collection of data was not well-planned, the collected data was not verified and the results were not transparent.

## Recommendations

The identified gaps were addressed with a set of recommendations for the improvement of the overall process for collection and update of risk-related data and post-disaster damage and loss assessment. The recommendations are grouped in seven categories for clarity, however they should be considered together when planning related measures and prioritising activities.

### Improvement of the functionality, accessibility and application of the Geoportal Geoportal under the responsibility of ASIG

> **Recommendation 1 Introduce tools to the Geoportal for the creation of intelligent digital maps, which can be easily analysed, queried and presented.** The usability and even the accessibility of data would be significantly improved if more tools for interactive data handling are introduced, such as: managing data layers (dissolve, merge, cross, etc), spatial patterns analysis (calculate density, find hot spots, etc.), statistical analysis (join features, summarize, aggregate, etc.), raster analysis (analyse image, convert feature to raster, extract raster, etc.) and similar.

**Recommendation 2 Improve the graphical user interface (GUI) and the Spatial Data Infrastructure.** Every GUI gets outdated with time and requires regular maintenance. Update of the GUI of the Geoportal would significantly improve its functionality and accessibility.

**Recommendation 3 Improve the quality and presentation of the datasets.** Some of the datasets were found difficult to read and interpret. Certain raster images have a rather low resolution and coded legends which are difficult to understand, unless the original sources are found. Investing in digitizing the raster images and translating the datasets to English where possible would be also very beneficial.

**Recommendation 4 Clearly define the levels of access to the Geoportal.** The expectation is that the Geoportal should have different access levels, especially if data is to be automatically uploaded and edited by the data providers/owners. Currently, it is not clear what the levels of accessibility are, which are the datasets with restricted access, if there is data that cannot be downloaded even by a registered user and who can request access to the restricted data.

**Recommendation 5 Facilitate the process of obtaining and updating data by building an efficient database management system (DBMS)**. In other words, allow the data owner to upload, edit and update the date directly on the Geoprotal. This does not mean that the data will be published once uploaded without any checks or confirmation. It is simply a quicker way for uploading and updating information and the publication itself is a different process that will depend on ASIG and the regulations it follows. Automatic reminders could be also programmed to be sent to the data providers for upload or update of the datasets for which they are responsible. To facilitate the checking of the data for consistency, data users could be given the opportunity to flag inconsistencies they have encountered.

**Recommendation 6 Specify the process for verification and validation of the data.** Currently, the only check that ASIG is responsible for is for compliance with the *State Standards for Technical Specifications of Geospatial Information*. The role of ASIG in the verification of the received data could be expanded with a number of crosschecks between datasets from different institutions, checks for consistency and completeness, which do not necessarily require expertise in each field of the data. The verification and validation could be also under the responsibilities of a "dedicated team" in AKMC, as suggested in Recommendation 21.

**Recommendation 7 Perform check and verification of the datasets already uploaded.** To improve the reliability of the uploaded information, inconsistencies, ambiguities and errors need to be removed. If needed, revisions could be additionally requested by the data owners. If the source of the inconsistencies cannot be identified and the dataset cannot be corrected, the conflicts of information should be indicated with notes on the corresponding datasets.

**Recommendation 8 Increase the resolution of the data as much as possible.** If the resolution of the available data is too low, it cannot be used for risk assessment and in the post-disaster assessment. The goal should be to collect and store risk-related data at resolution as high as possible and not lower than the lowest administrative level available.

**Recommendation 9 Link the Geoportal to networks for monitoring instrumentation.** Data from monitoring devices (such as those managed by the National Environment Agency (AKM) and the Institute of Geosciences, Energy, Water and Environment (IGJEUM)) could be very easily obtained in real time and automatically updated, which is a great advantage. It would save time

in case of a disaster and reduce the administrative procedure if the digital data collected from the monitoring devices are linked to one integrated digital platform under the governance of AKMC. The Risk Data Catalogue lists some useful sources for data from monitoring networks

**Recommendation 10 Link the Geoportal to international resources.** As for international sources, the most beneficial would be those that can provide satellite images and data/products based on analysis of satellite images. Data from satellite and radar monitoring could be extremely helpful, especially for short-term predictions of hazardous events, early warning and prompt evaluation of the impact of disasters. ASIG confirmed that such connection is feasible, there are no restrictions from the point of view of acting legislation, and that there has been already a similar project under consideration.

**Recommendation 11 Support institutions, municipalities and prefectures with guidelines, simple-to-use data forms and even digital tools for the compilation of the data.** Issues with the collaboration between ASIG and the institutions responsible for providing information are one of the main reasons for the limited number of datasets currently available on the Geoportal. One way to address this problem is to provide active support to institutions and municipalities/ prefectures in the preparation of the data. That said, it should be noted that according to the legislation ASIG is not expected to be in direct communication with the prefectures and the municipalities; this should happen through AKMC. Thus, as suggested in Recommendation 21, this role could be also transferred to a "dedicated team" in AKMC with the help of ASIG.

**Recommendation 12 Promote the functionality of the Geoportal and the ASIG services to municipalities and prefectures.** Together with the support to the local institutions, ASIG should also promote the services they provide and the use of the data already available on the Geoportal to municipalities from which they can benefit, especially when some of the main challenges that municipalities pointed out in meeting their obligations are insufficient resources and expertise. As already mentioned, ASIG is not expected to have direct communication with municipalities and prefectures. It is worth exploring whether such a direct link between ASIG and local institutions would lead to a better working collaboration.

## Improvement of the risk-related data collection and management

**Recommendation 13 Create an integrated national hazard, risk and post-disaster database.** As discussed already, such a database is currently not available, and the information collected by different institutions is not administered under one unified data structure. Such an integrated national database is not intended to replace the databases managed by different institutions and municipalities but to provide a common environment in which different datasets are unified under the same format and definitions. The database could also have different levels of accessibility according to the sensitivity of different types of information. One option for the development and maintenance of an integrated national digital database is for a dedicated team with the right expertise to be formed as part of AKMC. The other option is to build on the GIS expertise of ASIG team, to expand its capacity accordingly and to build the database under ASIG operation but still under AKMC governance to meet the requirements of the law.

**Recommendation 14 Define a data taxonomy with clear definitions to be used for structuring the datasets and creating new ones.** A clear hierarchical structure is a necessity for a

growing and continuously updated database. Good organisation of the data keeps it active for harvesting, improvement, checking and revision, and facilitates the user when searching and filtering through numerous datasets. It also helps identification of missing datasets and planning of their development. A data taxonomy with clear definitions could be used as guidance for the type of data to be collected, to keep track of updates and reference dates, and even to help municipalities identify what additional expertise and support they may need to fulfill their duties on risk-related data acquisition. The structure here proposed for the Risk Data Catalogue can be used as the basis for the classification of data on the national Geoportal. Emphasis should be placed on the definition of all terms used for data classification and the attributes used to describe the data and metadata.

**Recommendation 15 Plan the preparation and the collection of the needed datasets**. A very helpful tool to assist with this is the Risk Data Catalogue developed for this project. The first step would be to identify the missing datasets, the second step to develop a plan with short-term, mid-term and long-term goals, together with the needed resources, the third step to assign the compilation of the identified datasets to the corresponding institutions, local authorities and research teams, and at the end, the collected data is to be integrated in the national database after checks and verification for consistency, completeness and compliance with the standards. According to the Law, AKMC should not only be in charge of this process but should also supervise it and provide support with guidelines, data forms and training. The Technical Advisory Committee (TAC) could be the body with the needed expertise to support the planning of the data collection and to execute the related tasks.

**Recommendation 16 Keep updated datasets for unit rates, cost of construction and replacement of different types of assets, and costs of services.** One of the most common challenges in disaster damage and loss assessment is the estimation of the monetary equivalent of damage and affected services. Such information is often missing at the time of the assessment and different assumptions to fill in this gap are used by the sectoral teams, which often leads to inconsistency in the results.

**Recommendation 17 Explore the local sources for useful data.** Some are explicitly stated as the institutions that should provide information to ASIG for the Geoportal, others are not expected to prepare datasets but at the same time collect useful data as part of their activities. A good example for the latter is the Albanian Power Distribution Operator (OSHEE), whose address registry was used as the most up-to-date in the last post-disaster assessment after the November earthquake in 2019. Similarly, past and on-going national funding programmes and research projects could be very useful sources of data.

**Recommendation 18 Explore international sources for useful data.** International data platforms are most valuable for products that require resources beyond national capacities and are therefore generated through collaboration between multiple countries and teams. This includes data collected through remote sensing and satellite imagery, collected from international monitoring networks, obtained from large international research projects, collected from post-disaster reconnaissance and similar. The Risk Data Catalogue contains an extensive list of such sources which are worth considering for the risk data database.

**Recommendation 19 Prepare hazard and risk models and include their input data in the risk-related database.** Hazard and risk digital models, or more specifically the inputs for them,

should also be included in the compilation of the risk-related data. Most of them are expected to be mid- to long-term projects which would require experts in different fields, proper planning and investment. At the same time, they could be extremely useful not only for development of the risk profiles that each municipality should have, but also for rapid post-disaster loss and damage assessment.

**Recommendation 20 Support municipalities and prefectures with exemplary Terms of Reference (ToRs) for the collection of data.** Many municipalities do not have the expertise to collect and process data and they outsource the related activities to companies with the requisite experience. This, however, is associated with varying quality, standards and approaches, which makes the integration of datasets very difficult. The problem could be overcome with exemplary ToRs with all necessary requirements, which local institutions could use in case they need external support for the compilation of the data they are requested to provide.

**Recommendation 21 Dedicated team for risk and post-disaster data collection and management.** To improve the process of data collection, analysis and management, a team of composite expertise and clearly defined responsibilities could be established. One option is to strengthen and consolidate the current capacity in AKMC into one dedicated team, since AKMC is the national agency responsible for the establishment and operation of the National Disaster Loss Database and has in its structure the sector of disaster loss data (DLD) and statistics. Another option is to build on the GIS expertise of ASIG and the existing Geoportal to establish such a dedicated team under the governance of ASIG. The expectation is that such a team would also play a key role in amage and loss assessment after disasters, the management of digital tools for data collection during the assessment process, the preparation of assessment reports and the update of datasets on the DesInventar system. GIS experts alone would not be sufficient. Other specialists in the fields of data analysis and statistics, hazard and risk analysis, information technology, image recognition and machine learning are highly recommended.

## Legal framework, standards and methodology for disaster damage and loss assessment

**Recommendation 22 Bylaws to Law 45/2019.** With regards to disaster loss assessment and disaster loss data, in drafting the bylaws of Law 45/2019, as well as in its future amendments, a Normative Act with the force of the Law, No. 9, dated 16.12.2019 "On coping with the consequences of a natural disasters" should be considered, and vice versa.

**Recommendation 23 Improvements of Law 45/2019.** Clarify in Art. 11 what is implied by "local self-government" and whether it refers to municipalities. Clearly state the periods within which databases need to be created and updated – different periods may be specified for different types of data and some periods may be linked to the national campaigns for data collection. Clearly specify the process of checking and verification of the prepared datasets and who is responsible. As suggested by Recommendation 21, this could be performed by a "dedicated team" within AKMC.

**Recommendation 24 Reference data standards in Law 45/2019.** The approved data standards and formats should be clearly specified in the Law. Until national standards are issued, a temporary solution could be to refer to data structures and definitions of one of the internationally accepted post-disaster assessment methodologies. The methodology and the catalogue structure proposed in this project, which is consistent with the best international practice, are a

good starting point for the development of national standards and methodology for post-disaster data collection, storage and analysis.

**Recommendation 25 Approved methodology for post-disaster damage and loss assessment.** It is highly recommended to develop and issue a national methodology for post-disaster damage and loss assessment for consistent application in Albania. The methodology proposed here could be used as the basis. Special attention should be paid to the terms and the definitions. Guidelines and instructions specifically for the municipalities and the prefectures should be prepared. According to Law 45/2019, this should be under the responsibilities of AKMC.

**Recommendation 26 Strengthen control over the implementation of Law 45/2019**. Make sure that municipalities and prefectures maintain damage[2] and loss databases and that they are regularly updated. This could be supported by incentives or sanctions for meeting or not meeting the requirements of the law. According to the Law, Art. 23, this is within the responsibilities of AKMC.

## Improvement of the actual process of post-disaster data collection and analysis

**Recommendation 27 Define the structure and the responsibilities of a coordination team to be activated after a disaster for damage and loss assessment.** According to Law 45/2019, Art 23, AKMC is in charge of "*coordinating efforts for the … and Disaster Risk Assessment development at the central level*". However, the law does not specify further how this coordination should be executed and how the coordination team should be structured.

**Recommendation 28 Propose field investigation forms per sector.** The availability of survey forms prior to disasters would facilitate the assessment process and assure consistency between different teams and institutions. Since the conditions and the impact varies from event to event, survey forms could not be made compulsory or standardised, but they would still support on-site data collection, even if certain modifications have to be made after pre-testing. For correct and consistent application of the forms, they need to be accompanied by guidelines, explanatory notes and even examples.

**Recommendation 29 Develop data collection apps for on-site assessment.** Data collection applications for mobile devices would significantly support on-site surveying. They also help in the automatic georeferencing of the data and direct link to a GIS database for data upload, storage, post-processing, and visualization. A digital standardized interface together with the field data collection apps would allow municipalities to enter aggregated damage and loss data using a multi-sector template that goes directly to AKMC.

**Recommendation 30 Application of crowdsourcing tools.** It is worth investigating the benefits of using "crowdsourcing" methodologies for data collection immediately after a disaster. Based on the responses of the affected population, very useful information about the scale of the impact could be obtained promptly after the hazardous event. The obtained data will have to be verified, but the information will be very useful for the preliminary assessment, planning and coordination of emergency relief.

2 Administrative offence is stipulated in the Law 45/2019 for non-having in place DLD in municipality (according to Art 28/2/b). Similar sanctions should be in place for the analogous DLD in Prefecture (Art 30/ë) which are missing in Art. 68 Administrative offenses

**Recommendation 31 Define the baseline data as much as possible at the beginning of the assessment process.** When more than one team work on the assessment, it is very important to coordinate between the teams the available baseline data to be used, especially rates and cost estimates. This will guarantee consistency in the final results and will facilitate evaluation of cross-sectoral effects.

## Strengthen the institutional capacity in the damage and loss assessment process

### Recommendation 32 Strengthen municipalities' and prefectures' capacities.

- AKMC should support municipalities and prefectures in the preparation of instruments for post-disaster damage and loss assessment through guidelines, survey forms and tools, trainings in data collection and storage, clarification campaigns on the new concept of disaster loss data defined in the Law. Guidance for the actual process for reporting impacts, direct capacity building, as well as financing and contracting external experts for the preparation of these instruments is also needed.
- AKMC should also prepare guidance and recommendations for the creation and maintenance of a damage and loss database, including how to structure the database, how often it is to be updated, how to meet the national standards and similar.
- Practice has shown that usually more than 30 different institutions are involved in coordinating or reporting disaster information, which can lead to miscommunication and inefficient collaboration. It is very important to better define the data dissemination processes and inter-institutional cooperation, such that reporting is synchronized at a detailed level between the local and national level.
- Define clear roles and responsibilities for skilled personnel to deal with the volume, complexity and diversity of disaster information. It may be rather ambitious to establish 61 fully equipped teams with all the required experts (one per municipality), which is why the role of the "dedicated team" within AKMC, as proposed in Recommendation 21, would be very important. As long as the local teams are well-instructed on what type of data to collect and which terms and definitions to use, the formatting of the data based on the standards and the GIS processing could be centralized within the responsibilities of the "dedicated team".
- Perform training on the *DesInventar system*. Currently, municipalities do not have knowledge of this system, the definitions used by it and the format of the data cards for recording damage and losses. A good understanding of the DesInventar system by the local teams would really help AKMC with their responsibility for keeping the system up-to-date.
- Increased resources and funding for municipalities may be needed to strengthen their capacity. One of the most common difficulties that municipalities report is insufficient funding. Mobilization of funding could be more difficult for prefectures since they do not have any specific DRM budget line. AKMC should raise awareness on the need for establishing a budget program for the development and maintenance of risk-related and post-disaster databases in in municipalities[3] and Prefectures.

3 According to DCM Nr. 414, dated 8.7.2021 On approval of procedures and criteria for allocation and use of the conditional state budget fund for civil protection:
3. The conditional state budget fund for civil protection to be used according to prioritization, as follows:
3.1. 60 (sixty)% - 100 (one hundred)% of the fund dedicated to civil protection can be used for: ç) establishment, updating and maintenance of the database

**Recommendation 33 Establish working collaboration with international agencies that record and process post-disaster data.** This applies especially to agencies that have at their disposal satellite images and recordings from international networks with monitoring devices and remote sensors. A good example is the Copernicus programme[5] coordinated and managed for the European Commission by the European Union Agency for the Space Programme, in partnership with the European Space Agency and EU Member States. The Risk Data Catalogue provides other such agencies, the collaboration with which would be very beneficial not only for data but also for data analysis and tools for data collection . According to Law 45/2019, Art. 23, "*cooperating with international bodies and counterpart international organizations in the framework of civil protection and disaster risk reduction*" is under the responsibility of AKMC.

**Recommendation 34 Strengthen the collaboration with local research institutions the commercial sector.** Based on local experience and ASIG, there may be different relevant ongoing research projects initiated by universities and research institutions, the results of which have not reached the Geoportal, nor the AKMC team in charge of data management. It would be very beneficial for AKMC and ASIG to reach out to scientific teams working in related fields and to establish bilateral collaboration with them. This applies also to the private entities potentially through sector organisations and professional chambers.

## DesInventar Sendai system in Albania

**Recommendation 35 Regulate the use of *DesInventar* Sendai system with Law 45/2019 or linked legislation.** The use, management, update and verification of the *DesInventar* system need to be clearly defined. The process, timing for updates and responsible institutions need to be specified with an ordinance or a bylaw, or directly in Law 45/2019.

**Recommendation 36 Prepare guidelines for filling in data cards**. The inconsistencies observed in the data for Albania recorded in *DesInventar* indicate that concepts and definitions are not clear, are susceptible to interpretation and need to be precisely defined in a guiding document with examples. The link between the terms used in DesInventar and their analogues in the legislation and the national disaster database should also be defined.

**Recommendation 37 Review the entries already created on the system.** Many inconsistencies and errors were observed in the entries already available for Albania. The information needs to be reviewed and revised where needed in accordance with the DesInventar requirements. For cases where the information cannot be traced back and verified, a note rating the reliability of the data should be included.

## Quick-wins

**Recommendation 38 Expand the questionnaires used in the census.** The Census is one of the largest at-scale procedures of systematic collection and recording of information about the population. The legislation, the roles and the responsibilities for its execution are already set and budget is committed on a regular basis. This means that with very little additional investment in the expansion of the questionnaires used for it, the census could collect additional information extremely valuable for the development of exposure and vulnerability models. Engineers

and experts in structural vulnerability could prepare additional questions and criteria related to the building stock. Similarly, experts from other sectors could suggest additional information to be included in the questionnaire. For example, additional technical information about residential buildings could be collected through the census, such as structural types and material, reconstructions and retrofit, maintenance, period of construction with respect to the historical design codes in Albania, type of roof and façade, post-construction modification of the façade and similar.

**Recommendation 39 Introduce data collection forms as part of the approval of design projects.** This is also expected to be a very simple and easy-to-implement measure. For every new building, facility, infrastructure or geotechnical project, a data form with a predefined set of parameters could be requested as part of the compulsory documentation for approval and construction permits. The data form could include, for example, location in coordinates, general properties of the structure, year of design/reconstruction and design standards followed, purpose and design life, capacity and number of occupants, geotechnical properties of the soil and similar. Such parameters could be directly used for hazard and risk assessments. Similar data forms could be also introduced in the registration and issuing of permits for the productive sector, although, our expectation is that such a data collection process is already in place and managed by the Institute of Statistics (INSTAT).

# SUMMARY REPORT

The current report provides a summary of the performed activities as part of the project *Improving Disaster Risk and Loss Information in Albania and focuses on the main findings,* the project outcomes and their practical application.

The report starts with an overview of the project, its main objectives and scope. After that it discusses the main findings and the observed challenges and gaps from the review of the current practice in collection, analysis and management of risk-related and post-disaster data in Albania and the related legislation. Two of the sections describe in brief the Risk Data Catalogue and the Methodology for post-disaster data collection and analysis developed for this project. The last chapter is dedicated to practical recommendations for the improvement of the ASIG Geoportal, its functionality, accessibility and completeness, as well as the improvement of the over process for collection and update of risk-related data and post-disaster damage and loss assessment.

The report consists of a main body and four Appendixes. It was developed based on the project deliverables, which are referred to for more detailed information:

Inception Report

Technical Report TR1 - *Catalogue of risk-related information - Task 1*

Technical Report TR2 *- Assessing and improving accessibility of risk related information – Task 2*

Technical Report TR3 *- Recommendations for improvement of post-disaster loss information - Task 3*

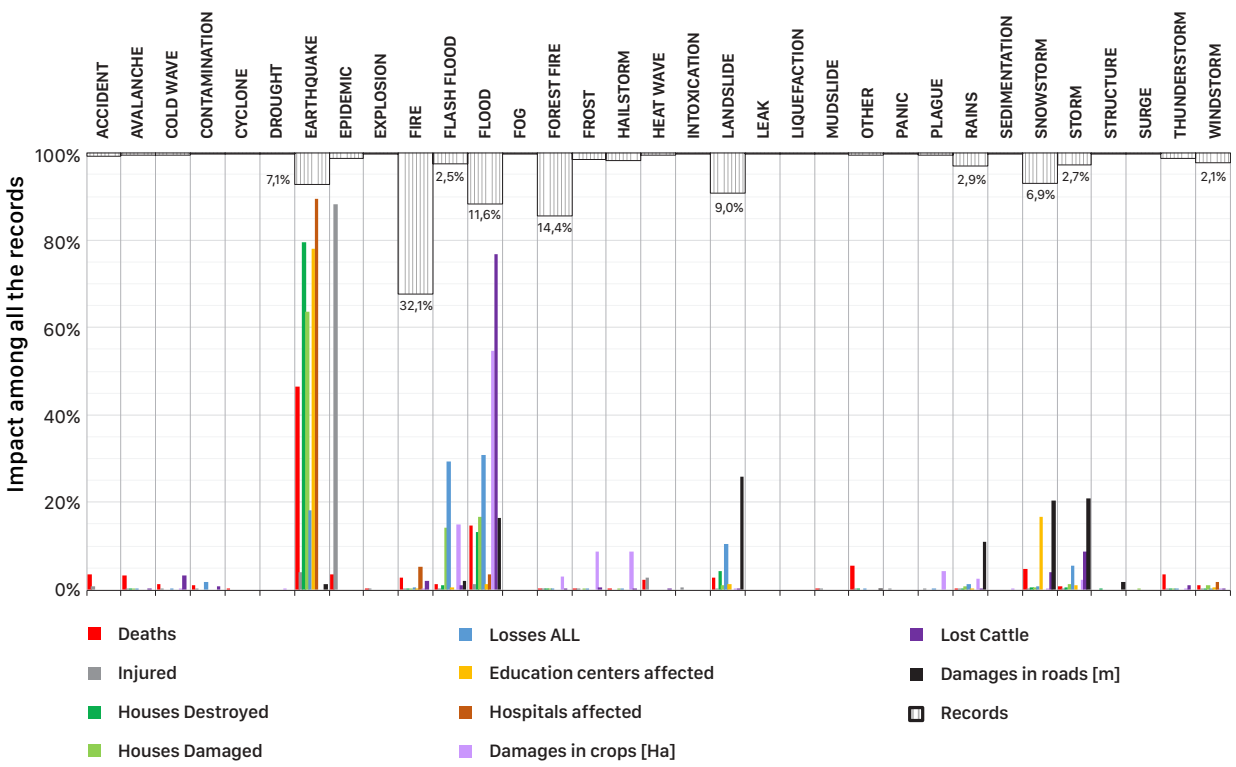
Risk Data Catalogue

The analyses, discussions and recommendations in this report were derived on the available data and acting legislation in Albania as reviewed for the project period between January 2021 and February 2022.

# 1. PROJECT OBJECTIVE, SCOPE AND OUTCOME

Albania ranks as one of the top ten countries in the world at the highest risk from multiple hazards (WB Report 2005)[4]. 88.5 % of the generated GDP, 86.4% of the total area, and 88.6 % of the population are exposed to two or more types of hazards. Since 2017 at least six extreme events in Albania have been mapped by the Copernicus Emergency Management Service (EMS)[5], including two wildfires, three flood events and one earthquake with magnitude 6.4. The historical data from DesInventar presented in Figure 1.1 shows that the top five most frequent hazardous events are fires, wildfires, landslides, floods and earthquakes, and the last two are associated with the highest impact on communities and most of fatalities. Still, the potential impact of other types of extreme weather conditions like heat waves and droughts should not be underestimated. Therefore, the capability to coordinate disaster risk management (DRM) and disaster risk reduction (DRR) strategies more accurately and effectively is vital.

**Figure 1.1: Past disasters and their impact according to the records from DesInventar since 1851**




The data on DesInventar system for Albania is incomplete and the graph is not expected to present a full record of all hazardous events that have happened since 1851

4 Natural Disaster Hotspots: A Global Risk Analysis (worldbank.org) [https://openknowledge.worldbank.org/handle/10986/7376]

5 Copernicus Emergency Management Service | Copernicus EMS - Mapping [https://emergency.copernicus.eu/mapping/list-of-components/EMSR412]

The ultimate goal of the current project is to contribute to better informed DRM decision-making in Albania by supporting the Government of Albania improve national disaster risk and loss information, the availability and accessibility of multi-hazard risk information and the development of a national multi-hazard overview. The project was assigned as part of Pillar 2 under the *World Bank Strengthening Disaster Resilience in Albania* technical assistance (P172145) and is financed by the Japan-World Bank Program for Mainstreaming Disaster Risk Management in Developing Countries (managed by the Global Facility for Disaster Reduction and Recovery - GFDRR).

The project was led by Mott MacDonald and was completed in collaboration with local experts.

The project was structured around three main tasks:

**Task 1 -** Developing a catalogue of existing datasets from local and international sources related to hazard, exposure, vulnerability and risk, including baseline data, relevant for the territory of Albania. The task included the following activities:

- Review of international risk-related data taxonomies, structures, attributes and definitions like EM-DAT[6], Risk Data Hub[7], CRED[8], DesInventar[9], OpenDRI[10], WB Risk Data Library[11], GEM Taxonomy[12] and others.
- Develop the structure of the catalogue, with all its definitions.
- Compile the Risk Data Catalogue.
- Provide examples on how the datasets from the Catalogue can be used in hazard and risk assessment.
- Suggest future development and application of the catalogue.

**Task 2 -** Providing recommendations on how to make existing information related to disaster risk management more accessible and useable across different stakeholders. This included

- Assessment of the datasets, products and Geoportal services provided by the Albanian State Authority for Geospatial Information (ASIG)
- Recommendations on whether the current Geoportal has sufficient functionality for data storage, visualization, sharing and risk analysis. The provided recommendations covered issues related to the National Geoportal maintained by ASIG, the overall collection and update of risk-related data, and some easy-to-implement improvements (quick-wins) of the current methods and process for data collection and management.

**Task 3 -** Developing recommendations for improving the collection, standardization, quality and inclusivity of disaster loss information, together with a methodology to be used in Albania for post-disaster damage and loss assessment.

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6 Classification | EM-DAT [https://www.emdat.be/classification]

7 Risk Data Hub - European Commission [https://drmkc.jrc.ec.europa.eu/partnership/Scientific-Partnerships/Risk-Data-Hub#key-publications]

8 Disaster Category Classification and Peril Terminology for Operational Purposes | Centre for Research on the Epidemiology of Disasters [https://www.cred.be/node/564]

9 United Nations DesInventar Open Source Initiative - Official Website [https://www.desinventar.net/]

10 OpenDRI Balkans and Risk: The State of Open Data for DRM [https://opendri.org/balkans-and-risk-the-state-of-open-data-for-drm/]
At the time of the execution of the project, OpenDRI platform was closed, and it was replaced by the Risk Data Library catalogue (beta), which is with a very different structure and approach. The new Risk Data Library is not intended for public upload of data, it is limited to GFDRR administrators and the 10 attributes that were previously defined by OpenDRI for describing datasets are no longer used. Currently, the Risk Data Library does not contain datasets about Albania.

11 Ged4all - Risk Data Library Standard [https://docs.riskdatalibrary.org/ged4all.html]

12 TaxtWEB - GEM building taxonomy editor [https://platform.openquake.org/taxtweb/]

The task included:

- Review of best international practice in post-disaster damage and loss assessment.
- Review of the current practice in Albania and related legislation.
- Developing a methodology for post-disaster damage and loss assessment to be applied in Albania.
- Examples with application of the methodology – three case-studies.
- Recommendations on the improvement of the procedures and interactions between institutions.

The project outcomes and the associated deliverables are:

**IR Inception Report,** which describes the activities and the information reviewed and analysed as part of the Inception Phase. The main goals of this phase were to:

- Identify data sources and datasets, local and international, to be included in the Risk Data Catalogue prepared as part of Task 1;
- Identify the related national legislation to be analysed in the next stages of the project;
- Gain insight into the connection and collaboration between the involved agencies and government units, the path of disaster risk and loss information and the authority structure;
- Propose priority sectors for loss assessment;
- Plan the successful completion of the project, together with the workshops as part of it.

The Inception Report provides a very extensive review of the National Geoportal and the *DesInventar Sendai* system currently used in Albania, specifies a wide range of local and international sources for risk-related data, provides a long list of laws and sectoral legislation related to the regulation of the data collection, storage and management in Albania, clarifies the authority structure of related institutions and agencies, roles and responsibilities according to Law 45/2019 (see Text Box 1 in Chapter 2.1), the flow of disaster and loss information with concise organograms, and reviews recently completed post-disaster damage and loss assessments. The report suggests also prioritization of sectors for loss assessment based on available statistical data for past events and with consideration of: 1) frequency, extent and magnitude of types of hazard in Albania, 2) vulnerability and criticality, 3) capacity to recover.

The Inception Report is cited as:

*Mott MacDonald (2021). Improving disaster risk and loss information in Albania. Inception report, 423090 IR, Rev. B*

**Risk Data Catalogue** and the related report **TR1 Catalogue of risk related information – Task 1**, which describes the structure of the risk data catalogue, explains the rationale behind it, provides clear definitions of the used terms and discusses the application of the catalogue and its future development. The Risk Data Catalogue was provided separately in a file called "Risk data catalogue.xlsx". For ease of use and wide application, the catalogue was prepared in a simple machine-readable format. It is an Excel table, where information can be easily filtered and searched for. It can be also easily export-

ed to other file formats, as well as read and automatically imported by variety of other software types and routines. The scope of the catalogue is data related to risk assessment due to natural hazards and only if applicable for the case of Albania. One of the key advantages of the catalogue is its structure. It is easy to use, flexible for modification, compliant with national and international data sources and clearly defined. It could be used as guidelines for collection, storage and sharing of risk related data and even considered as a starting point for national taxonomy of risk-related data.

The Technical Report TR1 is cited as:

*Mott MacDonald (2021). Improving disaster risk and loss information in Albania. Catalogue of risk-related information - Task 1, 423090 TR1, Rev. A*

Technical report **TR2 Assessing and improving accessibility of risk related information – Task 2,** which provides practical recommendations for the improvement of the ASIG Geoportal, its functionality, accessibility and completeness regarding disaster-relevant data and also suggestions for the improvement of the overall data collection and updating process. The recommendations provided in TR2 are linked to the recommendations provided in Technical Report TR3.

The Technical Report TR2 is cited as:

*Mott MacDonald (2022). Improving disaster risk and loss information in Albania. Assessing and improving accessibility of risk related information – Task 2, 423090 TR2, Rev. A*

**Methodology for post-disaster damage and loss assessment with examples,** described in a technical report **TR3 Recommendations for improvement of post-disaster loss information – Task 3.** The methodology is described in detail step by step. It is consistent with the current best international practice, and it is logically linked to the Risk Data Catalogue. The advantage of the proposed methodology is that the process is structured in a way to allow flexibility and easy adaptation of the approach according to the case, the scale of the disaster, the objectives of the post-disaster assessment, the available resources, expertise and managerial capacity.

Three case-studies of past hazardous events were used as examples for application of the proposed methodology. Together with the description of the proposed methodology, the other main objective of TR3 is to provide recommendations for the improvement of the assessment process and the interaction between institutions. Twenty-five recommendations were proposed, grouped in five categories: Preparing in advance for the post-disaster data analysis; Legal framework, standards and methodology; Strengthening institutional capacity; Improving the actual process of post-disaster data collection and analysis; and DesInventar Sendai system in Albania.

The Technical Report TR3 is cited as:

*Mott MacDonald (2022). Improving disaster risk and loss information in Albania. Recommendations for improvement of post-disaster loss information - Task 3, 423090 TR3, Rev. A*

**Summary Report,** the current report, which provides a recap of the performed activities and focuses on the main findings, the project outcomes and their practical application.

The project also included the preparation and organisation of two workshops with focus on the post-disaster data collection and loss assessment methodology in Albania:

**Consultation workshop** – carried out on the 8th of April 2021, shortly after the Inception Phase. The objective of the workshop was to better understand the challenges agencies face when collecting, reporting, sharing, and aggregating loss data.

and

**Endorsement workshop –** which took place on 28th of March 2022 in the last month of the project. The goal of the second workshop was to discuss the proposed recommendations and improvements of the existing post-disaster loss assessment methodology towards acceptance and consensus among the participants. Comments and feedback from ministries and relevant agencies were incorporated in the Summary Report.

Representatives from a wide range of institutions participated in the two workshops – AKMC National Agency for Civil Protection, AMBU Water Resource Management Agency, MB Ministry of Interior Prefecture of Tirana, MFE Ministry of Finance and Economy, MASR Ministry of Education, Sport and Youth, ASIG State Authority for Geospatial Information, AKPT National Agency for Territorial Planning, AKBN National Agency for Natural Resources, ARrSh Albanian Road Authority, ASHK State Cadastre Agency, AKSHI National Agency for Information Society, SMZS Fire Protection & Rescue Service. Important questions were raised and discussed and the feedback was integrated in the reports.

Apart from the two scheduled workshops, the project team organised several other meetings and consultations with relevant institutions and governmental units to maintain a successful collaboration with them throughout the project. Key findings were discussed and some outcomes were shared before the end of the project for feedback and additional information.

One important aspect of the project is that special attention was paid to the consistent use of terms and their clear definitions. Based on our experience and the feedback we received during the workshops, different data sources use different terms and even in the legislation terms vary in definition. To avoid ambiguities and the related difficulties in the application of the proposed catalogue, methodology and overall recommendations, the reports provide clear definitions and explanation of all the terms related to risk and disaster data. Where relevant, a comparison is also provided between the definitions used in this project and definitions of the corresponding terms currently used in the data standards, related legislation and international data sources.

Another important aspect is that post-disaster data is in essence part of risk-related data, even though the two were addressed in the project with different tasks. They are both expected to follow one data standard and similar principles for classification, storage and update. They are both an integral part of a future integrated national digital database with inbuilt algorithms for pre-disaster multi-hazard risk assessments, management of early-warning systems, facilitation of immediate response after a disaster, and estimation of post-disaster damage and loss towards the development of a recovery strategy. With the advantages of modern technologies, authorities and institutions around the world are investing more and more in smart automated systems towards risk-informed decision making and more resilient cities.

The proposed structure for a risk-data catalogue, developed methodology for post-disaster loss and damage assessment, together with the set of recommendations provide, a very good basis for the development of a national, digital risk data platform in Albania.

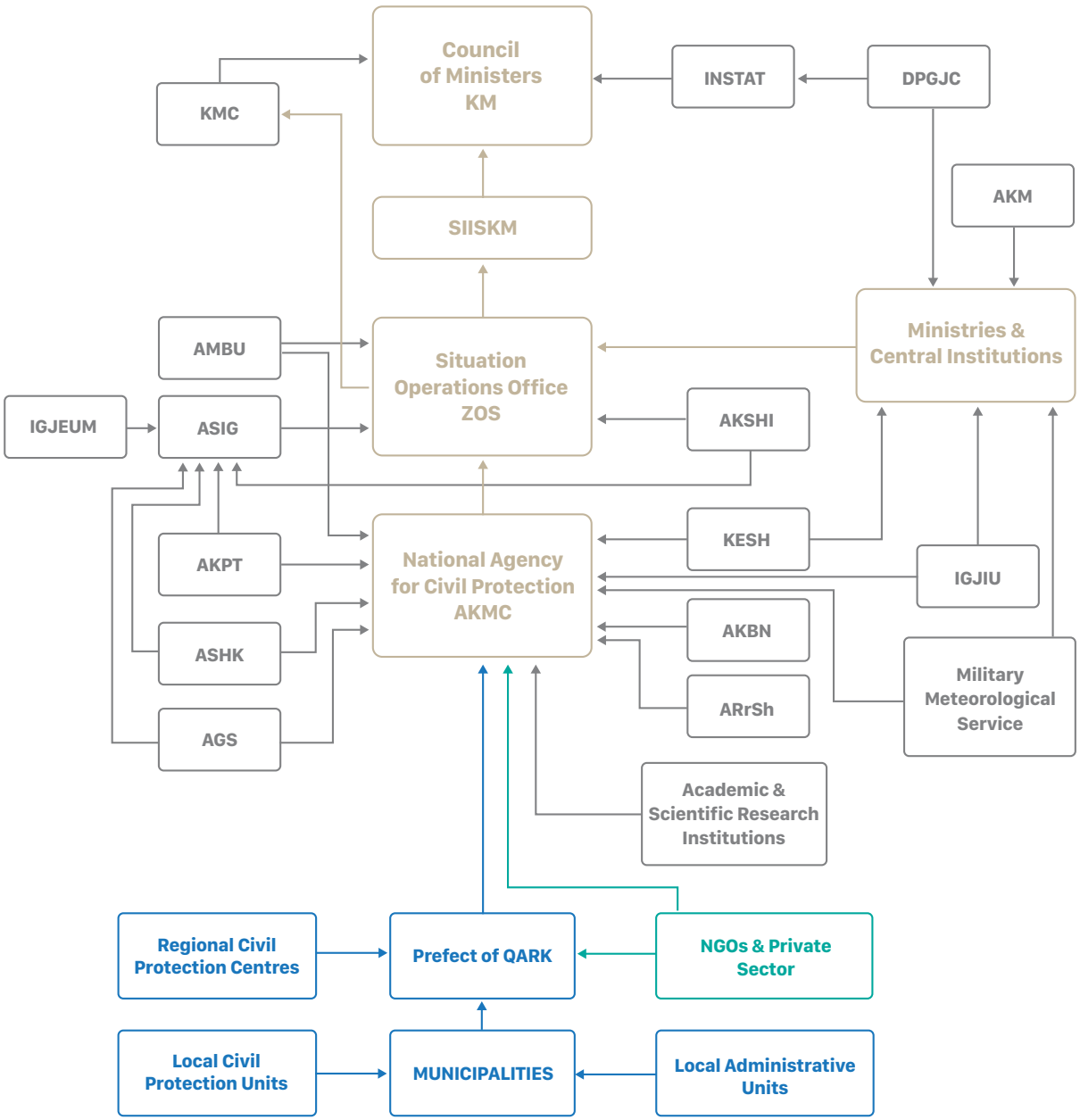
# 2. LEGISLATION AND CURRENT PRACTICE IN COLLECTION, ANALYSIS AND MANAGEMENT OF RISK-RELATED AND POST-DISASTER DATA IN ALBANIA

The Government of Albania has recently been actively improving its disaster risk management framework. As part of this, a new Law on Civil Protection, Law 45/2019 (see Text Box 1 below), was approved on 18 July 2019, which aims to modernize how the country implements DRM and ensures that Albania pursues adherence to relevant European Commission Directives and Regulations. Several ongoing initiatives (development of flood hazard maps, development of national risk assessment guidelines, scenario-based Electronic Regional Risk Atlas, geological studies, improvement of the national Geoportal) are helping the responsible agencies fulfil the requirements of the Law, but there are still many challenges to overcome.

## 2.1 Related legislation, institutions' responsibilities and current practice

There are many institutions involved in the collection and management of disaster risk and loss information in Albania. The flow of information is rather complicated and the organogram in Figure 2.1 tries to provide some clarity on the matter. The descriptions of the roles and the responsibilities as per Law 45/2019 are provided in Appendix A and the tree in Figure 2.2 shows the authority structure. Practically, the owners of data sit under different ministries and the focal point for risk and post-disaster data is the National Agency for Civil Protection (AKMC) under the Ministry of Defence. Further, the administration and management of the information in line with political and strategic decision-making of the Council of Ministers, Prime Minister and ministers, as well as maintenance of essential statistical data, is done by the Integrated Information and Statistics System of the Council of Ministers SIISKM, coordinated by the Situation Operation Office (ZOS). Most of the institutions provide the information to AKMC which then communicates it to ZOS.

**Figure 2.1: Management and flow of disaster risk and loss information**

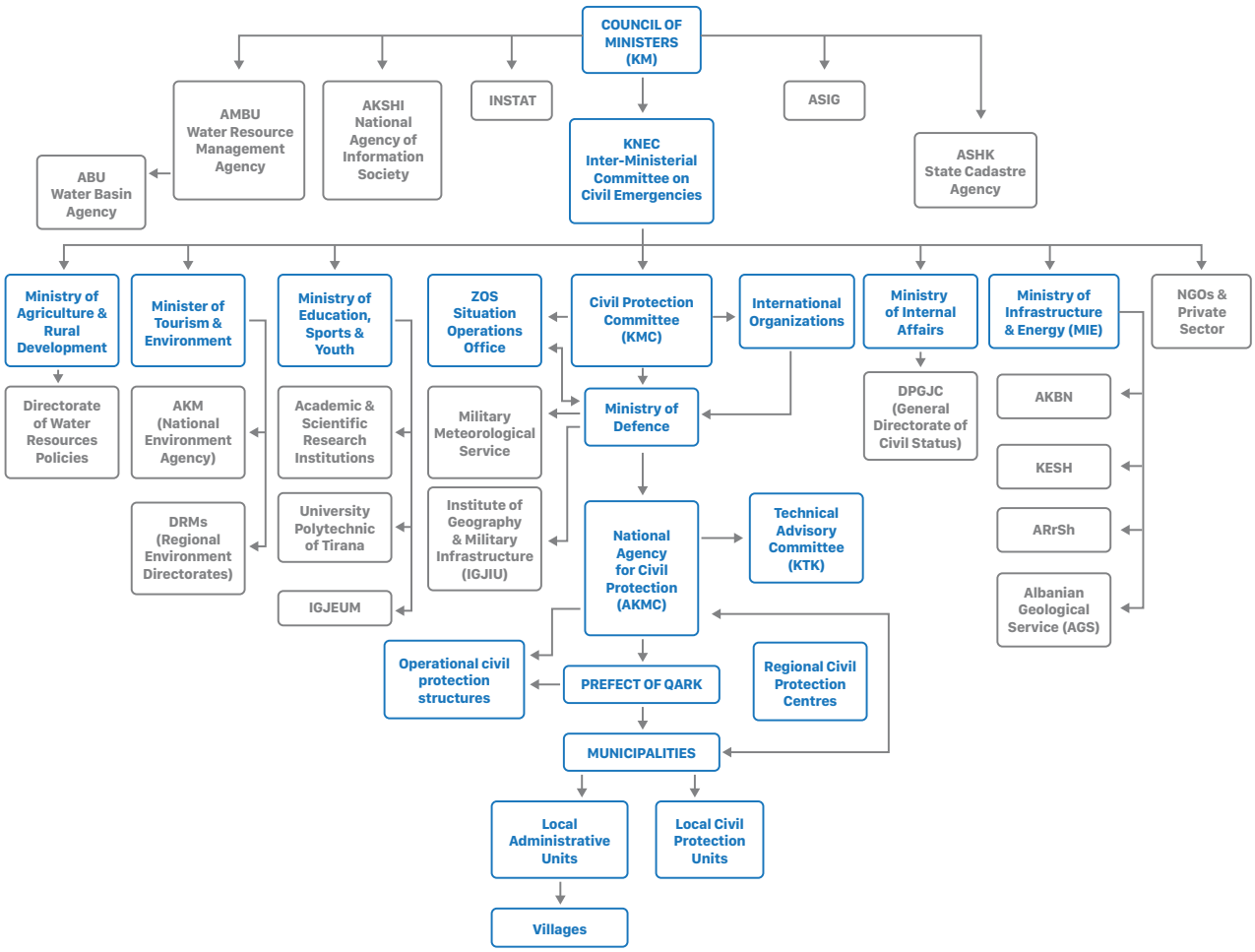



**Text Box 1**

Law No. 45/2019 "On Civil Protection", dated 18.07.2019, introduces new concepts like DRR, national and local strategies for DRR, harmonization of urban planning with DRR at local and national level, regional strategies for risk assessment, risk assessment certificates for development projects, civil emergency plans at all levels in line with National Plan for Civil Emergency, Disaster Loss Data and others. It establishes AKMC and ZOS and describes roles and responsibilities of units at national and local levels.

The law states also the need for establishing an integrated information system that serves to planning and preparation, on one side, and to coping with crisis and recovery after crisis, on the other. This information, together with early warning systems, should be used in the risk assessment process, and should be updated continuously and in a timely manner for stakeholders to undertake risk assessments. The information would also allow for the implementation of the subsidiarity principle (Art. 7), according to which planning and response should be delivered from the bottom up.

**Figure 2.2: Organization chart of Institutions involved in the disaster risk management**




According to the law, risk and disaster loss data must exist in three levels - municipalities, prefectures, ministries and central institutions - and is managed on a national level by AKMC. Municipalities, through the Prefect of QARK are responsible for generating risk and loss related data and to provide it to AKMC. Based on the Law No. 45/2019, risk assessment should be performed at the central level, at the county level and at the municipal level, and updated every three years. Municipalities are expected to perform risk assessment in their territory, develop and update a disaster risk reduction strategy, draft, and update local civil emergency plans, organize training activities in the domain of civil protection, ensure the operation of the monitoring, early warning, alert and alarm systems, develop investment plans for disaster prevention, protection and rehabilitation, maintain fire protection systems, etc.

Similarly, the municipalities/prefectures are obliged to develop disaster loss databases for their territories, which they shall maintain and update, and use to exchange information with the county prefect and AKMC, and to carry out assessment of damage and losses caused by disasters, including the evaluation of the compensations to citizens after a disaster. Public institutions and private entities are also obligated to provide data on disaster losses, if requested by AKMC. The loss data prepared by the municipalities is then supposed to feed the Disaster Loss Database at regional level, maintained, updated and used to exchange information

with AKMC by the prefectures. Further on, the overall assessment by sectors is within the responsibilities of Ministries and Central institution, each in their respective area. They are also expected to maintain and update Disaster loss databases to exchange information with AKMC. AKMC is the national agency, which shall establish and operate the National Disaster Losses Database and shall promote forms, methodologies, rational means for collecting, recording, processing and disseminating disaster information. The data for the database is collected not only from the ministries, prefectures and municipalities but also from the central and local civil protection system structures. AKMC is also obliged to ensure the development of disaster loss databases by the appointed institutions through regular inspections. According to Law 45/2019, when a state of natural disaster is declared, the Inter-Ministerial Committee for Civil Emergencies established by the Council of Ministers is the highest body coordinating and concerting the state institutions and private entities, and material and financial resources for dealing with natural disasters.

A comprehensive national methodology for loss and damage assessment for consistent application across Albania is not available. There is legislation, DCM 329/2012[13], National Civil Emergency plan of 2004 and documents issued specifically for the devastating floods between 2009 and 2011, DCM No.24[14] and DCM No.10[15], which define some general assessment procedures, assessment documentation and damage reporting forms but, in practice, emergency reporting to the National Operations Centre for Civil Emergencies[16] has not followed any protocols nor standardized forms for damage and loss assessment. The forms used by the local authorities for assessment consist of simple cost estimations of structural damage in dwellings, furniture, and household appliances because the only eligible subjects to indemnity in the non-declared disaster state are homeowners with damaged dwellings. For example, the assessment after the floods in 2009-2010 and 2010-2011 in Shkodra did not include the affected public assets and losses in business and production, presenting only the agricultural sector, which was not even fully covered. The only two assessments carried out based on the PDNA[17] methodology were: the assessment after the flood in November 2015, which was conducted following a simplified PDNA process of a rapid assessment of relevant sectors and was not intended to be an extensive PDNA; and the PDNA report[18] completed after the November earthquake in 2019, which was a full scope assessment with a recovery strategy.

An integrated national digital database for risk-related and post-disaster data with a clearly defined structure, standards and IT infrastructure for collection and processing of data is practically not available. The National Geoportal[19], developed and operated by ASIG, is currently the digital database for georeferenced information but it still seems to be in its initial phase of structuring and harmonizing, with a rather limited number of datasets and functionality that needs improvement. As for the disaster data, the only unified database currently used in Albania is *DesInventar Sendai, which contains summaries of the consequences after events*. The use of *DesInventar*, however, is not regulated by Law 45/2019 or related legislation, thus

13 DCM No.329, dated 16.05.2012 On criteria and procedures for the provision of financial state aid for the coverage of damage caused by natural disasters or other calamities caused by human activity, which is soon to be replaced by a new DCM, based on para 6, art 41 of Law 45/2019

14 DCM No.10, dated 6.1.2011 On the establishment of working groups to identify and assess the damage caused by rain and floods in the counties of Shkodra, Lezha and Durres – issued after the floods in 2010 and 2011 with ten evaluation forms: Buildings; Furniture and electrical-household appliances; Damage caused to agricultural crops; Damage caused to fruit trees, vines, olives; Damage caused to farm animals; Damage caused to the livestock food base; Damage caused to agricultural buildings; Damage caused to agricultural machinery; Damage caused to ornamental plants; Damage caused to fish breeding reserves.

15 DCM No.24, dated 20.01.2010 On the establishment of working groups, for the identification and assessment of damage caused by rain and floods, in the counties of Shkodra and Lezha – issued after the floods in 2009 and 2010 with eight damage assessment forms: Buildings; Furniture and electrical-household appliances; Damage caused to agricultural crops; Damage caused to fruit trees, vines, olives; Damage caused to farm animals; Damage caused to the livestock food base; Damage caused to agricultural buildings; Damage caused to ornamental plants

16 National coordination procedures are maintained by the 24-hour National Operations Centre for Civil Emergencies (NOCCE) which has direct links with all operational forces and other stakeholders, including Civil Emergency Sectors established in each prefecture. NOCEE is an organic part of the structure of AKMC.

17 Post-disaster needs assessment PDNA | United Nations Development Programme (undp.org) [https://www.undp.org/publications/pdna]

18 Albania Post-Disaster Needs Assessment Volume A Report - February 2020 - Albania | ReliefWeb [https://reliefweb.int/report/albania/albania-post-disaster-needs-assessment-volume-report-february-2020]

19 Kryefaqe | ASIG Geoportal [https://geoportal.asig.gov.al/]

its continuous update and the rules for the data entries are not defined. ASIG can also upload disaster data on the Geoportal it maintains, but such information was currently not found available.

Keeping reliable records of risk-related and post-disaster information is very important for the development of Disaster Management Strategy, for prioritisation of the risk against other calls on the resources available, social and political judgements in making decisions, for planning recovery and increased resilience of communities to natural hazards and mitigating the impact of future disasters. The data, however, would be of little value if the quality and consistency is not guaranteed through well-defined methodologies for data collection, management and storage, and clear roles and responsibilities of the involved parties. Since natural disasters are not bound to borders, compatibility with international databases facilitates international collaboration and support in risk management and post-disaster recovery.

## 2.2. The National Geoportal, ASIG's role and responsibilities

In the Republic of Albania, the organizations responsible for developing the National Spatial Data Infrastructure (NSDI) and the related legal framework are ASIG and the Board of Geospatial Information (BGI). BGI is an advisory body of ASIG and the Council of Ministers for the development of national geospatial information infrastructure. ASIG was established in 2013 with the Law 72/2012, dated 28.06.2012, "On the organization and functioning of the national geospatial information infrastructure in the Republic of Albania"[20] and started in collaboration with the Norway Cadastre Authority Statens Kartverk. Currently, ASIG is responsible for the development and administration of the National Electronic Geoportal and guarantees public access and access of stakeholders in accordance with the provisions. The Geoportal is a very important step in the framework of the Open Governance Policy (OGP), which basically has the policy of open data to citizens, providing services away from bureaucracy and assuring quality.

As stated by ASIG[21] and prescribed by the law, ASIG is expected to cover a wide range of functions in the field of geospatial data: maintaining the digital platform and guaranteeing access of the public and interested subjects to the national Geoportal; collecting and integrating data from the institutions and other sources; filing-in data gaps; establishing the standards for data collection and management; training and supporting institutions in the preparation of the data; participating in international projects for GIS data and representing the state in issues related to geospatial information infrastructure, supervising the implementation of the regulatory framework established by the law and more. ASIG is also expected to be part of the Technical Advisory Commission in the Ministry of Defence, "...which advises on issues of disasters risk reduction and civil protection."[22] The main responsibilities of ASIG are:

- Construction of the Albanian Geodetic Reference Framework according to European standards to enable the performance of accurate geodetic and cartographic works, with modern tools and methods.
- Development, operation and updating of GIS and the National Geoportal that provides information, data and geospatial services, in full compliance with the standards of Directive 2007/2 / EC "INSPIRE".
- Coordination and cooperation with the responsible public authorities, for the collection, processing and updating of geospatial information, for the drafting and implementation of standards in the field of geoinformation and the establishment of NSDI.

20 Autoriteti Shteteror per Informacionin Gjeohapsinor (asig.gov.al) [https://www.asig.gov.al/]

21 About ASIG [https://asig.gov.al/english/index.php/2014-11-06-22-33-30/rreth-asig]

22 DCM No. 1020, Dated 16.12.2020. On the composition, functioning and tasks of technical advisory commission for disaster risk reduction. Pursuant to Article 100 of the Constitution and point 3, article 25, of law no. 45/2019, "On civil protection", on the proposal of the Minister of Defence, the Council of Ministers

Currently, the uploading of the data on the Geoportal follows three main steps:

1. Geospatial data from different institutions is created/converted following ASIG recommendations by the INSPIRE directive.
2. The data is then sent to ASIG and it is reviewed for compliance with the State Standards for Technical Specifications of Geospatial Information[23].
3. If the data is compliant with the technical standards, it is uploaded on the Geoportal. If it is not, it is sent back to the institutions that provided it for modification.

There are three main sources of data for the Geoportal: institutions responsible for different types of data; the ASIG team who takes care of the basemaps, the geographical grid and other four base datasets; and, indirectly, the municipalities/prefectures, which often do not have the expertise and the resources to create the data therefore and assign the tasks to private entities. According to the acting legislation, ASIG is not expected to have direct collaboration with municipalities and prefectures (see Figure 2.1). At the same time, it is part of the Technical Advisory Commission (TAC), which is chaired by the Director General of AKMC, thus it can request information which local authorities are supposed to provide to AKMC. ASIG is not responsible for the actual verification and crosscheck of the data itself, it relies on the data providers for that. ASIG team does not take an active role in the post-disaster damage and loss assessment, except for providing requested baseline datasets. They have previously proposed a project for the development of an application, a digital tool for data collection, but the project did not go through. Currently, ASIG is working on the idea of implementing satellite images and linking the Geoportal to international databases.

More information about the structure of the ASIG, its interconnection with the different institutions and the flow of information can be found in the Inception Report[24] and Technical Report TR2[25].

## 2.3. *DesInventar* Sendai[26] in Albania

DesInventar has started to be used in Albania since 2013, as part of the loss data collection within the Hyogo Framework for Action (HFA) 2005-2015, adopted by 168 United Nation Member States. It was under the responsibility of the General Directorate for Civil Emergency (DPEC), which, since November 2019, following the enactment of the new Law 45/2019 "On civil protection", has been transformed into the National Agency for Civil Protection (National Civil Defence Agency) AKMC. At the same time, the update and management of the information in *DesInventar* is not regulated by any law.

The database for Albania in *DesInventar can be found on the servers:*

DesInventar - Profile (cimafoundation.org) and DesConsultar on-line Main Menu (desinventar.net) and the more recent version of the Albanian dataset is DesInventar - Profile (cimafoundation.org). Currently, the Albanian database in *DesInventar consists of more than 7000 data cards for the period 1851-2020. Only half of them have some quantitative indicators for the consequences of the events. Only around 12% of the cards provide information for the financial losses, of which those after 2014 are only 1.5%. The data is split in two periods* - 4 000 events for the period between 1851 and 2013 (Table 2.1) and more than 3300 records for the period after 2014 (Table 2.2).

23 Geoinformation Standards (asig.gov.al) [https://asig.gov.al/english/index.php/2014-11-06-22-34-05/ligji/267-geoiformation-standards]

24 Mott MacDonald (2021). Improving disaster risk and loss information in Albania. Inception report, 423090 IR, Rev. B

25 Mott MacDonald (2022). Improving disaster risk and loss information in Albania. Assessing and improving accessibility of risk related information – Task 2, 423090 TR2, Rev. A

26 United Nations DesInventar Open Source Initiative - Official Website [https://www.desinventar.net/]

**Table 2.1: Data cards in DesInventar for the period 1851-2013 (system last accessed Feb. 2021)**

The most frequent events and those that have affected most people are meteorological hazards. Geophysical events are mainly responsible for the life loss and the events that caused the majority of the economic losses are the hydrological ones. Forest fires, floods, landslides and snowstorms, account for more than 60% of all records. More than 60% of the reported casualties were caused by earthquakes and floods and more than 80% of the economic losses were caused by floods, flash floods and landslides.

| Event | Number of Data cards | | Affected people | | Casualties | | Economic losses ALL | | Economic losses US$** |
|---|---|---|---|---|---|---|---|---|---|
| | Total No / With quantitative indicators* | % from Total | No | % from Total | No | % from Total | ALL | % from Total | US$ |
| **Fire** | 69 / 52 | 2% / 1% | 175 | 0% | 10 | 1% | 56640183 | 1% | 30000 |
| **Rains** | 211 / 138 | 5% / 3% | 5002 | 1% | 3 | 0% | 168910583 | 2% | 0 |
| **Landslide** | 634 / 508 | 14% / 11% | 100686 | 12% | 51 | 3% | 1385595312 | 13% | 5100 |
| **Flood** | 734 / 561 | 17% / 13% | 93600 | 12% | 266 | 16% | 4032380838 | 37% | 48850 |
| **Contamination** | 14 / 12 | 0% / 0% | 31537 | 4% | 19 | 1% | 250000000 | 2% | 0 |
| **Forest Fire** | 991 / 664 | 22% / 15% | 188 | 0% | 3 | 0% | 18399894 | 0% | 0 |
| **Windstorm** | 157 / 53 | 4% / 1% | 215298 | 26% | 15 | 1% | 27042613 | 0% | 0 |
| **Hailstorm** | 120 / 82 | 3% / 2% | 0 | | 2 | 0% | 19829150 | 0% | 0 |
| **Snowstorm** | 532 / 158 | 12% / 4% | 107503 | 13% | 83 | 5% | 109527490 | 1% | 0 |
| **Thunderstorm** | 92 / 62 | 2% / 1% | 32 | 0% | 64 | 4% | 2003000 | 0% | 0 |
| **Flash Flood** | 187 / 152 | 4% / 3% | 107412 | 13% | 25 | 2% | 3827220623 | 35% | 410000 |
| **Frost** | 101 / 66 | 2% / 1% | 0 | | 3 | 0% | 575750 | 0% | 0 |
| **Storm** | 199 / 120 | 4% / 3% | 36679 | 5% | 13 | 1% | 721819022 | 7% | 0 |
| **Other** | 24 / 23 | 1% / 1% | 51 | 0% | 99 | 6% | 16882348 | 0% | 0 |
| **Avalanche** | 25 / 23 | 1% / 1% | 8 | 0% | 46 | 3% | 2267928 | 0% | 0 |
| **Epidemic** | 80 / 77 | 2% / 2% | 0 | | 66 | 4% | 0 | | 0 |
| **Cold Wave** | 24 / 15 | 1% / 0% | 0 | | 22 | 1% | 12000000 | 0% | 0 |
| **Plague** | 34 / 19 | 1% / 0% | 0 | | 0 | | 3750000 | 0% | 1100 |
| **Drought** | 1 / 1 | 0% / 0% | 0 | | 0 | | 0 | | 0 |
| **Surge** | 7 / 2 | 0% / 0% | 0 | | 0 | | 0 | | 0 |
| **Heat Wave** | 22 / 20 | 0% / 0% | 0 | | 40 | 2% | 0 | | 0 |
| **Accident** | 23 / 20 | 1% / 0% | 3 | 0% | 33 | 2% | 0 | | 0 |
| **Structure** | 12 / 1 | 0% / 0% | 250 | 0% | 0 | | 0 | | 0 |
| **Fog** | 1 / 0 | 0% / 0% | 0 | | 0 | | 0 | | 0 |
| **Sedimentation** | 3 / 2 | 0% / 0% | 0 | | 0 | | 0 | | 0 |
| **Earthquake** | 126 / 96 | 3% /2% | 115423 | 14% | 799 | 48% | 214949562 | 2% | 0 |
| **Leak** | 2 / 0 | 0% / 0% | 0 | | 0 | | 0 | | 0 |
| **Total** | 4425 / 2927 | 100% / 66% | 813847 | 100% | 1662 | 100% | 10869794296 | 100% | 495050 |

* Not all of the data cards contain information in quantities measures like number of affected people, economic losses, number of damaged assets, affected hectares, etc. This does not necessary mean that the data cards are wrongly filled in, some of these zero-entry data cards seem to be associated with events with no observed damage or loss.

** The entries in USD are not the equivalent to the entries in ALL

**Table 2.2: Data cards in DesInventar for the period 2014 - 2020 (system last accessed Feb. 2021)**

The most frequently reported classes of hazard were identified as technological (74%), geophysical (13%), hydrological (5%) and climatological (4%). Only around 23% of the data cards provide information about the damage, the affected population, or the financial losses.

| Event | Number of Data cards | | Affected people | | Casualties | | Economic losses ALL | | Economic losses US$** |
|---|---|---|---|---|---|---|---|---|---|
| | Total No / With quantitative indicators* | % from Total | No | % from Total | No | % from Total | ALL | % from Total | US$ |
| **Flood** | 168 / 61 | 5% / 2% | 771 | 33% | 4 | 3% | 0 | 0% | |
| **Forest Fire** | 124 / 15 | 4% / 0% | 0 | 0% | 0 | 0% | 0 | 0% | |
| **Earthquake** | 422 / 234 | 13% / 7% | 1440 | 61% | 51 | 39% | 2143018814 | 99% | |
| **Rains** | 16 / 2 | 0% / 0% | 0 | 0% | 1 | 1% | 0 | 0% | |
| **Explosion** | 9 / 5 | 0% / 0% | 0 | 0% | 4 | 3% | 0 | 0% | |
| **Intoxication** | 3 / 2 | 0% / 0% | 0 | 0% | 0 | 0% | 0 | 0% | |
| **Epidemic** | 1 / 1 | 0% / 0% | 4 | 0% | 1 | 1% | 0 | 0% | |
| **Panic** | 1 / 1 | 0% / 0% | 0 | 0% | 0 | 0% | 0 | 0% | |
| **Liquefaction** | 7 / 2 | 0% / 0% | 4 | 0% | 0 | 0% | 0 | 0% | |
| **Landslide** | 66 / 27 | 2% / 1% | 5 | 0% | 0 | 0% | 0 | 0% | |
| **Storm** | 13 / 11 | 0% / 0% | 58 | 2% | 3 | 2% | 0 | 0% | |
| **Accident** | 28 / 23 | 1% / 1% | 11 | 0% | 23 | 18% | 0 | 0% | |
| **Other** | 12 / 5 | 0% / 0% | 6 | 0% | 2 | 2% | 0 | 0% | |
| **Mudslide** | 6 / 1 | 0% / 0% | 0 | 0% | 1 | 1% | 0 | 0% | |
| **Windstorm** | 9 / 1 | 0% / 0% | 0 | 0% | 1 | 1% | 0 | 0% | |
| **Cyclone** | 2 / 1 | 0% / 0% | 0 | 0% | 1 | 1% | 0 | 0% | |
| **Sedimentation** | 1 / 0 | 0% / 0% | 0 | 0% | 0 | 0% | 0 | 0% | |
| **Plague** | 2 / 0 | 0% / 0% | 0 | 0% | 0 | 0% | 0 | 0% | |
| **Flash Flood** | 5 / 1 | 0% / 0% | 0 | 0% | 1 | 1% | 0 | 0% | |
| **Hailstorm** | 5 / 0 | 0% / 0% | 0 | 0% | 0 | 0% | 0 | 0% | |
| **Structure** | 2 / 1 | 0% / 0% | 0 | 0% | 0 | 0% | 0 | 0% | |
| **Frost** | 1 / 0 | 0% / 0% | 0 | 0% | 0 | 0% | 0 | 0% | |
| **Total** | 3367 / 761 | 100% / 23% | 2365 | 100% | 131 | 100% | 2159688814 | 100% | 1150100 |

* Not all of the data cards contain information in quantities measures like number of affected people, economic losses, number of damaged assets, affected hectares, etc. This does not necessary mean that the data cards are wrongly filled in, some of these zero-entry data cards seem to be associated with events with no observed damage or loss.

** The entries in USD are not the equivalent to the entries in ALL

More information about the use of *DesInventar platform in Albania is provided in the Inception Report IR*[23].

## 2.4. Challenges and gaps Capacity of local authorities

According to Law 45/2019 municipalities are expected to play a key role in the risk assessment, in drafting local emergency plans and in the post-disaster data collection and loss assessment. However, municipalities face many challenges in meeting their responsibilities defined by the law, as was demonstrated by a recent survey in 2020 led by the Association for Local Autonomy and with the support of the Strong Municipalities[27] and even a more recent project completed in 2021 by Co-plan as part of the World Bank project "Support to Local Authorities for Disaster Data Management". Some of the main findings are:

- The requirements of the law and the new concept of disaster loss data are not well understood by the municipality administration. The majority of the municipalities do not have knowledge related to EU directives for disaster risk management and risk assessment. Reporting for disaster risk management is still a very unclear process. In fact, most of the municipalities have not yet structured their civil emergency directorates or sectors with the required staff.
- Many of the municipalities identify insufficient financial resources as a key reason for the lag in their preparation and setting up an appropriate structure for civil protection.
- Expertise and technology for collecting, recording and analysing data are also very limited. Data storage and reporting varies from municipality to municipality, and it is not unified. Most of the municipalities keep their data records in the form of assessment reports, hard-copies and/or in digital format. The records, however, are not georeferenced, they are not linked to a geographic information system, including the national geoportal, and a specific platform for managing these data is not available.
- Methodology, standards and relevant guidelines for recording and analysis of risk-related data are not available and the reporting of disaster data is usually done through official letters.
- Municipalities do not have good knowledge of the *DesInventar* system and the recorded damage and loss do not even follow the *DesInventar* data cards.
- Collaboration with other directorates in the process of data collection and management is not always efficient and is conditioned to specific disaster events and the responses to them.

### Institutional capacity and control over the implementation of Law 45/2019

Expertise and tools are spread across different institutions and they do not seem to be in efficient collaboration, consolidated by the governmental units that should be in charge of the data collection process and the maintenance of databases for damage and loss after natural or man-made hazardous events. A wide range of experts in a well-organised team is required to build and manage a national risk database and control the process of data collection, especially if the ultimate goal is to develop a fully integrated multi-functional digital data platform. GIS experts alone would not be sufficient. Other specialists in the fields of data analysis and statistics, hazard and risk analysis, information technology, image recognition and machine learning are highly recommended. Establishing successful collaboration with international data platforms and local research teams in the fields of hazard and risk is also worth exploring.

27 The project was funded by the Swiss Agency for Development and Cooperation and implemented by Helvetas. Synthesis Report on Civil Protection Function at Local Level (shav.al) [https://www.shav.al/en/media-en/reports-and-publications/226-synthesis-report-on-civil-protection-function-at-local-level]

The Law 45/2019 *On civil protection, which provides the overall framework for post-disaster data collection and analysis, is in force for almost three years now, since July 2019, and still many of the prescribed reforms and new initiatives have yet to be implemented.*

### The National Geoportal maintained by ASIG

The review of the functionality of the Geoportal and the datasets available on it showed that it is still in its initial phase of structuring and harmonizing:

- Currently, the Geoportal functions more like a visualisation tool, rather than an interactive digital platform for data manipulation and creating knowledge. The Geoportal has only a limited number of tools (measure, search, zoom, print, pop-out info messages, add external layers) that allow the users to interact with the published data. Registered users, institutions mainly, can also download georeferenced data in different formats, but our experience has shown that whole data layers cannot be downloaded but only the data from selected regions. Overall, viewing, loading and handling the data layers are rather cumbersome procedures.
- The update and correction of the data received by ASIG for the Geoportal follows the same process as the receiving new datasets. This process could be made more efficient and compliant with the database management system (DBMS) procedures, such that creators/owners of the data can upload, edit and update the date directly on the database, managed by the institution.
- Currently, ASIG relies on the validation performed by the institutions and units responsible for the creation of the data. The only check that ASIG performs is for compliance with the *State Standards for Technical Specifications of Geospatial Information*[22]. Even though ASIG is not expected to have the technical knowledge in every field of the received information and to judge its correctness, certain crosschecks and verification for consistency and completeness are still logical to be performed by the administrator of the database.
- During the discussions we had with the ASIG team, they shared with us that many responsible institutions and municipalities have not provided data yet and for those that have, it is not clear when the provided data is to be updated. What is more, institutions have different approaches for sharing data with ASIG and the data is often not in the right format. Such discrepancies and issues with the working collaboration between ASIG and the institutions are some of the key reasons for the incomplete database currently on the Geoportal.
- Currently, it appears that most of the data can be viewed without restrictions but access to the data is granted only to the registered users. There is a simple registration form with which the access can be requested and if approved, the user receives a username and password with which the data can be downloaded. At the same time, the ASIG Geoportal User manual v. 1.0.0, 21.09.2017, describes a payment tool for purchasing dataset entries or regular feature classes from registered users, which means that there should be datasets that can only be downloaded after payment. It is not clear, however, what are the current levels of accessibility, what restrictions for access and use are assigned to which datasets, whether there is data that cannot be downloaded even by a registered user and who can request the access to the "special" data.
- ASIG Geoportal was created in 2014 and after that had a major update of the graphical user inter-

face in 2015-2016. Over the years different data had been added and the 34 INSPIRE base layers have been created. That is why, since 2014, it has been an important tool for engineers, architects, real estate offices, and other different users in Albania. Nowadays the Geoportal has many users but also faces many issues related to its functionality. The platform becomes slower and slower with time, it becomes more and more cumbersome to search for and download information, it crashes often or often does not respond to the given commands.

- The datasets available on the Geoportal are still rather limited and insufficient for application in hazard and risk assessments, inconsistencies were found between similar datasets provided by different institutions, not all of the datasets are georeferenced, the language of the data is not always as stated, legends on the maps are not always clear, and the metadata not always correspond to the content of the dataset. One example of inconsistency among the datasets on the Geoportal is the information about the buildings which is currently available from three sources - INSTAT, Cadastre and the Address book. At the same time, for the assessment of the damage to buildings after the November Earthquake in 2019 the on-site data collection relied on the billing register of the Albanian Power Distribution Operator (OSHEE), since it was considered the most accurate address and household register.
- Municipalities and prefectures seem not to be fully aware of how they can take advantage of the information stored on the Geoportal and the GIS services by ASIG, especially in the development of the risk assessment of their territories.

### *DesInventar* Sendai system in Albania

- A review of the records currently available on *DesInventar* for past hazardous events showed that there are incomplete and inconsistent entries. This applies not only for events that have happened before the implementation of *DesInventar* in Albania but also to more recent entries. Only 1.5% of the data cards filled in after 2014 provide information in terms of losses, and only around 23% of the data cards provide any information about the impact of the hazardous event, damage, affected population, or the financial losses. In fact, the records for the past 6 years do not have information about the economic losses.
- It appears that there is no consistent approach for the reporting of the damage and loss data on *DesInventar*. Some of the data cards contain much information in the "comments" section, while the fields designated for losses are either empty or do not correspond to the information in the comments. Other inconsistencies like using "dynym" instead of hectare or mixing USD with ALL were also observed. It is also not clear whether the "zero" consequences recorded for many of the events are due to the fact that no assessment has been done, or no damage has been actually observed. The latter contradicts one of the DesInventar principles, that only events with effects need to be recorded. Direct and indirect losses appear also to have been misinterpreted in some of the entries. A quick check of the records for a few recent events showed that there are even unreliable entries which need review and update.
- The process for checking and verification of the data to be uploaded on the DesInventar is not established. AKMC is in charge of updating the entries, but they rely entirely on the local authorities who are expected to verify the data for its correctness.

- The use of *DesInventar* Sendai system in Albania is not regulated by the law, even though it is currently the only unified system for consistent recording of damage and loss after disasters. Responsibilities for the update of the data cards are not clearly stated, guidelines for preparing the data for upload are not available and most of the local institutions, who should be the primary source of post-disaster data, are not aware of the system.
- It has to be mentioned also that there are some ambiguities with the *DesInventar* system itself. For example, a specific methodology to be followed for the assessment of the losses is not suggested. This leads to inconsistencies in the data inputs and limits the data for further application in more precise national hazard and risk assessments. The guiding documents that can be found on the website are a bit confusing, because both older and newer versions exist, before and after the transition to the Sendai framework compliance. This allows for different interpretation of some of the definitions that have undergone changes or parameters that are no longer needed within the Sendai framework. For example, the queries differentiate between directly and indirectly affected people but at the same time specific entries for indirect effects are not present in the data cards. Similarly, the entry "other losses" is susceptible to interpretation. In general, it appears that *DesInventar* requires only direct damage and losses in the data cards but at the same time the term "other losses", as explained in the manual, is rather broad and could be considered to refer to indirect losses. Confusion is additionally created by the fact that data is managed on several servers and the user has to make sure that she/he is looking at the most recent update.

### The availability of risk data for Albania

Many datasets, from local and international sources, were reviewed and listed in the prepared Risk Data Catalogue as relevant for hazard and risk assessment of Albania. Despite the large number of available data, the information would not be sufficient for reliable risk assessment analyses. Important datasets are missing, many are not ready for direct application, some are not georeferenced, and still others need to be crosschecked and verified before application application (for the definitions of the data groups see Appendix D):

- Some of the main gaps in the Exposure Data group are related to direct information about the exposed value of most assets, georeferenced data with a good resolution about the location and size of assets and ready exposure models developed for Albania. More specifically, very little information was found about hospitals and schools, about critical infrastructure facilities and the quaternary sector currently is not represented by any dataset. Having information about the actual conditions of the building infrastructure would be also very helpful for more realistic risk analyses. This is an aspect that needs to be accounted for in the evaluation of the building vulnerability and that can really change the estimation of the vulnerability levels compared to those based only on technical documentation and as-designed parameters..
- As for the Hazard Data group, earthquakes and floods are relatively well covered in the catalogue, although additional detailed review is needed to assess to what extent the datasets can be directly used, and whether the resolution is sufficient. For all other hazard types, the available information is limited.
- The Data group with the highest number of datasets that are not specifically for Albania is Vulnerability. Practically, vulnerability models developed for the specifics of the assets in Albania

were not found. The group is dominated by international sources, which can only be used with a number of assumptions and verification. The development of country-specific vulnerability models is expected to take time and resources and by then, models developed for different context could be utilised.

- Similar to the Hazard Data group, the Risk Data group is also dominated by earthquake and flood risk assessments, while the other risk categories are very poorly represented. In the Data group Capacity, datasets directly related to DRM and DRR capacity are very limited.

### Methodologies and standards for data collection, analysis and management

A comprehensive national methodology for loss and damage assessment for consistent application across Albania and a standardized taxonomy for risk data are not available.

- Currently, the ASIG geoportal specifies that the data to be uploaded on the platform has to be compliant with the *State standards for Technical Specifications of Geospatial Information*[22]. These standards, however, focus on the technical specifics of GIS matrixes and the structure of metadata which are of use predominantly for GIS specialists. A broader standardisation of terms, definitions, data structure, data types and attributes to be followed by everyone involved in the process of data collection and management is not available.
- Similarly, a consistent methodology for loss and damage assessment to be used after disasters is not available. Previous assessments have been carried out either following recommendations and field investigation forms created specifically for the case, or internationally accepted methodologies.
- Practical guidelines for data collection and structuring risk and disaster databases, exemplary field investigation forms per sector and tools for data collection are not available for use by the municipalities and prefectures.

### Current practice in post-disaster loss and damage assessment in Albania

Review of past experience in post-disaster loss and damage assessment in Albania shows that there were only two assessments carried out based on the PDNA methodology – the assessment after the flood in November 2015, which was conducted following a simplified PDNA process of a rapid assessment of relevant sectors; and the PDNA report completed after the November earthquake in 2019, which was a full scope assessment with a recovery strategy. Other assessments have also been carried out, but they were simplified estimations rather limited in scope, predominantly for indemnification purposes and often substantially underestimating the overall losses. Some of the main gaps identified in the methods previously used for the assessment of the impact of disasters are:

- The collection of the data immediately after the disaster was usually executed within the local constraints, limited expertise and tools, with data forms prepared on an ad hoc basis and no digital data platform. As a result, the collected data was very often incomplete, varies in quality and difficult to analyse.
- Very often, the baseline data was missing, or it was not up-to-date. The baseline information should provide an overall framework for the assessment of disaster impact and should allow

the necessary extrapolations to cover the entire affected areas of the country, even when the assessment team cannot cover them all during the field visits. What is more, the field missions normally focus on the affected assets and people and without the baseline data, the statistical processing of the collected data would be misleading. If the baseline data is managed in a consistent manner and is being periodically updated, it will serve as a very good basis for post disaster needs assessments.

- Double counting is another problem that needs to be carefully addressed, especially when estimating the indirect and intangible losses. Such estimations are usually cross-sectorial and they require very good coordination and efficient collaboration between the teams involved in the assessment.
- Advanced methods for rapid assessment after the event, which usually rely on remote sensing, digital networks of monitoring instrumentation and data collected from satellite imagery are of limited use.
- Gaps and inaccuracies were also identified in the estimation of indirect and intangible losses, which were not always covered in the assessment reports. In some cases when more than one team was involved, it was evident that different assessment methodologies were employed - different scales for the damage to physical assets were used, the losses were analysed with different level of detail and precision, terms were used inconsistently throughput the report and similar.
- In most of the assessments, the recovery strategy was briefly addressed. General recommendations and principles for reconstruction and recovery were provided in some cases, but a more detailed recovery strategy with a timeframe, proposed funding mechanisms and a plan for realisation was found only in the last PDNA completed after the November earthquake in 2019[17].

Problems were identified not only with the actual methodology for loss evaluation but also with the organisation and management of the assessment process. In many cases, the assessment process was poorly organised, the involved people did not have the needed training, nor experience, ministries were not prepared and did not know what type of data to collect, the collected data was not verified, and the results were not transparent.

### Legal framework

The Law 45/2019 *On Civil Protection* provides the overall framework for preparing and maintaining risk databases and for post-disaster data collection and analysis. However, additional clarification of some of the articles, additional legislation, reference to standards and methodologies are needed to provide directions and more specific instructions for the application of the Law, the implementation of which appears to be lagging. The new institutional arrangements, procedures, the new paths for collaboration, staffing and teams structuring, seems not to be effectively functionating yet, more than two years since the enforcement of the Law. What is more, some of the legislation linked to this Law still needs to be updated in compliance with it (refer to Technical Report TR3[28] for more details).

28 Mott MacDonald (2021). Improving disaster risk and loss information in Albania. Recommendations for improvement of post-disaster loss information - Task 3, 423090 TR3, Rev. A

### Integrated national hazard, risk and post-disaster database in Albania

An integrated national database for hazard and risk, damage and loss data, with its own digital infrastructure, is currently not available. According to the law, risk and disaster loss data have to exist in three levels - municipalities, prefectures, ministries and central institutions and AKMC is the national agency, which shall establish and operate the National Disaster Losses Database. As discussed previously, *DesInventar is the unified database for loss data and the Geoportal maintained by ASIG is the digital platform currently available for* geospatial information in Albania. The *DesInventar* contains just a summary about the impact of hazardous events and the information, although linked to the administrative territories, is not georeferenced strictly speaking. The Geoportal contains datasets useful for hazard and risk assessments, but the data is still rather limited and insufficient for the development of risk models and completion of full-scope multi-hazard risk assessments. Separate disaster reports are occasionally prepared, communicated and stored by municipalities and prefectures but they are not systematically collected and managed across all municipalities. They are also useful datasets regularly compiled by different institutions which have not reached the Geoportal, or simply have never been intended to be uploaded on the ASIG platform. Ultimately, a common well-structured national database to compile, unify and administer all available datasets and the creation of new ones has not been structured yet.

These and related issues are the focus of the current project and are addressed with the recommendations in Chapter 5 and supported with the proposed Risk Data Catalogue and the Methodology for post-disaster damage and loss assessment.

# 3. RISK DATA CATALOGUE

The main objectives of the Data catalogue are: 1) collection and review to some extent of a wide range of sources and datasets relevant to hazard and risk assessment for Albania and 2) building a risk data taxonomy with clear definitions and a catalogue structure for consistent application in the future, compatible with commonly used international data classifications. The second was considered extremely important and was given careful consideration. Having a well-defined structure of the catalogue not only facilitates the storage and search for relevant information but serves also as guidelines to institutions and responsible parties for risk-related data collection and sharing. What is more, the proposed structure and definitions could be used as the basis for a national standardised taxonomy for risk data, supported by the corresponding legal framework, together with instructions for the correlation between the definitions of the catalogue and those already used by DesInventar Sendai system, the acting legislation and the data specifications by INSPIRE[29] set up by ASIG as the standard for spatial datasets and services.

The scope of the catalogue is data related to risk assessment due to natural hazards and only if applicable for the case of Albania. Anthropogenic hazards are outside the scope of the current catalogue, but such can be easily included in the future without conceptual change of the structure. Risk-related data includes both data directly related to the risk or data that is needed for direct or indirect application to risk analysis assessment. In reality, this gives a very wide range of data types. In fact, the fewer the datasets directly related to one risk category, the large number of indirect datasets that may be needed to generate the missing data and to provide justification for the assumptions that will have to be made. Unreliable data or data not relevant for Albania is excluded. The catalogue considers both local and international sources. Hundreds of datasets are included and described by means of predefined attributes. It was not feasible to perform a full check and verification of every dataset. Still, the applicability of some of the datasets were rated based on experience. For others, it was very difficult to provide a realistic rating without being tested in practice.

The Risk Data Catalogue is provided separately with the file called "Risk data catalogue.xlsx". For ease of use and wide application, the catalogue was prepared in a simple machine-readable format. It is an Excel table, where information can be easily filtered and searched for. It can be also easily exported to other file formats, as well as read and automatically imported by variety of other software types and routines. Blank rows in the catalogue mean that the datasets for the corresponding data categories and types were not found and blank cells for the attributes mean that the values are unknown or not possible to retrieve.

One aspect which was not feasible to observe strictly in the catalogue is tracing back the original sources of the datasets. There are many digital platforms which compile and process data obtained from different sources, and it is sometimes very difficult to track which is the source that first published that data. Even if some of the datasets in the catalogue are linked to a source which may not be the first to publish them, this is not considered to be a major issue as long as the owner is correctly referred to.

One of the key advantages of the catalogue is its structure. It is easy to use, flexible for modification, compliant with national and international data sources and clearly defined. It could be used as guide-

29 Data Specifications | INSPIRE (europa.eu) [https://inspire.ec.europa.eu/data-specifications/2892]

lines for collection, storage and sharing of risk related data and even considered as a starting point for the development of a national taxonomy of risk-related data. While the datasets in it have to be continuously updated and filled in, the structure of the catalogue should be predefined and regulated for consistent application across institutions and regions.

The definitions of the terms used in the catalogue are provided in Appendix D. The definitions are consistent with international data taxonomies and also the local legislation. This facilitates the establishment of connections between different data sources and efficient information exchange. The definitions are also consistent with the DesInventar Sendai system. It should be noted that the main objective of the catalogue is classification and description of datasets in terms that are relatively easy to understand by users with different background and experience. Highly technical terminology related to standards of building metadata and GIS data matrixes, like the INSPIRE data specification[30], or the authoritative specification of metadata terms by the Dublin Core™ Metadata Initiative[31] was avoided. Still, there is no conflict between the proposed attributes and most common standards of technical specification of GIS data, including the local ones. In fact, such standards simply add another independent layer of presentation of the data for the purpose of digital system for data management and automation of data processing.

## 3.1. Guiding principles

The main concept was to build the catalogue based on what is actually needed for multi-hazard risk assessment, thus the missing or the outdated data could be also identified, together with the one already available. Different well-established taxonomies for hazard, exposure and vulnerability were reviewed and their structures and definitions were considered. The guiding principles used for structuring the catalogue are:

- Relevance and applicability of the data types and attributes to disaster risk assessment. In practice, the range of datasets that may turn out useful for risk assessment analysis is very wide. In fact, the less data available for direct application, the wider the range of indirect data needed to compile the input for the risk analysis based on assumptions and information crossing. That is why, the Risk Data Catalogue prepared for this project contains a large number of potentially useful datasets.
- Addressing the dependence between hazards and datasets unambiguously. One of the most challenging aspects of organising the structure of the catalogue was the fact that hazards can change identity depending on the context, that some hazards are triggered by other hazards and that one dataset could be equally relevant for the assessment of different risks and their components. This was addressed by providing a fixed hierarchical structure on one side and attributes based on applicability of the datasets on the other. It is desirable to group the hazards and the data overall into a set of categories to aid identification, reporting, and allocation of effort for collection. At the same time, the non-linear relationships between datasets and hazards were addressed by assigning applicability of each dataset to the risk categories.
- Clarity and simplicity in collecting and managing data. While the risk assessments would be performed by experts with relevant experience and good judgement about the required data, collecting and managing the data should be easily done by people with different background and

30 Data Specifications | INSPIRE (europa.eu) [https://inspire.ec.europa.eu/data-specifications/2892]

31 DCMI: DCMI Metadata Terms (dublincore.org) [https://www.dublincore.org/specifications/dublin-core/dcmi-terms/]

level of understanding of risk assessment. Every institution collects data for its own needs and tasks and some of this data is useful for risk assessment, even if not collected specifically for it. Thus, the structure of the catalogue was intended to be more versatile, such that information collected for different purposes can be easily integrated. What is more, having clear definitions and a clear structure of the branches of the Data tree allows for an easy distribution of responsibilities among teams, local and governmental units on the data collection of one or several data types or sub-types.

- Clear definitions of data types and attributes. This is considered highly important, not only because different sources use different definitions but to also meet the above principle about clarity and simplicity of use of the catalogue. Definitions are provided in Appendix D.
- Hierarchical structure for easy update and modification. By grouping the datasets in several layers of sub-categories, the catalogue can be easily expanded, shrank, or modified without the need for any major conceptual changes. It is expected that such a data catalogue will be continuously updated. Some datasets my need to be removed or replaced with other types of datasets and this can be easily done under clearly defined layers of dependency. The flexibility provided by the hierarchical structure allows also for more accurate connection of the catalogue to other data catalogues, by linking the consistent definitions.
- Structure and definitions compatible with the concept of a fully digital database. This means that all definitions are kept unique, overlapping of the attributes' meaning is avoided and different datasets are provided only once. Data can be easily filtered based on various criteria and unique combinations of them.
- Compatibility with the ASIG metadata. The defined data attributes are consistent with those found in the metadata published on the ASIG Geoportal and also with the INSPIRE principles and technical guidelines.
- The scope of the catalogue is datasets relevant for risk assessments of natural hazards for the territory of Albania. Datasets that do not cover Albania or cannot be applied for the case of Albania are not included, even if relevant for risk assessment. Datasets with a very large resolution on a country level, which do not provide information for different regions within the boundaries of Albania were also included, even though they may have a very limited applicability.

## 3.2. Structure of the catalogue

The structure of the catalogue was defined prior to the selection and review of the datasets. The main goal was not just to select and collect data sources, but to propose a useful and practical approach for sorting, classifying, updating, sharing, managing risk related data for consistent application in the future. The process of review and filtering of datasets should not stop with this catalogue. It is expected to be a continuous practice as part of the risk management strategy. In fact, some of the information required for a full-scope risk assessment was not available at the time of the preparation of the catalogue. Thus, having a clear structure of the catalogue for the purpose of risk assessment also plays the role of guidelines what type of data still needs to be generated and what would be the most efficient way to do that based on the data category.

The structure of the catalogue can be viewed as a two-dimensional matrix in which the rows are organ-

ised according to the data type based on a predefined Data tree, and the columns describe the data based on an Attribute tree. Each row is one unique dataset, and the datasets do not repeat. The fact that one dataset could be useful for different risk categories and different components of the risk assessment is addressed with the attributes describing the applicability of the data. Having the classification based on data type and attributes, the datasets can be easily filtered and searched for in the catalogue.

The Data tree starts with 6 main data groups, *Baseline data, Exposure, Vulnerability, Hazard, Risk and Capacity,* which branch out in data categories and types. The structure is shown in Table 3.1. Data subtypes were also suggested, but the lists are not meant to be exhaustive and simply to provide as many examples as possible for clarity and ease of the application of the catalogue. Historical data and events can be identified based on the Referenced date.

**Table 3.1. Structure of the Data tree used for the proposed catalogue – definitions provided in Appendix D**

| Category | Type |
|---|---|
| **Data group: Baseline Data** | |
| **Administrative regions** | State boundaries, Counties, Municipalities, Municipality units, Parcels, Cadastre zones, Protected zones |
| **Geodesy** | Grid, Coordinate system, Reference points |
| **Topography** | Maps, Elevation models, Elevation contours, Costal lines |
| **Land cover** | Urban, Rural, Forest, Grassland, Costal zones |
| **Geology** | Geological engineering maps, Soil profiles |
| **Socio-Economic indicators** | National, Regional |

| Category | Type | |
|---|---|---|
| **Data group: Exposure** | | |
| **Population** | **Demographics** | Density, (De)population rate, Sex, Gender, Ethnicity, Religion, Disability, Marital status |
| | **Human development indicators** | Health (life expectancy, mortality rates, immunisation, malnutrition, etc.), Education (education index, literacy, school drop rate, level of education, etc.), Income (income index, GDP per capita, labour share, etc.), Inequality, Poverty, Employment, Human security (homicide rate, refugees, prison population, etc.), Mobility and communication, Socio-economic sustainability |
| | **Cost** | Value of statistical life, Value of life, Quality adjusted life year, Insurance, etc. |

| Category | Type | |
|---|---|---|
| Building | **Occupancy** | Residential, Commercial, Public, Health, Industrial, Agriculture, Governmental, Educational, Mixed use, Special use, Fire stations, Rescue centres, Heritage structures, etc. |
| | **Structure** | Year of construction, Height, Design, Materials, Lateral-load resisting system, Roof, Horizontal diaphragms, Foundation and underground structure, Irregularity, Current state of structural components, Retrofit, etc. |
| | **Conditions and Functionality** | Non-structural components, Building infrastructure, Equipment and Content, Safety, Sustainability, Energy efficiency, Fire protection, Water proofing, Ownership, etc. |
| | **Surroundings** | Adjacent structures, Surrounding infrastructure, Ground conditions |
| | **Cost** | Construction cost, Downtime cost, Cost of equipment and non-structural components, Cost of design and permits, Debris removal, Cost of retrofit & Strengthening, Insurance, etc. |
| Infrastructure | **Transportation** | Roads, Railways, Harbours, Airports, Bridges, Ground retaining structures, Tunnels, Trenches, Engineered slopes, Pavements, Subways, Stations, Related warehouses and workshops, etc. |
| | **Telecommunication** | Broad casting stations, Transmitters, Receivers, Amplifiers, Telecommunication network, Internet connectivity, Broadband access, etc. |
| | **Utility networks** | Electric power network, Gas and oil network, Water and waste-water network and Corresponding facilities – energy generating facilities, water-retaining dams, sub-stations, transformers, water-treatment plants, etc |
| | **Cost** | Asset cost, Construction cost, Repair cost, Replacement cost, Downtime cost, Impact cost, Insurance, etc. |
| Sectors and Industries | **Primary sector** | Mining and quarrying, Fishing, Agriculture (crops, livestock), Forestry, Hunting and their Economic (added value, revenue, employees, enterprises, ownership, economic activities, export/import, etc.), development, sustainability, capacity, and other indicators |
| | **Secondary sector** | Processing, Manufacturing, Construction and their Economic (added value, revenue, employees, enterprises, ownership, economic, activities, export/import, etc.), development, sustainability, capacity, and other indicators |
| | **Tertiary sector (services)** | Retailers, Tourism, Entertainment, Real estate, Insurance, Public sector, etc. and their Economic (added value, revenue, employees, enterprises, ownership, economic, activities, export/import, etc.), development, sustainability, capacity, and other indicators |
| Sectors and Industries | **Quaternary sector (intellectual services)** | Research and development, Information Technology, Consultancy, etc. and their Economic (added value, revenue, employees, enterprises, ownership, economic, activities, export/import, etc.), development, sustainability, capacity, and other indicators |
| | **Cross sectoral data** | |

| Category | Type | |
|---|---|---|
| Habitats and Biotopes | **Habitats** | Types, Range, Distribution, etc. |
| | **Biotopes** | Types, Range, Distribution, etc. |
| | **Cost** | |
| Critical Infrastructure as defined by Law 45/2019 VENDIM1 Nr. 553, datë 15.7.2020[32] | **Energy** | |
| | **Health** | |
| | **Financial** | |
| | **Transportation** | |
| | **Governmental** | |
| | **Digital infrastructure** | |
| | **…. as defined by Law 45/2019** | |
| | **Cost** | |
| Models | **Exposure models** | Ready to us exposure models |

| Category | Type | |
|---|---|---|
| **Data group: Hazard** | | |
| Geophysical | **Earthquakes** | Ground shaking, Liquefaction EQ, Landslide EQ, Rockfall EQ, Surface rupture, Tsunami EQ, Subsidence/Uplift EQ |
| | **Mass movement G** | Landslide MM, Rockfall MM, Costal erosion, Subsidence MM, Tsunami MM, Ground shaking MM |
| | **Volcanic activities** | Landslide VA, Ground shaking VA, Lava flow, Pyroclastic Flow, Lahar, Ashfall, Ballistic, Tsunami VA, Lightening VA, Fire VA, Toxic gases |
| Meteorological | **Extreme temperature** | Heat wave, Cold wave, Frost, Icing, Snow pressure |
| | **Storm** | Cyclones, Strong winds, Tornado, Thunderstorms, Snowstorm, Hail, Sandstorm |
| | **Rain** | Precipitation, Rainfall above/below average, Acid rain |
| Meteorological | **Fog** | Fog, Haze, Polluted air |
| | **Soil erosion** | Soil erosion due to wind and rain |

32 VENDIM Nr. 553, datë 15.7.2020, PËR MIRATIMIN E LISTËS SË INFRASTRUKTURAVE KRITIKE TË INFORMACIONIT DHE TË LISTËS SË INFRASTRUKTURAVE TË RËNDËSISHME TË INFORMACIONIT. (DECISION 1 Nr. 553, dated 15.7.2020, ON THE APPROVAL OF THE LIST OF CRITICAL INFRASTRUCTURE AND THE LIST OF IMPORTANT INFRASTRUCTURE) regarding the security of information

| Category | Type | |
|---|---|---|
| Hydrological | **Flood** | River flood, Flash flood, Coastal flood (Surge flood), Ice jam flood, Snowmelt flood, Watershed boundaries |
| | **Mass Movement H** | Landslide H, Rockfall H, Mudflow |
| | **Wave action** | Rogue wave, Seiche |
| Climatological | **Drought** | Drought C (agricultural) |
| | **Wildfire** | Forest fire, Land fire, Bush fire |
| Biological | **Epidemic (humans, plants, animals)** | Viral Infectious Diseases, Bacterial Infectious Diseases, Parasitic Infectious Diseases, Fungal Infectious Diseases, Prion Infectious Diseases |
| | **Pandemic (humans)** | Infectious Diseases |
| | **Invasive species** | Insect infestation (Grasshopper, Locust, Worms), Invasive weed, Invasive animals |
| Extraterrestrial | **Impact** | Airburst, Meteor impact |
| | **Space weather** | Geomagnetic storm, Radio blackout, UV radiation |
| Technological | **Outside the scope of the catalogue** | |
| Environmental | **Outside the scope of the catalogue** | |

| Category | Type | |
|---|---|---|
| **Data group: Vulnerability** | | |
| Fragility functions | **Buildings** | Geophysical hazards, Meteorological hazards, Hydrological hazards, Climatological hazards, Biological hazards, Extraterrestrial hazards |
| | **Infrastructure** | Geophysical hazards, Meteorological hazards, Hydrological hazards, Climatological hazards, Biological hazards, Extraterrestrial hazards |
| | **Sectors and industries** | Geophysical hazards, Meteorological hazards, Hydrological hazards, Climatological hazards, Biological hazards, Extraterrestrial hazards |
| Fragility functions | **Critical infrastructure** | Geophysical hazards, Meteorological hazards, Hydrological hazards, Climatological hazards, Biological hazards, Extraterrestrial hazards |
| Consequence models | **Population**<br>**Buildings**<br>**Infrastructure**<br>**Sectors and industries**<br>**Habitats and Biotopes**<br>**Critical infrastructure** | |

| Category | Type | |
|---|---|---|
| Vulnerability | **Population** | Geophysical hazards, Meteorological hazards, Hydrological hazards, Climatological hazards, Biological hazards, Extraterrestrial hazards |
| | **Buildings** | Geophysical hazards, Meteorological hazards, Hydrological hazards, Climatological hazards, Biological hazards, Extraterrestrial hazards |
| | **Infrastructure** | Geophysical hazards, Meteorological hazards, Hydrological hazards, Climatological hazards, Biological hazards, Extraterrestrial hazards |
| | **Sectors and industries** | Geophysical hazards, Meteorological hazards, Hydrological hazards, Climatological hazards, Biological hazards, Extraterrestrial hazards |
| | **Habitats and Biotopes** | Geophysical hazards, Meteorological hazards, Hydrological hazards, Climatological hazards, Biological hazards, Extraterrestrial hazards |
| | **Critical infrastructure** | Geophysical hazards, Meteorological hazards, Hydrological hazards, Climatological hazards, Biological hazards, Extraterrestrial hazards |

| Category | Type | |
|---|---|---|
| Data group: Risk | | |
| Geophysical | **Earthquakes** | Direct/Indirect damage & loss, consequences |
| | **Mass movement G** | Direct/Indirect damage & loss, consequences |
| | **Volcanic activities** | Direct/Indirect damage & loss, consequences |
| Meteorological | **Extreme temperature** | Direct/Indirect damage & loss, consequences |
| | **Storm** | Direct/Indirect damage & loss, consequences |
| | **Rain** | Direct/Indirect damage & loss, consequences |
| | **Fog** | Direct/Indirect damage & loss, consequences |
| | **Soil erosion** | Direct/Indirect damage & loss, consequences |

| Category | Type | |
|---|---|---|
| Hydrological | Flood | Direct/Indirect damage & loss, consequences |
| | Mass Movement H | Direct/Indirect damage & loss, consequences |
| | Wave action | Direct/Indirect damage & loss, consequences |
| Climatological | Drought | Direct/Indirect damage & loss, consequences |
| | Wildfire | Direct/Indirect damage & loss, consequences |
| Biological | Epidemic (humans, plants, animals) | Direct/Indirect damage & loss, consequences |
| | Pandemic (humans) | Direct/Indirect damage & loss, consequences |
| | Invasive species | Direct/Indirect damage & loss, consequences |
| Extraterrestrial | Impact | Direct/Indirect damage & loss, consequences |
| | Space weather | Direct/Indirect damage & loss, consequences |

| Category | Type | |
|---|---|---|
| Data group: Capacity | | |
| Institutional | Structure | Functional structure of DRR and DRM units, Responsibilities, Procedures, National institutions, Regional institutions, Communal institutions |
| | Policies | Laws, Strategies, Programs |
| Organizational | Practice | Functionating, Coordination, Implementation of laws, Policies operation, Prioritization, Warning systems |
| Competence | Skill and Knowledge | |
| | Risk awareness | |
| Resources | Tools | Software, Methodologies, Training materials, Information, Models, Digital tools, Monitoring systems |
| | Financial resources | |

The Attribute tree consists of attributes with predefined ranges or format of values, grouped in five attribute groups: *Main features, Date, Terms of use and accessibility, Ownership and publication, Applicability to risk categories, Reliability. Table* 3.2 lists the attributes, the values they can take, and provides some clarifications where needed. Since one dataset can be useful for more than one hazard/risk category, an

Attribute group was created called *Applicability to risk assessment*. The main objective of this attribute is to provide some guidance for which risk category a certain dataset may be used in addition to the one in which it is already classified. The group *Reliability* was set up to provide some indication to what extent the data can be trusted. This attribute does not address strictly speaking epistemic or aleatoric uncertainties associated with risk assessment analysis but refers to errors and obvious inconsistency that have been spotted. Since it was not feasible within this project to review in detail and crosscheck each of the datasets listed, there are cases for which this attribute is currently blank, to be further defined.

Another possible future development of the catalogue is to define indicators as a combination of the current attributes. One example is the proposed by OpenDRI indicator called Open data, which is a function of the attributes in the group Terms of use and accessibility. If all attributes in this group take value "yes", the dataset is indicated as "Open data". Similarly, other indicators can be created like indicator Important data, for instance. If one dataset is applicable to many risk categories in the attribute group Applicability to risk assessment, it could be indicated as "Important".

**Table 3.2: Structure of the Attributes tree used for the proposed catalogue – definitions provided in Appendix D**

| Attributes | Value |
|---|---|
| **Attribute group: Main features** | |
| **Name** | The name of the dataset as published by the source, or when such is not available, a short name that best describes the data type. All names are unique, and they do not repeat each other |
| **Link** | The link to the dataset by the Publisher from which the dataset was reviewed. The link leads to the dataset as directly as possible. Where one dataset was found to be presented by more than one Publisher, alternative links are provided in the Notes. Please note that links keep on being updated and modified and some of the links may turn out not active in the future. In such cases data needs to be searched by name, owner and publisher. |
| **Description** | Short description of the dataset |
| **Display type** | The way the data is presented. The following fixed values are defined:<br>▪ map – scale and coordinate system clear<br>▪ image - artifacts that depict visual perception, such as a photograph or other two-dimensional picture<br>▪ graphic<br>▪ tabular – table or matrix<br>▪ publication – book, article, report, briefings, proceeding, etc.<br>▪ interactive database – visualisation of data on a map or graph with the option to select, filter or process. The data could be available for download but could be also read-only<br>▪ tools – algorithms, methodologies, digital application, etc. for consistent application<br>▪ models – procedure with all needed datasets and connection between them for direct use. The information needed for the recreation and modification of the model is available<br>▪ raw input – when the actual data is not displayed but it consists of list of raw input files<br>▪ other – mostly used when the display type is difficult to define |

| Attributes | Value |
|---|---|
| Digital data format | The format of the files, written as used in the extension of the file. When the data is available in more than one format, they are all listed, separated by commas. Examples of digital data formats are:<br>**Text, Documentation, Scripts:** XML, PDF/A, HTML, Plain Text<br>**Still Image:** TIFF, JPEG 2000, PNG, JPEG/JFIF, DNG (digital negative), BMP, GIF<br>**Geospatial:** Shapefile (SHP, DBF, SHX), GeoTIFF, NetCDF.<br>**Graphic Image:**<br>**raster formats:** TIFF, JPEG2000, PNG, JPEG/JFIF, DNG, BMP, GIF.<br>**vector formats:** Scalable vector graphics, AutoCAD Drawing Interchange Format, Encapsulated Postscripts, Shape files<br>**Cartographic:** GeoTIFF, GeoPDF, GeoJPEG2000, Shapefile<br>**Database:** XML, CSV, TAB<br>Where the information cannot be downloaded but it can only be viewed online, the format is indicated as html. |
| Language | The language of the data abbreviated according to ISO 639-2 and listed with commas, when the information is available in more than one language |
| Resolution | The resolution of the data where known. Where the data is available in different resolutions, they are listed with commas. The format is:<br>(value)(unit), (value)(unit),.....<br>Where the data is provided for a number of sites, limited number of points, this is indicated with the values **discrete**.<br>For resolution based on the administrative boundaries, the following values are defined:<br>**Country**<br>**County**<br>**District**<br>**Municipality**<br>**Municipality units**<br>There are datasets, for which Resolution is not a relevant attribute and this is indicated with N/A. |
| Covers the whole territory of Albania | This attribute shows whether the data covers the entire country, or it is partial and it takes three values:<br>**Yes**<br>**No**<br>**N/A** – when the data is not directly related to territories |

| Attributes | Value |
|---|---|
| **Attribute group: Date** | |
| Release date | This date is the last date when the data was published/released by the investigated source and referred to with the link |
| Reference date | This is the date/period for which the data was generated. When the dataset provides information for several dates, they are listed with commas, when it refers to a time window, the period is indicated in the format (year)-(year). For forecasts, the value [number of hours/days/months] forecast is used. Where a reference date is not relevant, like in the case of fragility and vulnerability functions, the value of the attribute is N/A. |

| Attributes | Value |
|---|---|
| Update frequency | This attribute shows how often had been the data updated. It takes the following values:<br>**(number) hours**<br>**(number) days**<br>**(number) months**<br>**(number) years**<br>**at events –** when the update is not regular but it is triggered by certain events or circumstances<br>**real-time**<br>**unknown**<br>**closed for update**<br>**N/A** |

| Attributes | Value |
|---|---|
| **Attribute group: Terms of use and accessibility** | |
| Data available in digital format33 | Is the data available in digital format or only in paper. In the current catalogue all datasets are available in digital format and the expectation is that with years this attribute will be redundant. Still, the State Archive still holds non-digitalised information which could be of use for risk assessment. The values for this attribute are simply **Yes / No** |
| Data available on-line[32] | For the data available on-line, the link is provided in the corresponding attribute. There are cases, in which the source is accessible on-line but the datasets are not. This attribute takes values **Yes / No** |
| Metadata available[32] | This attribute takes values **Yes / No** |
| Data is machine-readable[32] | This attribute is a function of the attribute **Digital data format**. Any data that can be easily read by a computer, is considered machine-readable. CSV, XML, JSON, GeoTIFF, all of these are machine readable formats, but PDF or HTML are not. This attribute takes values **Yes / No** |
| Data is publicly available[32] | This attribute addresses whether the data is "public". This does not mean that it is freely available but those require that someone outside the institution managing the data can access it in some form. If a freedom of information request or similar effort is needed to access the data, it is not considered public. The attribute takes values **Yes / No** |
| Data available for free[32] | If there is a charge to access the data, the data is not available for free. The attribute takes values **Yes / No** |
| Licence and Terms of use | This attribute refers to the legal conditions under which the work is provided, the terms under which the data can be accessed, used, modified, and distributed. It either takes the short name of the licence, or where the licence type is not explicitly defined, it provides a short description. Some Examples:<br>**CC BY 4.0**<br>**CC BY 2.5 DK**<br>**CC-BY-SA-4.0**<br>**CC BY-SA 3.0**<br>**CC BY 3.0 IGO**<br>**CC BY-NC-SA 2.5**<br>**CC BY 3.0**<br>**CC BY-NC-ND 4.0**<br>**CC BY-NC-SA** |

33 Attribute adopted from the OpenDRI platform, accessed 08/09/2021

| Attributes | Value |
|---|---|
| Licence and Terms of use | - Free for reproduction, distribution, communication to the public, adaptation, modification, combination with other data under Regulation (EU) No 377/2014 of the European Parliament and of the Council of 3 April 2014<br>- Dissemination for pedagogic, scientific, or private purposes is allowed, provided that the source is indicated. Use for commercial purposes shall require the approval by the institution.<br>- …. |
| **Data openly licenced**[32] | This attribute addresses whether the data is open as per Conformant Licenses - Open Definition - Defining Open in Open Data, Open Content and Open Knowledge. Open data means anyone can freely access, use, modify, and share for any purpose (subject, at most, to requirements that preserve provenance and openness). If the licence is not specified, the data is not openly licenced. This attribute is a function of the attribute **Licence and Terms of use** and takes values **Yes / No.** Examples of licenses that conform with the open definition are:<br>**CC0-01** – for data and content, dedicate to the Public Domain (all rights waived)<br>**PDDL-1.0** – for data, dedicated to Public Domain (all rights waived)<br>**CC-BY-4.0** – for content and data<br>**ODC-BY-1.0** – for data, attribution for data(bases)<br>**CC-BY-SA-4.0** – for content and data, attribution ShareAlike for data(bases)<br>**ODbL-1.0** – for data<br>In general, licence **CC-BY-1.0-03** is superseded by **CC-BY-4.0.** |

| Attributes | Value |
|---|---|
| **Attribute group: Ownership and publication** | |
| **Published by** | The source from which the dataset was reviewed |
| **Produced by** | The organization / team / person who derived / developed / updates the dataset (Example: Map of geological characterization of the soil type of Albania produced by Zdruli P., European soil bureau) |
| **Owned by** | The organization under whose leadership / financial support / initiative the dataset was derived (Example: Map of geological characterization of the soil type of Albania, owned by Mediterranean Agronomic Institute of Bari) |

## Applicability to risk assessment

Even though, the datasets are already classified according to the data types and groups, one dataset is often useful for more than one hazard, risk and even for more than one component of the risk

| Attributes | Value |
|---|---|
| **Risk category Geophysical** | The attribute evaluates whether the dataset is also applicable to the assessment of risk due to geophysical hazards. When applicable, directly or indirectly, it takes the value of the corresponding hazard type and when not applicable takes the value "N/A". The attributes are assigned in addition to the data category in which the dataset is already classified, and they do not repeat the latter. Where the attribute category coincides with the data category and type of the dataset, the value is "blank". The values are:<br>**Earthquake**<br>**Mass movement G**<br>**Volcanic activities**<br>**N/A** |

| Attributes | Value |
|---|---|
| **Risk category Meteorological** | The attribute evaluates whether the dataset is also applicable to the assessment of risk due to meteorological hazards. When applicable, directly or indirectly, it takes the value of the corresponding hazard type and when not applicable takes the value "N/A". The attributes are assigned in addition to the data category in which the dataset is already classified, and they do not repeat the latter. Where the attribute category coincides with the data category and type of the dataset, the value is "blank". The values are:<br>**Extreme temperature**<br>**Storm**<br>**Rain**<br>**Fog**<br>**Soil erosion**<br>**N/A** |
| **Risk category Hydrological** | The attribute evaluates whether the dataset is also applicable to the assessment of risk due to hydrological hazards. When applicable, directly or indirectly, it takes the value of the corresponding hazard type and when not applicable takes the value "N/A". The attributes are assigned in addition to the data category in which the dataset is already classified, and they do not repeat the latter. Where the attribute category coincides with the data category and type of the dataset, the value is "blank". The values are:<br>**Flood**<br>**Mass movement H**<br>**Wave action**<br>**N/A** |
| **Risk category Climatological** | The attribute evaluates whether the dataset is also applicable to the assessment of risk due to climatological hazards. When applicable, directly or indirectly, it takes the value of the corresponding hazard type and when not applicable takes the value "N/A". The attributes are assigned in addition to the data category in which the dataset is already classified, and they do not repeat the latter. Where the attribute category coincides with the data category and type of the dataset, the value is "blank". The values are:<br>**Drought**<br>**Wildfire**<br>**N/A** |
| **Risk category Biological** | The attribute evaluates whether the dataset is also applicable to the assessment of risk due to biological hazards. When applicable, directly or indirectly, it takes the value of the corresponding hazard type and when not applicable takes the value "N/A". The attributes are assigned in addition to the data category in which the dataset is already classified, and they do not repeat the latter. Where the attribute category coincides with the data category and type of the dataset, the value is "blank". The values are:<br>**Epidemic (humans, plants, animals)**<br>**Pandemic (humans)**<br>**Invasive species**<br>**N/A** |
| **Risk category Extraterrestrial** | The attribute evaluates whether the dataset is also applicable to the assessment of risk due to extraterrestrial hazards. When applicable, directly or indirectly, it takes the value of the corresponding hazard type and when not applicable takes the value "N/A". The attributes are assigned in addition to the data category in which the dataset is already classified, and they do not repeat the latter. Where the attribute category coincides with the data category and type of the dataset, the value is "blank". The values are:<br>**Impact**<br>**Space weather**<br>**N/A** |

| Attributes | Value |
|---|---|
| Risk component | This attribute specifies to which component of the risk the dataset may be applicable and takes the values:<br>**Baseline data**<br>**Hazard**<br>**Exposure**<br>**Vulnerability**<br>**Risk** |

| Attributes | Value |
|---|---|
| **Attribute group: Reliability** | |
| Level of reliability | This attribute takes the following values according to the level of reliability. This attribute is not linked to the uncertainties associate with the level of knowledge and randomness of processes (epistemic and aleatoric uncertainties which are integrated in the risk assessment) but to evident errors, ambiguities and inter/intra-nonconformity.<br>**Good** – when the data can be used with relative confidence, crosschecking has confirmed that the data is logical and even if some inconsistencies are encountered, they are not expected to have a meaningful effect on the risk analysis<br>**Medium** – when crosschecking and review have shown that the data cannot be used without certain level of modification and improvement<br>**Low** – the inconsistencies, gaps and errors in the dataset are evident and the data cannot be used for risk assessment |

**Notes**
Any additional information and clarifications which are useful to be recorded

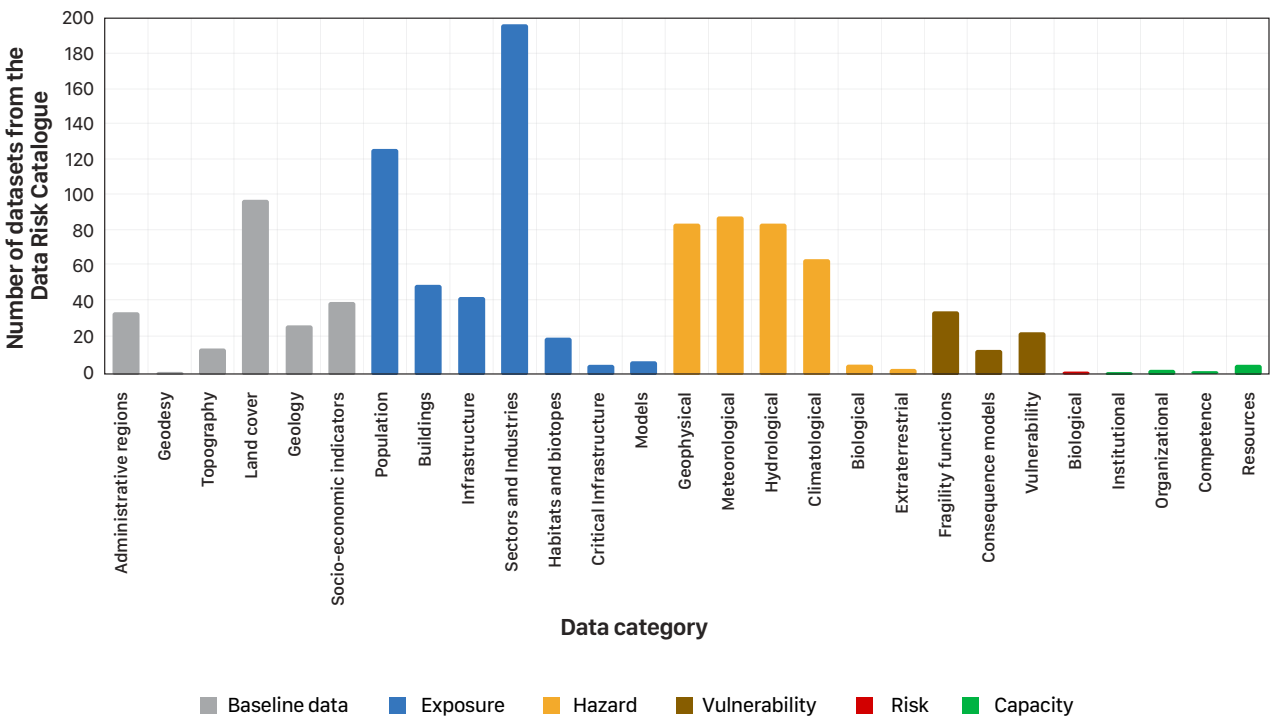
## 3.3. Future development

The structure of the catalogue provides a very good basis for the type of data needed and useful for multi-hazard risk assessment analysis. With the clearly stated definitions, the proposed data taxonomy could be developed further into a national standard for consistent application for risk-related data collection, share and use for the development of local and national risk profiles. It could be an intrinsic part of a methodology for risk assessment to assist municipalities fulfil the requirements of Law 45/2019.

Many useful datasets from local and international sources are listed in the catalogue. Figure 3.1 shows a histogram of the number of datasets in each Data Category. Still, the information found is insufficient for a full-scope risk assessment of different natural hazards in Albania. Many useful datasets

are not available and among the available ones, some are incomplete or with a large resolution and cannot be directly applied without pre-processing and crosscheck. The missing datasets and the categories with limited information can be easily identified in the catalogue "Risk data catalogue. xlsx". The gaps in the Risk Data Catalogue, together with the examples of datasets for each data type, can be used as guidance for the information that still needs to be collected and even for the prioritization of the resources for the completion of the associated tasks. Still, for consistent data collection across Albania, a data standard and clear methodology will have to be prepared. The proposed catalogue can be used as the basis for it. Gaps in the attributes are also something that needs to be addressed. For example, there are datasets, for which it is not clear what is the reference date or how often is the dataset updated, what is the resolution or the coverage, who owns the datasets and is responsible for updating it and so on.

**Figure 3.1: Number of datasets from the Risk Data Catalogue per Data Category and Data Groups**




A Data group with which the catalogue could be further extended is the anthropogenic hazards and the associated hazards. A classification for them can be easily added and integrated into the current structure.

One aspect of the Data catalogue that can be further elaborated is review, identification of inconsistencies and verification of the listed datasets. For example, information about the population is provided from different sources and with different resolution. We did not perform a full comparison analysis but our expectation, based on experience, is that there are discrepancies, which may be within the limits of statistical errors but may be more significant, as a result of errors or inconsistency in the definitions

between the different sources. At the same time, datasets about the population may turn out in conflict when crossed with other types of datasets, like number and size of households, employment rate or depopulation rate. It is highly advisable to perform such checks and to filter out unreliable datasets.

In addition, one more attribute could be defined to distinguish between datasets for direct and indirect application. This will basically provide some sort of prioritization of the datasets and one more criterion helpful for filtering preferred data. The accurate evaluation of such an attribute, similar to the Reliability attribute, will require a more detailed review of the datasets.

If found necessary, for future standardization of the proposed catalogue, it may be needed to provide additionally strict definitions for the data sub-types. The data sub-types currently listed in Table 3.1 could be expanded and supported with clear definitions. Thus, the current structure could branch out further in predefined sub-types and the datasets could be more precisely classified. Increasing the complexity of the catalogue structure, however, needs to be treated with caution. More strict and rigid classification does not necessarily mean better organised information. There are many datasets with multi-type data which would fit more accurately, and it would be easier to find in a more general data classes, rather than become restricted for use under a very specific label.

To widen the application of the catalogue, the description of the datasets can be further done by means of indicators as a function of the existing attributes. Currently, this was done for the category *Data openly licenced*, which is a function of the licence type and the terms of use. Similar indicators could be prepared considering different combinations of the attributes. For example, an indicator that states whether the data is up-to-date as a function of the attributes in the Attribute group *Date*.

# 4. METHODOLOGY FOR POST-DISASTER DATA COLLECTION AND ANALYSIS

Each disaster is a unique event that requires specific approach and planning of the assessment of the consequences. Disasters are different in scale, impact, duration and onset. Nonetheless, a comprehensive methodology for the assessment of the losses can still be a very useful tool to guide the process, with tuning of the scope, of the activities and the efforts according to the type and scale of the disaster.

The proposed methodology combines different approaches and techniques and can be used for large and small scale of disasters with adjustment of the scope and the steps based on the specifics of the hazardous event. It was compiled based on review of the best international practice, most common difficulties and current practice in Albania. It was structured for consistent application for post-disaster damage and loss assessment towards the development of a recovery plan and increased resilience.

Three examples for the application of the methodology in case of three different hazardous events are proposed in Chapter 6 of Technical Report TR3[27].

The preparation and execution of surveys were not covered in detail in the proposed methodology. Main principles are addressed and useful sources for preparation of questionnaires are suggested (see Technical Report TR3[27]), however, the elaboration of a step-by-step approach for the execution of on-site surveys was considered outside the scope of the project.

See Technical Report TR3[27] for a detail description of the methodology with examples for its application.

## 4.1. Concept

In the core of the proposed methodology is the idea that the post-disaster assessment process can be greatly facilitated by having significant relevant information prior to the event as part of a well-maintained and continuously updated national risk-related database. This applies not only to the availability and reliability of the baseline data, which appears to be one of the most common problems faced in past assessments in Albania, but also to risk models which can really help in the preliminary rapid assessment in the first couple of days after a disaster.

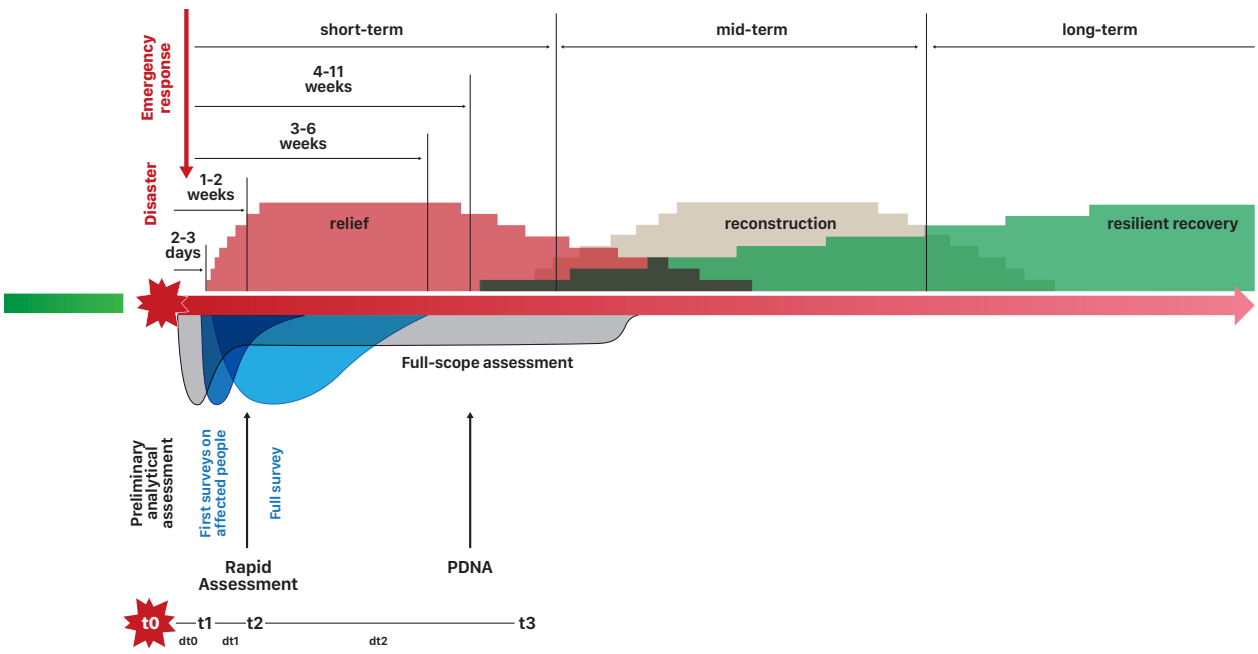
The different steps of the methodology are structured along a timeline from the moment a catastrophic event is recorded to the completion of the recovery strategy. Figure 4.1 shows a hypothetical, still realistic, timeline. It corresponds to a rapid onset of a disaster, such as earthquakes, severe storms, and floods, when the event is associated with a definitive period of impact. The proposed assessment methodology could also be applied to disasters with a slow onset or uncertain duration, like droughts, lasting food insecurity, extended public health crises, pandemics, but such are more difficult to represent on rectilinear timeline.

On the graph in Figure 4.1 the following post-disaster main activities can be identified: immediate response with rescue missions, post-disaster data collection, analysis of the data, activities related to re-

lief, reconstruction and recovery. Saving lives, assets and eliminating cascading hazards is the focus of the response immediately after the disaster, during the first most critical days. This of course, applies to disasters with rapid onset and a limited time window for rescue activities within a couple of days to a week after the event. For disasters with a slow onset, long or uncertain duration, emergency teams may have to be on alert for much longer periods of time.

The post-disaster data collection is usually split in two parts – "desktop" search for data sources and gathering data from remote sensors and satellites (the curve shaded in grey in Figure 4.1), and on-site surveys and reconnaissance (the curves shaded in blue in Figure 4.1). The "desktop" data collection can practically start immediately after the disaster and helps the immediate response. The on-site surveys, however, usually start after the initial search and rescue phase. This of course depends on the scale of the impact but, in any case, some time will be needed for mobilisation and planning of the survey activities.

**Figure 4.1: Timeline of post-disaster activities**




Two main groups of surveys are often required – preliminary rapid survey on the affected population in order to support and plan better the relief activities, and a full-scope survey which covers all affected sectors. Preliminary surveys may also include sample surveys on damaged facilities. Similarly, the data analysis and the assessment itself can start promptly after the disaster with preliminary evaluation of the nature and the scale of the disaster. Such preliminary assessment is based predominantly on the "desktop" data and analytical prediction models already available. Its focus is mostly on the direct damage of the affected sectors and the affected population.

According to the case, the available resources and the objectives, the assessment could be expanded in the next stage to a full scope assessment with all types of damage and losses, direct/indirect, tangible/

intangible, in order to prepare adequate strategy for recovery and reconstruction. If the PDNA process is requested and initiated by the Government, the result of the assessment could be a full-scope PDNA report prepared with the joined efforts of international and local teams.

The relief phase begins in the immediate aftermath of a disastrous event to meet people's basic needs. The emergency relief can go on for long time or can end fairly quickly, depending on the nature of the emergency and the resources at hand. In all cases, the relief phase of a disaster transitions into the recovery and reconstruction phases, when systems are in place and people are no longer worried about survival but can turn to rebuilding their lives. Recovery and reconstruction are usually split into early, medium and long-term and again the duration of these phases depends on the scale of the impact, the access to resources, adaptability and other similar considerations.

### 4.2. Main features

The main features of the proposed methodology are:

**Flexibility:** The core idea on which the methodology was founded is to provide flexibility and potential to adjust the approach according to the scale of the impact, the available resources and expertise to perform the assessment, the available information, tools and managerial capacity. This was done by considering two parallel processes, which complement each other but could also replace one another, partially or fully, according to the case. One is the analytical rapid post-disaster assessment based on predictive numerical models, and the other one is assessment dependent predominantly on the on-site collected data and surveys after the hazardous event. The first one can start immediately after the event is registered, could be completed in a couple of days, requires high expertise and advanced technology but less resources and personnel, and its accuracy and completeness depend on the available hazard, exposure, vulnerability and risk data and models. It could provide promptly very useful information for planning the immediate response and the sequential assessment process, identifying potential cascading hazards and prioritizing relief activities. In cases when on-site surveys cannot be performed, it is going to be the only tool to assess the consequences. If the available models are not reliable, however, the results of the analytical analysis would also be with low reliability and should be treated with caution. The second process, the collection and analysis of on-site data, is more accurate, captures better the specifics of the event, and depends less on the available risk-related data, but it takes more time and resources to organise and execute. For small-scale impacts, on-site surveys could be planned easily and performed quickly. For large-scale hazards, however, the surveys can take months and it could turn out more efficient to perform just sample surveys for calibration of the analytical models, which would be the main tool for the completion of the assessment. The assessment process starts with analytical predictive solutions which are continuously updated with the sequential receipt of survey data.

**Adjustable:** The steps proposed in the methodology and the scope of each of them could be easily adjusted according to the scale of the disaster, the available information and resources. Some steps could be merged, others could be skipped. The expectation is that the breadth of the assessment is planned and agreed with the teams at the beginning of the process.

**Rapid assessment:** Preliminary rapid assessment was defined as a separate activity because its utility and merits in specific situations has been reportedly valued by ministries of finance or economic planning immediately following a disaster. It has been often cited as being particularly beneficial in terms

of efficiency and the rapid dissemination of initially estimated recovery costs and priorities. At the same time, rapid assessments cannot be equated with or replaced by the comprehensive and collaborative features that characterize a full scope post-disaster damage and loss assessments.

**PDNA:** A PDNA report as a result of the assessment is indicated on the graph in Figure 4.1, but the methodology is not bound to it. PDNA has to be initiated by the Government, it is an inclusive, government-led and government-owned process which builds on the capacity and expertise of national and international actors. PDNAs are often used for designing and approving immediate disaster recovery grants or loans, and for developing extended national development programs. If the Government does not request the execution of PDNA, the proposed methodology could still be used for the completion of a well-targeted full scope assessment.

**Sectors:** The sectors that will be assessed need to be defined prior to the initiation of the assessment. Commonly, the sectors and the sub-sectors are grouped in the following way:

**Social sector** – Population; Housing and Settlements; Education; Health; Culture

**Productive Sectors** – Agriculture - livestock, fisheries and forestry; Industry; Commerce and trade; Tourism

**Infrastructure Sectors** - Water, sanitation and hygiene (WASH); Community infrastructure; Energy & electricity; Transport and telecommunications.

The classification of the sectors, however, is not strictly fixed. It can be adjusted according to the case without the need for conceptual changes to the methodology. The definition of the sectors depends on different factors like: the fields of responsibilities of ministries and central institutions which would be in charge of the post-disaster assessment, the scale and the impact of the disaster, the expertise of the staff that will carry out the survey and the data collection, the planning of the process, the main objective of the assessment and others. The sectors can be also defined only with their subsectors. For example, if in the productive sector agriculture is expected to be mostly affected by the disaster, it may be treated as a separate sector, outside the main sectoral group.

It is also very important to define at the beginning potential coupling and overlapping between sectors and subsectors, especially for the estimation of indirect losses, recovery and increased resilience. For example, indirect losses associated with the short-term medical demand due to high level of injuries caused by the disaster depends on the capacity of the health services and the damage they have experienced. In this example the coupling is between sub-sectors Population and Health. Examples for overlapping, cross-sectoral themes, are employment and livelihood, gender equality, environment and similar. These overlapping indicators could be actually grouped in a separate cross-cutting sector. Overlapping between sectors can also exist in the activities as part of the recovery strategy, which can be addressed with reduction algorithms. In any case, the coordination between the teams dealing with the assessment of different sectors should be very efficient, and the scope of the different sectors should be very well defined to avoid ambiguities, double counting or misinterpretation of losses.

**Timeframe:** The periods proposed in Figure 4.1 are examples based on the most common cases and own experience. They depend very much on the case and should not be considered as a requirement.

**Compatibility with internationally approved methodologies:** The proposed methodology was developed based on best international practice and internationally approved methodologies for post-disaster damage and loss assessment. Thus, international teams can be effectively engaged in the assessment process.

**Well-structured, easy to apply and clear definitions:** The methodology is structured around a sequence of steps and clearly defined hazard types and loss types. Extensive lists of recovery indicators and loss types per sector are provided and the application of the methodology is illustrated with three examples, three case-studies that correspond to recent disaster events in Albania – earthquake on the 26$^{th}$ of November 2019, flood in November 2017, wildfire in July 2021. The definitions of the damage and loss terms as used in the proposed methodology are provided in Appendix E. The terms related to the estimation of losses could be inconsistently treated by different teams involved in the analysis of the post-disaster data. That is why it is very important to clearly define the loss parameters in advance. It is also advisable, to prepare a national standard for the meaning of different loss terms and how they correlate to the DesInventar system, such that they are used consistently throughout the years and the assessment results can be easily and correctly included in an integrated national database for disaster data and in DesInventar.

## 4.3. Outline of the methodology for post-disaster damage and loss assessment

The workflow was structured around 21 parameters split in four main steps:

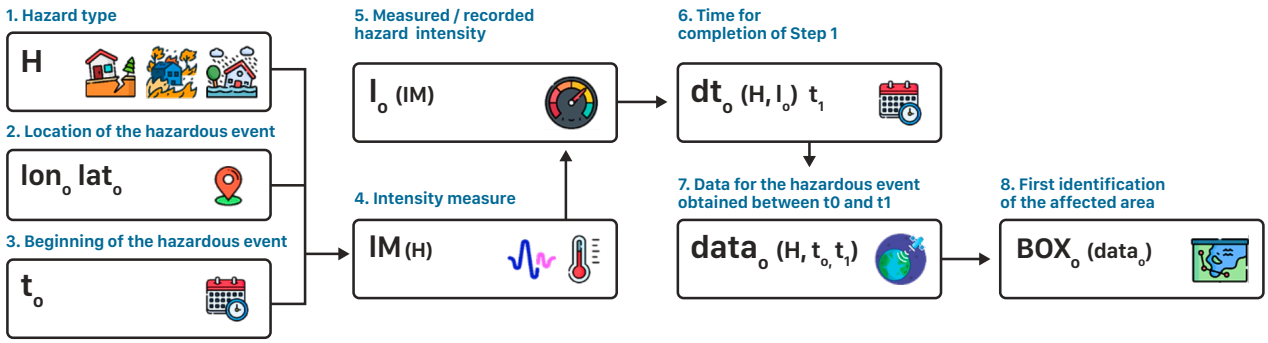
- Hazard identification and characterization
- Identification of the affected area
- Preliminary post-disaster assessment and loss estimation
- Full scope post-disaster needs assessment and recovery strategy.

Whether all of the parameters will be needed and whether some of the activities will be ignored or merged depends on the case, the scale of the disaster, the objectives of the assessment, the available resources to complete the assessment process and other factors. The proposed methodology is flexible, and steps can be skipped or merged without violating the logical flow and sequence of the activities.

The sequence of steps starts with analytical predictive analyses in the first couple of days after a hazardous event based on the available data before the disaster and digital data retrieved shortly after the disaster (recordings, monitored parameters, satellite images). It continues with regular verification, filling and update of the estimations based on on-site observations and survey data. If the survey process is slowed down or cannot be fully executed due to specific conditions, the assessment could be based predominantly on the analytical analysis by increasing its complexity and detail. If the surveys are promptly and efficiently organised and on-site data is retrieved shortly after the disaster, the analytical analysis could be used only to provide an overall understanding of the scale of the disaster and the most affected sectors to guide the emergency and relief activities and to facilitate the planning of the survey. In any case, the processing and the analysis of the data, which is often based on certain assumptions and analytical correlations, continues throughout the assessment.

## Step 1 - Hazard identification and characterization (Figure 4.2)

**Figure 4.2: Step 1 - Hazard identification and characterization**




The assessment process starts with the identification of the hazard type, its location and severity, so that a conservative preliminary estimate of the affected area can be performed. The outcome of Step 1 is parameter **BOX0**, which is the first evaluation of the affected area and possibly the intervention area. According to the proposed points from 1 to 7 (see Figure 4.2), the valuation can be performed in the following ways depending on the available information **data0**, the tools for data collection and the available technical competencies.

- Using analytical hazard/risk models – within the anticipated short time frame **t1** for Step 1, it is not expected that hazard models will be developed from scratch and used for the preliminary estimation of the impacted area. The idea is that such models, with different levels of detail, are available at the time of the disaster (seismic hazard models with the identified seismic sources across Albania, flood models with the water bodies, hazard models for landslide and liquefaction, models for the spread of infection, etc.), potentially used already in previous hazard and risk assessments in Albania, and with the new measures I0 taken at the time of the event, the event can be simulated and a conservative estimate of the affected area can be obtained. With full understanding of all the uncertainties associated with such models and the fact that they tend to be conservative, devoting time on full calibration and adjustment of the models is not expected, nor it would be of great use. Some verification still can be performed against monitored data but just to confirm that the affected area and certain phenomena will not be underestimated. Examples for software that can be used to perform the hazard analysis are listed in Chapter 5.2.1 in Technical Report 3[27] and useful sources of hazard models are provided in the Risk Data Catalogue. The simulation of the event could be also requested or directly obtained as part of the services provided by international platforms like Copernicus[34] and USGS[35].
- Using directly the data collected for the specific event – this includes satellite images, drone images, on-site recordings and reporting of the impact and similar. For example, in some cases, a bird view of the affected area could be sufficient to gain good understanding of the scale of the disaster, like a view of the flooded area or the burned-out area. Likewise, reports by the affected population across the affected area in the first few days after the disaster could indicate the affected territories. In other cases, however, this would not be enough. For example, damage

34 Homepage | Copernicus [https://www.copernicus.eu/en]

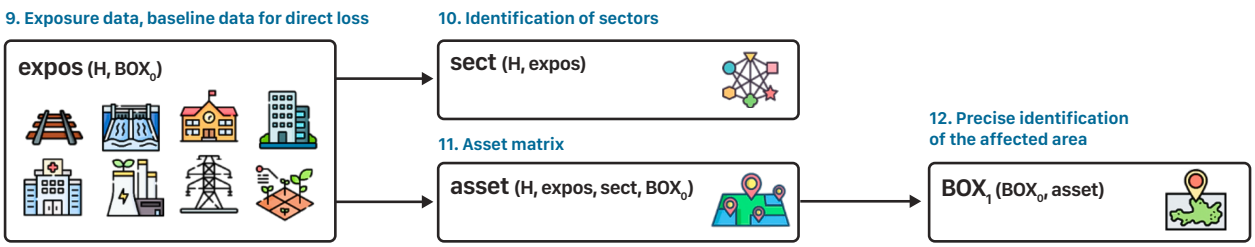
35 USGS.gov | Science for a changing world [https://www.usgs.gov/]

caused by an earthquake could be identified from satellite images only for the area close to the epicentre, because moderate or minor damage is very difficult to observe from a distance, let alone to assess the interruption of processes and services.

- Empirical knowledge and relationships derived from past events – this approach is the least accurate.
- Combination of the above.

### Step 2 - Identification of the affected area (Figure 4.3)

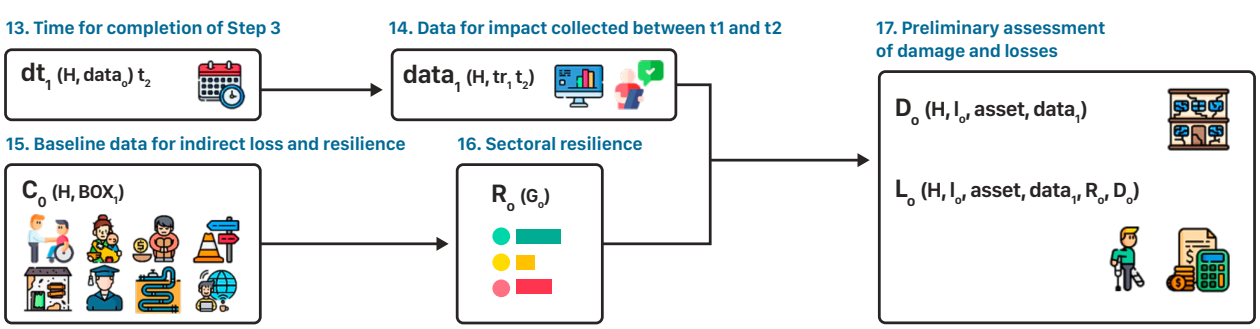
**Figure 4.3: Step 2 - Identification of the affected area**




The polygon or the multi-polygon that corresponds to **Box0**, outlines the zone where the effects of the hazardous event could be noticeable. However, when it comes to damage and loss assessment, only part of that area is likely to be of concern. A better understanding of the assets exposed to the hazard and the potential impact is the main objective of Step 2, in order to refine the area where survey, relief, and recovery efforts will be focused. Based on the position of the assets across **BOX0** and relevant understanding about their expected vulnerability, the affected regions are further defined with polygons **BOX1.**

### Step 3 - Preliminary damage and loss estimation (Figure 4.4)

**Figure 4.4: Step 3 - Preliminary damage and loss estimation**



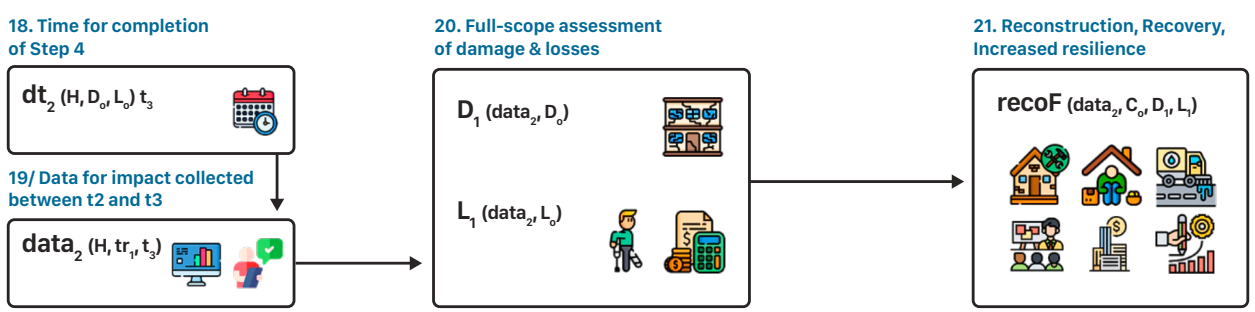

Step 3 is related to preliminary assessment of damage and losses. As mentioned already, the overall concept of the methodology is that analytical predictive simulations of the impact and estimations based on on-site collected data go in parallel and complement each other. This applies also to Step 3. According to the availability of one or the other component, the preliminary assessment could be completed predominantly with analytical models or predominantly with survey data. The expectation

is that at this stage the planning of the on-site data collection has already advanced and part of it has already started. Within the short time frame **dt1,** it may not be feasible to complete full scale surveys across the affected territory and, most likely, only part of them may have been executed with the focus on the affected population and emergency needs, together with sample surveys in selected regions and selected assets. To what extent surveys will be completed at this stage depends on many factors. If the disaster is limited and the organisation of the on-site teams is efficient, most of the surveys may be already completed. The aim is to obtain at the end of Step 3 first estimates of the direct losses and partially the indirect losses, mostly those related to the short-term needs and coping with the emergency. In some cases, preliminary assessment may not be envisaged as a separate step but rather as a part of the full-scope assessment Step 4.

The outcome of Step 3 is parameters **D0** and **L0.** These parameters correspond to the preliminary assessment of damage and losses. According to the coverage and reliability of the collected information at this stage, the assessment could be done through analytical predictive models, through the collected for the case data, or through a combination of them. For the analytical model, which already consists of hazard (Step 1) and exposure (Step 2), additional relationships will be needed to link the hazard intensity to the potential damage and loss. These relationships are fragility functions, consequence models and vulnerability functions. They are cumulative distribution functions which address the uncertainties related to the asset response, with an outcome expressed as confidence interval regarding damage/loss values. The vulnerability relationships address both direct and indirect losses, however, the latter are less common due to the complexity of deriving them. The Risk Data Catalogue suggest useful sources for fragility and vulnerability functions and consequence models. Unfortunately, such functions developed specifically for Albania were not found and the suggested international sources need to be used with caution. If survey data is already available, it can be used to fill in the gaps in the numerical model and adjust the assumptions where needed. In the cases when the assessment could be completed fully with the survey data **data1**, the efforts in the development of the numerical models beyond Step 2 could be significantly reduced at this stage.

### Step 3 - Step 4 - Full scope post-disaster needs assessment and recovery strategy (Figure 4.5)

**Figure 4.5: Step 4 - Full scope post-disaster needs assessment and recovery strategy**




At this stage of the assessment process, the on-site surveys are expected to be at completion and most of the efforts are devoted to the finalization of the damage and loss assessment, coordination of the estimates between the involved teams and the development of a recovery strategy. The outcome is a full-scope post-disaster damage and loss assessment, which could also be prepared as part of the PDNA process, if such has been requested by the Government after the disaster.

# 5. RECOMMENDATIONS

This chapter provides practical recommendations for the improvement of the ASIG Geoportal, its functionality, accessibility and completeness, as well as the improvement of the over process for collection and update of risk-related data and post-disaster damage and loss assessment.

The provided recommendations are in compliance with the related legal framework in Albania and the defined institutional roles and responsibilities.

Even though the recommendations are grouped in seven categories, they are interconnected to a great extent and should be considered together when planning related measures and prioritising activities.

## 5.1. Improvement of the functionality, accessibility and application of the Geoportal

The recommendations suggested in this sub-chapter address the currently available national Geoportal maintained by ASIG and the role of ASIG in risk-related data collection and management. In case the Geoportal is to be transformed or replaced by an integrated national hazard, risk and post-disaster database, some of these recommendations may be obsolete.

**Recommendation 1: Introduce tools to the Geoportal for the creation of intelligent digital maps, which can be easily analysed, queried and presented.** It would really improve the usability and even the accessibility of data, if more tools for interactive data handling are introduced, like: managing data layers (dissolve, merge, cross, etc), spatial patterns analysis (calculate density, find hot spots, etc.), statistical analysis (join features, summarize, aggregate, etc.), raster analysis (analyse image, convert feature to raster, extract raster, etc.) and similar. If currently the ASIG team does not have the expertise to build such tools, it may be necessary to introduce certain changes to the related legislation such that the task could be outsourced under the management, quality control and approval of ASIG. It is highly advisable to plan modifications and corresponding investment for a gradual shift from a viewers' focused functionality to user's focused one.

**Recommendation 2: Improve the graphical user interface (GUI) and the Spatial Data Infrastructure.** Update of the GUI and the interface would significantly improve the functionality of the Geoportal and the accessibility of the uploaded data. In general, every GUI gets outdated with time and requires regular maintenance. Planning the maintenance ahead of time, including additional resources and expertise if needed, is highly advisable.

**Recommendation 3: Improve the quality and presentation of the datasets.** Some of the datasets were found difficult to read and interpret. Certain raster images have a rather low resolution and coded legends which are difficult to understand unless the original sources are searched for. Investing in digitizing the raster images and translating the datasets to English where possible, would be also very beneficial for the improvement of the usability and applicability of the database.

**Recommendation 4: Clearly define the levels of access to the Geoportal.** Currently, it is not clear what are the levels of accessibility, which are the datasets with restricted access, is there data that cannot be downloaded even by a registered user and who can request the access to the restricted data. The expectation is that the Geoportal should have different access levels, especially if data is to be au-

tomatically uploaded and edited by the data providers/owners. The accessibility of different datasets should be clearly stated on the Geoportal, in addition to the permissions to use.

**Recommendation 5: Facilitate the process of obtaining and updating data by building an efficient database management system (DBMS)**. The efficiency of the process for update and correction of the data received by ASIG could be improved by integrating the DBMS principles. Thus, the creator of the data can upload, edit and update the date directly on the database, managed by ASIG. This does not mean that the data will be published once uploaded without any checks or confirmation. It is simply a quicker way for uploading and updating information and the publication itself is a different process that depends on the institution in charge of the database and the internal procedures it follows. The same applies to sensitive information which is expected to have a restricted access. To do this shift towards DBMS, some changes need to be made, a set of new procedures need to be established by the administrator and new tools need to be prepared. The new tools should provide automatic ways for upload, edit and update of data, algorithms for checking conformity, completeness, consistency of terminology and required formatting, algorithms to define interdependency between datasets. Checking data for consistency could be also additionally facilitated by establishing a feedback loop with the data users, where they can submit inquiries or inconsistencies that they found while using the data. Such feedback can then be relayed back to the data producer or result in the dataset being flagged or taken offline. The database could also send automatic messages to the data providers to remind them to upload or update the datasets they are in charge of. Changes to the parts of the legislation related to the roles and obligations of institutions to provide data to ASIG may be also needed.

**Recommendation 6: Specify the process for verification and validation of the data.** Currently, the only check that ASIG is responsible for is for compliance with the *State Standards for Technical Specifications of Geospatial Information*. The role of ASIG in the verification of the received data could be expanded with a number of crosschecks between datasets from different institutions, checks for consistency and completeness, which do not necessarily require expertise in each field of the data. For example, verifying the consistency between similar datasets from different sources and returning the information for review if inconsistencies are discovered. As mentioned already in Chapter 2.4, such inconsistencies among the datasets on the Geoportal were already observed. Similarly, the completeness of the datasets could be reviewed and confirmed by ASIG. Each dataset is expected to include a certain number of parameters and indicators and if such are not present, the data could be returned for revision. If such verification and validation process is considered to be beyond the responsibilities and capacity of the ASIG team, it could be transferred to a "dedicated team" in AKMC, as suggested in Recommendation 21.

**Recommendation 7: Perform check and verification of the datasets already uploaded.** To improve the reliability of the uploaded information, inconsistencies, ambiguities and errors need to be cleared out. Where needed, revisions could be additionally requested by the data owners. If the source of the inconsistencies cannot be identified and the dataset cannot be corrected, the conflicts of information should be indicated with notes on the corresponding datasets.

**Recommendation 8: Increase the resolution of the data as much as possible.** Very often, if the resolution of the available data is too low, it cannot be used in the risk assessment and in the post-disaster assessment. The goal should be to collect and store risk-related data at resolution as high as possible and not lower than the lowest administrative level available. With the modern technology and

computational power, the processing of large datasets is not really of concern, as long as the data is well-structured and indicated, so that filtering and classification can be easily applied.

**Recommendation 9: Link the Geoportal to networks for monitoring instrumentation.** Data from monitoring devises could be very easily obtained in real time and automatically updated, which is a great advantage. Such information could be also very useful for early warning, hazard and risk assessments, as well as for post-disaster damage and loss assessment. It would save time in case of a disaster and reduce the administrative procedure if the digital data collected from the monitoring devises is linked to one integrated digital platform under the governance of AKMC. In Albania, monitoring networks are under the governance of different institutions and a central role plays AKM and IGJEUM. Changes to the infrastructure of the portal will have to be made to perform such connections and additional resources and expertise may be needed. The Risk Data Catalogue lists some useful sources for data from monitoring networks.

**Recommendation 10: Link the Geoportal to international resources.** As for international sources, the most beneficial would be those that can provide satellite images and data based on analysis of satellite images. This aspect was already discussed with the ASIG team in one of our meetings and it was confirmed that such connection is feasible, there are no restrictions from the point of view of acting legislation, and that there has been already a similar project in mind. Naturally, work will be needed for the unification of the technical specification of the data between different sources. Data from satellite and radar monitoring could be really helpful, especially for short-term predictions of hazardous events, early warning and prompt evaluation of the impact of disasters. It is beneficial that Albanian institutions have already successfully collaborated with Copernicus, the European Union's Earth observation programme, which offers very useful information services that draw from satellite Earth observation and in-situ (non-space) data.

**Recommendation 11: Support institutions, municipalities and prefectures with guidelines, simple-to-use data forms and even digital tools for the compilation of the data.** Issues with the collaboration between ASIG and the institutions responsible for providing information are one of the main reasons for the limited number of datasets currently available on the Geoportal. One way of addressing this problem is by providing active support to institutions and municipalities/prefectures in the preparation of the data. ASIG team could prepare and distribute simpler to use data forms to be filled in, the information from which would be then converted to the right format by the GIS specialists in ASIG. Similarly, digital tools for collection and processing of the data, compatible with the Geoportal, could be prepared and provided to the data owners, for the compilation of the information in the right format. Organising courses and workshops is also a very effective way fro encouraging a proactive approach by the local institutions. That said, it should be noted that according to the acting legislation and the flow of information defined by it, ASIG is not expected to be in direct communication with the prefectures and the municipalities and this should happen through AKMC. Thus, the collaboration between ASIG and AKMC needs to be improved. As suggested in Recommendation 21, it is also possible to transfer the role of providing institutional support to a "dedicated team" in AKMC with the help of ASIG, if considered more efficient.

**Recommendation 12: Promote the functionality of the Geoportal and the ASIG services to municipalities and prefectures.** Together with the support and training of the local institutions in the compilation of the datasets for the Geoportal, ASIG should also promote the use of the data already available on the Geoportal and the services from which municipalities can benefit, especially in the

development of the risk assessment of their territories. Having information and GIS services available would really help municipalities/prefecture, especially when some of the main challenges that municipalities point out in meeting their obligations according to the law are insufficient resources and expertise. As already mentioned, ASIG is not expected to have direct communication with municipalities and prefectures. It is worth exploring whether such a direct link between ASIG and local institutions would lead to a better working collaboration both ways.

### 5.2. Improvement of the risk-related data collection and management

**Recommendation 13: Create an integrated national hazard, risk and post-disaster database.** As discussed already in Chapter 2, an integrated national database for hazard and risk, damage and loss data, with its own digital infrastructure, is currently not available. Useful datasets are compiled on the national Geoportal by ASIG, records are prepared and maintained by municipalities and prefectures, data cards are generated on *DesInventar* system, and different national institutions are in charge of variety of hazard and risk data. All of this information, however, is not administered under one unified data structure for easier management, more efficient information exchange and clear check and verification process. The integrated national database is not intended to replace the databases managed by different institutions and municipalities. The main idea is to build a common environment in which different datasets are unified under same format and definitions. The database could also have different levels of accessibility according to the sensitivity of different types of information. Some layers could be publicly available, others may require approval for access and still others may be reached only by a limited number of national or local authorities. Whether municipalities will have direct access to the database and the possibility to change and update data, depends on how the check and the verification process will be structured.

One option for the development and maintenance of an integrated national digital database is to be done by a dedicated team with the right expertise as part of AKMC. The other option is to build on the GIS expertise of ASIG team, to expand its capacity accordingly and to build the database under ASIG operation and still under AKMC governance to meet the requirements of the law.

**Recommendation 14: Define a data taxonomy with clear definitions to be used for structuring the datasets and creating new ones.** Building the database around a clear hierarchical structure is extremely valuable and even a necessity for a growing and continuously updated database. A good organisation of the data keeps it active for harvesting, improvement, checking and revision and facilitates the user when searching and filtering through numerous datasets. The structure we have proposed for the Risk Data Catalogue can be used as the basis for the classification of the data on the national Geoportal. The Data tree and the Attribute tree have a very wide scope, capturing varieties of data types relevant for hazard, risk and post-disaster damage assessment and at the same time they are flexible and easy to modify when needed.

A great advantage of having a clear predefined structure of a comprehensive database is that the missing datasets that still need to be created can be very easily identified, planned for future developments and assigned to the corresponding teams and institutions. A data taxonomy with the clear definitions could be used as guidance for the type of data to be collected, to keep track of the updates and the reference dates and even to help municipalities identify what additional expertise and support they may need to complete their duties on risk-related data acquisition.

Emphasis should be placed on the definition of all terms used for the data classification and the attributes used to describe the data and the metadata. It is highly advisable to keep the definitions in line with those used in the related acting legislation, in the *State Standards for Technical Specifications of Geospatial Information*[22], and in the *DesInventar* Sendai system. Any differences should be stated and explained.

The definition of the data taxonomy and the terms should be under the responsibility of the team in charge of the development of the integrated national hazard, risk and post-disaster database.

**Recommendation 15: Plan the preparation and the collection of the needed datasets**. The first step is to identify missing, outdated and incomplete data. A very helpful tool to assist with this is the Risk Data Catalogue (see Chapter 3). Its structure was defined in such a way as to include all the data types needed for full-scope risk assessment of natural hazards. Thus, the missing data types, those with limited information or the outdated ones could be very easily identified. Some of the main gaps in the Risk Data Catalogue are discussed in Section 2.4. Special consideration should be given to the collection of relevant data for the existing vulnerabilities and capacities for both women and men and vulnerable groups, such as children, the disabled, and minority groups. Vulnerabilities, exposure, and capacities to recover are often unequal and gendered. Gender-responsive disaster risk and loss information is critical to identifying capacities and needs in a disaggregated manner. Adopting this approach can prevent existing inequalities from being reinforced and help ensure that recovery efforts reduce gendered inequalities and risks.

The second step is to make a plan with short-term, mid-term and long-term goals, together with the needed resources, for data collection and also to specify the update periods for each data type. Some of the data types could be easily obtained with limited resources, others will require long-term investment. Some of the data types will need to be updated very often, others could be considered reliable for a long period of time, and most of them will have to be revised after related hazardous events. The collection of some of the data will require expertise in the corresponding fields, other data could be collected by non-experts after short trainings and clear guidance. The plan for the data collection will have to be prepared with the participation of all relevant institutions and local authorities, which will be in charge of the compilation of the datasets. According to the current legislation, the process should be managed by AKMC and TAC should be the body with the needed expertise to support the planning of the data collection and to execute the related tasks.

The third step is to assign the compilation of the identified datasets to the corresponding institutions, local authorities and research teams. Clear objectives and deadlines need to be set up. For those types of data that require extensive research and long-term investment plan, the appointed team should be also requested to provide a temporal solution. For example, datasets from international sources which could be temporally used with certain modifications or old data from local sources which could be applied with correction factors. Each team should also provide clear explanation about the approach and methods used to compile the data and its limitations.

At the end, the collected data is to be integrated in the national database after check and verification for consistency, compliance with the standards and completeness. According to the law, AKMC should not only be in charge of the process but should also supervise it and provide support with guidelines, data forms and training. This practically means that the successful completion of the planned tasks will strongly depend on the working collaboration between AKMC and TAC and AKMC and the local unites.

**Recommendation 16: Keep updated datasets for unit rates, cost of construction and replacement of different types of assets, cost of services.** One of the most common challenges in the post-disaster damage and loss assessment is the estimation of the monetary equivalent of the damage and the affected services. The main reason is that such information is missing at the time of the assessment and different assumptions to fill in this gap are used by the sectoral teams, which leads to inconsistency in the results. The loss estimations should be based on a standardized and continuously updated price list. That is why, it is highly advisable to keep a database with different unit rates and cost of services per sector, including the expected changes due to inflation/deflation in the short term. Such database could be prepared in collaboration with the branch organisations and professional chambers.

**Recommendation 17: Explore the local sources for useful data.** The Inception Report[23] lists different institutions and governmental units that could be a good source for risk-related data. Some of them are explicitly stated as the institutions that should provide information to ASIG for the national Geoportal (see Table 2.1 in the Inception Report), others are not expected to prepare datasets but at the same time they collect useful data as part of their activities. A good example for the second data type of data sources is OSHEE, which address register was used in the last post-disaster assessment after the November earthquake in 2019. Another not that obvious useful local source of data are past and ongoing national funding programs which are usually structured around a comprehensive data collection and statistical processing. For example, the National Energy Efficiency Programme most likely has been preceded by building surveys and collection of data related to the structural and non-structural specifics of the building stock in Albania. Similarly, research projects led by universities and research institutes in Albania could be actually investigating important topics related to hazard, vulnerability, short and long-term impact on economy and societies in disasters, which would have as an outcome important data to be included in the database.

**Recommendation 18: Explore international sources for useful data.** The international data platforms are most valuable for this type of data that requires international resources and collaboration, generated as a result of joined efforts between many countries and teams. For example, data collected through remote sensing and satellite imagery, collected from international monitoring networks, obtained from large international research projects, collected from post-disaster reconnaissance and similar. The Risk Data Catalogue contains an extensive list of such sources which are worth considering for the risk data database.

**Recommendation 19: Prepare hazard and risk models and include their input data in the risk-related database.** Hazard and risk digital models, or more specifically the inputs for them, should also be included in the compilation of the risk-related data. They depend on the quality and completeness of the other datasets and require experts in different fields to be prepared. Most of them are expected to be mid to long-term projects which would require proper planning and investment. At the same time, they could be extremely useful not only for development of the risk profiles that each municipality should have but also for the rapid post-disaster loss and damage assessment, as proposed in the methodology (see Chapter 4).

**Recommendation 20: Support municipalities and prefectures with exemplary Terms of Reference (ToRs) for the collection of data.** Many of the municipalities do not have the expertise to collect and process data and they outsource the related activities to companies with the needed experience. This, however, is associated with varying quality, standards and approaches which makes the integration of the datasets from different municipalities/prefectures very difficult and sometimes

impossible. What could be done in this regard is to prepare exemplary ToRs with all necessary requirements, which local institutions could use in case they need external support for the compilation of the data they are requested to provide.

**Recommendation 21: Dedicated team for risk and post-disaster data collection and management.** One way to improve the process of data collection, analysis and management is to secure a team of composite expertise and clearly defined responsibilities. One option is to strengthen and consolidate the current capacity in AKMC into one dedicated team, since AKMC is the national agency responsible for the establishment and operation of the National Disaster Losses Database and has in its structure the sector of DLD and statistics. The other option is to build on the GIS expertise of ASIG team and the existing already Geoportal and to establish such a dedicated team under the governance of ASIG. Wide range of responsibilities of the team are envisaged. Together with the compilation of the available data, the team could be also responsible for: the search and request of relevant information from governmental and local institutions and research teams; the standardization and formatting of the received data; verification and crosscheck of the datasets; assistance and training of local authorities in the process of data collection and update; and the maintenance of the integrated national digital database. The expectation is that such a team would also play a key role in the damage and loss assessment after a disaster, the management of digital tools for data collection during the assessment process, the preparation of the assessment reports and the update of the datasets on the *DesInventar* system. A wide range of expertise would be also required to make the team efficient and productive. GIS experts alone would not be sufficient. Other specialists in the fields of data analysis and statistics, hazard and risk analysis, information technology, image recognition and machine learning are highly recommended.

### 5.3. Legal framework, standards and methodology for disaster damage and loss assessment

The Law 45/2019 *On civil protection* provides the overall framework for post-disaster data collection and analysis but additional legislation, standards and methodologies are needed to provide directions and more specific instructions for the application of the Law. What is more, some of the linked to this Law legislation needs to be updated in compliance with it. Some of the gaps that were identified in this regard are addressed with the following recommendations.

**Recommendation 22: Bylaws to Law 45/2019.** With regard to disaster loss assessment and disaster loss data, in drafting the bylaws of law 45/2019, as well as in its future amendments, the Normative Act with the force of the Law, No. 9, dated 16.12.2019 "On coping with the consequences of a natural disasters" should be considered, and vice versa.

**Recommendation 23: Improvements of Law 45/2019.** Clarify in Art. 11 what is implied by "local self-government" and whether it refers to municipalities. Apart from the National DRR strategy, only municipality has the obligation to develop DRR strategies. At the same time, the other local self-government unit, the second level the Qark, has not been entailed specifically as institution in the Law 45/2019 due to the lower importance and limited capacities. In any case, it is advisable to amend the article and to make it more specific. Clearly state the periods within which databases need to be created and updated – different periods may be specified for different types of data and some periods may be linked to the national campaigns for data collection. Clearly specify the process of check and verification of the prepared datasets and who is in charge of it. As suggested by Recommendation 21, this could be done by a "dedicated team" within AKMC.

**Recommendation 24: Reference in Law 45/2019 to data standards.** The approved data standards and formats should be clearly specified in the Law. By the time the national standards are issued, a temporal solution could be to refer to data structures and definitions of one of the internationally accepted post-disaster assessment methodologies (see Technical Report TR3[27]). The methodology and the catalogue structure proposed in this project, which is consistent with the best international practice, are a very good starting point for the development of national standards and methodology for post-disaster data collection, storage and analysis.

**Recommendation 25: Approved methodology for post-disaster damage and loss assessment.** It is highly recommended to develop and issue a national methodology for post-disaster damage and loss assessment for consistent application in Albania. The methodology proposed here could be used as the basis. Special attention should be paid to the terms and the definitions, especially the definition of the loss types and how should they be computed. A temporal solution could be to refer in the Law to one of the internationally applied methodologies like DaLA or PDNA. However, it is not advisable to keep this as a permanent solution. The local specifics need to be addressed in a methodology developed explicitly for Albania with manuals and examples for application. Prepare guidelines and instructions specifically for the municipalities and the prefectures. According to the acting Law, this should be under the responsibilities of AKMC.

**Recommendation 26: Strengthen the control over the implementation of Law 45/2019**. Make sure that the municipalities and the prefectures maintain damage and loss databases and they are regularly updated. This could be supported also by incentives or sanctions[36] for meeting or not meeting the requirements of the law. According to the Law, Art. 23, this is within the responsibilities of AKMC.

## 5.4. Improvement of the actual process of post-disaster data collection and analysis

Experience has shown that the successful completion of post-disaster assessments depends to a greater extent on the planning, organisation and the available tools. The following recommendations are linked to these aspects of the assessment process.

**Recommendation 27: Define the structure and the responsibilities of a coordination team to be activated after a disaster for the damage and loss assessment.** According to Law 45/2019, Art 23, AKMC is in charge of "*coordinating efforts for the … and Disaster Risk Assessment development at the central level*". However, the law does not specify further how this coordination should be executed and how the coordination team should be structured. During the last PDNA after the November earthquake in 2019, four months after the enforcement of Law 45/2019, the assessment process was led and conducted by the Special Envoy of the Government of Albania for Crisis Response and Relief, the coordination was done by a national coordinator nominated by the Albanian Prime Minister and the focal point was the Ministry of Agriculture and Rural Development. More clarity about the coordination of the damage and loss assessment needs to be provided in the Law or in the related legislation.

**Recommendation 28: Propose field investigation forms per sector.** The availability of survey forms prior the disaster would really facilitate the assessment process and assure consistency between different teams and institutions. Since the conditions and the impact varies from event to event, survey forms could not be made compulsory or standardised, but they could really help with the on-site data

36 Administrative offence is stipulated in the Law 45/2019 for non-having in place DLD in municipality (according to Art 28/2/b). Similar sanctions should be in place for the analogous DLD in Prefecture (Art 30/ë) which are missing in Art. 68 Administrative offenses

collection, even if certain modifications had to be made after pre-testing. For the correct and consistent application of the forms, they need to be accompanied by guidelines, explanatory notes and even examples. Important considerations for the preparation and execution of the surveys are:

- Explain well the purpose of the survey to the surveyed people so that they do not have any worries in answering the questions.
- Pre-test the survey and make sure that all relevant topics are covered, and the needed information is collected.
- It is advisable to have all the questions closed, with a list of responses to choose from.
- The questions and the answers should be clear. If some of them are susceptible to interpretation, explanation needs to be provided.
- Concise surveys are preferred to long and detailed ones. Keep the questions and the topics limited to what would be needed for the assessment.

According to the acting law, the development of field investigation forms should be under the responsibility of AKMC.

**Recommendation 29: Develop data collection apps for on-site assessment.** Data collection applications for mobile devices could really facilitated the process of on-site surveys. They also help in the automatic georeferencing of the data and direct link to a GIS database for data upload, storage, post-processing, and visualization. A digital standardized interface together with the field data collection apps would allow municipalities to enter aggregated damage and loss data using a multi-sector template that goes directly to AKMC. For the cases when internet access is available on the place of the disaster, data can be uploaded live, for the other cases data is simply collected offline and shared after that.

**Recommendation 30: Application of crowdsourcing tools.** It is worth investigating the benefits of using "crowdsourcing" method for data collection immediately after a disaster. Based on the responses of the affected population, very useful information about the scale of the impact could be obtained promptly after the hazardous event. The obtained data will have to be verified, but the information will be very useful for the preliminary assessment, the planning and coordination of the emergency relief.

**Recommendation 31: Define the baseline data as much as possible at the beginning of the assessment process.** More than one team work on the assessment, it is very important to coordinate between the teams the available baseline data to be used, especially rates and cost estimates. This will guarantee consistency in the final results and will facilitate the evaluation of the cross-sectoral effects.

## 5.5. Strengthen the institutional capacity in the damage and loss assessment process

The recommendations in the sub-chapter address the observation that the staff, expertise and tools are rather limited among the municipalities and the governmental units that should be in charge of the data collection process and the maintenance of databases for damage and loss after natural or man-made hazardous events.

**Recommendation 32: Strengthen the municipalities' and Prefectures' capacity.** According to the current legislation, the assessment of damage and needs, including the evaluation of the compensations to citizens after a disaster, is within the responsibilities of the municipalities (Art. 30, Law

45/2019). Municipalities are also required to develop a disaster loss database for the territory of the municipality, which they shall maintain and update, and use to exchange information with the county prefect and AKMC. However, as discussed already, municipalities face many challenges in meeting their responsibilities defined by the law. To strengthen the municipalities' capacity the following recommendations are made:

- AKMC should support municipalities and prefectures in the preparation of instruments for post-disaster damage and loss assessment through guidelines, survey forms and tools, trainings in data collection and storage, clarification campaigns on the new concept of disaster loss data defined in the law and the actual process for reporting impact, direct capacity building, as well as financially through contracting external experts for the preparation of these instruments.
- AKMC should also support municipalities and prefecture with guidance and recommendations for the creation and maintenance of damage and loss database. How to structure the database, how often to be updated, how to meet the national standards and similar. The latter is the most important, especially for the consistent use of terms and definitions.
- It is very important to better define the data dissemination processes and inter-institutional cooperation, such that reporting is synchronized and detailed between the local and national level. Practices has shown that usually more than 30 different institutions are involved in coordinating or reporting disaster information which is a prerequisite for miscommunication and inefficient collaboration.
- Define clear roles and responsibilities for skilled personnel to deal with the volume, complexity and diversity of disaster information. It may be rather ambitious to plan fully equipped 61 teams with all required experts per municipality, which is why the role of the "dedicated team" within AKMC, as proposed in Recommendation 21, would be very important. As long as the local teams are well-instructed on what type of data to collect and which terms and definitions to use, the formatting of the data based on the standards and the GIS processing could be centralized within the responsibilities of the "dedicated team". This could be even more efficient way of keeping quality control on the process. Difficulties related to insufficient competence in GIS software and data processing in the local teams could be overcome by providing GIS layers converted to simpler tabulated datasets with coordinates and corresponding assets and easy-to-use applications for mobile devices for georeferenced recording of post-disaster impact.
- Perform training on the *DesInventar* system. Currently, municipalities do not have knowledge of this system, the definitions used by it and the format of the datacards for recording the damage and losses. Good understanding of the *DesInventar* system by the local teams would really help AKMC with their responsibility for keeping the system up-to-date.
- Planning of increased resources and funding for municipalities may be needed to strengthen their capacity. One of the most common difficulties that municipalities report is insufficient funding. Funding could be more difficult in the case of Prefectures since they do not have any specific DRM budget line. AKMC should raise the awareness on the need for establishing a budget program for the development and maintenance of risk-related and post-disaster databases in municipalities[37] and Prefectures.

37 According to DCM Nr. 414, dated 8.7.2021 On approval of procedures and criteria for allocation and use of the conditional state budget fund for civil protection: 3. The conditional state budget fund for civil protection to be used according to prioritization, as follows:
3.1. 60 (sixty)% - 100 (one hundred)% of the fund dedicated to civil protection can be used for: ç) establishment, updating and maintenance of the database

**Recommendation 33: Establish working collaboration with international agencies that record and process post-disaster data.** This applies especially to agencies that have at their disposal satellite images and recordings from international networks with monitoring devices and remote sensors. A good example is the Copernicus programme[5] coordinated and managed for the European Commission by the European Union Agency for the Space Programme in partnership with the European Space Agency, the EU Member States. The Copernicus Emergency Management Service (Copernicus EMS) provides timely and accurate geo-spatial information derived from satellite remote sensing and completed by available in situ or open data sources. It consists of two components – maps based on satellite images on request, including after a disaster, and early warning for flood, forest fire and drought based on short-term predictions. Even though, the Albanian Government or AKMC are not in the list of the authorised users for the Copernicus services, they can still trigger them[38] and obtain rapidly post-disaster maps. It is also worth exploring the opportunities for ratification of the potential future collaboration between Albania and Copernicus to establish a clear path for information sharing and save time in cases of disaster. The Risk Data Catalogue provides other such agencies, the collaboration with which would be very beneficial not only for data but also for data analysis and tools for data collection. According to Law 45/2019, Art. 23, "cooperating with international bodies and counterpart international organizations in the framework of civil protection and disaster risk reduction" is under the responsibility of AKMC.

**Recommendation 34: Strengthen the collaboration with local research institutions and the business.** Based on the experience of our local advisors and the feedback we received from the ASIG team during our discussions, we reached the conclusion that there may be different relevant ongoing research project initiated by universities and research institutions, the results of which have not reached the Geoportal, nor the AKMC team in charge of the data management. That is why, it would be very beneficial for AKMC and ASIG to reach out to scientific teams working in related fields and to establish bilateral collaboration with them. This applies also to the private entities potentially through the branch organisations and professional chambers. One of the challenges often faced in the post-disaster loss assessment is limited information from the private sector, from industry and trade enterprises. Guidelines and survey forms for assessing the losses could be provided to the branch organisations and the professional chambers such that promptly after a disaster the affected businesses could provide the required information.

## 5.6. *DesInventar* Sendai system in Albania

*DesInventar* system will continue to be used in Albania as part of the Sendai framework, even if an independent national database is created. Currently, a team in AKMC is in charge of updating the information on DesInventar and this could still be done in the future by the "dedicated team", as suggested in the previous recommendations. The following recommendations address current issues related to the use of the system.

**Recommendation 35: Regulate the use of *DesInventar* Sendai system with Law 45/2019 or linked legislation.** The use, management, update and verification of the *DesInventar* system need to be clearly defined. The process, the periods for update and the responsible institutions need to be specified with an ordinance or a bylaw, or directly in Law 45/2019.

38 Who can use the service | Copernicus Emergency Management Service [https://emergency.copernicus.eu/mapping/ems/who-can-use-service]

**Recommendation 36: Prepare guidelines for filling in the data cards**. The inconsistencies observed in the data for Albania recorded in *DesInventar* indicate that concepts and definitions are not clear, are susceptible to interpretation and need to be precisely defined in a guiding document with examples. It should be also indicated the link between the terms used in *DesInventar* and their analogues in the legislation and the national disaster database in the future.

**Recommendation 37: Review the entries already created on the system.** As already discussed in Chapter 2, many inconsistencies and errors were observed in the entries already available for Albania. To improve the reliability and the applicability of the data, the information needs to be reviewed and revised where needed in accordance with the *DesInventar* requirements. For the cases where the information cannot be traced back and verified, a note should be provided to rate the reliability of the data.

## 5.7. Quick-wins

An interesting observation from preliminary data review is that some of the missing risk-relevant data in fact could have been easily collected by different authorities without the need for additional resources, special skills or new techniques. Different types of data are regularly collected and with some additions to the data attributes or more flexible management, the value of such datasets could be increased. The following recommendations suggest such easy-to-implement improvements.

**Recommendation 38: Expand the questionnaires used in the census.** The Census is one of the largest in scale procedure of systematic collection and recording of information about the members of a given population. The legislation, the roles and the responsibilities for its execution are already set in place and budget is planned on a regular basis. This means that with a very little additional investment in the expansion of the questionnaires used for it, census could collect additional information extremely valuable for the development of exposure and vulnerability models. Engineers and experts in structural vulnerability could prepare additional questions and criteria related to the building stock. Similarly, experts from other sectors could suggest additional information to be included in the questionnaire. For example, additional technical information about the residential buildings such as structural types and material, reconstructions and retrofit, maintenance, period of construction with respect to the historical design codes in Albania, type of roof and façade, post-construction modification of the façade and similar. It is important, to keep the questions clear and relatively simple, to avoid ambiguities and additional complexity which may jeopardise the successful implementation of this improvement. In addition, digitising the census data collection would not only help with the data management and check, but could also make it georeferenced and compatible with GIS platforms for a higher resolution and precision.

**Recommendation 39: Introduce data collection forms as part of the approval of design projects.** This is also expected to be a very simple and easy-to-implement measure. For every new building, facility, infrastructure or geotechnical project, a data form with a predefined set of parameters could be requested as part of the compulsory documentation for approval and construction permits. The data form could include, for example, location in coordinates, general properties of the structure, year of design/reconstruction and design standards followed, purpose and design life, capacity and number of occupants, geotechnical properties of the soil and similar. Such parameters could be directly used for hazard and risk assessments. Similar data forms could be also introduced in the registration and issue of permits for the productive sector, although, our expectation is that such data collection process is already in place and managed by INSTAT.

# A. ROLES AND RESPONSIBILITIES OF THE INSTITUTIONS INVOLVED IN THE DISASTER RISK AND LOSS INFORMATION IN ALBANIA

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| **Name & Acronym (in Albanian)** | Këshilli i Ministrave (KM) |
| **Name & Acronym (in English)** | Council of Ministers (CM) |
| **Objective / Scope** | The Council of Ministers shall approve and ensure the implementation of policies for disaster risk reduction and civil protection in the Republic of Albania.<br>The Council of Ministers chairs the National Civil Disaster Management System in Albania. The Council of Ministers is the highest authority for coordinating the actions of state and private entities and provides the necessary financial means to overcome natural disaster emergencies and crises. |
| **Tasks / Roles & Responsibilities** | The Council of Ministers shall have the following responsibilities: (i) adopting the National Strategy on Disaster Risk Reduction in the Republic of Albania; (ii) approving the National Civil Emergency Plan; (iii) approving the central level risk assessment document; (iv)having the possibility to declare a state of natural disaster emergency for a period no longer than 30 days, for one are or the entire territory of the country; (v) **informing the Assembly of the Republic of Albania through the minister on the situation at hand, the present risks and the measures taken to manage the situation,** and requesting the approval of the Assembly on the Republic of Albania to extend the state of disaster emergency beyond 30 days. |

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| **Name & Acronym (in Albanian)** | Komiteti i Mbrojtjes Civile (KMC) |
| **Name & Acronym (in English)** | Civil Protection Committee (CPC) |
| **Objective / Scope** | The Civil Protection Committee (KMC) is established and functions within the Council of Ministers and is the highest, permanent body responsible for implementing policies to reduce the risk of disasters and civil protection in the Republic of Albania. The KMC is chaired by the Minister of Defense and is composed of cabinet ministers. Depending on the needs, representatives from scientific and monitoring institutions, heads of central structures, non-governmental organizations, etc. are also invited to KMC meetings. |
| **Tasks / Roles & Responsibilities** | The KMC implements policies related to disaster risk assessment at the central level, the National Strategy for DRR and the National Civil Emergency Plan and, through the minister responsible for civil protection (Minister of Defence), proposes changes or updates. KMC is the highest permanent authority that coordinates the inter-institutional cooperation and institutions activities, structures and all entities involved in civil protection system. KMC, at the request of the mayor, in case the value of compensation exceeds 8 % of the municipal budget, decides on compensation for damages by the AKMC. **The Situation Operation Office (ZOS) is the structure responsible for gathering information on civil emergencies, crises and compiling periodic analytical reports for the Prime Minister, the Council of Ministers and the KMC.**<br>The **Technical Secretariat of KMC** is established and functions at AKMC, which is responsible for the preparation of meeting materials and for notifying the members of KMC for the next meeting, no later than 10 (ten) days before the date of its development. The composition of the Technical Secretariat of the KMC is determined by the specific order of the Director General of AKMC |

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| **Name & Acronym (in Albanian)** | Komisioni Teknik Këshillimor (KTK) |
| **Name & Acronym (in English)** | The Technical Advisory Committee (TAC) |
| **Objective / Scope** | The Technical Advisory Committee (KTK) advising on DRR, is established and shall operate in the ministry responsible for civil protection, under the direction of the AKMC. KTK is chaired by the Director General of AKMC and is composed of representatives of ministries, their subordinate structures and institutions. The level of representation in KTK is a manager or specialist, who, in the exercise of the duties, has competencies for DRR and Civil Protection, according to the areas of state responsibility of the institution or structure he/she represents. |
| **Tasks / Roles & Responsibilities** | The Technical Advisory Committee reviews strategies, policies, programs and plans for DRR and civil protection, with the aim of protecting people, lives, property, cultural heritage and the environment; reviews and recommends education programs for the structures of the civil protection system and the general public in the field of civil protection; reviews and analyses civil emergency plans, prepared by public and non-public institutions, and provides relevant recommendations, as appropriate; assists in improving the civil protection system, putting it into full efficiency, setting priorities, and identifying needs; contributes to resolving and taking preventive, rehabilitation and recovery measures for various types of natural or other disasters; reviews or evaluates studies in the field of civil protection. The KTK meeting is arranged and chaired by the General Director of AKMC, whenever he considers it as necessary, but not less than once every six months. |

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| **Name & Acronym (in Albanian)** | Sistemi I Integruar I Informacionit dhe Statistikës të Këshillit të Ministrave (SIISKM) |
| **Name & Acronym (in English)** | Integrated Information and Statistics System of the Council of Ministers (IISMCM) |
| **Objective / Scope** | SIISKM aims to administer and manage the flow of information in function of political and strategic decision-making of the Council of Ministers, Prime Minister and ministers, as well as in function of inter-institutional communication and interaction and maintenance of essential statistical data, in accordance with the legislation in force. |
| **Tasks / Roles & Responsibilities** | **Collection, processing and analysis of information in the interest of planning, public communication, statistics and important decision-making, at the level of the Minister, the Prime Minister and the Council of Ministers;** Preparation of periodic daily, weekly, monthly and annual reports for the ministers, the Prime Minister and other instances determined by their order, which reflect the general situation according to the areas of responsibility of the ministries, as well as the general situation of the country in the case of reports being prepared for the Prime Minister. In addition to general reports, SIISKM also prepares thematic reports on certain important issues; Collection, processing and publication of statistical information at the level of ministries and Prime Ministries. |

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| **Name & Acronym (in Albanian)** | Zyra Operacionale e Situatës (ZOS) |
| **Name & Acronym (in English)** | Office Responsible for the Situation (ORS) |
| **Objective / Scope** | To coordinate all the activity of SIISKM and to fulfil the tasks defined in the decision, in function of the Prime Minister and the Council of Ministers. |

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| **Tasks / Roles & Responsibilities** | **ZOS (The Office Responsible for the Situation) shall be the structure at the Prime Ministry which shall collect information on civil emergencies, crises, and periodic analytical report development for the Prime Minister, the Council of Ministers and the CPC, in addition to maintaining ongoing communication between the Council of Ministers and the relevant structures charged with civil emergencies and crises functions.** ZOS is supported by the State Authority for Geospatial Information (ASIG), as well as by the AKSHI with geospatial information, informatics, as well as other products necessary for the preparation of reports and presentations for The Prime Minister and the Council of Ministers. |

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| **Name & Acronym (in Albanian)** | Agjencia Kombëtare e Mbrojtjes Civile (AKMC) |
| **Name & Acronym (in English)** | National Agency for Civil Protection (NACP) |
| **Objective / Scope** | The AKMC is an integral part of the structure of the Ministry of Defense.<br>AKMC is a central public legal entity, responsible for Disaster Risk Reduction (DRR) and civil protection, throughout the territory of the Republic of Albania.<br>AKMC exercises coordinating, leading, technical, supervisory and controlling authority in the field of Disaster Risk Reduction and civil protection. AKMC is organized as the general directorate at the central level, while at the local level it is organized on a regional basis, according to the civil protection centres in the county/region. |
| **Tasks / Roles & Responsibilities** | AKMC implements the policy of the Council of Ministers in the field of disaster risk reduction and civil protection; implements the strategic directions and objectives set by the ministry responsible for civil protection; **coordinates the work activities for the drafting of the National Strategy for DRR, the National Plan for Civil Emergencies and the DRA at the central level;** cooperates with international organizations and counterpart international organizations in the framework of civil protection and DRR; plans funds for taking preventive and rehabilitative measures against disasters, in damaged infrastructure, as well as other activities in the field of civil protection, the criteria and procedures for which are determined by a decision of the Council of Ministers; creates and implements the methodology for drafting plans for civil emergencies; **promotes forms, methodologies, rational ways of collecting, recording, processing and disseminating information on disasters; Collects information from the structures of the civil protection system, central and local, on the measures taken to prevent and cope with disasters, as well as data on damages and losses;** Prepares, every year, a report to the Minister on the general situation of DRR and civil protection; through the National Training Center for Civil Protection, conducts trainings of state structures, private and voluntary entities; enters into agreements with non-profit organizations or other legal entities, inside and outside the country, regarding civil protection; conducts inspections for the implementation of the provisions of this law on civil protection for state institutions and structures and private entities. **The Disaster Losses Database shall be established and shall operate at the National Civil Protection Agency, pursuant the rules for the collection and administration of Disaster Losses Data, made by a decision of the Council of Ministers, upon the proposal of the minister.** |

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| **Name & Acronym (in Albanian)** | Qendrat e Mbrojtjes Civile ne Qark (QMCQ) |
| **Name & Acronym (in English)** | Regional Civil Protection Centers (RCPCs) |
| **Objective / Scope** | The Regional Civil Protection Centres (RCPC) shall be NCPA-subordinate structures with headquarters in every county and shall constitute a specialized institutional network that performs disaster risk reduction and civil protection tasks in the region. |

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| **Tasks / Roles & Responsibilities** | Implements the duties of the AKMC based on law no. 45/2019, "On civil protection", and performs all tasks delegated by the Agency in the region regarding to the issues of civil protection; Coordinates the activity on a regional basis with all local government leaders to reduce the risk of disasters; Oversees the preparation of civil emergency preparation plans in the county and the implementation of protection measures; Collects and processes the necessary data from the municipalities for the implementation of the tasks of planning and coping with civil emergencies; Realizes the organization, mobilization and coordination of operational forces. |

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| **Name & Acronym (in Albanian)** | Ministria / Ministri përgjegjës për Mbrojtjen Civile |
| **Name & Acronym (in English)** | The Ministry / Minister Responsible for Civil Protection |
| **Objective / Scope** | The Minister Responsible for Civil Protection (**Ministry of Defence**) determines the instructions and strategic objectives of the National Civil Protection Agency |
| **Tasks / Roles & Responsibilities** | The minister responsible for civil protection shall have the following responsibilities: defining the strategic directions and objectives of the National Civil Protection Agency; developing and overseeing the implementation of disaster risk reduction and civil protection policies; periodically informing the Council of Ministers on disaster risk reduction and civil protection; overseeing the National Civil Protection Agency budget management, in accordance with the applicable financial legislation. |

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| **Name & Acronym (in Albanian)** | Ministritë dhe Institucionet Qendrore |
| **Name & Acronym (in English)** | Ministries and Central Institutions |
| **Objective / Scope** | All ministers and central institution chairpersons shall be responsible for DRR & CP, within the scope of state responsibility or of their competences.<br>They draft, approve and update the civil emergency plan, according to the area of state responsibility and send it to AKMC for analysis and planning purposes; |
| **Tasks / Roles & Responsibilities** | Within each ministry the Civil Emergency Disaster Departments will be established, which consists of employees who, in addition to their permanent roles, also take on some tasks related to the DRR. These offices are coordinated by AKMC and their activities are involved in all stages of disaster risk management and, where appropriate, AKMC plays a leading or supporting role, which depends on the nature and magnitude of the disaster event.<br>The Ministries are responsible for; drafting, approving and updating the civil emergency plan, according to the area of state responsibility, and submitting it to AKMC for analysis and planning purposes; planning an annual budget for DRR & CP, according to the scope of their state responsibility. For ministries responsible for civil protection, defence, internal affairs, transport, infrastructure, agriculture, health, energy, education, environment and culture, budget planning should be between 2% and 4% of the total annual budget; organizing and maintaining monitoring, early warning, alert and alarm systems in their domain of activity; within **2 years from entry into effect of this Law, establishing a disaster losses database in their area of responsibility, which they shall be maintained, updated, and used to exchange information with the AKM;** continuously informing the AKMC about various activities in the field of DRR & CP; analysing the existing state of the administrative, technical and financial capacities for civil protection in order to continuously improve them and informing the AKMC at least once a year; conducting **an assessment of disaster losses, within their area of responsibility;** engaging all available capacities to cope with disasters. |

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| **Name & Acronym (in Albanian)** | Autoriteti Shtetëror për Informacionin Gjeohapësinor (ASIG) |
| **Name & Acronym (in English)** | State Authority for Geospatial Information (SAGI) |
| **Objective / Scope** | ASIG was established in 2013, according to Law 72/2012 "On the organization and functioning of the national infrastructure of geospatial information in the Republic of Albania" (www.asig.gov.al). ASIG is organized and operates on the basis of the law, as a central public institution. Dataset resources for INSPIRE entries are data from Albanian Geographic (Military) Institute (AGMI), Albanian Geologic Survey (AGS), Agency for Legalization of Urban and Informal Zones and Buildings (ALUIZNI), Central Technical Archive in Tirana, Central Office Registration of Immovable Properties and Parcels and its branches, National Agency of Forest, National Agency of Water, National Agency of Environment, National Agency of Territory Administration, or Cities Hall in Albania, Private Companies. |
| **Tasks / Roles & Responsibilities** | ASIG is responsible for the Implementation of national policy for geospatial information infrastructure, responsible for the design, construction, maintenance and updating of Geodetic Framework "KRGJSH2010"; Making decisions on the collection, processing and updating geospatial information from public authorities, according to relevant topics. ASIG is responsible for standards and rules for the creation of the National GIS in accordance with the relevant European standards.<br>**Prepare rules for creating, updating, sharing, access and use of geospatial information and related services; Administer geospatial information collected, processed and updated by public authorities under the relevant topics; Ensures coordination through the initiatives and activities related to geospatial information in the public and private sectors;**<br>Develops and administers the National Geoportal and guarantees public access and stakeholders in accordance with the provisions of Law 72/2012; Represents the state in European and international organizations, membership in which it serves the functioning and modernization of the national geospatial information infrastructure.<br>ASIG supports ZOS with geospatial information, and other products necessary for the preparation of reports and presentations for The Prime Minister and the Council of Ministers. |

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| **Name & Acronym (in Albanian)** | Agjencia Kombëtare e Shoqërisë së Informacionit<br>(AKSHI) |
| **Name & Acronym (in English)** | National Agency for Information Society<br>(NAIS) |
| **Objective / Scope** | AKSHI provides policies, strategies and regulates the ICT (Information & Communication Technology) sector, excluding the field of electronic communications. AKSHI is a provider of ICT and electronic services to citizens, businesses and public administration. |
| **Tasks / Roles & Responsibilities** | Provides focused ICT services for institutions and administrative state authorities under the responsibility of the Council of Ministers. This service is also offered to other public institutions, at their own request.<br>**Provides electronic data exchange with interconnected databases in government interaction platform as well as electronic services on the portal and in the module for public administration officials**, for any natural and legal person exercising the function in accordance with applicable law, according to the tariffs of approved by instruction of the minister responsible for finance and economics.<br>ASIG supports ZOS with informatics, as well as other products necessary for the preparation of reports and presentations for The Prime Minister and the Council of Ministers. |

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| **Name & Acronym (in Albanian)** | Instituti i Gjeoshkencave, Energjisë, Ujit dhe Mjedisit (IGJEUM) |
| **Name & Acronym (in English)** | Institute of Geosciences, Energy, Water and Environment (IGEWE) |
| **Objective / Scope** | IGJEUM is a national research unit that operates under the umbrella of the Polytechnic University of Tirana (Law No. 80/2015: On Education & Scientific Research Institutions in the Republic of Albania). IGEWE is the institution for national monitoring and warning structure for natural hazards of meteorological origin, including floods, wildfires and earthquakes. |
| **Tasks / Roles & Responsibilities** | The Scope of Work of the Institute of Geosciences Energy, Water and Environment is to improve scientific research in the field of geosciences in Albania through: (i) conducting scientific and applied research; (ii) providing leadership in the educational process of young students and scholars; (iii) **undertaking services with third parties in the fields of seismology, natural resources, georisk, geology, water and environment.** IGEWE is endorsed by the World Meteorological Organization as the National Meteorological and Hydrometeorological Service for Albania.<br>**The monitoring and forecasting systems include a network of telemetering stations, the WMO Global Telecommunication System and an analysis and forecast center at IGEWE**. One of the main tasks of this Institute is the development of geomodels which support scientific research in the fields of geophysics, geology, geoenvironment, seismology, thermal energy, etc. based on modern geoinformation technology. Hydro-meteorological services in Albania are shared between IGEWE, the Military Meteorological Service (MMS) and Albcontrol (National Air Traffic Agency, NAT) Met Service. (They have their stations but are subordinate to IGEWE). WMO (World Meteorological Organization) approved national weather service for Albania is IGEWE |

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| **Name & Acronym (in Albanian)** | Prefect of Qark |
| **Name & Acronym (in English)** | Prefect of Qark |
| **Objective / Scope** | The prefects are appointed by the government (Ligj Nr. 107/2016: "For the Prefect of County") and oversee the Regional (Qark) councils and communities. In addition, they carry out certain local government affairs that have not been assigned to the local authorities or coordinate between the local offices of the ministries. The prefects are thus the extended arm of the government in the counties. |
| **Tasks / Roles & Responsibilities** | The Law no.45/2019, defines that **Prefect of Qark is among the main local civil protection and institutions which collects and processes the necessary data from the municipalities and other structures operating at the regional level, for the DRR and civil protection, as well as continuously informs the National Agency of Civil Protection (AKMC);**<br>Prefect of Qark has a primary role in DRR and civil protection at the county level. The Prefect performs the risk assessment in the territory of the respective county, drafting and approving the DRA document at the regional level, within 2 years from the entry into force of this law, which must be sent to the National Civil Protection Agency for analysis and planning;<br>**Within 2 years from the entry into force of this law, creates the database of losses from disasters at the county level, which it maintains and updates, as well as exchanges information with the AKMC, etc.** In case of civil emergency or disaster, the Prefect has the duty to disseminate and exchange information with the AKMC, local self-government units and prefects of other affected or endangered counties, as well as to promote and coordinate undertaking of the necessary measures for coping with the situation, monitoring and implementation of emergency services, reaction of institutions and administrations for specific interventions;<br>The **Civil Planning and Protection Sector** functions as part of the prefectural administration structure. The prefect coordinates with the municipalities within the administrative territory for establishing the permanent planning and civil protection structures. |

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| **Name & Acronym (in Albanian)** | Bashkitë |
| **Name & Acronym (in English)** | Municipalities |
| **Objective / Scope** | One of the basic principles of law 139/2015 "On local self-governance" is' Subsidiarity ', which is 'the principle of performing functions and exercising competencies at a government level as close as possible to the community. In this context, based on article 29, the municipality, as a local authority, has direct competencies in the feld of civil protection, which are subsequently granted by the sectoral legislation.<br>Law 45/2019 "On Civil Protection" has also sanctioned the "Subsidiarity" principle and proposes three main instruments to be used at both national and local level, namely: a risk and vulnerability assessment document, a risk reduction strategy, and a civil emergency plan. Based on the above law, all municipalities are obliged to establish as part of their structures the respective directorate of civil protection. |
| **Tasks / Roles & Responsibilities** | Municipalities have the following tasks: within 2 years from the entry into force of this law, should prepare risk assessment in their territories, drafting and approving the DRA document, which is sent to the prefect of qark and AKMC, for analysis and planning purposes; inform the public and the endangered community, based on the DRA document; draft and review the strategy for DRR; draft, approve and update the local plan for civil emergencies and should send it to AKMC and the prefect of qark, for analysis and planning purposes;<br>Municipalities **provide, administer and update the necessary data for citizens and private entities, possible to be planned and engaged in disaster prevention and coping; within 2 years from the entry into force of this law, create the database of losses from disasters for the territory of the municipality, which they maintain and update, as well as exchange information with the Prefect of Qark and AKMC;** perform the assessment of the damages caused by the disasters in their territory, the assessment of the needs for their coping, as well as compensate the citizens for the disasters that occurred in their territory; cooperate with neighbouring municipalities in the implementation of tasks related to DRR and civil protection, in order to join their capacities to address common issues in the specific area. |

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| **Name & Acronym (in Albanian)** | Shërbimi Meteorologjik Ushtarak (SHMSH) |
| **Name & Acronym (in English)** | Military Meteorological Service (MMS) |
| **Objective / Scope** | The Military Meteorological Service is an integral part of the Armed Forces of the Republic of Albania and depends on the Air Force Command, Ministry of Defence. The Military Meteorological Service, in exercising its duties, cooperates with specialized hydrometeorological institutions in the Republic of Albania. |
| **Tasks / Roles & Responsibilities** | **The Military Meteorological Service provides meteorological data at altitude through the emission of radio sounds; conducts meteorological observations, collects data from stations and transmits data to international organizations specialized in the field of weather forecasting** or interested entities inside and outside the country; provides meteorological assistance for the safety of the population, air or sea navigation, as well as in cases of civil emergencies; **exchanges meteorological data with counterpart institutions of other countries.** |

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| **Name & Acronym (in Albanian)** | Shërbimi Gjeologjik Shqiptar (SHGJSH) |
| **Name & Acronym (in English)** | Albanian Geological Service (AGS) |
| **Objective / Scope** | The Albanian Geological Service carries out its activity in the field of geosciences, based on Law no. 111/2015, dated 15.10.2015, "On the Albanian Geological Survey", which regulates the relations between this institution and the public and private sectors, to promote the use of mineral resources to the maximum benefit of the public. |
| **Tasks / Roles & Responsibilities** | According to the Regulation "On the Functioning of the Albanian Geological Survey", approved by Order no. 88, dated 22.02.2016, by the Minister of Energy and Industry, Albanian Geological Survey, has the legal status as "advisory, technical and scientific institution of the state, public, budgetary legal entity, which carries out activities in the field of earth sciences in the territory of the Republic of Albania.<br>**AGS provides useful geosciences information, service and advice that are relevant to national and local needs. Albanian Geological Survey (AGS) is focused on sustainable management of natural resources, monitoring natural phenomena, modelling and elaboration of digital data in order to set up the Geographic Information System.** |

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| **Name & Acronym (in Albanian)** | Agjencia e Menaxhimit të Burimeve Ujore (AMBU) |
| **Name & Acronym (in English)** | Water Resource Management Agency (WRMA) |
| **Objective / Scope** | The Water Resources Management Agency, in cooperation with the ministry responsible for civil emergencies, drafts bylaws on flood risk management plans and rules, in accordance with applicable civil emergency legislation and the National Civil Emergency Plan. WRMA in cooperation with the water basin administration offices drafts a flood risk management plan for its water basin districts, which focuses on prevention, protection, preparedness, including flood forecasting and flood warning systems. early, which it submits for coordination to the structures responsible for civil emergencies. |
| **Tasks / Roles & Responsibilities** | **The Water Resources Management Agency is the body that creates, manages and updates the National Water Resources Cadastre which ensures the functioning of 3 main pillars for operating the national for water resources cadastre related to: a) data generation; b) data processing, analyses and validation; c) data interlinkages, publishing and their access.**<br>This includes strengthening the hydro-met monitoring network by among other things designing optimizing and upgrading of the network, training and specifications for procurement and installation; developing the integration (including telemetry) and managing hydro met data by linking data collection with a geoportal and the cadastre for data collection, management and storage from all sources where possible in (near-) real time. Such data generation shall include local data collection at hydro and met stations from the core network, shall expand this with real-time stations, possibly radar, crowdsourced data as well as global and regional data sets. Data processing shall include safe storage and be designed for future operational uses, such as planning decision support systems, licensing, and operational decision support in full flow forecasting including early warning systems, infrastructure operations (hydropower cascade, irrigation, ecological monitoring). |

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| **Name & Acronym (in Albanian)** | Instituti i Gjeografisë dhe Infrastrukturës Ushtarake (IGJIU) |
| **Name & Acronym (in English)** | Institute of Geography and Military Infrastructure (IGMI) |
| **Objective / Scope** | The Institute of Geography and Military Infrastructure (IGJIU) is a state institution, researcher and scientist, designer and producer which functions as the National Cartographic Agency. IGJIU / IGMI functions according to law no. 8907 "On the functioning of the Military Geographical Institute (IGJU) of Albania" dated 06/06/2002, as amended, by law no. 72/2012, "On the organization and functioning of the national geospatial information infrastructure in the Republic of Albania". |
| **Tasks / Roles & Responsibilities** | **This Institute is essentially responsible for the topographic mapping and geodetic works in Albania. It is the main institution producing and providing data on Datum, projection, state triangulation coordinates, state levelling heights and networks.**<br>Geographical support of military operations of the Armed Forces. Carrying out activities in support of the development of the national economy in the fields of geodesy, cartography and photogrammetry and remote sensing. Supporting requirements for study, design, standardization, certification of all existing and prospective facilities. |
| **Name & Acronym (in Albanian)** | Agjencia Kombëtare e Mjedisit (AKM) |
| **Name & Acronym (in English)** | National Agency of Environment (NAE) |
| **Objective / Scope** | The National Environment Agency (AKM) is a government agency in Albania under the supervision of the Ministry of Tourism and Environment.<br>AKM was established as a restructuring of the Environment and Forestry Agency in support of Law No. 10431, dated 09.06.2011 "On Environmental Protection" and DCM No. 47, dated 29.01.2014 "On Determination of the Rules on the Organization and Functioning of the National Environment Agency and Regional Environmental Agencies ". |
| **Tasks / Roles & Responsibilities** | The National Environment Agency is a central public institution which exercises its jurisdiction through the head office and regional branches in the counties, which are the Regional Environmental Directorates.<br>Its main duties and responsibilities are related with the: monitoring **of the state of environment in all the country based on the main environmental indicators and components in: air, waters, soil, forests and biodiversity. AKM is also the national institution in charge with the building up and managing the National Environmental Information System and National Forest Inventory. Part of environmental data bases is also PRTR which is arranged by AKM**. All the private operators who have been subject of Environmental Permission and Environmental Impact Assessment Procedures, have to submit to AKM the self-monitoring reports in line with the conditions established for them to the EP. Among other issues NEA also follows and approves (or reject) the procedures related to the EIA and EP.<br>AKM is dedicated to improving, conserving and promoting the country's environment and striving for environmentally sustainable development with sound, efficient resource management.<br>**AKM provides dataset resources for INSPIRE entries to ASIG and other interested public and private entities.** |

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| **Name & Acronym (in Albanian)** | Agjencia Kombëtare e Planifikimit të Territorit (AKPT) |
| **Name & Acronym (in English)** | National Agency for Territorial Planning (NATP) |
| **Objective / Scope** | The National Agency for Territorial Planning (AKPT) is the authority with planning responsibilities, under the ministry responsible for territorial planning and development issues. Its mission is to contribute to the sustainable development of the territory guided by well-planned strategies and medium-term and long-term development programs; to ensure the implementation of the law and bylaws in force that guarantee the proper planning of the territory; as well as to support professional dialogue in the field of territorial planning |
| **Tasks / Roles & Responsibilities** | AKPT is responsible for: informing the processes of improving the territorial planning legislation; ***administration and maintenance of the spatial planning database (National Register of Spatial Planning);*** informing the public about the territorial planning processes, as well as promoting his participation during the processes of and implementing planning documents; providing legal, technical and methodological standards in the field of territorial planning; **AKM provides dataset resources for INSPIRE entries to ASIG and other interested public and private entities.** |

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| **Name & Acronym (in Albanian)** | Agjencia Kombëtare e Burimeve Natyrore (AKBN) |
| **Name & Acronym (in English)** | National Agency of Natural Resources (NANR) |
| **Objective / Scope** | The scope of the National Agency of Natural Resources is the development, supervision of the rational use of natural resources, based on government policies, and monitoring of their post-exploitation, in the mining, hydrocarbon and energy sector. |
| **Tasks / Roles & Responsibilities** | AKBN's field of activity consists of: proposing, consulting, and cooperating with relevant government structures to draft its policies and strategies in the field of mining, hydrocarbons and energy; implementation of government policies in the field of mining, hydrocarbons and energy; promotion of mineral, hydrocarbon, hydropower and renewable energy sources; supervision of mining, post-mining, hydrocarbon and energy activity; monitoring of concession contracts for hydropower plants; **administration of all primary data of the hydrocarbon sector and data related to mining and post-mining activity; drafting and publishing the annual energy balance, at national and regional level, in accordance with the formats of EUROSTAT and the International Energy Agency.** |

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| **Name & Acronym (in Albanian)** | Instituti i Statistikave (INSTAT) |
| **Name & Acronym (in English)** | Institute of Statistics (INSTAT) |
| **Objective / Scope** | INSTAT is an independent institution under the authority of Council of Ministers INSTAT's mission is to provide transparent, neutral and timely statistics that help the user to judge on the developments of the transformation processes within the country. |
| **Tasks / Roles & Responsibilities** | **INSTAT, is the main institution of producing official statistics and coordinator of the national statistical system, aims to provide reliable and comparable data, adapting methodologies and adding a list of statistical indicators.** |

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| **Name & Acronym (in Albanian)** | Autoriteti Rrugor Shqiptar (ARrSh) |
| **Name & Acronym (in English)** | Albanian Road Authority (ARA) |
| **Objective / Scope** | The field of activity of the Albanian Road Authority (ARA) is the administration of the state road network in accordance with the provisions of the National Road Code and the Law "On the Albanian Road Authority". |
| **Tasks / Roles & Responsibilities** | **ARA provides geospatial data for:**<br>- **Road/street network.** The road street network is presumably developed in WebGIS but is not publicly available. It should include the entire road network together with the network infrastructure (ex. Bridges, culverts, etc.)<br>– **Database with road network and road facilities attributes-** it is supposed to be implemented in the WebGIS system<br>– **Road Inventory:** the data should be in table format and contain information such as, segment lengths, coordinates of starting and ending segment points, road layer, etc. It needs to be researched further who is actually the owner of this data, whether it is ARRSH or IST. |

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| **Name & Acronym (in Albanian)** | Agjencia Shtetërore e Kadastrës (ASHK) |
| **Name & Acronym (in English)** | State Cadastre Agency (SCA) |
| **Objective / Scope** | The State Cadastral Agency was created as part of the institutional consolidation process. Law No.111/2018 (dated 7.02.2019) "On Cadaster" brings together the Immovable Property Registration Office (IPRO), the Agency of Inventory and Transfer of Public Properties (AITPP), and the Agency for the Legalization and Urbanization of Informal Areas (ALUIZNI) |
| **Tasks / Roles & Responsibilities** | **Cadastre in digital format is the state database on real estate.** The Ministry of Justice has access to this database, in the role of its supervisor. Detailed rules for the use, administration and storage of the database on real estate are determined by a decision of the Council of Ministers, in accordance with the requirements of the legislation on state databases.<br>As regards the functioning and organization of the cadastral system and the rules on the registration of private, state and public immovable properties, as well as of the real rights over them, **the law stipulates that any immovable property shall be registered with the cadastre, by being reflected in their respective property record and cadastral map.**<br>The property record contains, inter alia, the cadastral data concerning the geographical position of the property, its surface and type, the identification of the owner and the act that the property title is based on, the third-party rights over the property, as well as the property value. Whiles**, the cadastral map contains, inter alia, the boundaries and geographic position of the property, the unique property identification number within the cadastral area number, etc.** |

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| **Name & Acronym (in Albanian)** | Drejtoria e Përgjithshme e Gjëndjes Civile (DPGjC) |
| **Name & Acronym (in English)** | General Directorate of Civil Status (DGCS) |
| **Objective / Scope** | The General Directorate of Civil Status is the agency in charge of civil records in Albania. |

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| **Tasks / Roles & Responsibilities** | **The General Directorate of Civil Status administers the National Registry of Civil Status and the National Register of Addresses.** The National Registry of Civil Status is a unique state document, which reflects the components of civil status for every Albanian citizen, for foreign citizens and for stateless persons, when they have temporary / permanent residence in the territory of the Republic of Albania, as well as for citizens foreigners who have been granted asylum in the Republic of Albania. |

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| **Name & Acronym (in Albanian)** | Korporata Elektroenergjitike Shqiptare (KESH) |
| **Name & Acronym (in English)** | Albanian Power Corporation (APC) |
| **Objective / Scope** | Energy of Albania (KESH) is the public producer and, at the same time, the largest electricity producer in Albania. KESH operates the most important electricity generating plants in the country. KESH is also responsible for the administration, the proper operation as well as for guaranteeing the technical and operational safety of the power plants it operates. |
| **Tasks / Roles & Responsibilities** | KESH Emergency Response Plans elaborate and define for every possible scenario of emergencies that may occur (due to the operation and management of the Drin River Cascade HPPs in conditions of major floods, earthquakes, or demolitions). potential of a dam), tasks and organizational charts for timely reporting by Institutions involved in the process of dealing with and managing civil emergencies. This plan aims to increase the collaboration of local and national institutions during emergency situations, i.e AKMC, Ministries, Municipalities, National Dam Committee, etc.<br>**KESH responsibility is to provide Information on the hydroelectric situation and management of Cascade, to forecast and withstand the floods which may by caused by the intensive flow from the Plots of Hydro Power Plants located over Drin River; as well, flood maps that may be caused in the Drin-Buna watershed area during the HPP operation of the Drin River cascade (Fierza, Koman and Vau i Dejes) or damage to their dams.** |

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| **Name & Acronym (in Albanian)** | Kryqi i Kuq Shqiptar (KKSH) |
| **Name & Acronym (in English)** | Albanian Red Cross (ARC) |
| **Objective / Scope** | Albanian Red Cross is the oldest humanitarian association in Albania, as part of the International Red Cross and Red Crescent Movement. KKC is the main non-governmental organisation that provides volunteer services for local risk and capacity assessments, public education and community-level disaster planning. |
| **Tasks / Roles & Responsibilities** | Albanian Red Cross is the main non-governmental stakeholder with 80 000 members, 2 000 volunteers and 39 branches. Founded in the 1920s, its current activities are based on Law No. 7864, dated September 29, 1994 on the "Albanian Red Cross.". According to the National Plan for Civil Protection **the Albanian Red Cross has an important role in disaster prevention, preparedness, response and recovery**. The Albanian Red Cross has developed its own disaster plans and its structure for responding to disasters is organised in two levels: central, which manages the main human and material resources; and local, where disaster-trained volunteer teams have been established throughout Albania. |

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| **Name & Acronym (in Albanian)** | OJQ & Sektori Privat |
| **Name & Acronym (in English)** | National NGOs and the private sector |
| **Objective / Scope** | Several private sector companies are called in to provide humanitarian assistance, including mobile phone companies, Tirana International Airport and so on. In addition, non-governmental humanitarian organizations (NGOs), such as the Albanian Red Cross, provide humanitarian services. |
| **Tasks / Roles & Responsibilities** | **Non-profit organizations and private sector entities, at the request of the AKMC, are required to provide data on disaster losses, which serve to reduce the risk of disasters and civil protection.** They are involved in specific tasks, in accordance with the preparation, skills and the need to help overcome the state of natural disaster |

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| **Name & Acronym (in Albanian)** | Institucionet Akademike dhe Kërkimore Shkencore |
| **Name & Acronym (in English)** | Academic & Scientific Research Institutions |
| **Objective / Scope** | The academic institutions, universities, research institutions, as well as other organizations engaged in research and scientific work: notify the National Agency of Civil Protection about scientific research and findings, regarding disaster risk reduction and civil protection; |
| **Tasks / Roles & Responsibilities** | **They carry out scientific research activities in the interest of civil protection, and, when requested by the AKMC, inform the relevant institutions about their results; promote scientific research activities in cooperation with civil protection structures, in the service of civil protection.**<br>The AKMC, institutions and other civil protection structures promote and, if necessary, provide financial support for scientific research activities to reduce the risk of disasters and civil protection. |

# B. RELEVANT LEGISLATION FOR DATA COLLECTION, STORAGE AND USE

**Law No. 45/2019 "On Civil Protection", dated 18.07.2019** introduces new concepts like DRR, national & local strategies for DRR, harmonization of urban planning with DRR at local & national level, regional strategies for risk assessment, risk assessment certificates for development projects, civil emergency plans at all levels in line with National Plan for Civil Emergency, list of critical infrastructure. It establishes the **National Agency for Civil Protection AKMC** and provides clear division of tasks & responsibilities of the numerous players at national & local levels. Also, it establishes Situation Operation Offices (ZOS), regularly reporting at Council of Ministers and AKMC.

A major improvement in the new law is the widening of the scope of work from emergencies to protection. This bears not only new responsibilities for the affected stakeholders, but also a conceptual revision, emphasizing prevention and preparedness and the integral approach to risk reduction and protection of habitat. The law is partially aligned with several EC directives that address critical infrastructures, floods, dangerous substances, electronic communication, and the EU mechanism of civil protection.

The law states also the need for establishing an integrated information system that serves to planning and preparation, on one side, and to coping with crisis and recovery after crisis, on the other. This information, together with early warning systems, should be used in the risk assessment process, and should be updated continuously and timely for stakeholders to undertake risk simulations. The information would also allow for the implementation of the subsidiarity principle (article 7), according to which planning and response should be delivered from the bottom to the top - the more complex the disaster risk becomes, the lower administrative level are the local capacities to handle it.

In terms of institutions and instruments, the law no. 45/2019 defines proportionally equal responsibilities for the national, regional and local institutions. There is a principle of hierarchy and harmonisation among the institutions and planning instruments. There should be vertical and horizontal alignment among the instruments.

**National Disaster Plan 2004** supporting the **Law 8756 on Civil Emergency Services:** Draws together and clarifies the roles and responsibilities of all stakeholders, State or otherwise. This aims to channel the flow of relevant information and through coordination, to reinforce the capacity to respond through all phases of the disaster cycle.

**The National Strategy for Disaster Risk Reduction and Civil Protection 2014-2018** provides the common direction for all institutions working on disaster risk reduction and civil protection in Albania. It includes a vision, objectives and guiding principles. The Strategy identifies priority actions around 5 strategic components. It includes recommendations for the required financing and highlights the importance of regional and international cooperation.

**Law No. 72/2012: "On the organization and functioning of the national infrastructure of geospatial information" - ASIG** (Autoriteti Shtetëror i Informacionit Gjeohapësinor / State Authority of Geospatial Information).

The State Authority for Geospatial Information (ASIG) and the and the Board of Geospatial Information (BIG) was established in 2012 with the **Law No. 72/2012**, approved on 28.06.2012, "On the organization and functioning of the National Geospatial Information Infrastructure in the Republic of Albania". It followed the Adoption of the INSPIRE Directive (Directive 2007/2 / EC) at the end of 2010.

Provisions of the Law and Government decisions define ASIG and BIG as the main institutions, responsible for the implementation, maintenance and use of the National Spatial Data Infrastructure (NSDI). These institutions have series of tasks and responsibilities related to aspects of dealing with geodetic infrastructure in the framework of the Albanian Satellite Positioning System ALBPOS, connected to the geodetic reference frame, coordinate reference system, etc.

**This law defines the regulations for:**

- creation of the national infrastructure of geospatial information in the Republic of Albania;
- organization and functioning of national geospatial information authorities;
- determination of the general conditions related to the collection, creation, processing, updating, interaction, access, storage, use and archiving of geospatial information;
- obligations and competencies of public authorities for the creation, security, access and use of geospatial information.

According to the provisions of this law, ASIG is the responsible authority for issues related to the national geospatial data infrastructure. A summary of its responsibilities can be found here: http://asig.gov.al/english/index.php/2014-11-06-22-33-30/rreth-asig.

The State Authority of Geospatial Information (ASIG), based on **Law no. 72/2012, date 28.16.2012** has published on the National Geoportal the updated geospatial information for themes" Administrative Units Bounders". The updated map over administrative-territorial boundaries of local government units, has been approved DCM no 360 date 29.05.2019 "On the approval of the updated units of Local Governance mapping of administrative-territorial boundaries", pursuant to Article 93, point 1, of Law no. 139/2015, "On Local Self-Government".

The National Spatial Data Infrastructure represents an integrated geospatial data system, enabling users to identify and access spatial information acquired from different sources, from local via national to global level, in a comprehensive manner. The National Metadata Catalogue can be accessed in https://geoportal.asig.gov.al/en/data/metadata.

**DCM No.147, dated 20.02.2013: "On the organization and functioning of ASIG".** The objective of this DCM is to define the rules of organization and functioning of ASIG, as a central public institution.

ASIG responsibilities include:

- Implementation of national policy for geospatial information infrastructure;
- Responsible for the design, construction, maintenance and updating of Geodetic Framework "KRGJSH2010";
- Making decisions on the collection, processing and updating geospatial information from public authorities, according to relevant topics;

- Standards and rules for the creation of the National GIS in accordance with the relevant European standards;
- Prepare rules for creating, updating, sharing, access and use of geospatial information and related services;
- Administer geospatial information collected, processed and updated by public authorities under the relevant topics;
- Ensures coordination through the initiatives and activities related to geospatial information in the public and private sectors;
- Develops and administers the National Geoportal and guarantees public access and stakeholders in accordance with the provisions of Law 72/2012;
- Represents the state in European and international organizations, membership in which it serves the functioning and modernization of the national geospatial information infrastructure.

**DCM No. 402, date 20.05.2020** - for the approval of the policy document **"On the Governance of the Geospatial Information Sector in Albania, 2020-2030"**

**DCM No.747, dated 20.11.2019: "On the organization and functioning of the National Civil Protection Agency"**

**DCM No. 923, Dated 25.11.2020: "On the functioning and organization of the Civil Protection Committee and the Inter-Institutional Cooperation of the institutions and structures of the Civil Protection System",** which abrogated the DCM No. 965/2015: On institutional cooperation of management structures in cases of civil emergencies and crisis.

**DCM No. 1020, dated 16.12.2020: "On the composition, functioning and tasks of the Technical Advisory Commission for Disasters Risk Reduction"**

This DCM decides that under the direction of the AKMC at the Ministry of Defence to establish and operate the Technical Advisory Commission (KTK), which advises on issues of Disaster Risk Reduction and Civil Protection.

**DCM No 835 of 3.12.2004: "On the approval of the National Plan for Civil Emergencies"**

**Law No. 80/2015: "On Education & Scientific Research Institutions in the Republic of Albania", under which the Institute of Geosciences, Energy, Water and Environment (IGJEUM) operates under** the umbrella of the Polytechnic University of Tirana. IGJEUM was established in 2011 by merging the Institute of Geosciences (IGJEO) and the Institute of Energy, Water and Environment. IGJEUM is the institution for national monitoring and warning for natural hazards of meteorological origin, including floods, wildfires and earthquakes. IGJEUM is endorsed by the World Meteorological Organization as the National Meteorological and Hydrometeorological Service for Albania. The monitoring and forecasting systems include a network of telemetering stations, the WMO Global Telecommunication System and an analysis and forecast centre.

**DCM N0. 1077, dated 23.12.2015: "On the approval of the regulation on Creation, Storage and Updating of Metadata, Cataloging Structure and Deadlines for Creating Specific Metadata for Geo-**

**spatial Information".** This regulation sets out detailed rules for the creation, storage, updating, and cataloguing of metadata for geospatial data, geospatial data sets as well as geospatial data services for the topics listed in Article 11 of Law No. 72/2012, dated 28.6.2012, "On the organization and functioning of the national infrastructure of geospatial information in the Republic of Albania", as well as for any other topics approved by the DCM.

**Law no. 111/2015, dated 15.10.2015: "On the Albanian Geological Survey",** based on which the Albanian Geological Survey (SHGJSH) carries out its activities in the field of geosciences. According to the **Regulation "On the Functioning of the Albanian Geological Survey", approved by Order no. 88, dated 22.02.2016,** by the Minister of Energy and Industry, SHGJSH, has the legal status of an "advisory, technical and scientific institution of the state, public, budgetary legal entity, which carries out activities in the field of earth sciences in the territory of the Republic of Albania."

**Law No.17/2018: "On Official Statistics"** sets out the principles of official statistics, compliant with the principles of the European statistics Code of Practice, and defines the role of INSTAT and the National Statistical System (SKS). The SKS consists of INSTAT, the Bank of Albania, and "Other public authorities determined under the official statistics production program". The Law provides the mandate for data collection and for access to administrative data. The law also describes in some detail the coordination role of INSTAT. Other pieces of legislation which are relevant for the SKS include: the Law on Civil Servants, the Law on Management of Budgetary System, the Law on Protection of Personal Data and the Law on Census of Population and Dwellings. Law No.17/2018 has been partially aligned with Regulation (EC) No.223/2009 of the European Parliament and Council, dated 11.03.2009 on European Statistics, and Regulation (EU) No.2015/759 of the European Parliament and of the Council, dated 29.04.2015, amending the Regulation (EC) No. 223/2009 on European statistics. The statistical processes in INSTAT make use of a wide variety of IT tools such as SPSS, SAS, Stata, MS Access, R, and others. Across line departments, the software use differs widely. This increases the complexity and reduces the efficiency of data management.

**DCM No. 146 dated 28.03.2007** established the Center for Research & Development in Information Technology (QKZHTI) within the Polytechnic University of Tirana.

**Law No. 9887, dated 10.03.2008:** "On personal data protection" as amended, and Decision of the Parliament No. 211, dated 11.09.2008 "On the appointment of the Commissioner for the protection of personal data".

The Republic of Albania has also ratified the following international acts:

- Convention on the Protection of Individuals regarding the automatic processing of personal data (Law no. 9288/2004) ("the Convention").
- Additional Protocol to the Convention regarding supervisory authorities and trans-border flows of personal data (Law no. 9287/2004).

**Law No 119/2014: "On the right to information".**This law regulates the right of access to information produced or held by public authorities. The rules provided in this law aim to guarantee the public access to information, in the context of exercising the rights and freedoms of the individual in practice, as well as the formulation of views on the state of society.

**Law No 9154, date 06.11.2013: "Archives".** This law defines the basic rules for the organization and functioning of the archival service in Albania, the institutions that perform this service, as well as their legal obligations for the creation, preservation and use of archival property, as part of the national heritage.

**Law No 10273 dated 29.04.2010: "On electronic documents"** creates the necessary legal framework for the recognition and use of electronic documents. It regulates the use of electronic documents by natural, legal, public and private persons, whose electronic programs and equipment enable the realization, production, transmission, reception, storage and security of electronic document information.

**DCM No. 891, date 18.11.2020** for the approval of the document "State Standards for Technical Specifications of Geospatial Information in Albania - Topic: Protected Areas"

**DCM No. 809, date 21.10.2020** for the approval of the document "State Standards for Technical Specifications of Geospatial Information in Albania - Topic: Land cover".

**DCM No. 810, date 21.10.2020** for the approval of the document "State Standards for Technical Specifications of Geospatial Information in Albania - Topic: Areas with natural hazards".

**DCM No. 811, date 21.10.2020** for the approval of the document "State Standards for Technical Specifications of Geospatial Information in Albania - Topic: Land use".

**DCM No. 812, date 21.10.2020** for the approval of the document "State Standards for Technical Specifications of Geospatial Information in Albania - Topic: Determination of the geodetic reference framework and geodetic control".

**DCM No. 813, date 21.10.2020** for the approval of the document "State Standards for Technical Specifications of Geospatial Information in Albania - Topic: Geographic network systems".

**DCM No. 923, dated 25.11.2020:** "On the functioning and organization of the civil protection committee and the inter-institutional cooperation of the civil protection institutions and structures"

**DCM No.329, dated 16.05.2012:** "On criteria and procedures for the provision of financial state aid for the coverage of damage caused by natural disasters or other calamities caused by human activity"**, which is soon to be replaced by a new DCM, based on para 6, art 41 of Law 45/2019**

**DCM No.529, dated 2.6.2010:** "On the approval of the value of compensation of damages in the agricultural crops of the farmers of Korça county from the floods caused due to the rain and the damage of the Devoll river embankment, during the months of February-March 2010"

**DCM No.155, dated 1.3.2017:** "On taking measures to identify and assess the damage caused by earth tremors in the administrative units of Zharrëz, Patos (Dukas village), Patos municipality, and Kuman, Roskovec municipality"

**DCM No.10, dated 6.1.2011:** "On the establishment of working groups to identify and assess the damage caused by rain and floods in the counties of Shkodra, Lezha and Durres"

**DCM No.24, dated 20.01.2010:** "On the establishment of working groups, for the identification and assessment of damage caused by rain and floods, in the counties of Shkodra and Lezha"

**DCM No. 431, dated 15.7.2021:** "On the composition and tasks of organizational units that have in their competence the civil protection issues in the line ministries"

**Normative Act with the force of the Law, No. 9, dated 16.12.2019:** "On coping with the consequences of a natural disasters"

**Joint Instruction No.263, dated 24.05.2013:** "On the criteria and procedures for providing state financial assistance to cover damages caused by natural disasters or other disasters caused by human activity"

**Minister of Interior Order No.1185/1, dated 18.07.2007:** "Criteria, rules and procedures for the use of the civil emergency fund planned in the annual budget of the Ministry of Interior, as well as donations provided as assistance in cases of civil emergencies"

# C. CHECK OF *DESINVENTAR* ENTRIES FOR RECENT EVENTS IN ALBANIA

***The provided examples are as reviewed in February 2021.***

### Query for the COVID pandemic 2020

Only one record was found, the data card serial 13687. The event date is 8th of March, the duration of the event is 1 day, and the description of the cause is "Two citizens were affected with coronavirus" (*2 shtetas u egzaminuan të prekur nga koronavirusi*). The reported effects are: death of 1 elder man above 65-years old, 2 injured males between 15-64 years, 2 evacuated, 2 relocated, 2 directly affected people.

According to the World Health Organisation https://covid19.who.int/region/euro/country/al the confirmed cases of people infected with COVID19 in Albania from March 2020 to the end of October 2020 are more than 19000.

### Query for the earthquake in November 2019

A query for an earthquake with date 26/11/2019 gave 2 results: the data card serial 13618 and 13619. The first data card reports an event date 26th of November, duration 1 day and the description of the cause is "Earthquake with magnitude 6.3 Richter" (*Tërmet me magnitudë 6.3 Rihter*). The reported effects are: 51 deaths and disruptions of the following public services are reported in checkboxes, with no quantitative values: Health, Education, Transportation, Power and Energy, Water Supply, Relief, Sewerage, Industrial/Services, Other services. The second data card reports an event with the same date and duration, but the description of the cause is "Earthquake with magnitude 5.6 Richter" (*Tërmet me magnitudë 5,6 Rihter*) and effects are reported.

Another query for earthquakes for the period of November and December 2020 showed 20 data cards (Table C.1), only one of which has a reported quantitative indicator for the casualties.

According to the PDNA report prepared after the earthquake, extensive damage was observed in 11 municipalities, including Tirana and Durres. As a result of the disaster, a total of 202 291 people were affected in the country, 47 263 directly and 155 029 indirectly. The earthquake caused 51 fatalities and injured at least 913 people. Moreover, up to 17 000 people were displaced due to the loss of their homes. In terms of damage, 321 educational institutions and 36 health facilities were reported with damage, 11 490 housing units were categorized as fully destroyed or for demolish and 83 745 partially or lightly damaged. There was damage to buildings for emergency response, office buildings, municipality buildings, river embankments, infrastructure and the productive sector. The total damage and losses were estimated at 985 million Euro.

**Table C.1: Data cards from DesInventar query for Albania the event earthquake in the period 01/11/2019 to 31/12/2019**

| Number of data cards | Date | Region* | District* | Deaths | Destroyed houses | Losses, US $ | Losses, ALL |
|---|---|---|---|---|---|---|---|
| 10 | 2019/12/19 | Durrës | Durrësit | 51 | 0 | 0 | 0 |
| 2 | 2019/12/19 | Lezhë | Kurbinit | 0 | 0 | 0 | 0 |
| 1 | 2019/12/17 | Fier | Lushnjës | 0 | 0 | 0 | 0 |
| 1 | 2019/12/6 | Durrës | Krujës | 0 | 0 | 0 | 0 |
| 1 | 2019/11/22 | Fier | Fierit | 0 | 0 | 0 | 0 |
| 2 | 2019/11/1 | Korçë | Devollit | 0 | 0 | 0 | 0 |
| 3 | 2019/11/1 | Korçë | Kolonjës | 0 | 0 | 0 | 0 |

* In the table, the terms "Region" and "District" are as used in *DesInventar* system. For the case of Albania, "region" corresponds to the first level of administrative division of 12 counties and "district" seems to correspond to the second level of administrative division - municipalities.

## Query for the earthquake in May 2014

A query for an earthquake event in the period 19th of May to 31st of May 2014 resulted in 47 data cards, 45 for the first event and 2 for the second (Table C.2). The first earthquake is registered in the data cards with magnitude 4.5 and the second with magnitude 5.6. This is inconsistent with the information found on the USGS Earthquake Catalogue, based on which the first earthquake was with magnitude 5.0 and the second on the 20th of May was with magnitude 4.6. No seismological report was found on the site of IGJEUM IGJEUM - IGJEUM - Institute of GeoSciences, Energy, Water and Enviroment-Seismologic bulletin to compare the qualitative entries. According to an Albanian news channel 5.2 Richter earthquake - Top Channel (top-channel.tv) damage have been observed to residential buildings and schools, three apartment buildings were damaged in Cerrik, together with others in the suburbs, some houses have been damaged in Belsh, Hysgjonaj, Lushnje and Gostime, two of which have been declared inhabitable.

**Table C.2: Data cards from DesInventar query for Albania the event earthquake in the period 19/05/2014 to 31/05/2014**

| Number of data cards | Date | Region* | District* | Deaths | Destroyed houses | Losses, US $ | Losses, ALL |
|---|---|---|---|---|---|---|---|
| 1 | 2014/5/19 | Berat | Kuçovës | 0 | 0 | 0 | 0 |
| 32 | 2014/5/19 | Elbasan | Elbasanit | 0 | 37 | 0 | 2081004565 |
| 2 | 2014/5/19 | Elbasan | Gramshit | 0 | 0 | 0 | 2405878 |
| 10 | 2014/5/19 | Elbasan | Peqinit | 0 | 0 | 0 | 31007330 |
| 1 | 2014/5/25 | Elbasan | 0 | 0 | 0 | 0 | 0 |
| 1 | 2014/5/25 | Elbasan | Librazhdit | 0 | 0 | 0 | 0 |

* In the table, the terms "Region" and "District" are as used in DesInventar system. For the case of Albania, "region" corresponds to the first level of administrative division of 12 counties and "district" seems to correspond to the second level of administrative division - municipalities.

# D. DEFINITIONS FOR THE TERMS USED IN THE RISK DATA CATALOGUE

The six main Data groups are:

**Baseline data –** this data group contains information that may not be directly related to risk assessment and its components, but it is important for the interpretation of the risk analysis results and also for the basis of risk reduction strategies, investment prioritization and post-disaster recovery. Sometimes, it is difficult to make a clear classification of data within Baseline data and the data potentially useful for the other components of the risk assessment – exposure and hazard.

**Exposure –** people and all tangible human assets located in the hazard-prone areas, like infrastructure, housing, production capacities, agricultural land, etc. The data categories and types should be linked to the hazard-specific vulnerability on one side and to the risk metrics on the other side. Almost all the categories have a data type called Cost, which basically corresponds to the exposed value, the monitory equivalent of the impact, direct and indirect consequences. The definition of Exposure used in the catalogue is consistent with the definition stated in Law 45/2019, namely "people, infrastructure, housing, production capacities and other human assets present in hazard zones that are subject to potential losses", which is almost identical to the definition in DCM no.810, 21.10.2020[22].

**Hazard -** a process or phenomenon that may cause loss of life, injury or other health impacts, property damage, social and economic disruption, or environmental degradation. Hazards may be single, sequential, or combined in their origin and effects. They can have natural, associated with natural processes and phenomena, or anthropogenic, associated with human activities, origin. The definition is fully consistent with the one state in Law 45/2019 and DCM no.810, 21.10.2020[22]. The focus of the current catalogue are the natural hazards, technological and environmental hazards due to human activities are outside the scope. What makes the classification challenging is the interconnection between the hazards and the fact that some hazards could be secondary (consequential) to other hazardous events. In other words, there is difference between the trigger sources and the process types. For example, ground shaking could be the result of a tectonic earthquake but could be also the result of a volcanic eruption, or landslide could be triggered by an intensive rainfall or an earthquake. The approach that was chosen for the classification of the hazards in the catalogue is the following: the data type reflects the trigger source, and the sub-type indicates the processe. For differentiation of same processes triggered by different sources, a different letter is added to the names of sub-types. The definitions in *DesInventar for hazard types relates directly to the sub-types defined in the proposed catalogue*.

**Vulnerability -** are the conditions determined by physical, social, economic, and environmental factors or processes which increase the susceptibility of an individual, a community, assets or systems to the impacts of hazards. A vulnerability relationship depends on both, the type of asset and the type of hazard the asset is exposed to. It is basically the link between a certain intensity measure describing a hazard and the expected losses/consequences as a result of the impact on an asset or a portfolio of assets due to that hazard. Vulnerability relationships can be derived empirically based on data from past hazardous events, can be derived analytically through analytical models, van be based simply on experts' judgement or a combination of the three. Vulnerability functions can be also obtained by linking fragility functions

(functions that describe the expected damage given an intensity measure of a hazard type) with consequence models (the correlation between the level of damage and the expected losses/consequences). Hence, the data categories defined within the Vulnerability data group are *Fragility functions, Consequence models and Vulnerability function directly*. Ideally, what this data group should contain is vulnerability relationships for all the exposure asset types (6 categories as defined) under all relevant hazards (6 categories in total as defined). In reality, this data group is the least complete, especially when it comes to local sources and vulnerability relationships developed for the specifics of the assets in Albania. That is why, the catalogue suggests many international sources, the data from which should be verified before application for the case of Albania. The definitions of vulnerability in Law 45/2019 and DCM no.810, 21.10.2020[22] complement each other and are fully consistent with the definition of the term used here for the catalogue. Law 45/2019 states that "Vulnerability" shall mean conditions determined by physical, social, economic and environmental factors or processes which increase the susceptibility of an individual, a community, asset or service network to the impact of hazards." and DCM no.810, 21.10.2020 defines Vulnerability as "The characteristics and circumstances of a community, system or asset that make it susceptible to the damaging effects of a hazard".

It is important to note that the terms "vulnerability" and "vulnerability models" are often used with a slightly different meaning in the context of different risks. For example, for flood risk, the terms often refer to the damaging potential of the flood, which is different levels of damage to assets given water depth or water velocity. In the context of earthquake risk, a vulnerability model links the consequences (losses, affected people, downtime, etc.) due to the damage to a ground shaking intensity measure and fragility models are used to describe the levels of damage. In the catalogue, the second definition of the term is used, which is why there are some datasets classified as Data type Fragility functions but with "vulnerability" in the name.

**Risk -** the potential losses (direct and indirect, tangible and intangible), loss of life, injury, or destroyed or damaged assets which could occur to a system, society or a community in a specific period of time under hazardous events. This data group includes results from previously completed risk assessments, available models and methodologies for the performance of risk assessments. The risk categories were conditioned to the 6 hazard categories and the corresponding data types for the hazard trigger sources. The expectation is that each of the data type should contain information about the direct and the indirect damage and losses. Similar to the other terms, there is no conceptual difference in the definitions of Risk for the catalogue and the acting legislation. Law 45/2019 states that "Risk" shall be the combination of the probability of an event and its negative consequences" and DCM no.810 defines it as "Risk is the combination of the consequences of an event (hazard) and the likelihood / probability that this event will occur".

**Capacity -** the strengths, attributes, and resources available within an organization, community or society to manage and reduce disaster risks and strengthen resilience. The definition of capacity used for the catalogue is almost identical to the one stated by Law 45/2019. Sometimes, the capacity assessment is integrated with the risk analysis results into one risk assessment and other times it is a subject of an independent analysis with its own complexity and scope.

## Baseline data

**Administrative regions** – State boundaries, Counties, Municipalities, Municipality units, Parcels, Cadastre zones, Protected zones

**Geodesy** – Grid, Coordinate system, Reference points

**Topography** – features of the land surface - Elevation models, Elevation contours, Costal lines

**Land cover** – the physical material at the surface of the earth - Urban, Rural, Forest, Grassland, Costal zones

**Geology** – Engineering geology maps, Soil profiles, Geotechnical databses

**Socio-Economic indicators** – varieties of socio-economic parameters on a national or regional scale

## Exposure

**Population** – all aspects related to community demographics, development, and well-being.

- **Demographics** – structure, distribution, size of the population
- **Human development indicators** – indicator that genuinely "counts" for people's lives, quality of living and well-being – healthy life, access to knowledge, decent standards of living. Such are often expressed with combined indexes.
- **Cost** – monetizing life using different methods based on a wide range of disciplines including economics, health care, adoption, political economy, insurance, worker safety, environmental impact assessment, and globalization.

**Building** – all building assets that are not in the list of critical infrastructure and facilities based on Law 45/2019 and are not part of the infrastructure

- **Occupancy** – the building purpose and use
- **Structure** – main properties of the load-bearing components and systems
- **Conditions and functionality** – all the information related to the inside environment of the building, living conditions and services
- **Surroundings** – information related to the surrounding environment
- **Cost** – all cost associated with building, replacement and retrofit of buildings and restoration of their functionality

**Infrastructure** – the set of fundamental facilities, systems and network that support the sustainable functionality of households, companies, and economy, in general, the physical components of interrelated systems providing commodities and services essential to the societal living and maintenance of the surrounding environment. It is composed of private and public assets

- **Transportation** – the fixed installations that allow a vehicle to operate, network and related facilities and buildings (example: roadway, terminals and stations, facilities for parking, facilities for maintenance, repair and support of the network and vehicles)
- **Telecommunication** – facilities and network for electronic transmission of information over distances
- **Utility networks** – the network and the related facilities that provide the energy, water and sanitation

**Sectors and Industries** – data related to the economic activity of consumers and businesses - economic indicators, (added value, revenue, employees, enterprises, ownership, economic activities, export/import, etc.), development, sustainability, capacity, and other indicators

**Primary sector** – companies engaged in economic activity that utilizes the Earth's natural resources, including processing and packaging of raw materials

**Secondary sector** – companies engaged in processing, manufacturing, and construction and overall production of goods from the natural products within the primary sector

**Tertiary sector** – companies that provide services, such as retailers, entertainment firms, financial organizations, etc.

**Quaternary sector** – companies engaged in intellectual activities and pursuits

**Cross sectoral data** – datasets that provide comparative cross sectoral statistics and information

**Habitats and Biotopes** – characterisation of geographical areas being functional for living organisms

**Biotopes** being the spatial environment of a biotic community;

**Habitats** being the spatial environment of specific species.

**Critical infrastructure** – this category includes all assets as defined by Law 45/2019 and specified in the approved lists. At the time of preparing the catalogue, the only approved list of critical infrastructure available was the one on information/cyber security VENDIM1 Nr. 553, datë 15.7.2020[39]

**Models** – prepared and ready to use exposure models

## Hazard

**Geophysical** – hazard originating from solid earth[40]. This term is used interchangeably with the term geological hazard because it includes all hazards with geological origin.

**Earthquakes** – shaking of the surface of the Earth resulting from a sudden release of energy creates seismic waves. The earthquakes can be natural, caused by tectonic movements or man-made, induced by human activity such as mining, gas extraction, fluid injection for enhanced oil recovery, dams, etc. The current catalogue considers only natural ground shaking

**Mass movement G** – mass movements other than surface erosion of a hillside and not associated with excessive ground water

**Volcanic activities** – all processes related to active volcanoes

**Meteorological** – hazards caused by short-lived, micro- to meso-scale extreme weather and atmospheric conditions that last from minutes to days[39]

**Extreme temperature** – change of the atmospheric temperature well above/below the average for the season

**Storm** – strong winds that can also happen in combination with rain, or snow, or ice pieces, or lightening

**Rain** – precipitation, includes punctual, persistent or torrential rain, or rain exceeding the rainfall averages of a specific region. Unusual long rain periods. Rain includes terms such as downpour, cloudburst, heavy shower, deluge, persistent drizzle, squalls, etc[41].

**Fog** – a visible aerosol consisting of tiny water droplets, ice crystals suspended in the air or dust particles

39 VENDIM1 Nr. 553, datë 15.7.2020, PËR MIRATIMIN E LISTËS SË INFRASTRUKTURAVE KRITIKE TË INFORMACIONIT DHE TË LISTËS SË INFRASTRUKTURAVE TË RËNDËSISHME TË INFORMACIONIT. (DECISION 1 Nr. 553, dated 15.7.2020, ON THE APPROVAL OF THE LIST OF CRITICAL INFRASTRUCTURE AND THE LIST OF IMPORTANT INFRASTRUCTURE) regarding the security of information

40 Classification | EM-DAT (emdat.be) [https://www.emdat.be/classification]

41 DesInventar definition

**Hydrological** – hazards caused by the occurrence, movement, and distribution of surface and subsurface freshwater and saltwater

**Flood** - overflow of water that submerges land that is usually dry

**Mass movement H** – mass triggered by presence of water and water flows

**Wave action** – the effect of surface water waves

**Climatological** - hazards caused by long-lived, meso- to macro-scale atmospheric processes ranging from intra-seasonal to multi-decadal climate variability[39]

**Drought** – Unusually dry season, without rain or with rain deficit. These are long periods (months, years, and even decades) typical in limited continental areas or on regional scales[40]

**Wildfire** – The event includes all open-air fires in rural areas, natural and artificial forests, plains, etc.[40]

**Biological** - hazards caused by the exposure to live organisms and their toxic substances (e.g. venom, mold) or vector-borne diseases that they may carry[39]

**Epidemic (humans, plants, animals)** – rapid spread of disease to a large number of people, animals and vegetation within a short period of time

**Pandemic** - epidemic of an infectious disease that has spread across a large region, across multiple continents or worldwide, affecting a substantial number of individuals

**Invasive species** - organism that causes ecological or economic harm in a new environment where it is not native

**Extraterrestrial** – hazards originated outside earth

**Impact** – hazards related to airburst and meteor impact

**Space weather** – hazards related to the changing environmental conditions in near-Earth space - magnetic fields, radiation, particles and matter, which have been ejected from the Sun

## Vulnerability

**Fragility functions** – indicate the probability that a component, structures, or system will be damaged to a given or more damage state given different intensities of a specific hazard

**Consequence models** – relationships that link different levels of damage to losses and consequences

**Vulnerability** – defines the probability of expected losses / consequences given different intensities of a specific hazard

## Capacity

**Institutional** – refers to the policies, procedures, and processes as well as the functional structure, roles and responsibilities set in the legal basis for DRR and DRM

**Organizational** – structures and systems, which shape how various actors come together to perform given functions, such as implementing a policy or program

**Competence** – the level of skills, both technical and functional, from the ability to conduct geospatial analysis, to an individual's professional motivation and awareness. Law 45/2019

**Resources** – this includes the financial resources allocated to DRR, as well as, the availability of required data, tools, methodologies, information, training materials, etc.

# E. DEFINITIONS OF THE DAMAGE AND LOSS TERMS AS USED IN THE PROPOSED METHODOLOGY

- **Damage/direct loss (tangible)** - the total or partial destruction of physical assets and stock. Damage is considered to occur during and immediately after the disaster and is measured in physical units like square meters, kilometres, cubic meters, numbers, etc. The value of damage is used as the basis for the estimation of the reconstruction needs. The monetary value of damage is expressed in terms of repair/replacement costs according to prices prevailing just before the event. The repair/replacement cost should include all expenses anticipated as part of the retrofit or reconstruction works – labour, design and approval, permits and taxes. For the current methodology, demolition and debris removal is included in the indirect losses and the recovery needs and additional cost to meet the "build-back-better" principle is included in the increased resilience.
- **Indirect losses (tangible)** – all losses associated with the unexpected expenditures to meet humanitarian needs during the post-disaster emergency phase and changes in economic flows and services arising from the disaster. Examples of such losses are: cost for temporal restoration of services; relocation and temporal shelter; training emergency workers; higher operational costs due to the destruction of physical infrastructure and inventories or losses to production and income; diminished production or service provision due to the total or partial paralysis of activities; additional costs incurred due to the need to resort to alternative means of production or provision of essential services; income reduction; additional costs for dealing with new situations arising from a disaster; lost production or income due to linkage effects, similar to those that occur during a recession; etc. The indirect losses are measurable in monetary terms and re-expressed in current values. The indirect losses are included in the estimation of recovery needs and increased resilience.

**Damage loss and indirect loss give the total loss.**

- **Intangible effects** – these are effects that cannot be converted into monetary value or are difficult to identify, associated with the damage and the indirect losses. They are associated with human perception and behaviour, community values and interaction. They are independently estimated in addition to the tangible losses.
- **Macro-economic effects** - reflect the manner in which the disaster modifies the performance of the main economic variables of the affected country. The macroeconomic effects must not be added to the total losses, since they reflect the repercussions of direct damages and indirect losses. Rather, macroeconomic effect estimates are a complementary way to assess direct damages and indirect losses from a different perspective.
- **Reconstruction** – it is estimated based on the direct losses plus additional cost to execute the retrofit or reconstruction.

- **Recovery needs and Increased resilience** – it includes all the other additional costs needed to restore services and production, with considerations for quality improvement, technological modernization, disaster risk reduction features and similar. Recovery and increased resilience are usually considered together because it is often difficult to strictly differentiate activities between one or the other type.

Japan-World Bank Program
for Mainstreaming Disaster Risk Management
in Developing Countries

GFDRR
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