Learn to Be Resilient 1010017950 – L2BR – UCMP-2020-KN-AG

Evaluation - Case study on City of TIRANA in prevention preparedness, and response to earthquakes

Work package:	**5**
Deliverable Number:	**5.2**
Lead Beneficiary:	**Municipality of Tirana**
Contributing Beneficiaries:	**NALAS, SCMUS, UZGF, UoM, AAM, ALA, ACC, AMC, MoI, IPH**
Dissemination Level:	**Public**
Date:	**October 26, 2022**

MUNICIPALITY
OF TIRANA

Evaluation - Case study on City of TIRANA in prevention preparedness, and response to earthquakes WP-5/D5.2

Contributing Authors: Miranda DEDA

Genc Hoxhaj

Adela Krajka

TABLE OF CONTENT

LIST OF FIGURES

LIST OF TABLES

1. EARTHQUAKE THREAT

1.1. History of Earthquakes in the vicinity of City of Tirana

Albania is a country with very high risk of natural hazards. Country Risk Profile Albania is vulnerable to earthquakes, floods, forest fires, and landslides. The International Disaster Database (EMDAT) shows that during the period 1979–2019, but also Desinvantar national database[1] , showed that floods accounted for the major share of disaster events, followed by forest fires and earthquakes.

According to the annual World Risk Report (Bündnis Entwicklung Hilft and RUB 2021), which calculates the Disaster Risk Index for 180 countries based on exposure, susceptibility, vulnerability, and coping and adaptive capacities, Albania ranks as 61th in the world with very high risk, and in the Europe the second one. Of Albania's total territory, 86 percent is prone to disasters; this area generates 88.5 percent of gross domestic product (GDP). Average annual losses due to disasters are about 2.5 percent of GDP, or about US$68.7 million per year. Albania is hit by approximately one disaster a year.

Just in the last 20 years the number of **earthquakes in the country has been increased**, this can be seen in the quick analysis of the DesInventar database, the unique Disaster Data Loss database operationally in use by the National Agency for Civil protection from 2013. The *Graphic 1* show that.
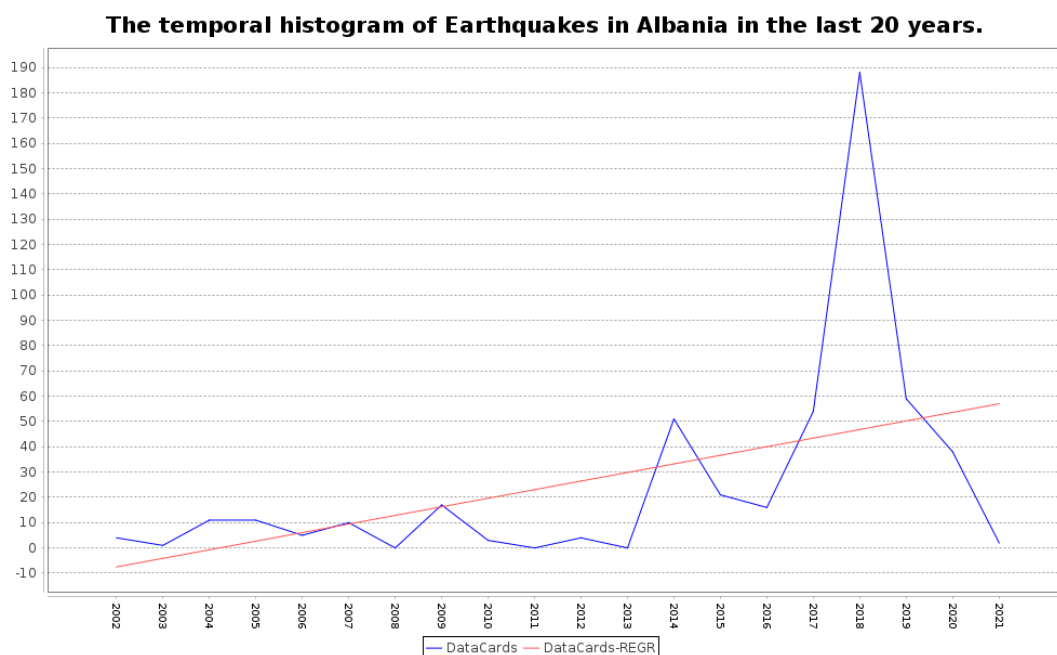
Figure 1. The Accumulative numbers of earthquakes by year in Albania in the last 20 years. Source: DesInventar database Albania

---

[1] *DesInvaantar database – UN methodology implemented in Albania in the 2013. Is the unique disaster data losses database in the country, operationally at the National Agency for civil protection.* Financed by UNDRR and Implemented by CIMA Research Foundation.

The history of the earthquakes in the Tirana and his vicinity areas if we investigate the database, we can see that **has been significant events in the last 20 years,** but the biggest one it was the earthquake of 26 November 2019. This event it was also evaluated as the biggest in 40 years in the country.

The *table 1* presented the historical earthquake disaster data losses in the interested area, but the Economic losses are incomplete for the last event of 26 November, because the process it was not finalized.

Table 1. Historical earthquake events in Tirana and vicinity municipalities Kamza and Vora, and their effects. (Source DesInventar database)

Event	Area	Year	Data Cards	Deaths	Injured	Houses Destroyed	Houses Damaged	Directly affected	Indirectly Affected	Evacuated	Economic losses
EARTHQUAKE	Tiranë	2003	1								
EARTHQUAKE	Tiranë	2007	1			1		3			475276
EARTHQUAKE	Tiranë	2010	1				1				591003
EARTHQUAKE	Tiranë	2012	1			1					3421980
EARTHQUAKE	Tiranë	2017	1								
EARTHQUAKE	Tiranë	2019	1	1	283	3592	5884	14652	48059	3170	
EARTHQUAKE	Tiranë	2020	1								
TOTAL			7	1	283	3594	5885	14655	48059	3170	4488259

1.2. Tirana 26 November 2019 Earthquake

According to the Albanian Institute of Geosciences[2] on 26th November 2019 at 03:54, a devastating earthquake, with a magnitude of 6.3 on the Richter scale at a depth of 38 km, hit the country. The epicentre was 22 km from Durres and 30 km from Tirana, where most of the major historically recorded earthquakes have occurred, in the convergent boundary between the Eurasian Plate and the Adriatic Plate. After three strong aftershocks with Mw 5.1 to Mw 5.4 on the same day, the increased seismic activity continued for a few months with regular Mw 4 earthquakes until at least the beginning of January 2020 (EEFIT report 2020).

According to this study the estimated epicentres and magnitudes of the felt earthquakes (Mw > 3.5) in the sequence based on ANSS Comprehensive earthquake catalogue [2.4] are shown in *Figure 2*.

Figure 2. Albanian earthquake sequence of 2019

Source: ANSS ComCat [2.4], EDSF fault traces [2.3], base map from OSM

---

[2] https://geo.edu.al/site/

The earthquake has been described by the national authorities as the strongest to hit Albania in 40 years. **It caused extensive damage in 11 municipalities**, including the two most populous, urbanized and developed municipalities (Tirana and Durres). The worst affected municipalities were: Shijak(6.6%),, Durres(31,5%), Kruja(8.75%), Tirana(30,8%), Kamza(2%), Kavaja(7,0%), Vora(5,1%). The other five municipalities comprise the remaining 10% of effects (PDNA report).

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. Overall, first responders rescued 48 people from collapsed houses.
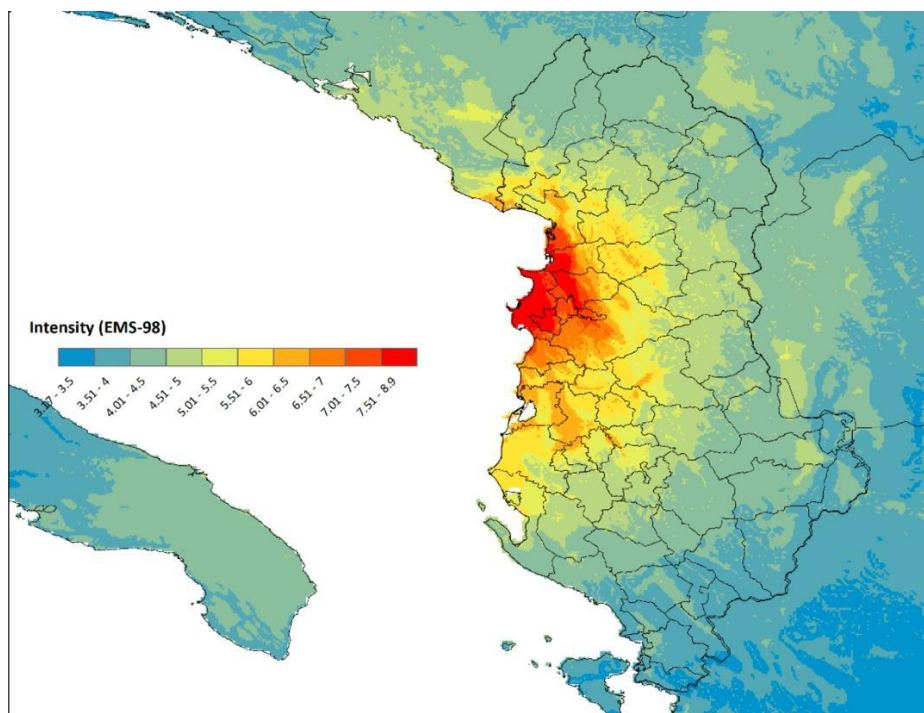
Figure 3. Map showing the modeled seismic intensity distribution of the main shock. The red darkest colour corresponds to intensity VIII (severe) on the European macroseismic intensity (EMS-98) scale and the yellow and orange shades correspond to intensities VI and VII (strong and very strong, respectively).

1.2.1. Basic earthquake data

This strong earthquake caused extensive **damage to** the two most populous, urbanized and developed municipalities Tirana and Durrës(Source: WB report).
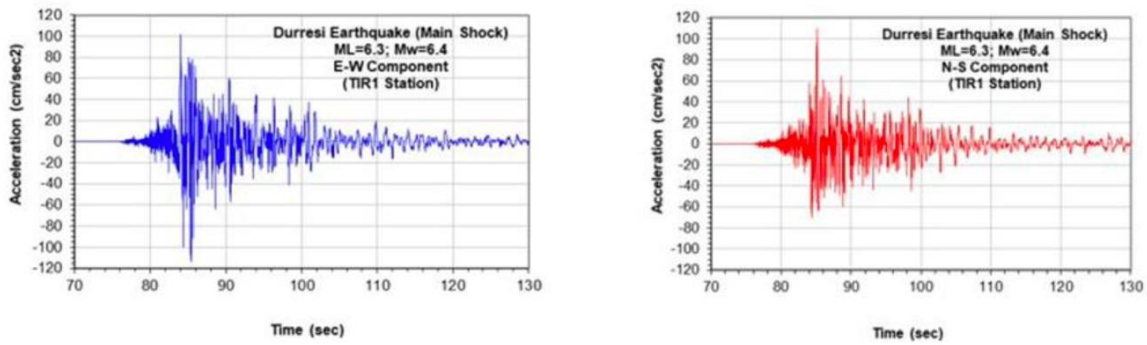
Figure 4. Strong motions recorded in Tirana during the 26th November earthquake (source IGEWE)

The PDNA Analysis show that the economic impacts are dominated by damages **to residential buildings** (three quarters of the total), followed by **commercial/public buildings** (just under 10% of the total), while effects to the infrastructure and the health sector are the lowest. More than half of the total damages occur in the four municipalities (Durrës, Krujë, Shijak and Vorë) around the epicentre of the earthquake, and just under **a third in Tirana and surrounding area (Kamëz and Vora municipalities).**

Considering the damage estimation for each municipality done by the PDNA, we can directly estimate the total event damages and loses just for the Tirana Municipality with 31%, and his respectively surroundings municipalities Vora with 5% and Kamza with 2%. The *figure 5* represent an approximation of the damages in different sectors caused by the direct earthquake effects.
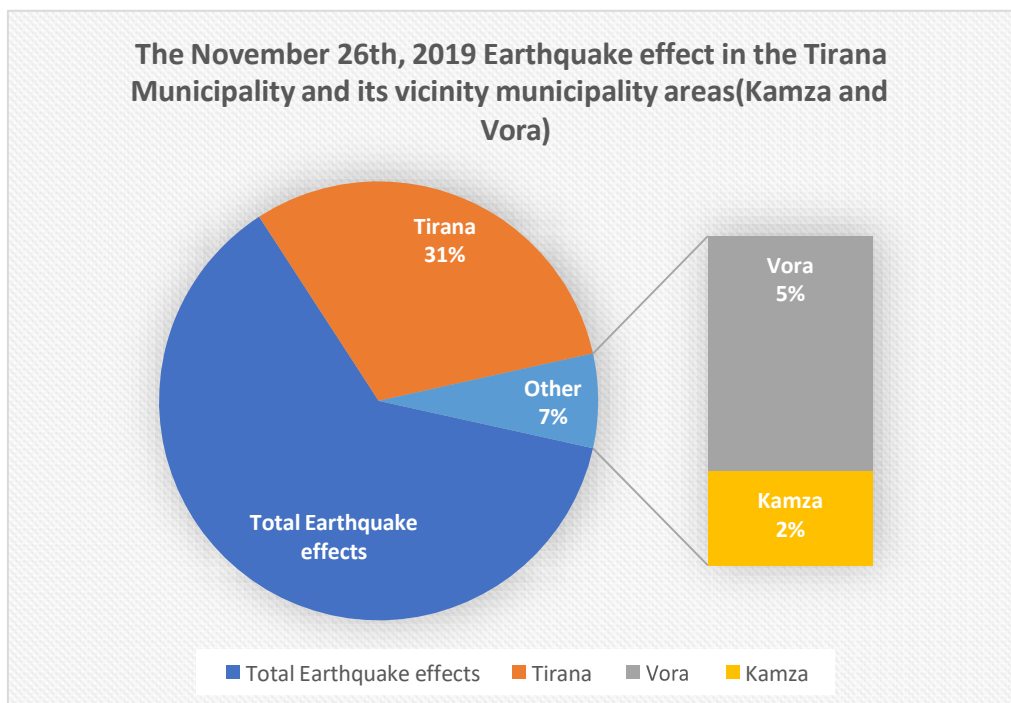
Figure 5. The direct effect of earthquake of 26 November 2019, in Tirana and his vicinity municipalities Vora and Kamza. Source: PDNA -UNDP.

1.2.3. Losses and Damages to the City

Estimate of the breakdown of the economic damage in absolute values (in million USD). The yellow bars highlight the damage severity in each zone relative to the damage in the epicentral zone for the sector.

The total value of damage and losses just for Tirana calculated by PDNA through UN methodology for different sectors are represented in *table 2* in follow. The damage estimated for each sector is represent in the in million EURO.

Table 2. Damage and losses in Million EURO for Tirana Municipality and his vicinity municipalities (Kamza and Vora)(source: PDNA)

Losses	Education	Health	Housing	Infrastructure	Productive	Social protection	Civil Protection and DRR
Tirana	46,06	2,13	214,33	15,56	21,91	0,06	3,40
Kamza	0,06	-	14,49	0,49	1,25	0,06	1,82
Vora	1,18	0,02	40,16	1,00	5,59	0,06	1,80
Total in M/Euro	**47,30**	**2,15**	**268,98**	**17,05**	**28,75**	**0,18**	**7,02**

The direct effect of this devasting event to the people leaving in the epicenter of earthquake ne surrounding areas has been very shocking. The *table 3* in following represent the damages and losses in the case study area of Tirana, Kamza and Vora municipalities.

Table 3. It was estimated approximately the effect of earthquake in the life of people directly on 26 November 2019.

	Deaths	People ignured	Afected	Directly Affected	Indirectly Affected	People Displaced
Total Earthquake effect in people in affected the area	51	913	202291	47265	155028	10225
Tirana	1	283	62710	14652	48059	3170
Vora	-	46	10115	2363	7751	511
Kamza	-	18	4046	945	3101	205

1.2.4. Prevention and Preparedness Pre-Earthquake Measures

According to the Disaster Risk Reduction Strategies of UNDRR, the countries need to address disaster resilience comprehensively, several factors need to be addressed simultaneously:

$\Rightarrow$ physical resilience —which includes, for instance, seismic reinforcement.

$\Rightarrow$ social resilience —which includes better early warning and emergency preparedness.

$\Rightarrow$ financial resilience —which includes preparedness to manage financial and fiscal impacts of disasters.

The countries lake Albania the most appropriate measures to decrease the disaster risk is to invest in the *low measures*, like social resilience, focused on the early warning and emergency preparedness. This means that the financing capacity of the country to invest in *hard measures* like the physical's resilience or the financial resilience are very limited due to different factors that the country has overpassed.
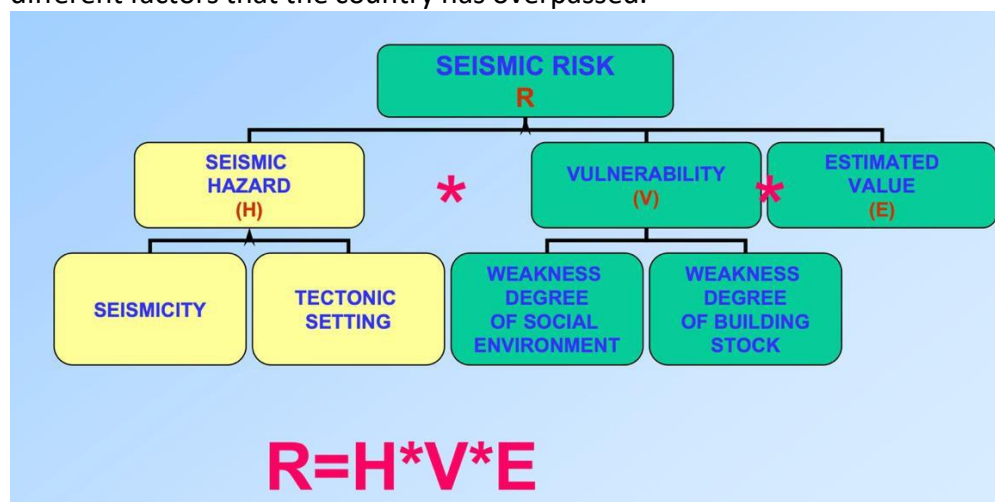
Figure 6. The factors that direct impact the Seismic risk value.

The *figure 6* represents all the factors that have a direct impact in the values of seismic risk calculations. The factors represented in the yellow colored are factors that are unpredictable, and we cannot change them. The unique value that we can intervene **is to decrease the Vulnerability.** An earthquake or other seismic event is impossible to prevent, but in high-risk areas that Albania and especially Tirana is measures can be taken to limit the most negative effects related to damage to life and property of citizens. The prevention and preparedness are essentially for the reducing the vulnerability in the city. The most important actions to do that are:

Monitoring, analyzing and estimation of seismic risk

Increasing the capacity of the scientific institutions in the country specifically the Institute of geosciences. This will improve the enactment of specifications and recommendations for the elaboration of studies related to seismic hazard to produce the respective maps. Ensuring of reliable seismological data and increasing the monitoring and maintenance of a Network of Seismographs.

Standard building

Means to **fully adopt the Eurocodes and technical specifications for building** in the new constructions, especially. This will be essential for improving construction quality and decreasing seismic risk for the feature. Improvements, adoption and enforcement of building Eurocodes and standards to withstand seismic shaking, can reduce damage to people and private and public property. Preventive and preparatory measures also reduce possible damage to supporting infrastructure (health facilities, main public buildings, roads, railways, airports, water supply systems, energy, etc.), which will be very important for the phase of managing with and recovering from a seismic shock (National Operational Plan 2004).

Building back better is very important to decrease the risk of disaster. In case of earthquake 26 November 2019 all the new buildings construct has been according to the new building standards. The new construction in seismically prone areas should be designed to withstand stronger seismic shocks than required by standard codes and is a worthwhile investment. This investment is cheaper than upgrading existing old structures.

Also a special focus need to have to the Important objects that pose a risk, such as dams, public and private infrastructure, it is important to maintain them at least at the level of the original standards, looking for ways and means to ensure the highest maintenance conditions in them and, if it is necessary, making improvements without delay to the structures(Prevention web).

Emergency planning and preparedness

According to the law on Civil Protection nr.45 date 18 July 2019, National Agency for Civil Protection is in charge for the Disaster Risk Management in the country. Based on that all the prefectures and respective municipalities are constraint to prepare yearly the **Civil Protection emergency plan**. This plan needs to have a strict structure according to the to the National Operational Plan (2004), and a detailed analysis of the most important risks of this prefecture. The earthquake risk is one of the most important risks that Tirana municipality is affected the city. Tirana with the respective municipalities (Kamza and Vora) prepared and updated yearly emergency planes with detailed analysis of the most important risks of them.

The Emergency planning is coordinated also with all the other territorial plans that the municipalities need to have in place. The *figure 7* demonstrate the land use map used in the Plan for Territorial Development of Tirana municipality.
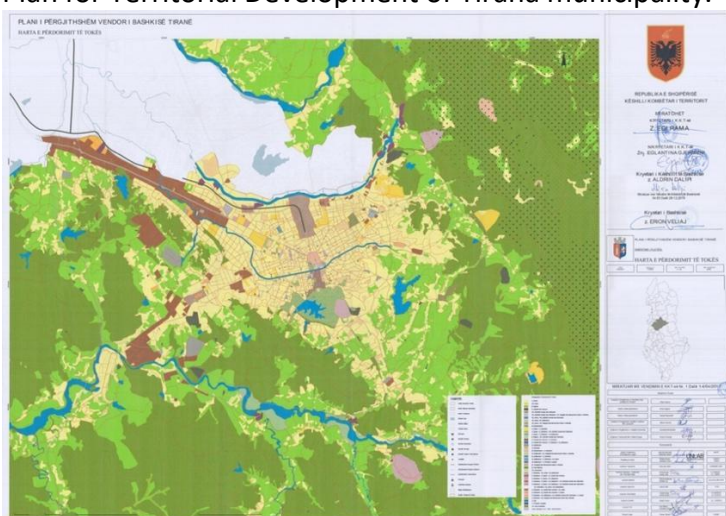
Figure 7. The land use map part of the Territorial General Plan of Tirana Municipality. (source: National Agjenisia Kombetare e Planification te Territorit)

Briefing of citizens

The education is one of the most important components to increase the awareness and knowledge e for the vulnerability decreasing in case of earthquakes. The most important actions are related to the:

- School education programs;
- Educations seminars to school teachers;
- Bring of citizens on the subject related to earthquake;
- Forming and training of group of citizens.

2. PANDEMIC THREAT

2.1. History of Pandemics in the vicinity of City of Tirana

There is not much information on the earliest epidemics and pandemics on the territory of the present -day City of Tirana. Tirana is proclaimed as capital city of Albania in 1920. Before that period, it was a small town in the center of the country. Only after the proclamation as the capital and Tirana was become the most populated city of Albania.

The history of the pandemic is as long as the history of man itself. The first recorded epidemic of Black Death in the Albanian today dated 1372-76 when territory was under the Byzantine Empire. It was spread from Northern Greece to Albania.

In 1814–15 the plague epidemic spread from the Ottoman Empire to Albanian territories, including Tirana.

In the 19th century the epidemic of cholera has affected Albanian territories. It began to spread throughout city of Vlore and Durres as port cities to all the country.

The Spanish influenza epidemic was spread in Albania during the early September of 1918. When the pandemic known as the Spanish flu spread in Albania, the country at that time was administered by foreign armies, the Italian, Austro-Hungarian and French.

Consequently, its management cannot be said to have been centralized. At that time, the country lacked a well-organized health system, doctors, and hospitals to cope with a health event of this magnitude.

Two measles epidemic peaks: epidemic of 1947-48 with 40,106 cases, and epidemic of 1954-55, spread all over the country, with 190,020 cases.

The epidemic of peaks Rubella were recorded over the period: 1969 with 3,676 reported cases, epidemic of 1985, the largest one, with 78,594 reported cases, and epidemic of 1994 with 3,432 reported cases.

Among the first "imports" epidemics to Albania in the post-communist era have been cholera, syphilis, hepatitis-B and AIDS.

After chaotic change in the political system, the Albanians massively slip illegally into Greece and Italy. That migrant work force is believed to be more than 500,000 and was the source of the sudden emergence of AIDS in this country, with 10 HIV-positive cases identified in less than a year and three Albanians already sick with the virus.

In September 1994, cholera struck Albania. The first case was found in the city of Berat and the entire hospital and Berati region was quarantined. Tirana was not affected.

After 2000 no major pandemic or epidemic such as SARS, 2002, Bird flu, 2003, Swine flu, year 2009, MERS-Cov, 2012, has affected City of Tirana with significant impacts, until COVID-19 pandemics.

2.2. Covid-19 Pandemics

On March 8, 2020 the first two cases of Sars-Cov-2 were identified and hospitalized in Tirana. As a result of the situation created by COVID-19, the goverment of Albania declared the state of natural desaster starting from 24th of March untill 23th of June 2020.

COVID 19 STATISTICS

City of Tirana COVID 19 statistics
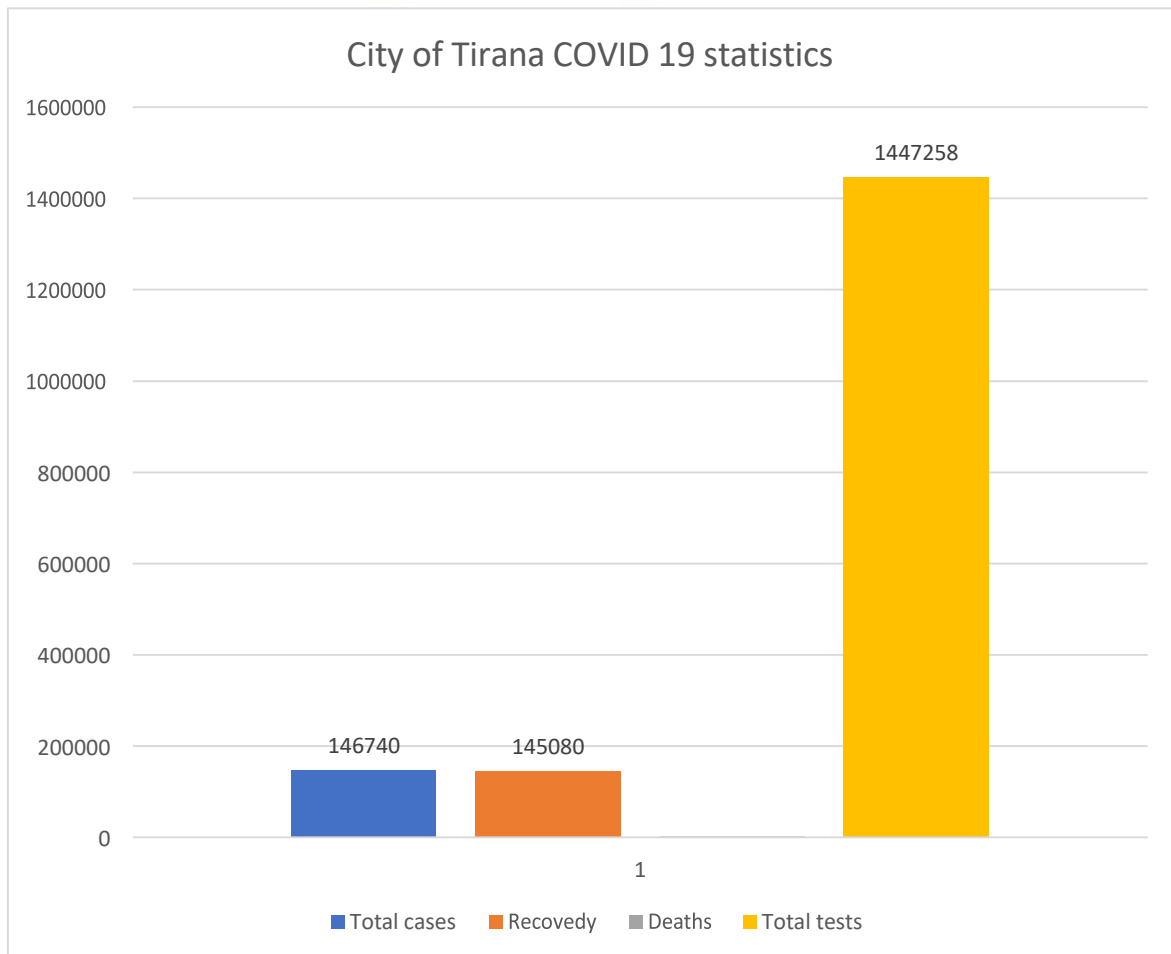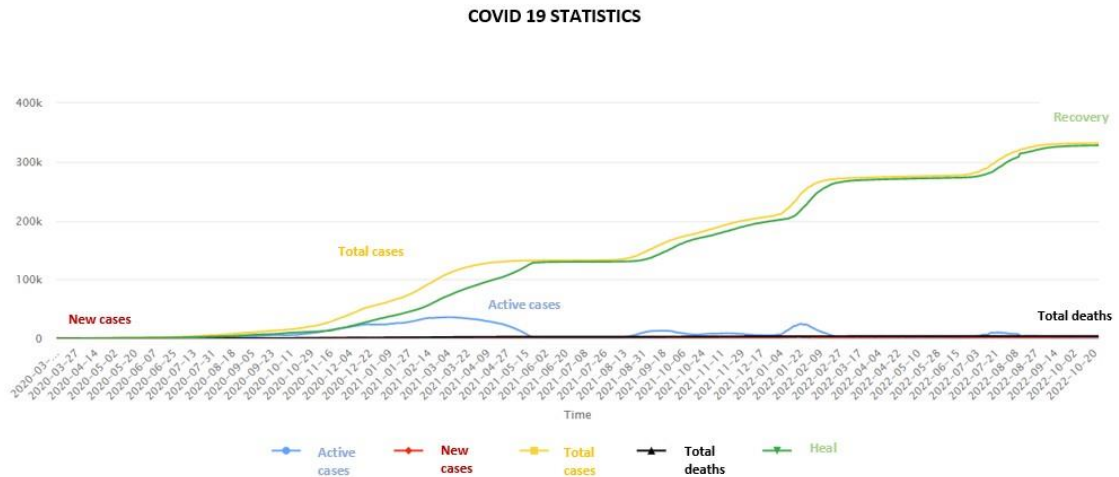
Figure 8. City of Tirana COVID 19 statistics

Affected by age group
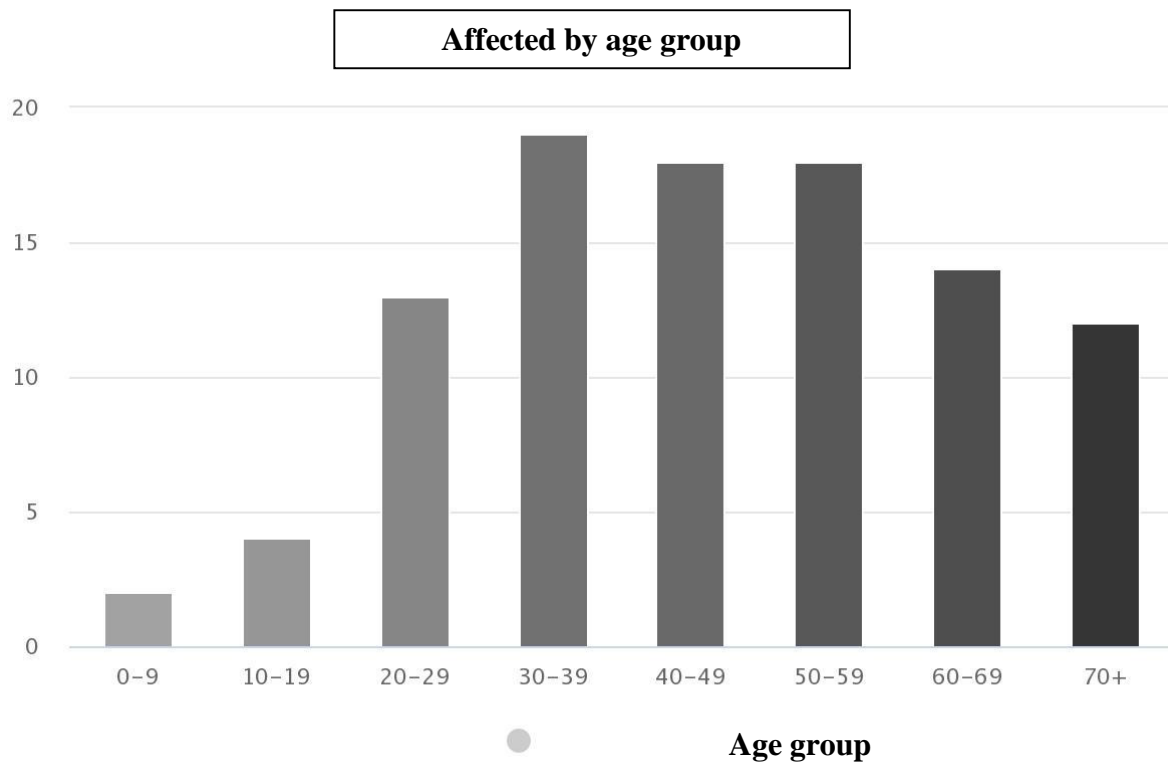
Highcharts.com

Table 4. Hospital capacities in City of Tirana

No.	Hospital	Total beds	Emergency beds	Neonatology and premature birth beds
1	TIRANË (Trauma)	252	17	0
2	TIRANË (QSUT)	1569	19	0
3	TIRANË (M. Geraldinë)	148	2	98
4	TIRANË (K. Gliozheni)	132	0	61
5	TIRANË (Sh. Ndroqi)	193	16	0
6	TIRANË (QKMZHF)	30	0	0
	Totali	**2324**	**54**	**159**

2.2.1. Epidemiological Situation in the City

From the identification and hospitalization in Infectious Diseases (ID) service of University Hospital Center Tirana of the first two cases and so far in this service that includes 3 Covid hospitals, over 8000 patients have been hospitalized (4). Facing a new syndrome in our country not encountered before with similar forms SARS Cov and MERS, based on the initial media data or the first articles on it that focused on symptoms such as fever, dry cough, dyspnea, asthenia; we focused on each of the signs and symptoms referred by the patient, the variety of clinical forms, concomitant diseases clinical forms that appear. In the first 12 weeks, cases were hospitalized with positive RT-PCR of mild forms to severe in order to receive early medical treatment and limit the spread of the virus, through negativity in the hospital and then "self-isolation" after discharge for up to 14 days. As the months went by and the progressive increase of cases and the emergence of new genetic variants of Covid19

we encountered as a result a wider spectrum of clinical forms, the severity of the presentation and the most affected age groups.

Based on the place of residence, the highest frequency of infections was encountered in Tirana, the capital city of Albania (44.9%), due to the higher population density and testing capacities in the capital.

Clinical aspects:

Among the most common signs and symptoms there were weakness 98.6%, fever 92.3%, paleness 86.4%, dyspnea 88.2%, cough 82.3%, myalgia 72.2%, sweats 72.9%, arthralgia 69.7%. The most affected age group was between 50-79 years (comprising 75% of the overall number of participants). There was evidence of a more prevalent moderate type of disease with an increase in the age of the affected patients with Sars Cov 2. On the other hand, the age group over 80 years was less prevalent compared to some studies in other countries, because Albania is characterized by a young population and social centers and asylums are in smaller numbers which explains the lower exposure of older people in Tirana (1-3,7). There was evidences of male predomination (with 64.8% of the cases).

A variety of 20 symptoms; their manifestation varied from 1-30 days, with greater predominance in the number between the day 5-11 before hospitalization. In the analysis made on their number for each patient, the most predominant ones had 7-11 symptoms. Age was a strong risk factor for severe illness, complications, and death (15-17). The most frequent underlying diseases included hypertension and diabetes mellitus (52% and 26.4%, respectively). Our detailed analysis indicated also the time when the symptoms started among patients affected (14-25). Prediction of symptoms onset (days) was run through multiple linear regression controlling for age, sex and comorbidities. Variables in equation significantly predicted symptom onset $F(4, 2995) = 22.669$, with few symptoms and few comorbidities. It seems they started as mild cases for many days unpredictably precipitating. There were also a few cases with many comorbidities, but a few symptoms upon hospital admission. In conclusion, this study provides useful evidence about Covid-19 in Albanian adults including its demographic distribution, symptomatic diversity and the clinical signs manifested.

2.2.2. Losses and Economic Impact to the City

As COVID-19 infections began to be reported around the world, many countries responded by shutting down places like schools, workplaces and international borders in order to contain the spread of the virus.

The COVID-19 pandemic situation has impacted the city's economy considerably with the main immediate effects felt by the trade, tourism, and services sectors. The impact can be easily observed through the revenue collection performance of the city, where except the real estate sector (building permits), every other financial indicator in Tirana has underperformed.

The Tirana region accounts for about 40.4% of the country's GDP, which makes it the main economic engine of Albania. Approximately a third of the Albanian population lives in Tirana, and a third of businesses operate in the capital. The main economic sectors of the city, employing the majority of its population are (in decreasing order) the trade and construction sectors, the public services sector, the tourism sector, and public administration.

Labour Market

According to the Albanian National Institute of Statistics (INSTAT), in the first quarter of 2020, the total unemployment rate at the national level increased by 0.2% in comparison to the last

quarter of 2019. The greatest increase is among women (0.9%), as well as among the age group 30 to 64 years old (0.8%). The total employment rate at the national level decreased by 1.3%, specifically in agriculture (2.8%), industry (0.9%), and service sector (0.3%). Given that Tirana hosts one third of the country's population, and is the most urbanized area of the country, the decrease in the rate of employment in the industry and service sector may be representative of the city.

Business Environment

Businesses were affected by the decrease of demand for products, which led to a loss of incomes and revenues, simultaneously bringing the problem of liquidity. According to data from the National Business Centre, in April until May 2020, a total of 221 business activities were unregistered in the city of Tirana, which constitutes around 54% of the total businesses unregistered in the country during the same period. At the national level, statistical observations from the Bank of Albania of the first quarter of 2020 conclude that the economic sensitivity of business, in particular of the service sector, had decreased drastically by 50.2 points, reaching a historically low level. The level of capacities employed from businesses during the first quarter also reached historically low levels, ranging from 56% to 64%, particularly for the construction and industrial sector

Financial Environment

According to official local government data, during the first quarter of 2020, the collected own revenues of the municipality of Tirana had decreased by 14% in comparison to the same quarter of year 2019. The major part of this decrease came from local taxes and local fees. Among the most important decrease in local tax revenues is the tax on infrastructure impact, with around 21.4%, while the small business income tax has exceptionally registered an increase in comparison to the same quarter of year 2019. Based on expert projections on the Municipality of Tirana, revenues in the next 5 semesters scenarios vary from -51 million Euros in the negative scenario to +17 million Euros in the positive scenario.

Economic Governance

The government allocated a total of ALL 45 billion (1.2% of total GDP) through two support packages for the population and the private sector affected by COVID-19. ALL 19.65 million was made available for the immediate needs of the most disadvantaged part of the population. USD 10 million was made available as a reserve fund to the Council of Ministers for any emergencies. The Albanian law 45/2019 'On social protection', Article 65, determines that the condition of a minimal local government budget for civil protection in case of emergencies is at 4%, and is to be financed from the central government conditional transfer. This arrangement is already in place; however, it remains isolated due to the lack of institutional governance and national strategic planning for crisis management.

2.2.3. Response to the Covid-19 Pandemics

Albania has experienced several waves of the pandemic. The first case of COVID-19 on 8 March 2020. Two and a half months later, there were around 300 cases and 10 registered deaths per million inhabitants. The data show that Albania had the lowest cumulative number of cases in the Western Balkans with 131 517 cases (45 953 cases per million inhabitants).
On 26 May 2021, it registered the lowest rate of daily new cases in the region. Albania has also the lowest number of registered deaths from COVID-19 in the Western Balkans deaths (850 per million inhabitants)

The prime minister declared a state of natural disaster throughout the economy on 25 March 2020. The government then prolonged the state until 23 June 2020 and took a series of measures to control the epidemic.

Albania had in place policy framework that provided a basis for dealing with the outbreak. It includes the National Civil Emergency Plan of Albania, the Ministry of Health and Social Protection Emergency Operation Plan, the National Pandemic Influenza Preparedness and Response Plan, and the Infectious Diseases Hospital Crisis Prevention Plan, Focused on Pandemic Flu H1N1 (WHO/European Commission/European Observatory on Health Systems and Policies, 2020[1]).

The Municipality of Tirana does not have an emergency preparedness for disaster response plan, nor any strategic document approaching crisis management. The COVID-19 pandemic crisis was managed solely from the central government. Municipalities in general have historically lacked the financial, human, and technical resources to draft or implement such a plan. With the lack of a plan, the role of the Municipality of Tirana was mostly limited to engaging volunteer groups to carry out activities as defined by the relevant Council of Minister's Decision on March 2020. This included delivering food and non-food supplies at home to vulnerable groups, payments, purchase of medicines, and COVID-19 prevention measures, among others. The Municipality also had a role in monitoring the application of the citizens' movement restriction. It managed to continue the delivery of the most basic public services, with the exception of public transportation, which was closed by ministerial order during the lockdown period, and remained closed for about one more month after the reopening. In relation to the financial resources, the annual budget at the start of the crisis was already approved by the Municipal Council and the Ministry of Finance and Economy. Under this restriction, the Municipal Council approved the deployment of the usual emergency fund, as well as a reallocation of the budget to support emergency expenditures, such as food and non-food supplies and the disinfection of market places. In addition, the local government took some initiatives to soften the economic crisis by revising the fiscal package in terms of tax exemptions, tax reduction, and tax payment postponement, respecting the policies of the central government. The central government supported salaries and firm liquidity with USD 100 million through the instrument of a sovereign guarantee. The government supported the businesses that had stopped working due to COVID-19 with a benefit of USD 14 000, which is used to pay their employees with the minimum wage of ALL 26.000.

The greatest challenge in the coordination between the central and the local government was the unpreparedness of the local government in the event of an emergency crisis and its complete dependency for local measures on guidelines from the central government. According to the study of Co-Plan and the Association of Local Autonomy, guidelines were not provided to the local government until the beginning of March, when the first cases of COVID-19 were confirmed in Tirana. Afterwards, continuous communication was established mainly with the Ministry of Health and Social Protection, National Agency on Civil Protection, Prefecture, Health Inspectorate, Association of Local Autonomy, and the State Police. There was little or no role seen from other actors, including private stakeholders and the civil society, in the crisis management. The current law on local self-governance in Albania entitles local government units with a significant role in terms of the strategic planning of recovery measures for civil protection in case of emergency; however, the inadequacy of local financial resources constitutes one of the major causes in the limited fulfilment of this function. Its

exercise is not currently charged to citizens by fee; therefore, the local government cannot generate its own revenues, while transfers from the central government are very limited. Inadequacy of local financial resources principally limits the building of local human capacities for strategic planning for civil protection. For the local government to fulfil a more significant role in crisis management, it is critical that the central government consolidates the institutional framework and provides national plans on which local plans may be elaborated. This would open the way to building cross-sectorial multi-level governance, including economic, financial, and technical governance.

The most significant intervention from the Municipality of Tirana is the adoption of a supportive fiscal package from March until August 2020, which has managed to relieve the situation for thousands of citizens (businesses and households) to some extent. The package includes postponing the application deadline for social housing programmes, postponing the payment of selected taxes for businesses from April to August, reducing the payment of selected taxes for businesses for a 2 month period, exemption of businesses from the payment of selected tariffs for March and April, and exemption of public transportation operators from the payment of selected tariffs from March until December. The Government of Albania supported small and medium businesses with the payment of their employees through a national minimum wage salary, erasure of credit payment arrears of active debtors, and exemption from profit tax for small businesses with a very low annual turnover. Concerning households, the most significant interventions are through financial support for those who are unemployed due to the COVID-19 pandemic, including unemployment benefits, and through televised education courses for primary and secondary school.

Vaccination is one the main measures against the COVID – 19. Until the October 25, 2022 in The Republic of Albania total number of vaccine doses consumed is 2,983,222 (Vaccinated with one dose: 1,322,702, Vaccinated with two doses: 1,268,099, Vaccinated with three doses: 366,851) (Government of Albania/ Ministry of Health and Social Protection, 2022)

2.2.4. Prevention and Preparedness Pre-Covid-19 Measures

In Albania, the national government led the entire process of crisis management. The government declared the state of natural disaster for the whole territory of Albania on 24 March 2020, for a period of 30 days through the decision of the Council of Ministers no. 243. It then extended it for another two months, until June 23, 2020, through a Parliament's decision, as defined in the Constitution. Within this broader framework, the government applied several containment measures, such as closing of borders, setting curfew times, isolation and quarantine, closing schools and any other public activities, banning travel and motorized mobility, forbidding the use of public open spaces and parks, etc.

Local government units, under the Civil Protection Law no.45/2019, have the responsibility to identify the populations at-risk and provide them with humanitarian aid in times of emergency, in coordination with higher levels of government. This competency was extensively tested during the crisis period, even though, a deeper analysis of LGUs' performance has not yet been conducted. Coordinated Referral Mechanisms (CRMs), with a tailored protocol endorsed by the Ministry of Health and Social Protection (MoHSP), managed urgent and non-urgent cases of domestic violence in the COVID-19 situation. More concretely, this DV case management protocol aims to assist CRM members in adequately handling domestic violence cases during the period of the pandemic caused by COVID19. The MoHSP Gender Equality Department shared this protocol with all municipal mayors and 61 Local

Domestic Violence Coordinators (LDVC), to encourage adoption by each CRM responsible structure. Similarly, the Ministry of Health and Social Protection issued a Ministerial instruction (nr 253 of 10 April 2020) which ensures continuation of protection services for the most at-risk children during COVID-19 emergency, confirming the child protection workforce as a core service during COVID-19. The Instruction introduces measures for Child protection system that ensure that Child Protection Workers will continue life-saving interventions to protect children at risk of violence, exploitation, abuse and neglect while ensuring that they are supported with the necessary personal protection equipment and the required logistics to make home visits for high-risk cases. The instruction also elaborates on the types of emergency protection measures and alternative care arrangements required during COVID-19 emergency.

Institute of Public Health of Albania (ISHP), is the National Center in the field of public health, consists in the development and application of the prevention and control of diseases, injuries, disabilities, environmental health-damaging factors, and the development and application of health promotion, in close cooperation with national and international agencies / organizations/organizations.

In more detail, the mission of ISHP is:

- Monitoring the health status of the population to identify in time and scientifically solve the encountered health problems.
- Identification and monitoring of health risk determinants.
- Undertaking and increasing the level of population information, education, and awareness on health problems.
- Stimulating, coordinating, and supporting the initiatives of institutions and communities in terms of the activities undertaken by them to identify and solve health problems.
- Stimulation and support of draft laws and regulations aimed at protecting the health of the population and its health insurance.
- Continuous training and education of public health workers and professional support to them.
- Assessing the effectiveness, accessibility, and quality of both population-based and patient-based health services.

Scientific research to provide innovative solutions to health problems and to establish effective strategies for disease control and prevention.

Mid- to Long-Term Recovery the Municipality of Tirana is currently working towards the development of a Crisis and Resilience Management Plan that also includes Pandemic and Earthquake response, where one of the main objectives is green recovery. It is also working on readapting the Sustainable Development Strategy 2018-2022 with post COVID-19 measures. Furthermore, the municipality is also developing ambitious urban interventions, such as an Orbital Forest, comprising a virtual wall of 2 million trees around the city to contain the urban sprawl, improve microclimate, and air quality and biodiversity; and the Tirana RiverSide project, a major post-COVID regeneration intervention, consisting of a 29-hectare green neighbourhood. Another major transformation is foreseen for the Kombinati neighbourhood, which was severely affected by the earthquake and is a flood prone area. This new strategic pole of the city, soon to be called KombinART, will become a cultural artistic pole that will be reconstructed as a resilient, sustainable, and smart city neighbourhood.

Ongoing resilience measures taken by the municipality immediately after the first cases of COVID-19 comprise of the enlargement of sidewalks, especially in central and more crowded

parts of the city, and the pavement of pop up bike lanes (over 4 km of new bike lanes as of April), improving the cycling infrastructure network and aiding citizens in public transport avoidance. The municipality is continuing to work to the increase public spaces, such as green and play parks in residency blocks for children and families in order to cope with the pandemic restrictions and distances and to avoid crowded spaces.

Vaccination is one the main measures against the COVID – 19. Until the October 25, 2022 in The Republic of Albania total number of vaccine doses consumed is 2,983,222 (Vaccinated with one dose: 1,322,702, Vaccinated with two doses: 1,268,099, Vaccinated with three doses: 366,851) (Government of Albania/ Ministry of Health and Social Protection, 2022).

3. MEASURING URBAN RESILIENCE

3.1. Urban Disaster Risk Index (UDRi)

Urban Disaster Risk Index (UDRi) – A risk communication tool which provides a holistic view of disaster risk by capturing through indices, both the direct physical damages of buildings and infrastructure. It also considers social vulnerability and lack of resilience that can aggravate the physical effects. The main objective of this indicator system is **to measure disaster risk from a holistic and integrated perspective to guide decision-making**, not only by considering the potential direct impacts of disasters but also by identifying multiple factors contributing to social vulnerability and lack of resilience in a city.

We have used the proposed methodology to describes three urban disaster risk and resilience indicator systems, developed as complementary tools to communicate risk and promote discussion around appropriate level risk and resilience strategies for Tirana city as case study the event of 26 November 2019.

The general evaluation of risk by means of indices is achieved by affecting the physical risk with an intensifying coefficient/impact factor (F), obtained by considering related conditions of the target event, such as the socioeconomic fragility and lack of resilience, that intensify initial physical losses. The total risk represented by UDRi depends on the direct effect, or physical risk, and the indirect effects expressed as a factor of the direct effects. Therefore, the total risk can be expressed as follows:

$$UDRi = R_F *(1+ F)$$

The physical risk, RF and the impact factor F is evaluated using transformation functions. The procedure for calculation of the total risk or UDRi is graphically presented in figure 8.
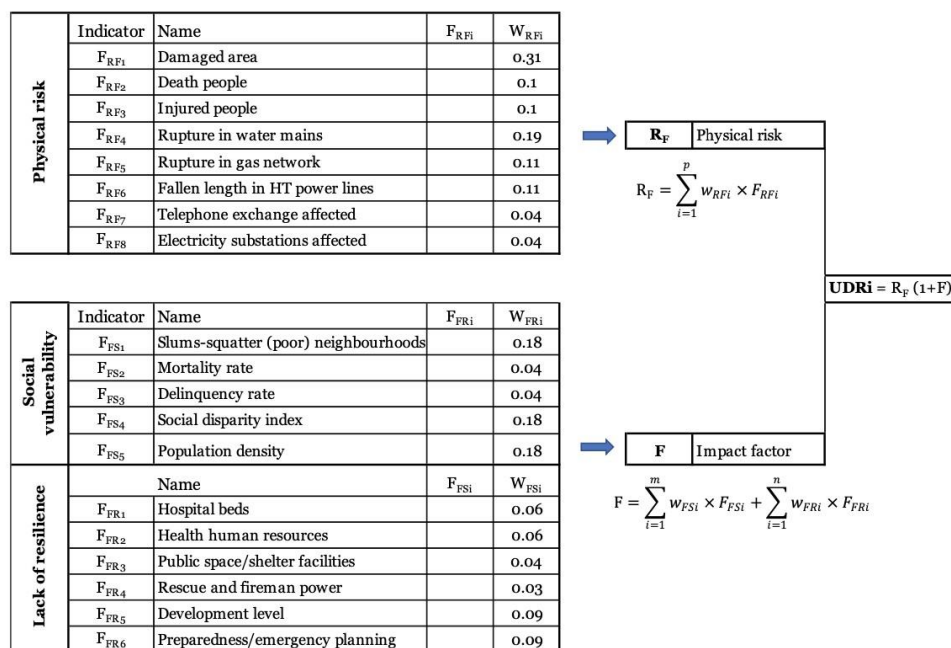
Figure 9. Urban disaster risk index methodology to be used for Tirana case study

The data required for the calculation of the Urban Disaster Risk Index (UDRI) were gathered from various official sources (e.g. INSTAT 2022, City of Tirana; Albanian Ministry of Health and Social Protection 2022, Albanian Institute of Public Health; Population census 2011, Albanian Institute for Statistics; Institute of Geosciences – Polytechnic University of Tirana, COVID and crime in 2020, Ministry of Interior, Albanian National Agency for Civil Protection, Ministry of Reconstruction, World Bank – Albanian data, etc.). In this case also the expert's judgment it was essential for data correlation and verification.

3.1.1. Tirana 26 November 2019 Earthquake

The implementation of the proposed methodology by the project L2BR for the Tirana municipality imply to developed on a multi-hazard evaluation environment and, therefore, it is necessary to include physical damage estimations for all the considered hazards. The evaluation of different impact factors is essential for a good analysis. The data is the challenge for assessment of different factors, we have tried to approximate and to collect data from different sources as it was explained in above mentioned.

- Total population number of Tirana Municipality is **919 511** citizens in the 2022, see the *figure 9.* Total area of Tirana municipality is 1 101 003 km2
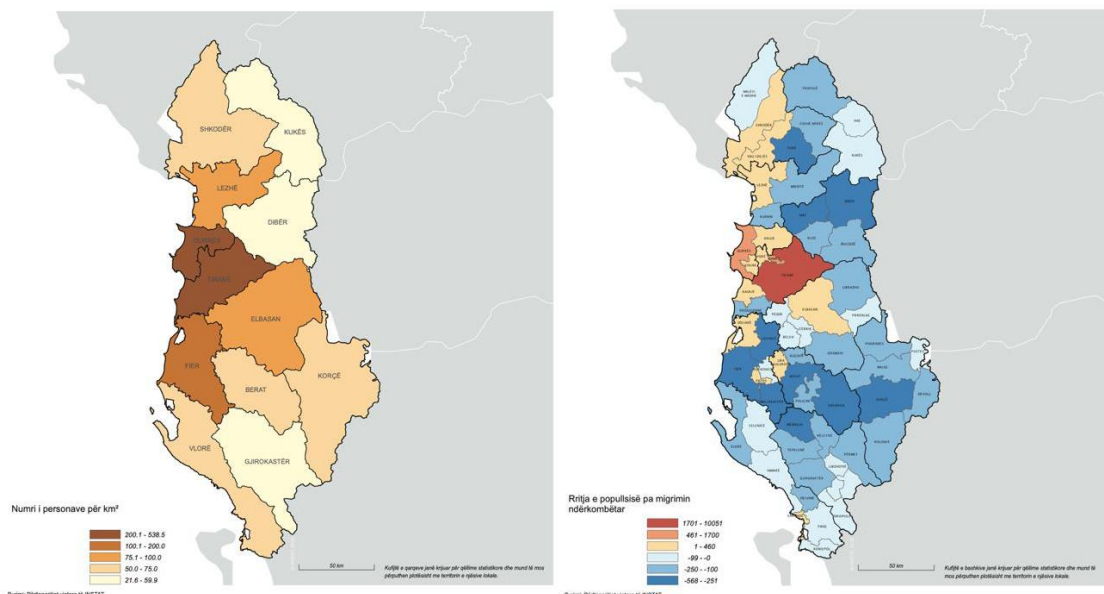
Figure 10. The population density by Qarks in all the country in the left side and The increasing number of populations in the country distributed by each municipality, without calculation of international migration of citizen, in the right side. Source: INSTAT

- The number of hospital beds for 1000 inhabitants for Albania from 1980, represented in the *figure 11.*
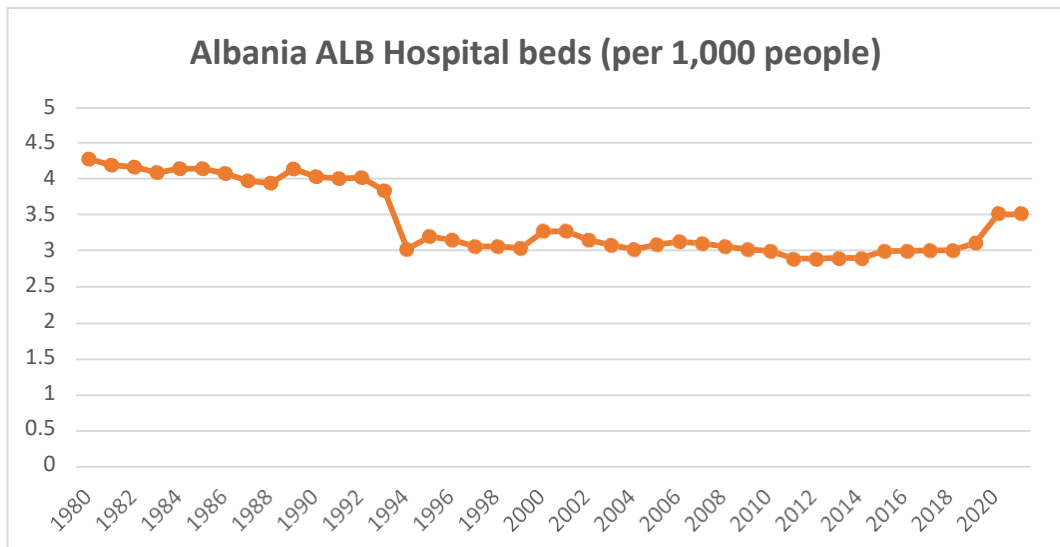
Figure 11. Albanian Hospital beds per 1000 people in years from (Source: World bank database)

- Poverty in Albania is estimated to have fallen significantly to **22 percent** of the population in 2021, and baseline projections for 2022 are thus far optimistic; however, inflation could disrupt this trend (World Bank)
- Albania nurses and midwives (per 1,000 people) was at level of 5.09 per 1,000 people in 2019, up from 3.65 per 1,000 people in 2016, this is a change of 39.42%[3].

The implementation of the methodology proposed according to the main factors that have a great impact in the population affected in case of earthquake disaster for Tirana municipality considering the event of 26 November 2019.

---

[3]   (https://knoema.com/WBHNPS2018DEC/health-nutrition-and-population-statistics?tsId=1197100)

In the table is presented the summary of indicators for the analysisng the Urban Disaster Risk index for 26 November 2019 earthquake for Tirana city.

Table 5. UDR index for the Tirana 26 November 2019 earthquake

	Indicator	Name	$F_{R Fi}$	W_{RFi}	$F_{R Fi} * W_{RFi}$
Phisical indicator	FR F1	Damaged area	1,5	0,31	0,465
	FR F2	Death people	0,001	0,1	0,0001
	FR F3	Injured people	0,21	0,1	0,021
	FR F4	Rupture in water mains	0,001	0,19	0,00019
	FR F5	Rupture in gas network	0	0,11	0
	FR F6	Fallen length in HT power lines	0	0,11	0
	FR F7	Telephone exchange affected	0,01	0,04	0,0004
	FR F8	Electricity substations affected	0	0,04	0
					0,48669
Social vulnerability	Indicator	Name	$F_{FS i}$	W_{FSi}	$F_{R Si} * W_{RSi}$
	FFS1	Slums-squatter (poor) neighbourhoods	0,1	0,18	0,018
	FFS2	Mortality rate	0.67	0,04	0.0268
	FFS3	Delinquency rate	0,2	0,04	0,008
	FFS4	Social disparity index	0,5	0,18	0,09
	FFS5	Population density	0,835	0,18	0,1503
Lack of Resilience		Name	$F_{FR i}$	W_{FRi}	$F_{FRi} * W_{RSi}$
	$F_{FR 1}$	Hospital beds	0,6	0,06	0,0036
	$F_{FR 2}$	Health human resources	0.1	0,06	0,006
	$F_{FR 3}$	Public space/shelter facilities	0,39	0,04	0,0156
	$F_{FR 4}$	Rescue and fireman power	0,3	0,03	0,0009
	$F_{FR 5}$	Development level	0,3	0,09	0,027
	$F_{FR 6}$	Preparedness/emergency planning	0,4	0,09	0,036

One of the main goals of this methodology is to **Lead and participating organizations utilizing UDRi for each of these areas** along with milestones and potential resource/funding requirements.

Table 6. The Urban disaster risk Index for Tirana City, related the earthquake event of 26 November 2019

Indicator	Formula	Value
R_F	$R_F = \sum i\text{-}p * W_{RFi} \times F_{RFi}$	0.48
F	$F = \sum i\text{-}p * W_{rfi} \times F_{rfi} + \sum i\text{-}p\ w_{rfi} \times F_{rfi}$	0.90
UDRI	**UDRI = R_F*(1+F)**	**0.93**

The transformation functions used to standardize the factors of physical risk, social vulnerability and the lack of resilience are shown in the following figure (red line marks the adopted value for the calculation).
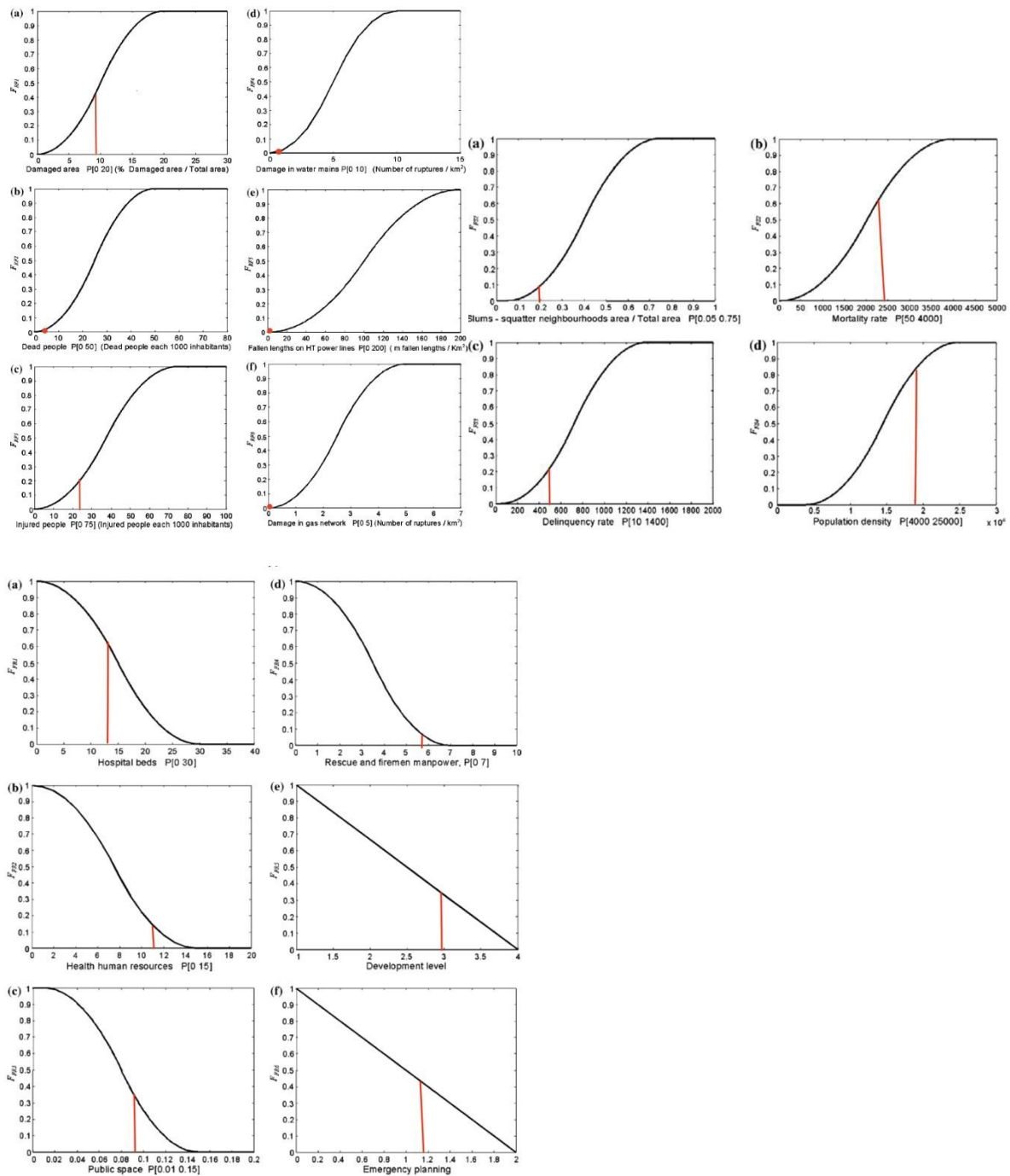
Figure 12. Transformation functions used to standardize the factors of physical risk, social vulnerability and the lack of resilience for Tirana (Carreño et al. 2007).

Earthquake of 26 November 2019 it was with high magnitude but the 33 km distance from Tirana, this has decrease the value of damages and losses the could be it was bigger that in the other affected areas of Durres and Mamurras city.

In conclusion, it is evident form the very high Urban Risk Disaster Indicator – UDRI = **0.93** due to the fragility of many factors that increase the risk values indicators of the city. Calculations of all the parameters make in evidence a very high density of the capital form one hand and from another low capacity of disaster management and resilience in the country to faced disasters like event of 26 November 2019.

3.1.2. Covid-19 Pandemics

The COVID-19 pandemic is still ongoing; therefore, the scenario has a progressive nature and a period of 0-5 years. During the pandemic, thousands of different variants of the SARS-CoV-2 virus have been discovered, and more variants will continue to be discovered. Among these variants, five have been declared variants of concern (VOC - variant of concern) by the WHO. Currently, the predominant variant is Omicron (B.1.1.529), which was first reported from South Africa on 24 November 2021 and was assessed as a VOC by the WHO Technical Advisory Group on the Evolution of SARS- CoV-2 (TAG-VE) on November 26, 2021. Currently, according to the GISAID database, in the European region the predominant variant is Omicron clade 21 L (BA.2) representing 87% of cases, followed by the Omicron clade 22B variant (BA .5), Omicron clade 22A (BA.4) and Omicron clade 22C (BA.2.12.1), which have been identified respectively in 7%, 3% and 2% of cases in the European region.

Currently, in Albania, the number of new infections from SARS-CoV-2 has been decreasing for two weeks due, number of hospitalized patients decreasing with the same pattern, although the numbers are modest compared to previous waves (currently 2 hospitalized) and only one loss of life in the last 30 days, but that tends to increase during the autumn and Winter.

Considering the seasonality of this respiratory virus, its possibility to have other mutations and to have future VOCs, the fading of immunity induced by the vaccine or from the previous infection, it is very likely that during the next autumn-winter period the number of infections increases several fold, although vaccine-induced immunity and previous infection should be able to limit the proportion of severe cases, hospitalizations, and loss of life.

The main impact will be on life and health, undoubtedly exceeding 50 deaths during the next three years and, according to the assessment methodology proposed by the AKMC, it is categorized at the level of catastrophic impact. Also, SARS-CoV-2 has shown that it can significantly affect the economy and the functionality of society, adding these effects to the catastrophic impact on life and health.

COVID-19 Scenario 1: Reasonable best case scenario*	
Transmissibility	The same
Immune evasion	Less / Better
The degree of internal severity	The same
Real degree of severity	Less / Better
Narratives	New variants appear but without major antigenic evolution, increased transmissibility, or a return to the intrinsic severity level of the Delta variant. Minimal evasion from immunity provided by current vaccines or previous infection. Minor seasonal/regional outbreaks from waning immunity and minor antigenic changes. Existing vaccines are used every year only for vulnerable people. Antivirals have a significant impact on mortality and morbidity and remain effective. Years with higher waves of SARS-CoV-2 tend to have less case of flu.

In the next 12-18 months	Relatively minor re-emergence in Autumn/Winter 2022-2023 with low case numbers with heavy shapes.
*Compared to the Omikron variant	

COVID-19 Scenario 2: centrist-optimist*

Transmissibility	The same
Immune evasion	The same
The degree of internal severity	The same
Real degree of severity	Less / Better
Narratives	Severe forms and mortality will be mostly limited to the vulnerable, the elderly and those without previous immunity. Updated vaccines will be given every year to vulnerable people, while to others only in the worst years. Voluntary defensive behaviors will be high during the wave period. Some states will impose non-pharmaceutical measures (eg: mask use) during bad years. Resistance to antivirals begins to emerge, limiting their use until therapies are available combined.
In the next 12-18 months	Seasonal wave of infections in Autumn/Winter of real size and severity comparable to Omikron current wave
*Compared to the Omikron variant	

COVID-19 Scenario 3: central-pessimistic*

Transmissibility	More / Worse
Immune evasion	More / Worse
The degree of internal severity	The same
Real degree of severity	The same
Naratives	High global incidence together with increased population immunity enables the unpredictable emergence of variants over many years, with a combination of increased immune evasion and higher transmissibility compared to the Omikron variant, sometimes more often than once a year and /or with internal roughness similar to the Delta variant in bad years. Existing immunity and updated vaccines continue to provide good protection against more severe forms. Although less severe, repeated waves of infection will cause widespread impairment of societal functioning and disproportionate impacts on certain groups, such as school-aged children. Comprehensive annual

	vaccination with up-to-date vaccines. Antiviral resistance has increased. SARS-CoV-2 waves do not reduce flu; waves of SARS-CoV-2 overlap, increasing the burden on health care systems. Some states impose more substantial non-pharmaceutical measures over the years bad.
In the next 12-18 months	The emergence of a new variant of concern causes a large wave of infections, potentially without long warning and outside the autumn-winter season. However, severe forms and mortality remain concentrated in certain groups (and are lower than before vaccination), such as the unvaccinated, the vulnerable and the the elderly.
*Compared to the Omikron variant	

COVID-19 Scenario 4: Reasonable worst-case scenario*	
Transmissibility	More / Worse
Immune evasion	More / Worse
The degree of internal severity	More / Worse
Shkalla reale e ashpërsisë	More / Worse
Narrativa	High global incidence, incomplete global vaccination and circulation in animal reservoirs lead to repeated emergence of variants, including recombination (exchange of genetic material between different variants infecting the same cell). Not all variants are equally challenging, but some of them show significant immune evasion of the immunity provided by vaccines and previous infection. Unpredictable changes in the way the virus causes disease alter the rate and age profile of severe disease and mortality, with long-term impactsafter infection. Extensive annual vaccination with up-to-date vaccines is required. Antiviral resistance is widespread. Voluntary protective behaviors are largely absent and/or a source of social conflict. The use of non-pharmaceutical measures is needed, especially when new variants appear at a faster rate than updating vaccination (and/or testing technologies fail).

In the next 12-18 months	This leads to a very large wave of infections with increased levels of severe disease observed in a wide spectrum of the population, although most severe forms continue to be felt mainly among people with immunity previous.
*Compared to the Omikron variant	

The institutions that were included in the technical working groups were:
- Ministry of Health and Social Welfare
- National Agency of Civil Protection
- Ministry of Agriculture and Rural Development
- Ministry of Tourism and Environment
- Public Health Institution
- National Authority of Food
- State police
- University of Medicine, Tirana
- Agriculture University of Tirana
- Health Care Services Operator

RISK IDENTIFICATION INDICATORS (RI)

Indicators	Level	Level 1: Little or no awareness	Level 2: Awareness of needs	Level 3: Engagement and Commitment	Level 4: Policy Engagement and Solution Development	Level 5: Full Integration
RI1. Systematic disaster and loss inventory	2		■			
RI2. Hazard monitoring and forecasting	2		■			
RI3. Hazard evaluation and mapping	3			■		
RI4. Vulnerability and risk assessment	2		■			
RI5. Public information and community participation	3			■		
RI6. Training and education on risk management	2		■			

RISK REDUCTION INDICATORS (RR)

Indicators	Level	Level 1: Little or no awareness	Level 2: Awareness of needs	Level 3: Engagement and Commitment	Level 4: Policy Engagement and Solution Development	Level 5: Full Integration
RR1. Risk consideration in land use and urban planning	NA					
RR2. Hydrological basin intervention and environmental protection	2		▓			
RR3. Implementation of hazard-event control and protection techniques	2		▓			
RR4. Housing improvement and human settlement relocation from prone areas	1	▓				
RR5. Updating and enforcement of safety standards and construction codes	3			▓		
RR6. Reinforcement and retrofitting of public and private assets	3			▓		

DISASTER MANAGEMENT INDICATORS (DM)

Indicators	Level	Level 1: Little or no awareness	Level 2: Awareness of needs	Level 3: Engagement and Commitment	Level 4: Policy Engagement and Solution Development	Level 5: Full Integration
DM1. Organization and coordination of emergency operations	3			▓		
DM2. Emergency response planning and implementation of warning systems	2		▓			
DM3. Endowment of equipment's, tools and infrastructure	3			▓		
DM4. Simulation, updating and testing of inter institutional response	2		▓			

Indicators	Level					
DM5. Community preparedness and training	2		■			
DM6. Rehabilitation and reconstruction planning	N/A					

GOVERNANCE AND FINANCIAL PROTECTION (FP)

Indicators	Level	Level 1: Little or no awareness	Level 2: Awareness of needs	Level 3: Engagement and Commitment	Level 4: Policy Engagement and Solution Development	Level 5: Full Integration
FP1. Interinstitutional, multisectoral and decentralizing organization	3			■		
FP2. Reserve funds for institutional strengthening	2		■			
FP3. Budget allocation and mobilization	3			■		
FP4. Implementation of social safety nets and funds response	2		■			
FP5. Insurance coverage and loss transfer strategies of public assets.	2		■			
FP6. Housing and private sector insurance and reinsurance coverage	NA					

3.2. Risk Management Index (RMI)

The Risk Management Index (RMI) is a tool that brings together a group of indicators that measure a city or country's risk management performance and effectiveness. These indicators reflect the organizational, development, capacity and institutional actions taken to reduce vulnerability and losses, to prepare for crisis and to recover efficiently from disasters. The proposed methodology in the project explained in the *Task 2.1 (2.2.2.3. Methodology for Assessment)*, their definition, aim and goals of the proposed indicator systems, as well as the participatory processes for their development, customization, and implementation will be further elaborated in the Tirana case study of 26 November 2019 Earthquake. For RMI formulation, four components or public policies are considered:

- Risk identification (RI),
- risk reduction (RR),
- disaster management (DM)
- Governance and financial protection (FP).

Assessment of each subindicator is made using **five performance levels: low, incipient, significant, outstanding and optimal, that corresponds to a range from 1 to 5**, where 1 is the lowest level and 5 the highest.

The data used to define the components of the RMI has been taken form the Tirana municipality, National institutions, literature, ongoing projects in the country on the fluid of Disaster risk reduction, civil protection, early warning system and emergency planning and recovery in the country.

3.2.1. Tirana 26 November 2019 Earthquake

In the following are reported an analysis for each of the components of the Risk Management Index. The analysis has been done using the value and the weight of each indicator as it was represented in the *table 6* bin undermentioned.

RMI - Indicators of Risk Identification(RI). The measurement of risk is relevant when the population recognizes and understands it.

	INDICATORES	Value (1-5)[4]	Weight	Σ (PL x W)
RI1.	Systematic disaster and loss inventory	4	0,15	
RI2.	Hazard monitoring and forecasting	3	0,1	
RI3.	Hazard evaluation and mapping	4	0,15	
RI4.	Vulnerability and risk assessment	3	0,35	**3,05**
RI5.	Public information and community participation	2	0,1	
RI6.	Training and education on risk management	2	0,15	
	Total value of Indicator			

Table 7. The Assessment of risk Information values for Tirana earthquake of 26 November 2019.

---

[4] *VALUES: five performance levels: low, incipient, significant, outstanding, and optimal, that corresponds to a range from 1 to 5, where **1 is the lowest level and 5 the highest.***

Risk Identification
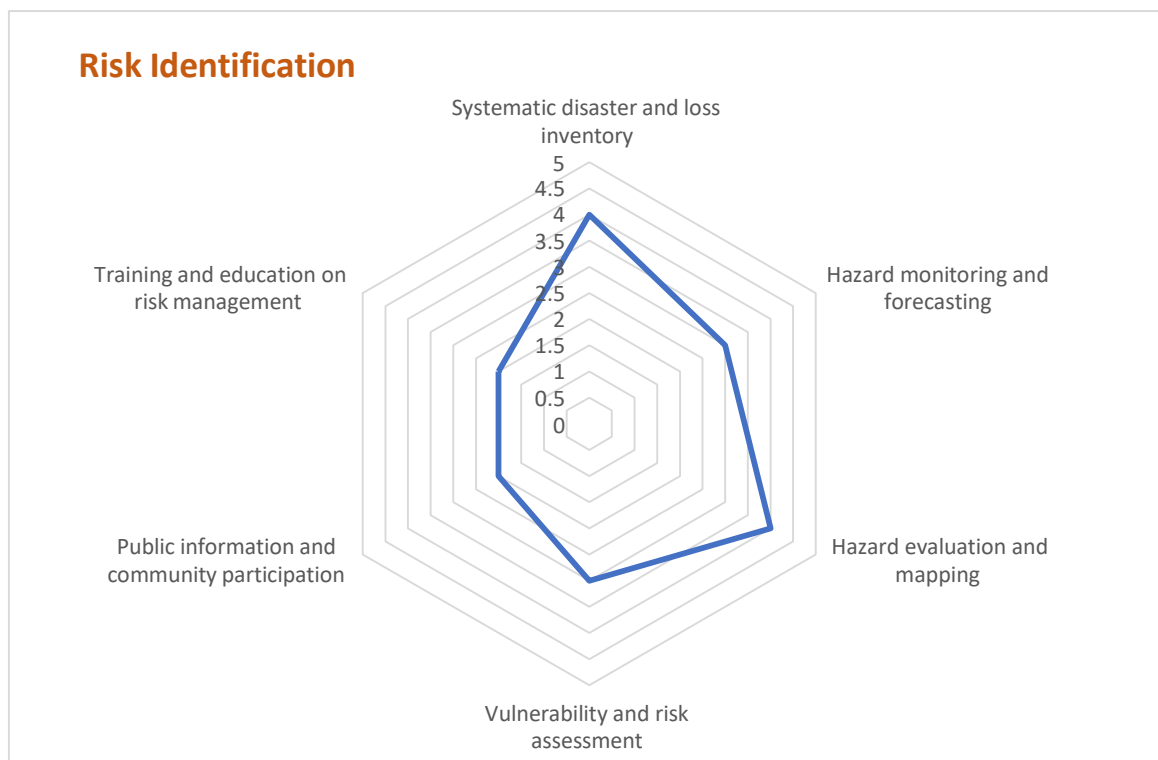
Figure 13. The Assessment of Risk identification related the Tirana 26 November 2019 earthquake..

The performance of all factors connected to risk identification indicators are reported as:
- the higher performance has been given by the Systematic disaster and loss inventory, segued by the hazard evaluation and mapping.
- the lowest performance is the training and education and public information community participation.

RMI - Indicators of risk reduction (RR)

This requires the execution of structural and non-structural prevention-mitigation measures, that is it implies planning processes. The most important indictors are reported in the table 7 and represented graphically in the figure 13.

Table 8. The assessment of risk Information values for Tirana, 26 November 2019 earthquake.

	INDICATORES	VALUE (1-5)	Weight	Σ (PL x W)
RR1.	Risk consideration in land use and urban planning	3	0,1	0,3
RR2	Hydrological basin intervention and environmental protection	3	0,1	0,3
RR3	Implementation of hazard-event control and protection techniques	2	0,1	0,2
RR4	Housing improvement and human settlement relocation from prone areas	2	0,25	0,5
RR5	Updating and enforcement of safety standards and construction codes	2	0,2	0,4
RR6	Reinforcement and retrofitting of public and private assets	2	0,25	0,5
	Risk Reduction Total value			**2,2**

Risk Reduction Indicator
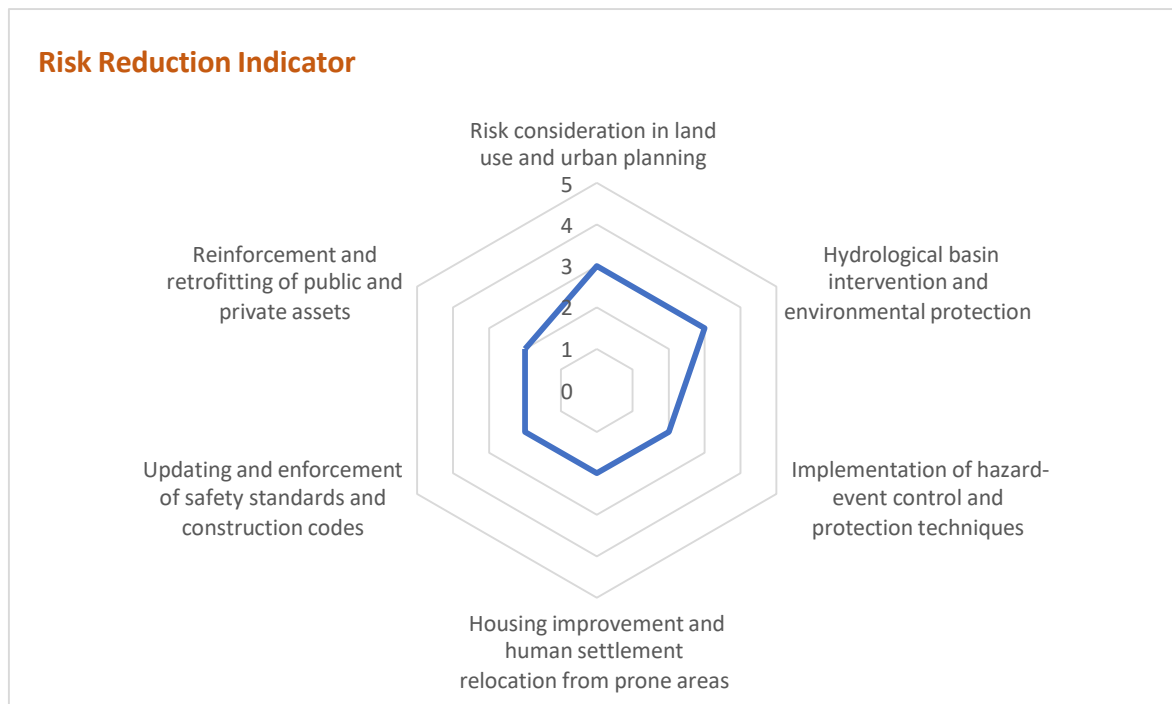
Figure 14. Assessment of Risk Management Index for Risk Reduction related the Tirana 26 November earthquake.

As it is evident from the analysis of each component accordingly to the weight of each of them, we have idealized that the structural and non-structural prevention-mitigation measures that directly implies the planning processes:

- the highest performance has been done by the non -structural measures, risk consideration in land use and urban planning segued by the hydrological basin intervention and environment protection.
- The lowest performance is identified by the structural measures.

RMI - Indicators of disaster management(DM)

Disaster management should provide appropriate response and recovery post disaster and depends on the level of preparation of operational institutions and the community. The indicators that represent the capacity for disaster management, DM. The *table 6* in the following represent the assessment for these indicators for Tirana taking into acount the last Earthquake event.

Table 9. The assessment of disaster management values for Tirana, 26 November earthquake 2019.

	Indictores	**value (1-5)**	**Weight**	**Σ (PL x W)**
DM1	Organization and coordination of emergency operations	4	0.3	1.2
DM2	Emergency response planning and implementation of warning systems	3	0.1	0.3
DM3	Endowment of equipment's, tools and infrastructure	3	0.15	0.45
DM4	Simulation, updating and testing of inter institutional response	2	0.1	0.2
DM5	Community preparedness and training	1	0.15	0.15
DM6	Rehabilitation and reconstruction planning	3	0.2	0.6

Total Disaster management Index	2.9
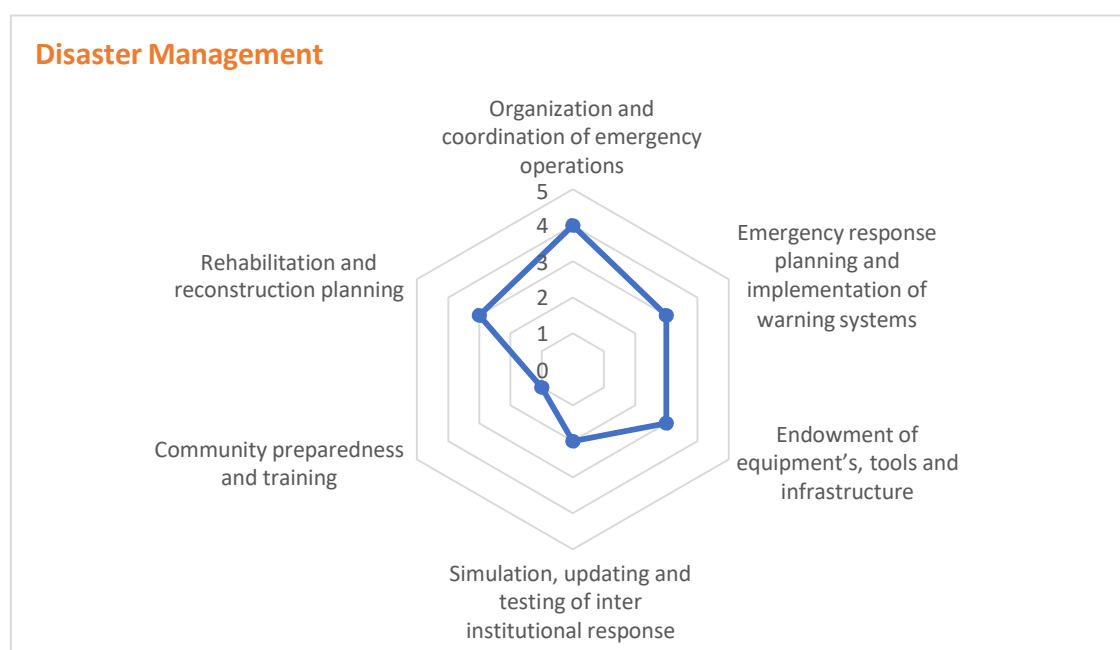
Figure 15. The Assessment for Disaster Management Indicator related the Tirana 26 November earthquake event 2019

Assessment of the performance of each indicator for the disaster management is very understandable, starting from the:

- higher performance of the organization coordination and Emergency response planning and implementation of warning systems
- The lowest performance has been identified the community preparedness and training followed by the rehabilitation and reconstruction planning.

RMI - Indicators of governance and financial protection(FP)

Governance and financial protection is fundamental for the sustainability of development and economic growth in a country, this implies coordination between different social actors that necessarily are guided by different disciplinary approaches, values, interests and strategies. On the other hand, governance depends on an adequate allocation and use of financial resources for the management and implementation of appropriate strategies for the retention and transference of disaster losses.

The *table 9* in the following represent the assessment for Governance and Financial protection indicators for the city related the target event.

Table 10. The assessment for indicators connected to Governance and financial protection values for Tirana 26 November earthquake 2019.

	Indicatores	Value (1-5)	Weight	Σ (PL x W)
FP1	Interinstitutional, multisectoral and decentralizing organization	3	0.3	0.9
FP2	Reserve funds for institutional strengthening	3	0.25	0.45
FP3	Budget allocation and mobilization	3	0.15	0.75

FP4	Implementation of social safety nets and funds response	2	0.1	0.2
FP5	Insurance coverage and loss transfer strategies of public assets.	1	0.1	0.1
FP6	Housing and private sector insurance and reinsurance coverage	1	0.1	0.1
	Governance and financial protection total value			**2.5**
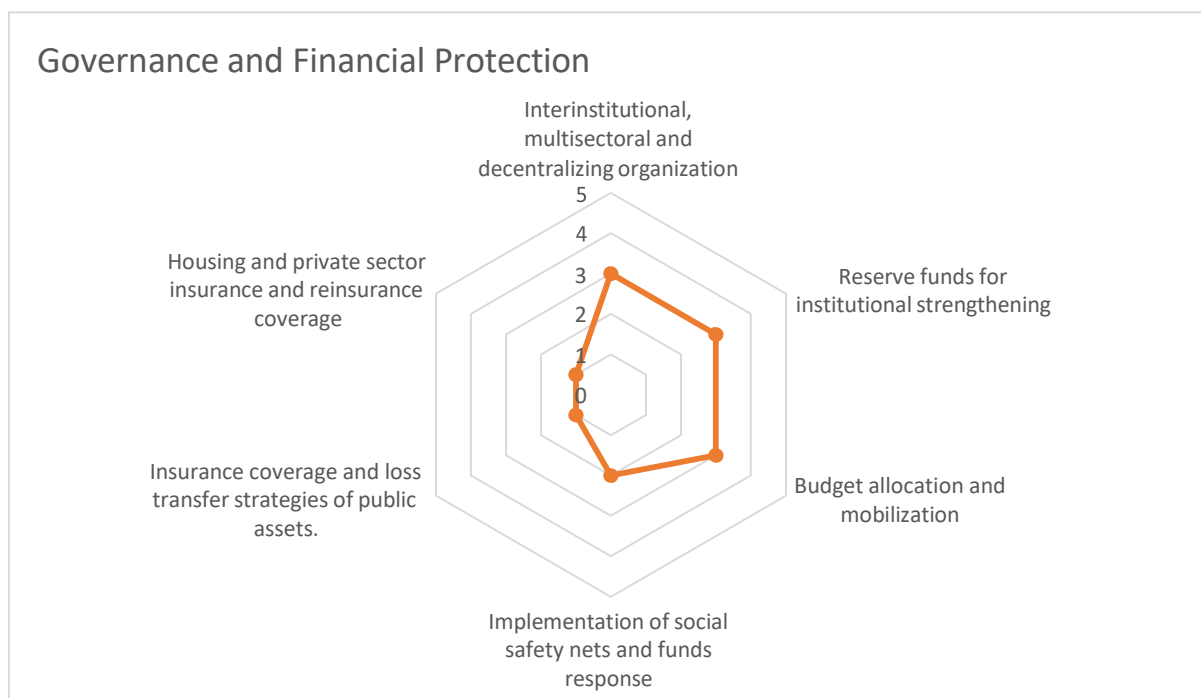
Figure 16. The RMI – Governance and Financial protection for Tirana, 26 November 2019 earthquake

After the definition of value[5] of all sub indicators divided according to each Risk management Index, the value of each component of RMI is determined.

Table 11. The Risk Management Index for Tirana 26 November 2019

	Indicator	Value (1-5)
RI	Risk identification (RI),	3,05
RR	Risk reduction (RR)	2,2
DM	Disaster management (DM)	2,9
FP	Governance and financial protection (FP)	2,5
Risk Assessment Index	**The average of all indicators according to their specific weight**	**2,7**

Total RMI is the average of the four composed indicators that represent each public policy. **When value of RMI is high, performance of risk management in the country is better**, this mean that we have very huge work to be done, in order to increase the performance level of each indicator for a better disaster management and recovery, to save the life of people, properties and environment protection.

---

[5] *The value of each composed element is between 0 and 100, where 0 is the minimum performance level and 100 is the maximum level.* – According to the methodology proposed.

The public policy that had the lowest performance in Tirana is the Risk reduction, followed by the financial protection, whereas the policy with the greater performance is the risk identification, followed by the disaster management.

Figure 17. The Risk Management Index for Tirana 26 November 2019

Estimation of the total RMI

$$RMI = \frac{\left(RMI_{RI} + RMI_{RR} + RMI_{DM} + RMI_{FP}\right)}{4}$$

According to this evaluation for each indicator calculated strictly according to the methodology proposed, the Risk Assessment Index is evaluated as 2,75. This means that the Government and specially the municipality need to invest more in different indicators related Risk Assessment index and Disaster management and recovery.

3.2.2. Covid-19 Pandemics

3.3. Disaster Resilience Index (DRI) for Tirana City

Disaster Resilience Index (DRI) is a monitoring and evaluation tool for benchmarking and measuring progress or lack thereof, along a city's key development policies and processes for mainstreaming risk reduction and increasing resilience. DRI allows the stakeholders to go through an iterative self-evaluation process by defining, assessing, and monitoring their resilience objectives and respective benchmarks themselves. The main aim is to track progress on the mainstreaming of risk reduction approaches in the city's organizational and operational processes, and to capture the performance of each of the identified DRMMP1 focus groups and sectors achieving risk resiliency.

The main strategic goals to be achieved are:

- Development and strengthening of institutions, polices and capacities for mainstreaming DRR;
- Systematic integration of risk reduction approaches into critical services and infrastructure, and emergency preparedness, response, and recovery;
- Main streaming DRR into development polices and planning.

Using this methodology to assess the performance of Disaster Resilience index is difficult to have a screening on all the issues requested but also to have a very presided knowledge for each indicator.

3.3.1. Tirana 26 November 2019 Earthquake

The DRI is a self-assessment tool which aims to establish an initial benchmark and obtain consistent and objective evaluations around 10 indicators grouped along five thematic areas i.e., DRMMP sectors (Fig. 16). This methodology will be used in the to assess the performance of institutions in disaster resilience in the country. The DRI is comprised of a five-step analysis, which is particularly decision-maker driven and employs institutional learning and adaptive governance as a key concept to ensure sustainable solutions are focused on:

1. Stakeholder Identification
2. Stakeholder Consultation
3. Initial Indicator Development
4. DRI validation in workshops
5. Participatory evaluation of the DRI

Aim of DRI

To track progress on the mainstreaming of risk reduction approaches in the city's organizational and operational processes, and to capture the performance of each of the identified DRMMP focus groups and sectors achieving risk resiliency

Strategic Goals in Mainstreaming DRR

Development and strengthening of institutions, polices and capacities for mainstreaming DRR	Systematic integration of risk reduction approaches into critical services and infrastructure, and emergency preparedness, response, and recovery	Mainstreaming DRR into development polices and planning

Key Areas for Mainstreaming DRR

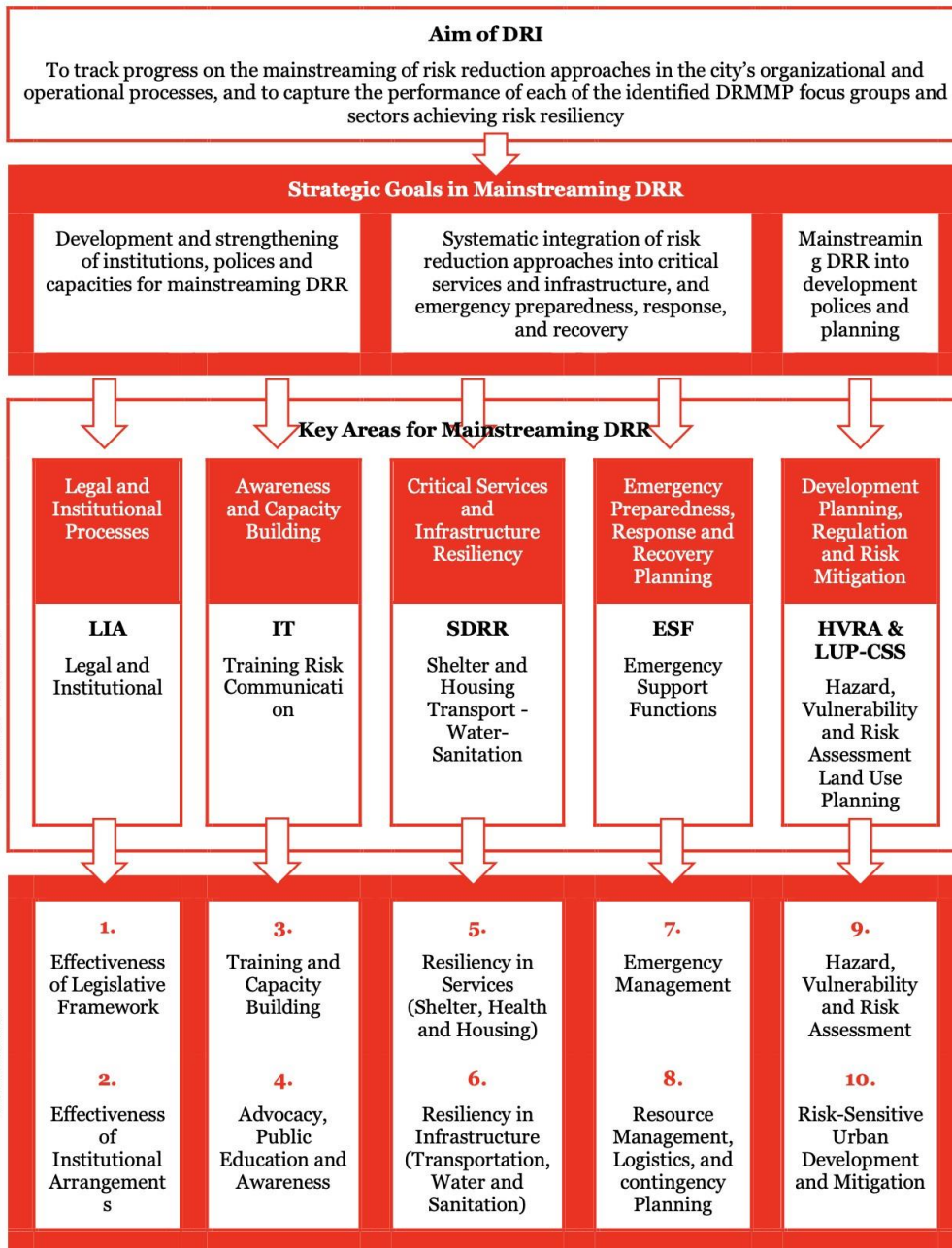| Legal and Institutional Processes	Awareness and Capacity Building	Critical Services and Infrastructure Resiliency	Emergency Preparedness, Response and Recovery Planning	Development Planning, Regulation and Risk Mitigation
LIA Legal and Institutional	**IT** Training Risk Communication	**SDRR** Shelter and Housing Transport - Water-Sanitation	**ESF** Emergency Support Functions	**HVRA & LUP-CSS** Hazard, Vulnerability and Risk Assessment Land Use Planning
1. Effectiveness of Legislative Framework	3. Training and Capacity Building	5. Resiliency in Services (Shelter, Health and Housing)	7. Emergency Management	9. Hazard, Vulnerability and Risk Assessment
2. Effectiveness of Institutional Arrangements	4. Advocacy, Public Education and Awareness	6. Resiliency in Infrastructure (Transportation, Water and Sanitation)	8. Resource Management, Logistics, and contingency Planning	10. Risk-Sensitive Urban Development and Mitigation

Figure 18. DRI Methodological Concept Scheme

Each indicator using the prepared forms needs to be evaluated by the stakeholders in 5 levels of attainment i.e., performance target levels:

Level 1: Little or no awareness
Level 2: Awareness of needs
Level 3: Engagement and Commitment
Level 4: Policy Engagement and Solution Development
Level 5: Full Integration

Detailed description and explanation of each of 10 indicators is given in *Task 2.1 (2.2.3.4. Methodology for Assessment), for that evaluation has been used by the experts the template of questions in order to define the index values* presented in *Task 2.1 (Appendix A).*

The following table and figure present the average values of the disaster resilience indicators evaluated by five different groups of experts.

Table 12. Disaster resilience index for the City of Tirana

Indicatores	I_1	I_2	I_3	I_4	I_5	I_6	I_7	I_8	I_9	I_{10}
Average values	2.5	3	2	2	2.25	2.5	2	3	3	2.5

The disaster resilience average values for each indicator for Tirana according to the average values of each target indicator represent in the methodology.
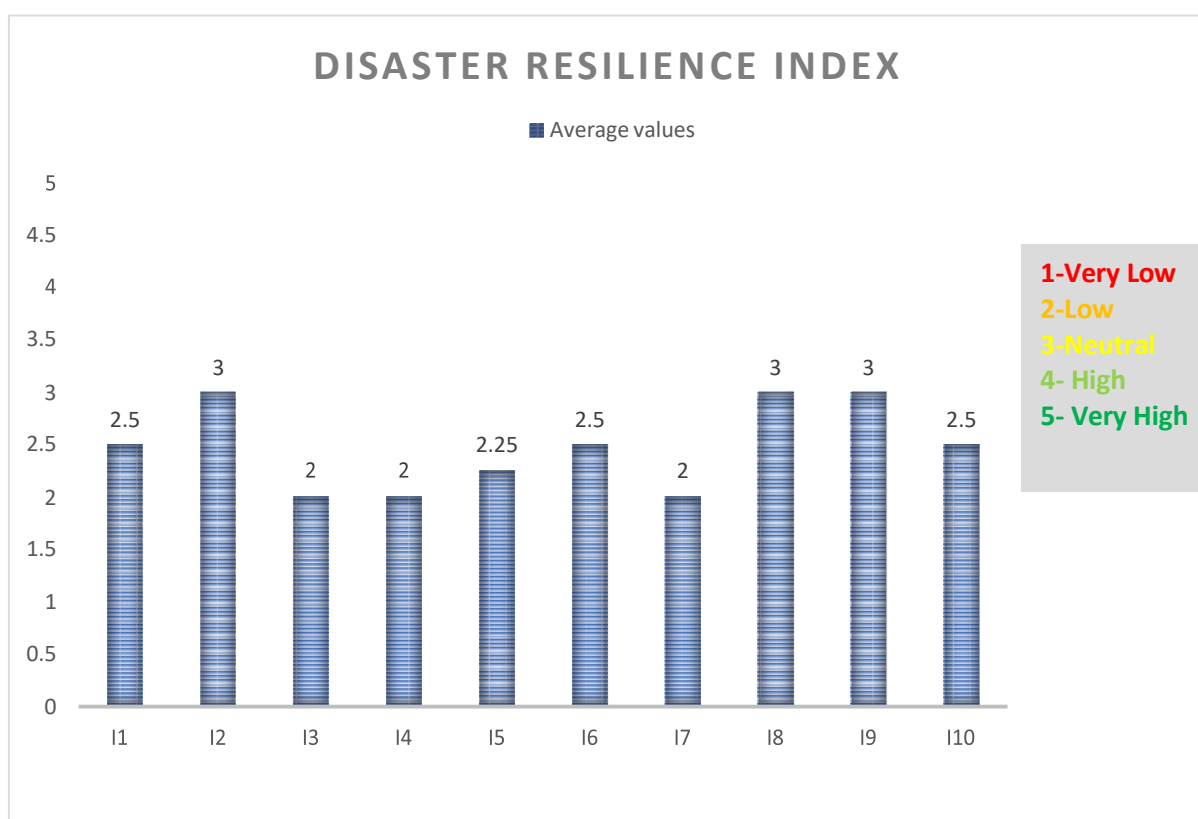
Figure 19. Schematic representation of the disaster resilience indicators

The assessment of the disaster resilience indicators it may be observed from *figure 17* that almost all disaster resilience indicators are below the average and that the strategy aimed at development and strengthening of institutions, polices and capacities, and systematic integration of risk reduction approaches into critical services and infrastructure, and emergency preparedness, response, and recovery need to be adopted as soon as possible.

3.3.2. Covid-19 Pandemics

DRI indicators and their characteristics

Sectors	Indicators	Characteristics	Level 1: Little or no awareness	Level 2: Awareness of needs	Level 3: Engagement and Commitment	Level 4: Policy Engagement and Solution Development	Level 5: Full Integration
LEGAL AND INSTITUTIONAL	**Indicator 1:** Effectiveness of Legislative Framework	o Laws, acts and regulations;			X		
		o DRR Polices;		X			
		o Compliance and Accountability;			X		
		o Resource mobilization and allocations (financial, human).		X			
	Indicator 2: Effectiveness of Institutional Arrangements	o Organizational structures that define roles and responsibilities;			X		
		o Review, update, enforcement, monitoring and reporting process;		X			
		o Partnership with civil society and communities.		X			
AWARENESS AND CAPACITY BUILDING	**Indicator 3:** Training and Capacity Building	o Institutional commitment to training and capacity building with dedicated resources and evaluations;			X		
		o Knowledge Management, Research and Development.		X			
	Indicator 4: Advocacy, Communication, Education and Public Awareness	o Commitment to advocacy and public awareness and education programs that engage all relevant audiences and stakeholders including civil society and community organizations;			X		
		o Commitment to participatory processes and community involvement;			X		
		o Research facilitation, Use of Information, Information Technology and Communication (ITC) to disseminate information;	X				
		o Pro-active and constructive Media relations.			X		
CRITICAL SERVICES, INFRASTRUCTURE RESILIENCY	**Indicator 5:** Resiliency of Critical Services	o Inclusive, participatory, and transparent slum rehabilitation policies and programs;			X		
		o Protection of living (i.e., shelter) and livelihood conditions (i.e., access to and availability critical services including opportunities for livelihood) against disasters;		X			
		o Resiliency of health services to deliver services during a disaster.		X			
	Indicator 6:	o Resiliency of water, sewer, and storm drain systems;		X			

		o Resiliency of transportation systems		🟧			
	Resiliency of Infrastructure	o Contingency for delivery of essential services.		🟧			
CRITICAL SERVICES, INFRASTRUCTURE RESILIENCY	**Indicator 7:**	o Functioning EOP3 with Basic Plan and ESF4 system;		🟧			
		o Year-round Response Planning functioning SOPs5;		🟧			
	Emergency Management	o Drills and Simulation involving relevant stakeholders including civil society and communities;		🟧			
		o Preparedness programs for first responders and leaders and representatives of communities at risk.			🟨		
	Indicator 8:	o Self-analysis of resource management and logistics;		🟧			
		o Contingency planning for key institutions for pre-defined scenario analysis and planning parameters;			🟧		
	Resource Management, Logistics and Contingency Planning	o Ability to manage delivery of resources to most vulnerable populations;		🟧			
DEVELOPMENT PLANNING, REGULATION AND RISK MITIGATION	**Indicator 9:**	o Awareness of hazards and vulnerabilities (natural and man-made);			🟨		
		o Risk identification and Assessment, Vulnerability and Capacity Analysis;		🟧			
	Hazard, Vulnerability and Risk Assessment	o Impact assessments (loss analysis) by relevant sectors and segments of populations at risk;		🟧			
		o Use of forecasting and early warning in preparedness and response planning.		🟧			
	Indicator 10:	o Risk-Sensitive Land use planning and urban re-development;			🟨		
		o Enforcement of codes and standards, particularly in slum upgrading programs, quality control norms in construction;			🟨		
	Risk-Sensitive Urban Development	o Reinforcing and retrofitting of critical assets and infrastructure.		🟧			

4. CONCLUSIONS

The earthquake of 26 November 2019 has been the as case study for the definition of the Urban Disaster Risk Index tool, for improvement of the capabilities of the city to prevent, prepare and recovered from similar events. In analyzing the results and building a picture of the disaster resilience system in Tirana, there are several important elements to consider in the near future:

- Awareness of the population related the earthquake risk was extremely low, which was reflected in a number of activities at the city/state level that completely ignored or paid no attention to the potential impact of the earthquake.
- Improved the monitoring and prevention system, increasing human capacity building, awareness raise in population, increase the monitoring and models for earthquakes in the country level.
- The capacities of the city (also country) to intervene in similar disasters was very low. This will help the decision making about risk resilience and disaster risk mitigation, including Investments, coordination and awareness campaigns of institutions and the public encourage mitigation and reduction of risks.
- The municipalities itself need to invest immediately to increase (also national) intervention capacities and investments in the rescue equipment and technologies for trapped persons.
- Strengthening public health, and the health and social system from emergency to recovery by maintaining COVID 19 preparedness and response; ensuring safe delivery of health services and strengthening the health system.
- Strengthen and expand resilient and pro-poor social protection systems reducing poverty and inequality and supporting inclusive and sustainable growth by comprehensive and shock-responsive social protection system that protects people's lives and livelihoods and mitigates adverse economic consequences during the crisis and in the recovery period.
- Developing a resilient economy, through increased public-sector investment in labor-intensive development schemes for job creation in sectors of high priority such as trade, agriculture, rural infrastructure development, etc. and targeted incentives packages for vulnerable productive sectors through policy, regulatory measures, and financial measures to protect and sustain private sector
- Managing a fiscal and financial surge through efficient financial and resource planning, management, and mobilization for COVID-19 response.
- Inculcating principles of social cohesion and community resilience for the socio-economic response to COVID-19 by establishing systems and processes through which citizens and communities can participate in and benefit from local government emergency and development programmes, including well-tailored social dialogue and political engagement, grounded in fundamental human rights

Accordingly to the performance analysis represented using the methodology proposed for disaster risk management and reduction in the country, is evident that Tirana (and country also) has very huge work to be done, in order to increase the performance level of each indicator for a better disaster management and recovery, to save the life of people, properties and environment protection.

In conclusion, according to presented results, urban resilience in Tirana is relatively low and further strategic actions need to be implemented as soon as possible, as are listed above.

5. REFERENCES

1- Albania Post-Disaster Needs Assessment (PDNA) Volume A Report, February 2020.pdf – UNDP Albania:

2- Plani Kombetare I emergencave Civile - Miratuar me VKM nr. 835, dt. 3 Dhjetor 2004

3- M 6.4 ALBANIA EARTHQUAKE GLOBAL RAPID POST DISASTER DAMAGE ESTIMATION (GRADE) REPORT : https://assessments.hpc.tools/assessment/962989f7-01c9-4318-a43c-f36c9fc677a3

4- Ministria e Rindertimit: https://rindertimi.gov.al/slide/nis-shperndarja-e-granteve-per-shtepite-e-demtuara-nga-termeti-ne-bashkine-e-tiranes/

5- INSTAT - http://www.instat.gov.al/al/temat/statistikat-e-përgjithshme-dhe-rajonale/tregues-sipas-bashkive.

6- INSTAT, VJETARI STATISTIKOR RAJONAL 2019 - http://www.instat.gov.al/al/rreth-nesh/aktivitetet/promovimi-i-aktiviteteve-statistikore/vjetari-statistikor-rajonal-2019-të-dhëna-të-reja-në-nivel-bashkie/

7- Ministry of Interior - General directorate of Firefighting's

8- Marku.S at al. January 2022 - Seismic characterization of Tirana–Durrës–Lezha region (northwestern Albania) and analysis effort through NSHDA method.

9- Riza Hasanaj, at al 2019 - Status and further development of Eurocodes in Albania http://eurokodovi.ba/wp-content/uploads/2018/06/5_DPS_Albania.pdf

10- Ministry of energy and Infrastructure 2019 - Albania – Civil Emergency Preparedness: https://unece.org/fileadmin/DAM/env/pp/a_to_i/6th_meeting/Presentations/6TFAI_2a_8_Albania_Malaj.pdf

11- National Agency for Territorial planning https://planifikimi.gov.al/index.php?id=732

12- EEFIT, Fluid report 2020 - THE Mw6.4 ALBANIA EARTHQUAKE ON THE 26th NOVEMBER 2019. Earthquake Engineering Field Investigation Team https://www.istructe.org/IStructE/media/Public/Resources/report-eefit-mission-albania-22102020.pdf

13- World bank- Albanian databank report 2022 https://databankfiles.worldbank.org/data/download/poverty/987B9C90-CB9F-4D93-AE8C-750588BF00QA/previous/Global_POVEQ_ALB.pdf

14- Qirjako G, Qosja A, Draçini X, Çomo N, Hyska J, Fico A, Bukli M, Burazeri G. Infection prevention and control in healthcare facilities in Albania. SEEJPH 2021; posted: 20 August 2021. doi: 10.11576/seejph-4702

15- Ministry of Health and Social - https://coronavirus.al/

APPENDIX-A: Disaster Resilience Index

	Indicatores	Characteristics	LEVELS	Average values
Legal and Institutional	**Indicator 1:** Effectiveness of Legislative Framework	- Laws, acts and regulations;	4	2,5
		- DRR Polices;	3	
		- Compliance and Accountability;	2	
		- Resource mobilization and allocations (financial, human).	2	
	Indicator 2: Effectiveness of Institutional Arrangements	Organizational structures that define roles and responsibilities;	3	3
		Review, update, enforcement, monitoring and reporting process;	3	
		Partnership with civil society and communities.	1	
Awarness and capacity building	**Indicator 3:** Training and Capacity Building	Institutional commitment to training and capacity building with dedicated resources and evaluations;	2	2
		Knowledge Management, Research and Development.	2	
	Indicator 4: Advocacy, Communication, Education and Public Awareness	Commitment to advocacy and public awareness and education programs that engage all relevant audiences and stakeholders including civil society and community organizations	2	2
		Commitment to participatory processes and community involvement;	2	
		Research facilitation, Use of Information, Information Technology and Communication (ITC) to disseminate information;	2	
		Pro-active and constructive Media relations.	1	
CRITICAL SERVICES, INFRASTRUCTURE RESILIENCY	**Indicator 5:** Resiliency of Critical Services	Inclusive, participatory, and transparent slum rehabilitation policies and programs;	2	2,25
		Protection of living (i.e., shelter) and livelihood conditions (i.e., access to and availability critical services including opportunities for livelihood) against disasters	2,5	
	Indicator 6: Resiliency of Infrastructure	Resiliency of health services to deliver services during a disaster.	3	2,5
		Resiliency of water, sewer, and storm drain systems;	2	
		Resiliency of transportation systems	3	
		Contingency for delivery of essential services.	2	
	Indicator 7: Emergency Management	Functioning EOP3 with Basic Plan and ESF4 system;	2	2
		Year-round Response Planning functioning SOPs5;	3	
		Drills and Simulation involving relevant stakeholders incl uding civil society and communities;	2	
		Preparedness programs for first responders and leaders and representatives of communities at risk.	2	
	Indicator 8:	Self-analysis of resource management and logistics;	2,5	3

DEVELOPMENT PLANNING, REGULATION AND	Resource Management, Logistics and Contingency Planning	Contingency planning for key institutions for pre-defined scenario analysis and planning parameters	3	
		Ability to manage delivery of resources to most vulnerable populations;	3	
	Indicator 9:	Awareness of hazards and vulnerabilities (natural and man-made);	3	3
		Risk identification and Assessment, Vulnerability and Capacity Analysis;	3	
	Hazard, Vulnerability and Risk Assessment	Impact assessments (loss analysis) by relevant sectors and segments of populations at risk;	2	
		Use of forecasting and early warning in preparedness and response planning.	3	
	Indicator 10:	Risk-Sensitive Land use planning and urban re-development;	3	2,5
		Enforcement of codes and standards, particularly in slum upgrading programs, quality control norms in construction;	2,5	
	Risk-Sensitive Urban Development	Reinforcing and retrofitting of critical assets and infrastructure.	2	