INGENIOUS

2 ISSUE 1

Editor-in-Chief: Prof. Dr. Petraq Papajorgji/ Scientific Journal of the Faculty of Engineering, Informatics and Architecture / No. 2, issue 1/ 2022

ISSN 2789-4800

IT AND ENGINEERING

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UETPRESS

INGENIOUS

No. 2, issue 1/2022

JOURNAL OF THE FACULTY OF ENGINEERING, INFORMATICS AND ARCHITECTURE

ISSN 2789-4800

UETPRESS

Published under the series “ACADEMIC JOURNALS”.

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The journal has been catalogued at the National Library of Albania and the Library of the European University of Tirana, Albania.

(print ISSN: 2789-4800/ online ISSN: 2958-888X)

ingenious@uet.edu.al
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UETPRESS

Published by:
EUROPEAN UNIVERSITY OF TIRANA / ALBANIA

content

EDITORIAL

IT and Engineering

Prof. Dr. Petraq PAPAJORGJI
EDITOR-IN-CHIEF

Information technology is vital in our lives in many aspects; it helps enormously while dealing with the dynamism of daily things. There is no field in human activities where there is no role for information technology. Information Technology offers numerous tools to facilitate the development process and exchange of information. Both these processes are the objective of IT to make many tasks more accessible and easy to solve.

Thus, the use of technology brings a plethora of various delivery methods. It has access to massive information, uses many tools to enhance learning, and provides excellent examples through simulations and models.

Information Technology has had a significant impact on the engineering sector. These new technological innovations include the widespread adoption of 3D printing, robots, and Internet of Things (IoT) devices. Adopting these innovations has forever changed work processes, design, production, and testing in many engineering sectors. Nowadays is almost natural to sit in a car and enjoy the ride provided by a self-driving vehicle. Software systems/robots translate fluently from one language to another and make automatic summaries of scientific papers. Everything is getting more complex. Ordinary people believe that if it ain't broke, don't fix it. Engineers believe that it doesn't have enough features if it ain't broke.

Ad-hoc wireless sensor communications for health monitoring systems

Prof. Dr. Mimoza DURRESI
mimoza.durresi@uet.edu.al

Abstract

The Covid 19 challenge, the increased aging population, and the modern way of living are increasing the need for health monitoring communications services. Healthcare monitoring is a very important research field of study. This is related in finding new, more efficient ways in health data communications with three main quality of service requirements: low delay, high security, high quality data transmission. Considering these requirements and recent developments in domestical health monitoring services, it is important not only the equipment used for health monitoring sensing but also the communication protocol used to access the data center. In this paper we develop a new communication protocol for ad-hoc wireless network created by the sensors used for personal health monitoring systems installed in patient wrists. This is a hierarchical protocol where the sensors communicate through a virtual infrastructure that helps to collect the data from the personal health monitoring equipments in an efficient way even in the areas with no wireless infrastructure. The communication scheme ensures a hierarchy of nodes that gets translated to hierarchy of costs as only a few nodes need to have a larger processing power resulting in a lower battery consumption for most of the patients. The neighbourhood area is divided into virtual cells where each cell is represented from one node center that holds the communication for all the surrounded nodes and forwards its information towards the next cell center found in the direction of the sink. As a result the information collected even in the fields without any wireless infrastructure might be carried towards the cells that are in a communication distance with the sink. The updated information data is forwarded toward the data centers to be analysed by the specialists. Taking in consideration that even in the urban areas the elderly population doesn't have internet services, this ad-hoc communication protocol represents a good solution for health monitoring

equipments. Moreover the same communication protocol can be used for signaling life signs in war areas.

Keywords; *Wireless sensors networks, virtual infrastructure, wireless sensors protocols, health monitoring equipments*

Introduction

Social development, modern way of living and aging world population are causing larger percentage of world population living alone.

On the other hand, the Covid 19 pandemics and other public health threats, caused by natural or human disasters, are major concerns encouraging the development of new technologies for individual health monitoring systems that can optimize operation of the large scale health monitoring systems, notifying the health services when necessary.

The purpose of this paper is to contribute toward improving the use of individual health monitoring equipment in large scale population even in the absence of fixed or wireless infrastructure.

In this paper we study and design of a new ad hoc communication protocol that makes possible to have individual health monitoring equipment sense the need for emergency assistance by comparing the life sign data with the threshold registered ones and communicate with health services even in rural or under war areas.

Previous research

Many studies have been developed especially the past two years regarding the possibility of individual health monitoring equipment as a part of Internet of Things applications that can monitor and save lives. By analyzing most of the research work published on this direction, we conclude that there are two main issues: the communication protocol and the individual sensing equipment. The system needs to ensure an efficient communication protocol for having the quickest possible notification of critical health conditions toward the nearest health services. Also, it is important to develop a low-cost wearable equipment that would sense the vital parameters as pulse, oxygen levels, blood pressure etc.

The patient monitoring system involves the integration of many individual health equipment distributed over a large geographical area that would serve as nodes of an ad-hoc network, capable to communicate with each other according to a specific communication protocol. This communication protocol need to

fulfill the following requirements: long communication distance between the critical health condition patient and the local health services or the Health Data Center, good communication quality even in rural areas; high integration range of wireless sensors as part of individual health equipment distributed over a large geographical area; immune to radio interference; the same technology distributed and implemented by many local municipalities; ensuring continuous health monitoring service for all the patients in the integration areas; practical wearable equipment and low-power consumption for ensuring long life battery usage, providing a good ratio cost performance solution.

The challenges are great considering the small communication distance capability of the health monitoring equipment due to the limited access resources of sensors like processing capabilities, available data storage or limited power sources.

Optimizing health monitoring services has always been of great the interest from research communities all over world, especially in the past two years. As we mentioned before there exists a lot of work previously done in the field of health monitoring of patients not hospitalized. In the research work presented from the collaboration of Shanghai Universities (Zhang et al.,2021) present a device for COVID-19 prevention that monitors and records continuously the important health data of a patient. According to their solution the equipment installed in patient wrist records two main parameters: the patient's body movements and the patient's body temperature, the data collected are transmitted to a computer using Bluetooth, the main problem with this solution is the short range of communication, about 10m. This solution is to be used in urban areas where the wireless infrastructure will support the data transmission from the PC to the local Health Services,

Another work to be mentioned is the research done from the collaboration of Islamabad, Pakistan-Aerospace University and South Korea (Ullah et al., 2021). According to their solution they propose a patient quarantine monitoring system using multiple sensors distributed over patient's body that will measure temperature, respiratory, accelerometer, pulse, SpO2 and the patient's location data given by GPS (global positioning system). As in the previous work the data are transmitted by using the Bluetooth towards the microcontroller and then toward the local server by using the Internet connection.

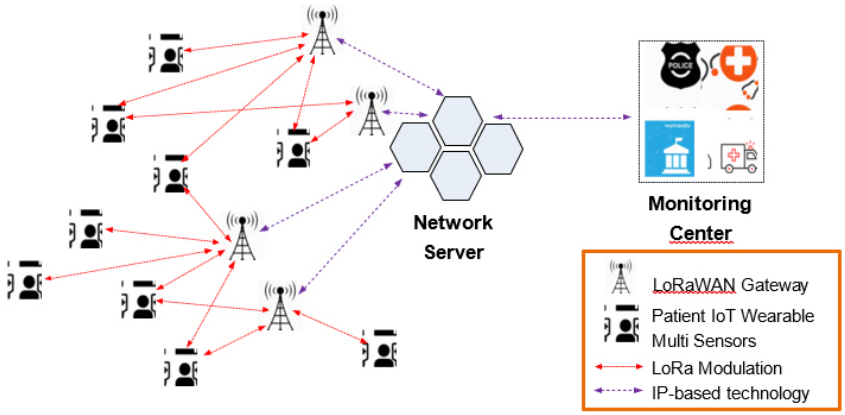
The system monitors the patient's health and his location to notify the services in the case that the patient would break the quarantine rules. As in the previous work mentioned the system works only in the presence of the Internet which means it doesn't support the use in the absence of the wired or wireless infrastructure, The other disadvantage is the complexity of the system as the sensors are distributed over patients' body which means that will be very uncomfortable and prone to technical defects.

Another solution is proposed by research developed at (Mukhtar et al.,2021) which is very similar to the abovementioned one and has the same disadvantage of using sensors distributed over patient's body and not a practical equipment. Regarding to data communication their solution is based to the use e of the wireless infrastructure as the data collected are sent and processed to the Cloud even though they use the IEEE 802.11 protocol only at the first hop.

Another work to be mentioned is the one from Salerno University presented in (Hoang at al., 2021) where they propose the use of a similar patient monitoring system. They use an accelerometer for recording the patient's movements and two temperature sensors (a contact one and an IR—infrared sensor) for recording the patients temperature. In addition, their solution includes two sensors to monitor the ambient condition such as temperature and humidity which are positive additions especially in the case of patients living alone. The data collected are transmitted toward a web-based application by using the Bluetooth which means that the system can't be used in the absence of the internet connection.

The group of researchers from University of Sucieva, Rumenia, (Lavric, at al., 2022) developed the system showed in Fig.1. Their Health Monitoring System uses LoRaWan, which means that their solution provides a better solution regarding the absence of the infrastructure, but still only in the first hop.

FIG 1: LoRaWAN multi-sensor patient monitoring architecture.



As mentioned before there are two challenges for Health Monitoring Systems, the distance to reach the gateway and the convenience of the device. LoraWan has the possibility to communicate in longer distances than other protocols, but still considering the rural areas this isn't sufficient. On the other hand, the data rate is too low and the traffic toward the gateway, is high which causes extra delays and low signal quality.

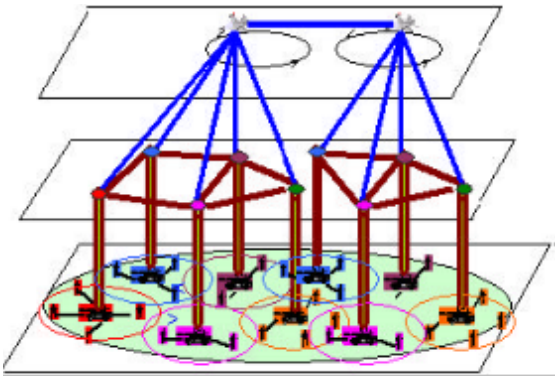
To have a better and longer communication distance we develop a new communication protocol presented here as HealthComm protocol, by proposing a new virtual infrastructure. This would enhance the communication distance range in the absence of any fixed or wireless infrastructure and overcome the main challenges of previous systems.

HealthComm Protocol

Our approach is based in our previous work on intervehicle communication protocols adapted and developed for health monitoring system. The patient's neighborhood area is divided in virtual cells. Each patient's device is considered as e node inside a certain virtual cell. The density of the nodes inside a cell is changeable, depending in the neighborhood architecture..

In this work we propose a virtual infrastructure created from distributed health monitoring devices which will be considered as nodes of an ad-hoc network. To have a low cost and controlled signal quality according to our approach the communication scheme will be a hierarchical one using up to three levels of hierarchy (only 2 levels for rural areas). (Fig.2) The first level represents by a simple health monitoring unit (HMU) that transmits to the HMU neighbor with a higher scale of hierarchy. The second level of the hierarchy is the HMU that has a certain number of neighbors (less than N), is located somewhere in the center of the cluster and will be considered as a Center Cell Node. The second level of the hierarchy when the HMU that has a number of neighbors > N, is found near the center of the cluster and will be considered as a CenterSubCell Node. The third level of hierarchy in the most populated areas will be created by the Center SubCell nodes that are neighbors and will be considered as simple Cell Nodes, by transmitting their data to the Cell Center Node located at the center of the considered area.

FIGURE 2: Multi-level hierarchical ad hoc infrastructure



The fact of using hierarchical communication scheme brings several benefits such as larger communication distances between the patient and the monitoring centers, helping people even in rural areas. The other benefit brought using the Hierarchical scheme is the low network load. According to this solution less traffic will be generated between the patients and the local health service as only the CenterCell nodes will be transmitting the data of all the nodes in their respective cell in a certain moment of time. The other benefit is the low cost of the hardware. Only the Cell Centers equipment need to have more complex design such as memory, and transmission power. Also, it is important to note that only the high hierarchy nodes (equipment) will have a higher consumed power which means that for the rest of the patient's equipment the battery will have a longer life.

FIG. 3 Communication using the Virtual Infrastructure

There is also the possibility to modify the activity of the HMUs inside the cell, which means not all patients will be monitored with the same rate. This can be completed by using the sleep-awake scheme for certain nodes in the case of people moving or not willing to be monitored any more.

According to HealthComm protocol a flexible Virtual Infrastructure is created and maintained to enable scalable and effective communications (Fig 3). The number of nodes inside a cell can be modified. In each cell only one node (HMU) will be self-chosen as a Cell Center according to its location being approximately at the geographical center of the Virtual Cell. This node will behave as a Base Station for a certain period. The hierarchical distribution of CellCenters will be transferred to the hierarchy of their costs, which means that only the equipment corresponding to the cell center need to have larger memory, processing power

and battery consumption. The Hierarchical Virtual infrastructure created enables the optimization of the routing process.

At a certain rate each node updates the data from the GPS, which gives the Coordinates (x,y) for each node at a certain moment. Every node has its geographical position given by Global Positioning System (GPS). Then the higher ranked nodes transmit the data along each-other using the sequential Cell Centers as intermediate communications points and finally transmit the data to the Gateway when it reaches an infrastructure covered area as in Fig 3.The Information Management System might be a server located at Local Health Services Center that will do the process of analyzing the data collected from all the patients living in a certain area and decide about a certain action to be taken accordingly.

The equipment we propose to be used is similar to the wrist wearable equipment used in [5] including a microcontroller board with add-on sensors that will sense the patients vital signs such as temperature, oxygen levels, blood pressure etc. It will include a peripheral GPS receiver and a cellular modem.

HealthComm Benefits

As a conclusion this protocol will be more optimal to be used everywhere even in the absence of wired or wireless infrastructure, in natural emergency or under war areas. The protocol to be used gives the possibility of using tunable fine-grained sensing regarding the Data acquisition rate, threshold health alert values or node activity status. This system gives the possibility of using a mixed protocol routing scheme such as ZigBee for inside cell communication and IEEE802.11 for intracell centers communication. As we explained above the other benefit is that the hierarchical levels are tunable too, depending on the neighborhood architecture and population density ensuring good communication quality, low latency and low power consumption.

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The necessary permanent WiFi health monitoring of the structures as condition for the smart buildings in smart cities

PhD. Paola PATERNA
Dept. of Civil Eng.& Computer Sciences, Univ. Rome «Tor Vergata»

MSc. Carlo MAROCCHINI
Dept. of Civil Eng.& Computer Sciences, Univ. Rome «Tor Vergata»

MSc. Srey Mom VUTH
Dept. of Civil Eng.& Computer Sciences, Univ. Rome «Tor Vergata»

Prof. Dr. Andrea MICHELETTI
Dept. of Civil Eng.& Computer Sciences, Univ. Rome «Tor Vergata»

MSc. Carlo ROSA
Dept. of Civil Eng.& Computer Sciences, Univ. Rome «Tor Vergata»

Prof. Asoc. Dr. Alessandro TIERO
Dept. of Civil Eng.& Computer Sciences, Univ. Rome «Tor Vergata»

PhD. Silvana SUKAJ
UET University, Tirana

Prof. Asoc. Dr. Donato ABRUZZESE
Dept. of Civil Eng.& Computer Sciences, Univ. Rome «Tor Vergata»

Abstract

In the past our safety "standard" were much lower than now. We felt comfortable driving cars without a seat belt, without exterior rear mirror, without ABS nor Air-Bag. Today our cars are equipped with sensors and controls much better than the airplanes that flew in second World War.

Our continuous request of comfort goes hand in hand with the increasing safety for our life. Most of the machines and equipments around us enjoy of sophisticated control system, but civil structures not yet. Only few special bridges, mainly suspension or cable stay bridges, have some permanent tools to control them, and provide alert communication in case of suspect behaviour. "Normal", simple bridges miss this type of controls. Buildings, monuments, schools, hospitals, strategic buildings (Civil protection, Municipality, Police Stations, TV stations, communication centers…), all miss monitoring system for structural safety. Most of "smart solutions" refer to domotic (house automation) aspect like temperature, heating/air conditioning, lights, burglar alarm. All of them miss structural health control, forgetting problem like earthquake, structure aging, material decay and so on.Increasing the structural safety control of the buildings with smart devices means to increase the global safety for the cities.

The paper introduces some experiences of the authors in this field, and presents some possible scenario for the future.

Keyword: *Infrastructures, health structure monitoring, IoT for structures, monitoring network*

Introduction

In the '60s the safety request from the population, at the work and in private life, was much lower than now. The big-boom of the market was pushing much ahead, and most population, mainly European, were coming from the II World War disaster, and were accustomed to the survival situation, and did not pretend

too much from the already satisfactory conditions offered by the technology. Of course this reduced safety produced much injuries and casualties, even though not so much, if compared to the reduced safety level. At that time machines, mechanical and electronic devices, cars, electronic tools were all missing the "standard" measurements which now we are accustomed to. For instance, the cars were carring only the central rear mirror, and not yet using the lateral ones. Safety belts appeared only around 1975, and the air-bag some decade later, along to ABS and other controls.

FIG.1,2,3,4 – The cars in the '60. Only the central rear mirror. One decade later appear the first lateral rear mirror- (IoT Bridge-AB, Sweden, P. Rosegren,2017)

The increasing number of cars, drivers, and passenger pushed the designer to consider more the safety for the cars, and not only the comfort, the economy of transportation, the reduced cost of the maintenance. This approach brought the cars in the context of safety, being passive or active. Then we saw the evolution of the safety belt, first only for the front seats, later for all the passengers, then the ABS (anti brake system), to control in automatic way the differential slippage of the wheels, on driving on the snow, on the mud or simply experiencing aquaplaning during a strong rainfall. One investigation in USA by the Transportation Department and NHTSA (National Highway Traffic Safety Administration) evaluated around 15.000 lives saved in US between 2013 and 2017 (4 years) thanks to the use of the safety belt in the car, and about 12.000 in the same period for the action of the airbags.

FIG.5 – The cars. In the late '70 appears the safety belt.
(IoT Bridge-AB, Sweden, P. Rosegren,2017)

FIG.6 – The cars. Airbag becomes compulsory at the end of last century
(Motori.it, on-line magazine,)

FIG. 7,8 - The cars. In the last decade the car are equipped with all kind of sensors
(IoT Bridge-AB, Sweden, P. Rosegren,2017)

For instance the airbags, despite being invented in the '60s, were installed first time on a car about 20 years later, and become compulsory in the late '90.

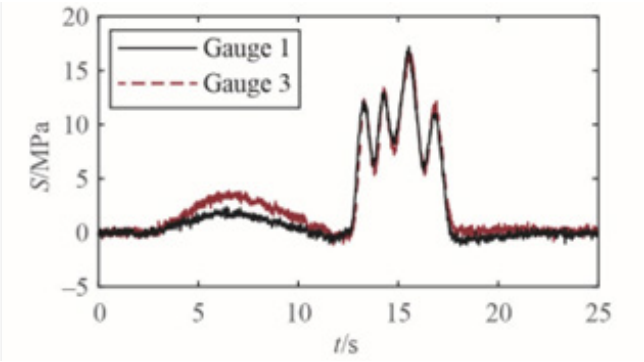
Considering this progress in the safety for the car, we can move also to the other "component" of our life, like infrastructures, bridges, buildings, and any other environment where we will pass through during our life.

FIG.9 – The Västerbron bridge, in Stockolm, built on 1935, equipped with device within IoT platform (IoT Bridge-AB, Sweden, P. Rosegren,2017)

Let look at the Västerbron bridge, in Stockolm, built on 1935, with 600 m total span, and a traffic flow of 50.000 vehicles per day. We will discover that in 2019 the bridge has been included in one pionieristic project related to the permanent control of the traffic, vibration, displacement, stress. In one word the structural health of the bridge has been put under permanent control. In Sweden even a harvesting prototype was installed on the Old Lidingö Bridge, 166 daily train passage, collecting energy useful to power at least the structural health monitoring system.

FIG.10 - An energy harvester prototype, installed on the Old Lidingö Bridge (Rosengren et al., 2017)

FIG.11 - Stress history at the passage of a train on a bridge (Rosengren et al., 2017)



Today great importance is giving, more and more, to the structural health monitoring, not only for short term but mostly as permanent control. The permanent control reduces dramatically the risk of sudden collapse, since a long term monitoring can result in accumulation of data about the state of the structure, and possibly also about its mechanical change. The accurate measurement of stress and deformation and vibration can give a trend of the behaviour of the structure. The reduced risk in this case can be accompanied by a suitable maintenance, which will prevent further damage to the structure. The Tacoma Bridge collapse few weeks after the completion of the structure. Despite some warning given by previous shacking of the deck under strong wind, no specific measurement could be done at that time, no sensors were installed on it in order to monitor the behaviour and the unusual swing of the bridge.

FIG.12 – November 1940.Tacoma Bridge collapsed for the vibrations induced by the wind

FIG.13 – An imaginary scenario of total control of Brooklin Bridge, in N.Y., by VackerGlobal Co., Dubai

Buildings

If the infrastructures contribute to the development of the regions, facilitating movements and trade, and then their safety is considered very important, as well as the cost for repair damage and replace the satisfactory safety level, the buildings are even more important for the human life.

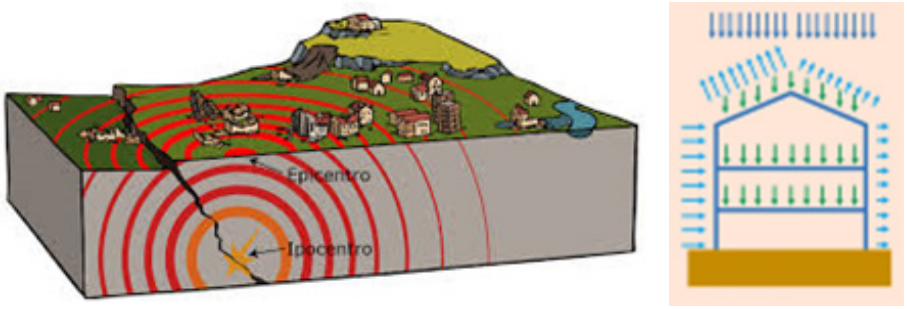
The scenario of living in a not safe building, considering the possible vulnerability for wind, fire, or earthquake cannot keep calm anybody. And like in the infrastructure we can classify the road with different importance, considering as main road artery some highway and then classifying other smaller one as secondary road, even for the buildings we could have a sort of classification of buildings in term or importance of the "content". And in this case hospitals and schools can play a main role among the all the other buildings in the city.

FIG.14 –HOSPITAL and school should be considered as main environment to control in term of safety

From the point of view of the risk, for the buildings also we can mention two main factors. One is related to the loads, it means that a monitoring activity

should consider in the time all the active loads on the structure, being live load from the people living in the building or wind or earthquake coming from the natural event. An adequate permanent monitoring system should work within four different spaces. One is the collection of the data, it means the external load (for instance, the wind speed or the intensity of the earthquake or the crowding level), but also the stress connected to all these events. The second one is the alert in case some measurements overpass the trigger level assigned for the sensors (displacement, stress, acceleration). Then, after this level, it is possible to imagine two more levels. One is related to the classic activity of maintenance, since the continuous monitoring can give a clear situation of the stress inside the structural elements, and a well alerted building maintenance operator can interpretate the signal coming from the structure and react correspondingly, increasing the safety level. On the other hand, the collected data can be sent to a specific program (so called artificial intelligence) which is able not only to file and classify the single event, but also to elaborate a probability function that finally give a trend of the structure behaviour and foreseen future situation. For instance a repeated strong wind can suggest the installation of a TMD (tuned mass damper) tuned on the load history suffered previously by the building.

FIG.15 – Earthquakes and other loads should be monitored in order to have the continuous control of the structure.



But also the aging and the decay of the structure should be monitored, since the safety of a structure is based on the intensity of the loads and on the quality of the material. Suitable sensors should then installed on the structure in order to measure the coming loads as well as the stresses in the material and its level of integrity.

FIG.16 – The corrosion of the rebars in the concrete affect the quality of the material, and the resistance of the structural element can be much lower than what expected in the original design.

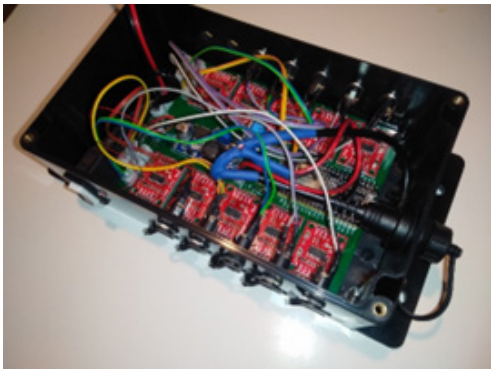
Inside our houses since several years we have some quite efficient "assistant" of our "life-at-home". We mean the control of the heating system, or air conditioned, or the sensor for the gas leakage, and even the burglar system. Often one system can be connect several devices and sensors, and sometime this "network" can be very efficient, if the software controlling the system can take advantages from the complementary measurements by different sensors. Usually this kind of approach is called "domotic", it means "home automation", considering the humans relieved from daily control of home temperature, and consequently switch on or off the heating system.

FIG. 17. – Typical application of "home automation", related mainly to control the comfort inside the houses.

In the "home automation" there is not yet any refer to the structural safety of the building. But the platform for the home automation, so called IoT, is quite efficient and smart. Then it seems a reasonable idea to extend the number and type of sensors to those one able to give answer about the structural health of the building. We can imagine to use the same "platform" already happily used in home automation and transfer under control other type of value. Acceleration, vibration, displacement, stresses, all the mechanical parameters can be measured and recorded somewhere, and even transmitted on line for a remote monitoring and control. We are then talking about the "IoT for the structures", where the sensors are obviously different, but the communication system between the devices is very similar, if not exactly the same, to that used for home automation.

All the building can be monitored in its mainly structural parameters, and we can have a sort of log where all the "structural" activity will be recorded, and even elaborated if we can equip the system also with a AI (artificial intelligence) engine, able to connect together the values coming from different sensors in different moment of the life. The cost of this kind of devices is very low, at the moment, and there is a flowering of new compact and more efficient devices, which help in distributing all over the structure the sensors without impact much on the visual of the inhabitant.

FIG. 18. – Some devices "IoT for structure" made by the authors, in the research team "Moni2BSafe" at University of Rome "Tor Vergata". It is visible the hexadecimal number, meaning the wifi tag of the device.



Indeed the best application of these devices will be when it will be installed on the structure "during" the construction, in order to have some sensors not on the skin of the structure, but inside the body of the structure elements. We develop a family of this sensors, and we did some interesting application on several civil structures. One of this is the Exposition Palace in Turin, Italy, designed by Pierluigi Nervi on 1960. We measured for about eight months the displacement of some cracks, the temperature inside the building and the vibration of the main arch.

All the information collected in Wifi in Turin were then transmitted to Rome (at University main collecting point) via wifi/Internet.

FIG. 19. – The inner part of huge barrel vault of Exposition Palace in Turin, by P.L.Nervi. On the right the moment of sensors installation

FIG. 20. – The installed system at Exhibition Palace in Turin has also a solar panel (left), an automatic control camera (center) and several sensors (right) to measure the crack evolution in some observed part.

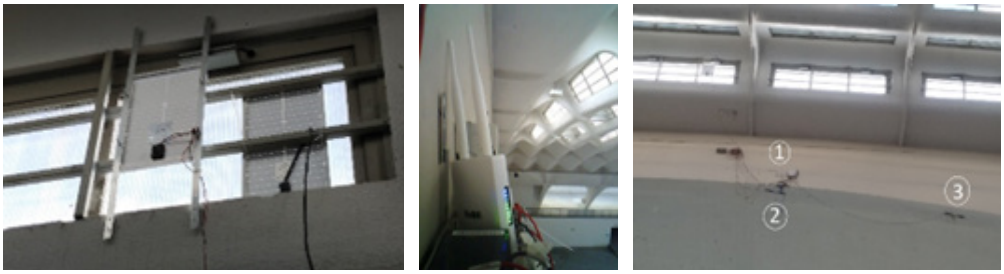
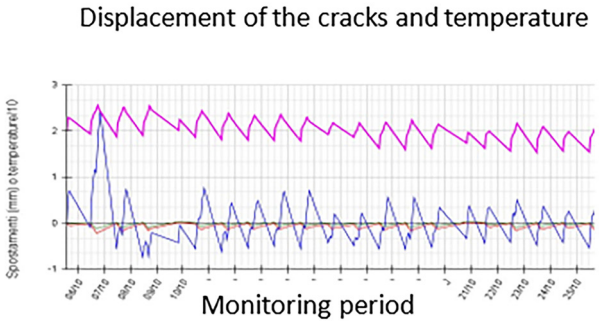


FIG. 21. – One recorded chart from one device installed to measure the trend of the cracks in the concrete.



Another work by P.L.Nervi is in progress to monitor is the Pirelli Skyscraper, in Milano. In that building (30 floors) has been installed 40 piezo-accelerometers and 24 mems accelerometers. The system is all Wifi, with a backbone of 6 access

point connected by net cable, should control the vibrations of the tall building. The result between piezo-accelerometer and mems, when the control will end, will be compared, in order to evaluate the noise and the sensibility of the two systems.

One very interesting experiment on the Wifi system has been carried out in China, in collaboration with the University of Yangzhou. Our aim has been to check the stress on the structural element of a pedestrian bridge made by steel truss when the "bridge" will be uplifting between two buildings up to the 25th floor.

FIG. 22. – The Pirelli skyscraper by P.L.Nervi. On the right the location of each sensors

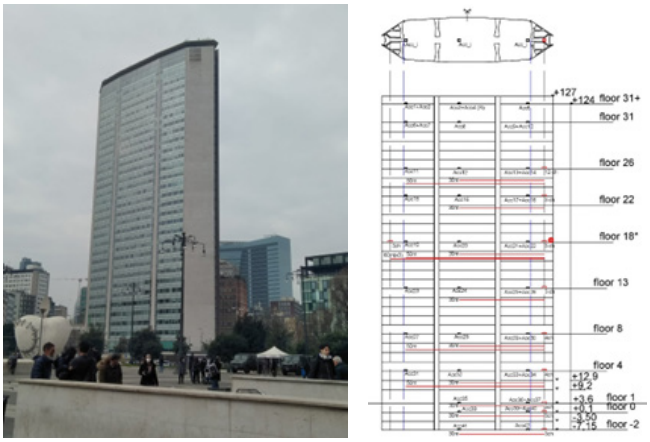


FIG. 23. – The twin Towers n Yangzhou, China, and (right) the pedestrian bridge to be uplifted. On the right the architecture of Wifi control with multiple access points.

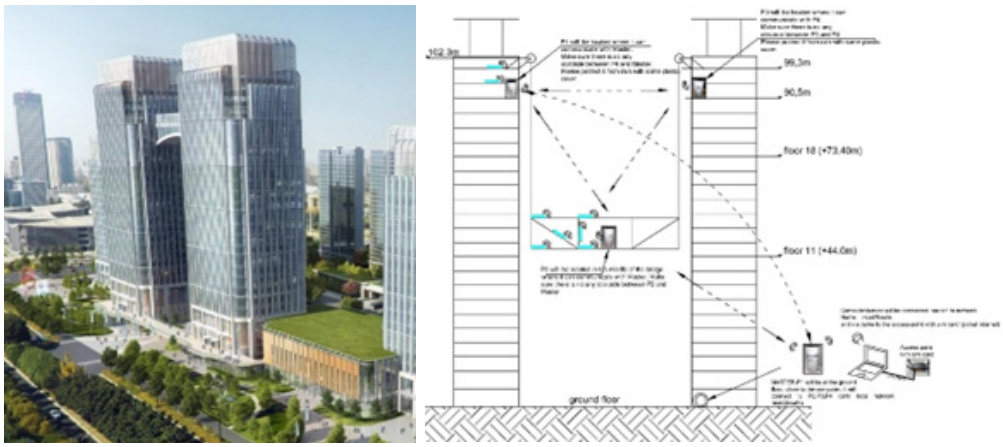


FIG. 24. – The control panel during the uplifting of the bridge to control 240 stress sensors.

Conclusion

Today the electronics allow us to access high quality devices and sensors, get measurements not possible in the past, and, most important, we can distribute all over the structure the sensors since they are wireless and the transmission is performed on the air, via several options for the Wifi or Bluetooth, or similar. The cost of this devices is reducing continuously, and the building can easily install a global monitoring system with a cost less than 2% of the building, giving back a quite high level of structural safety and helping the maintenance staff to select much better the intervention in order to keep working safe the structure.

The method and the platform proposed is already quite known, and in the very near future we could experience permanent monitoring of buildings, bridges (real bridges), towers, and any other structure of our city landscape.

FIG.25 - An overview of IoT applications within the concept of Smart Cities. From Alavi et al. (2018).

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The impact of micro:bit technology use on improving students' coding skills

MSc. Eriksen MERSINLLARI
Quality Assurance Agency for Pre-University Education
Ministry of Education and Sports of Albania
Tiranë, Albania
mersinllarieriksen@gmail.com

Prof. Dr. Petraq PAPAJORGJI
Faculty of Engineering, Informatics and Architecture.
European University of Tirana, Albania
Tiranë, Albania
petraq.papajorgji@uet.edu.al

Abstract

This study analyses the use of micro:bit to improve the coding performance and the analytical skills of kids in elementary school. A sample of 460 students ranging from 6th grade to 9th grade and 60 IT teachers were selected and analyzed. Both students' skills and teachers' abilities were the focus of the effort to point out the role of the method micro:bit was used to improve overall students' coding abilities and academic performance. In the end, a web-based application is designed to allow students to get enrolled to attend specific coding courses and thus, improve their coding abilities.

Keywords: *component; micro:bit, coding skills, educational platforms, digital competencies*

I. Introduction

In a technology-based society, there is a constant need for an army of ICT specialists able to address a significant number of technical problems we face every day. The technical skills needed to have even the most common jobs constantly increase. Addressing the issues encountered during the difficult road towards creating a new generation able to face this formidable challenge successfully is not an easy task. One of the most relevant issues to solve sooner rather than later is the improvement of the ICT curricula and how these topics are taught in our school system. The British Government has offered essential investment in collaboration with the BBC (British Broadcasting Corporation) to design and implement a digital tool referred to as micro:bit. This experiment aims to improve the digital skills of the next generation worldwide. In 2018 this project was implemented in Albania as well. This project provided all schools of the country with an open source hardware ARM-based embedded system, micro:bit, designed to help students improve their coding skills. Special attention was paid to the way kids will communicate with the tool; it must be fun and interactive.

II. Educational technology

The use of technology in the education process is not new. The term "education technology" was used for the first time in England in 1967 B.Jones Robert (Mathews & Ross, 2010). It referred to the systematic application of scientific knowledge in the education process. Education Technology is considered as the use of hardware and software combined with education theories to improve the education performance using the necessary technological resources (Spector, 2015).

Another definition of the concept "education technology" is provided by (Richey, 2008) as the study and the ethics practice aiming at the academic performance increase using and managing the necessary technological resources. Another definition of the same concept is the application of the scientific and technical process in teaching (Ranga, 2006).

Other authors have studied the effectiveness of technology-based approaches in education and outlines areas for future inquiry (Todri et al., 2020). A particular focus is across the following categories of education technology: (1) access to technology, (2) computer-assisted learning, (3) technology-enabled behavioral interventions in education, and (4) online learning (Escueta et al., 2017). (Wenglinsky, 1998) defines education technology as a complex concept incorporating education theory, computer-based training, online learning, mobile-based learning, and multimedia tools.

Thus, the education technology can be presented as:

1. the theoretical and practical approach to teaching
2. technological tool and media
3. a tool for the management of the teaching process
4. interactive and pleasant tool for education (micro:bit).

III. A short description of micro:bit

Micro:bit is a portable microcomputer that the user can program. It does contain a 32-bit microprocessor and a RAM of 16 kb. This device allows students to program it and encourages them to improve and further develop critical thinking and coding skills. Micro:bit is half the size of a credit card; it contains open-source hardware explicitly designed for educational purposes. The list of its components is as follows:

1. 25 leds, which are individually programmable
2. 2 programmable buttons labeled A and B
3. Connection pins
4. Temperature and light sensors
5. Motion sensors (accelerometer and compass)
6. Wireless communication via radio and Bluetooth
7. USB interface
8. Reset button

Some initial infrastructure is needed to make the system functional. Part of this infrastructure is the micro:bit, a battery, the connector, a laptop/tablet/mobile device.

Related studies on the use of micro:bit

The first study on the effectiveness of using micro:bit for education purposes was undertaken in the United Kingdom (Martin, 2016). This study interviewed kids of 10 to 12 years old to gather their feelings regarding this new technology. The study pointed out that:

- 70% of participating girls were decided to choose Computer Science as an elective course
- 90% of participants stated that micro:bit convinced them that everybody could code

- 86% of participants admitted that micro:bit made Computer Science more interesting.

Two years after the Make it Digital initiative, in 2018 a study was undertaken by the Department of Educational Research at Lancaster University to assess the continued use of the micro: bit device in some UK schools. The study surveyed 40 participating schools, where it turned out that the micro: bit was used more often by the lower secondary education cycle, respectively by students of the age group (11-14 years). The most common uses of micro:bit by students were during group work and during the development of the Computer Science lesson, but also from this study it was noticed that a good part of the students used the micro: bit device for development of various projects in other subjects such as Geography, Physical Education or Mathematics.

Similar studies were undertaken in St. Mary's Belfast, Ireland, in 2017 and at the University of Lancaster, the United Kingdom, in 2018. These studies reached similar results.

IV. Population and sample selection

The population of this study is composed of an ensemble of students in Albanian schools participating in the 21st century schools project. Thus, 460 students (N = 460) from three elementary schools in the city of Tirana and 60 ICT teachers in different schools in the country. The sample selection is based on non-probability sampling for both students and teachers. The first phase of sample population selection was based on a random selection of schools that had the opportunity to provide the micro:bit devices to their students. In order to avoid the effects of differences in school performance among students, only the schools that were included in the project were selected. After the school selection process, contacts with school directors were established. An initial test was organized with students to understand their coding skills better. Students were informed that the reason for the test was only academic, and the study would respect the anonymity of the experiment. Our team made all the effort to respect individual and professional rules regarding the ethics aspect. In this regard, all regional education offices were previously informed. The same procedure was followed with ICT teacher selection.

The questionnaire for students contained general questions related to their demographic data and questions related to the approach towards the use of micro: bit as a digital device, which affects the improvement of their coding skills. The purpose of this questionnaire (physically distributed to students) was to collect data and students' attitudes about how do they evaluate the use of micro: bit in

improving coding skills and how do they use the micro: bit device to develop digital competence.

V. Empirical analysis of data generated by instruments

From the analysis of data to see the number of student participants by gender component, it resulted that226 males (49.1%) and 234 females (50.9%) participated in the study. The tendency of distributing the questionnaires to the students was such that it included an almost equal number between male and female students, in such a way that the final result was not influenced by this component, knowing that the male gender is more drawn towards technology and computer science, especially coding.

a. Frequency display for the Gender component

	Gender	Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	226	49.1	49.1	49.1
	Female	234	50.9	50.9	100.0
	Total	460	100.0	100.0	

In terms of grades, the study is extended to all grades of the Lower Secondary Education cycle taking into account the sixth, seventh, eighth and ninth grades. These classes were selected because according to the initiative of the micro: bit project, this was the most appropriate focus group for the implementation of the micro: bit device in the Western Balkans. From the data of table below, we see that the highest percentage of surveyed students have seventh grade students with 180 students surveyed (39.1%), eighth grade with 130 students (28.3%), ninth grade with 90 students surveyed (19.6%) and the sixth grade with 60 students participating in the questionnaire at the level of 13%.

b. Frequency display for the Grade component

	Grade	Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Grade 6	60	13.0	13.0	13.0
	Grade 7	180	39.1	39.1	52.2
	Grade 8	130	28.3	28.3	80.4
	Grade 9	90	19.6	19.6	100.0
	Total	460	100.0	100.0	

Asked whether students had known about the basic concepts of coding 275 students (59.8%) answered that they had knowledge about the basic concepts of

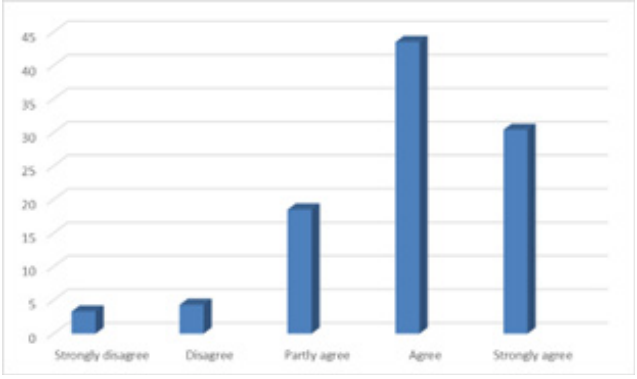
programming (such as variables, outputs, logical conditions or loops) and 185 students in the mass (40.2 %) claimed the opposite. From the data generated by this type of question we see an improvement in the trends of knowledge of basic notions of coding, compared to the previous reports , where only 34.5% of Albanian students of grade 9, had acceptable knowledge in the field of coding.

c Familiarity with coding notions

Coding notion:		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	NO	185	40.2	40.2	40.2
	YES	275	59.8	59.8	100.0
	Total	460	100.0	100.0	

In the following questions, students were able to rate the Linkert scale (strongly disagree, disagree, partly agree, strongly agree) on certain statements regarding the use of the micro: bit. Assertion: I think that micro:bit has aroused my interest in the field of coding, students respond according to the data generated in table following. From the data of this table we see a very positive perception regarding the interest of students in the field of coding between the use of the micro: bit device in the learning process.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly disagree	15	3.3	3.3	3.3
	Disagree	20	4.3	4.3	7.6
	Partly agree	85	18.5	18.5	26.1
	Agree	200	43.5	43.5	69.6
	Strongly agree	140	30.4	30.4	100.0
	Total	460	100.0	100.0	

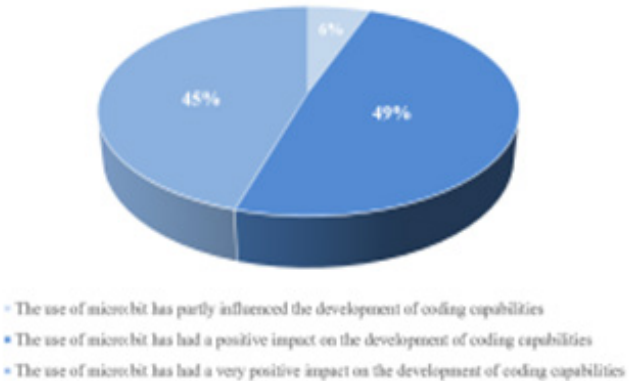


Regarding the statement: Micro:bit helped me to understand more about the notions of coding, from the results of the questionnaires we see a positive approach of students about using the device micro: bit to understand the notions

of programming, where about 71% of them are in the Linkert scale 5 and 4 degree of agreement (agree and strongly agree).

The survey of teachers who teach the subject of Information and Communication Technology targeted 60 lower secondary school teachers to complete an online questionnaire regarding the attitude, implementation and approach to the use of micro: bit during the development of lessons, but only 53 teachers managed to complete the questionnaire. Based on the result of the questionnaire addressed to ICT teachers, these data were generated. Asked about the degree of knowledge of using micro: bit, all teachers stated that they had very good knowledge in using this device. Where only 2 teachers stated that they had not very good knowledge in knowing this device, while the vast majority possessed good knowledge (34%) and very good knowledge (62.2%).

Regarding the implementation of micro: bit for the development of coding skills, the teachers responded according to the following graph: None of them selected the option Using micro: bit did not affect the development of coding skills.



VI. Test results

The sampling group consisting of students underwent a preliminary test at the end of the questionnaire to see and evaluate the knowledge they possessed in the field of computer science, respectively in the coding discipline. Due to the limited time we had available, the students were informed that the primary subject of the study was considered the questionnaire and that the completion of the test was completely in their free hands. Therefore, the rate of return of the tests was not at the expected level, but this fact does not affect the quality or testability of hypotheses and research questions, as the test results of students belong to the category of secondary data. The test was completed by 185 students and the answers obtained show that:

- 87% of students know the concept of block-based programming.
- 71% of them manage to distinguish basic programming concepts
- 62% of students manage to correctly identify the main instructions of a certain block in the work environment Make it Code.
- 74% of them are able to show what is displayed on the screen after the execution of a simple program (block-based programming).
- 38% manage to solve complex exercises using micro:bit.

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Political destability and economic crisis have produced population losses in Albania

A quick look at the demographic dynamics throughout the history of the Albanian State

Dr. Gentian KAPRATA
gentian.kaprata@uet.edu.al

Dr. Otjela LUBONJA
otjela.lubonja@uet.edu.al

Abstract

Since the early 1990s, Albania has entered the path of transition from a monist country of Stalinist socialism and a central planning economy to a country of liberal democracy and a free market economy. This journey has produced, in addition to economic and political freedoms for citizens and everything positive that comes from them, also negative phenomena for society. One of the most evident is the significant decline of the resident population in the country. As we will see in this paper, the population decline during the transition years has come as a result of the two most important contributing components to the country's demographic level: (i) external migration; and (ii) lowering the birth rate. While external migration is directly reflected in the decline of the country's resident population, the decline in fertility has an indirect impact because together with the death rate they shape the level of natural population growth. Both of these together, external migration and the level of natural population

growth, directly shape the demographic level of the country. This paper observes these two important indicators in a historical dynamic, starting from the 15th century, a time when we can find published information and statistics. In this time context, the paper analyzed the statistics collected in relation to these two demographic indicators, and found that there is a very clear link between the increase in external migration and the decrease in the Synthetic Fertility Index (ISF) with political and economic crises. which the Albanian society has faced during the period under observation. Every time a political instability has been presented, starting from the second half of the 15th century until today, so many times Albanians have left the country. Likewise, the difficult economic situation (i) between the years 1960-1990 of the last century, as a result of the central planning economy, and (ii) the difference between the high economic expectations of the citizens and the actual economic reality in the country along years of transition, have resulted in a steady decline in ISF.

Keywords: *External Migration, Natural Population Growth, Synthetic Fertilization Index (ISF), Demographic Dynamics, Population and Housing Census.*

1. Introduction

One of the biggest concerns of the Albanian society at the end of the third decade of transition is the decrease of the population level in the country. The issue has received much political debate, but has been dealt with very little at the scientific level. This has been the reason that has led us to analyze this phenomenon, hoping to understand more about it, and especially about its causes.

In order to have a more complete and broader perspective and understanding of this very serious social phenomenon, we have not limited ourselves to analyzing it only in the years of transition. On the contrary, this paper has aimed to extend wider in time, since the formation of the Albanian State on November 28, 1912. The paper brings previous statistics, especially regarding the external migration of Albanians of that period, to expand further more the spectrum of information studied.

This paper presents one of the most important elements of a state, such as demography, in its dynamics throughout the history of the existence of the Albanian State. It starts with the demographic dynamics of the period before the Second World War, focusing generally on the massive waves of emigration and the level of the country's population, according to censuses conducted by the occupying armies or the Albanian State itself. Further, it continues with the period

of the communist regime, where it focuses on the demographic level of the country in relation to the governing policies in the service of natural population growth and the dynamics of the Synthetic Fertility Index. This part of the paper also addresses the almost non-existent level of external migration, as a result of state coercion. The paper continues with a description of the demographic dynamics of the transition period, focusing on two main aspects: mass external migration and declining below the ISF population replacement threshold. The paper closes with the presentation of the conclusions reached and its modest recommendations.

This paper has minimalist aspirations, and aims to find some simple truths. He does not intend to 'shock' Albanian society through his findings. Its main purpose is to open a new door for the study of issues related to the relationship between demography and territory, as a field of study in the science of urban planning (planned spatial / territorial and urban developments).

Its greatest public and scientific value is to become part of a wider analysis, which is related to the 'Demographic-territorial model of the country'. To understand how the demographics are distributed throughout the country, we must first understand what happened to the population dynamics of the country, because it is this remaining population that then shapes the demographic-territorial model of the country. Moreover, researchers in the demographic sciences have found a very strong link between external migration and internal migration (Vullnetari, 2012), which is one of the shaping components of the country's demographic-territorial model.

Demographics and territory, as well as the relationship between them, are the 'raw materials' for the development of the fundamental issues of a society and a state. They affect all economic, socio-political models and lifestyle of a nation. Fuga in 2012 would consider demographics and territory as the two greatest treasures of a society, from which all others are formed (Fuga, 2012: 9).

2. Waves of external migration before World War II

Demographic data on the number of resident population for periods earlier than the time of the creation of the Albanian state, November 28, 1912, are missing or scarce (Misja and Misja, 2004). The two main pillars of population dynamics, natural growth and migration, have not been measured, or even if they have been measured their findings have not come to the present day (INSTAT, 2004). Data on natural population growth are not available, while data on external emigration can be found in limited quantity and quality since the second half of the 15th century, when the national hero Gjergj Kastriot Skënderbeu died (Vullnetari, 2007: 9; King dhe Vullnetari, 2003).

After the death of Skanderbeg and the fall of Kruja to the Ottoman Empire, many Catholics, including the family of George Kastriot and his warriors who had resisted the Ottoman occupation, fled the country mainly to Italy but also to Greece and the Dalmatian coast (King dhe Vullnetari, 2003). This migration was considered a 'religious migration', as Catholic Albanians left as a result of the Muslim occupation of the Ottoman Empire (Vullnetari, 2007: 9; King dhe Vullnetari, 20003). Referring to the Vullnetari "It is estimated that about 200,000 Albanians left their homes during the period 1468-1506" (Vullnetari, 2007: 9). According to her, this figure made up about a quarter of the population, and therefore can be considered an exodus of biblical proportions. This ratio is similar to that of today's Albanian emigrants abroad until 2004 (Vullnetari, 2007)

After the Ottoman occupation, the lands inhabited by Albanians would be included in the territories under the control of the Ottoman Empire for about 500 years. From this period comes the Albanian word 'kurbet' which King dhe Vullnetari in 2003 would consider as a slight change of the Turkish word 'gurbet' which carries the same meaning, and refers to a trip around the world, to foreign lands, generally to work (King dhe Vullneti, 2003: 18). King dhe Vullnetari in 2003 would present that "The biggest waves of Albanian migration have occurred around the most important historical and political events of the country" (King dhe Vullnetari, 2003: 21).

In the period of the occupation of Albania by the Ottoman Empire, during the 15th-17th centuries there was a mass emigration of Albanians and referred to Vullnetari in 2007, Italy and Greece were the places where Albanians of this period migrated and established their settlements, in the years 1444, 1464, 1468 (Vullnetari, 2007: 14). If we refer to INSTAT in 2004 "In the 15th-17th centuries as a result of the occupation of Albania by the Turkish [Ottoman Empire], there was a mass emigration of Albanians across the coast, to Italy" (INSTAT, 2004: 9).

In Italy they joined several small Albanian communities that had previously settled in those territories and were originalized by fighters who had gone to Italy to "Fight for the House of Aragon, three or four decades ago" (King dhe Vullnetari, 2003: 21). This historically important Albanian diaspora would be isolated in Southern Italy and Sicily, would be called 'Arbëresh' and would create 49 towns and villages in these territories (King and Vullnetari, 2003; Vullnetari, 2007). They would preserve their language and traditions for five centuries, to the present day, while it is thought that this emigration would end in the first half of the 18th century. Many Albanians of this generation, along with other Italians would leave in the early 20th century for the United States (King dhe Vullnetari, 2003).

Another important wave of external migration for Albanians was introduced in the late 19th and early 20th centuries, during the disintegration of the Ottoman Empire and the Balkan Wars (King dhe Vullnetari, 2003; Vullnetari, 2007). The influx of Serbs in those Albanian lands, which today is called Kosovo, was one of the most important reasons for the departure of Albanians from their lands. This period represents a mass exodus of Albanians beginning in Turkey, Runami and Egypt, later in Greece, Bulgaria and Russia and finally in France, America and Australia (King dhe Vullnetari, 2003: 21). According to the Vullnetari, the end of the 19th century opened a new space for the migration of Albanians, which was Turkey where in 1928 there were 250-300 thousand Albanians, of which 60 thousand in Istanbul alone (Vullnetari, 2007: 15).

But even later, during the first half of the 20th century, this phenomenon returned to the lives of Albanians, and was expressed in three waves of international emigration (INSTAT 2004: 9; Vullnetari, 2007: 8-20).

The first wave extends through the years 1912 and 1923, which belong to the time after the declaration of Independence of the country. The decline of the agricultural economy, which was the main economy of the country due to the First World War and the lack of industry or other productive economies, caused 21 thousand Albanian families to leave their homeland (INSTAT, 2004: 9).

The second wave extends during the years 1923-1939, and comes as a result of the economic backwardness and political uncertainty of this time space. In this period, 110 thousand Albanians left Albania (INSTAT, 2004). To be underlined is the fact that in the 1920s the migration of Albanians changed form, from an individual migration for employment, as it was in the first wave, to the model of family departure. After returning from the 'kurbet' many migrants left again taking their families with them, and sometimes the whole village. The increased migration of this period went especially to the United States, where in 1981 there were about 70 thousand Albanians who had migrated in this period (King dhe Vullnetari, 2003: 21).

Whereas, the third wave belongs to the years 1939-1945, which forced 19 thousand people to leave the homeland, most of whom were opponents of the communist authorities who were coming and stabilizing in power (INSTAT, 2004: 9; Vullnetari, 2007, 2012). These belonged mostly to the Legality Party and the National Front Party, two anti-communist political parties that would be persecuted by the communists who came to power in 1944. The stabilized communist regime in power would close national borders, and as a result many few Albanians would be able to 'cross to the other side', until the 1990s (King dhe Vullnetari, 2003: 24; INSTAT, 2004: 9).

3. Demographic level, according to censuses developed, before the Second World War

In Albania, the first attempts at population censuses were made by foreign warring and occupying powers during the First World War (Bërxholi, 2000; Pandelejmoni, 2019). The first of them is the attempt of the Austro-Hungarian army for the northwestern and central part of Albania, in 1918 (Pandelejmoni, 2019: 44-46). The results of this partial census tell us that this territory included a population of 524 thousand inhabitants (Pandelejmoni, 2019: 49; Misja and Misja, 2004).

Such censuses were also developed by the French army for the cities under their administration, which include Korça, Devolli, Kolonjë and Skrapar, a territory which was inhabited by 122,331 inhabitants in 1918 (Pandelejmoni, 2019: 54). Also, the Italian army conducted a census for the territory under their control, according to which the population went to about 170 thousand inhabitants (Pandelejmoni, 2019: 54). In its entirety, referring to the three partial censuses, Albania of 1918 was populated by about 800 thousand inhabitants.

More accurate data on the number of population for the entire territory of the country come to us from the censuses developed by the Albanian governments. The first Albanian state census was conducted in September 1923 (INSTAT, 2014: 21), the results of which show that Albania this year was inhabited by 803,959 inhabitants (Pandelejmoni, 2019), but different documents give different figures. Misja and Misja, referring to a document of 1928, introduce us that in 1926 another measurement was conducted which presented that the population of the country was 828,693 inhabitants (Misja and Misja, 2004).

The second general population and housing census was conducted in May 1930, which showed that the total population was 833,850 inhabitants (INSTAT, 2014). It turns out that during this seven-year period, 1923-1930, in Albania there has been an increase in population with 29,897 inhabitants, which means that in each year, the average natural increase was 4,270 inhabitants (Bërxholi, 2000: 14-16).

Through Pandelejmoni we are introduced to another census conducted in December 1938 (Pandelejmoni, 2019). According to the data found by Pandelejmoni, it results that the population of Albania in 1930 was 1,003,097 inhabitants, while that of 1938 is presented to be 1,128,143 inhabitants (Pandelejmoni, 2019: 80). Which means that the population of Albania during these 8 years has increased by 125,046 inhabitants or by 15,600 inhabitants every year. These dynamics of the Albanian population during the years 1912-1945 come as a result of the natural population growth (INSTAT, 2014: 17) and the external migration of this period (INSTAT, 2014).

Natural increase was based on a level of fertility, which according to INSTAT in 2014 "remained high until the 1960s", and mortality that "began to decline since the 1930s" (INSTAT, 2014: 17). The high level of fertility has been a distinctive feature of the Albanian population before the Second World War, compared to other countries. This would be noticed by INSTAT in 2014, which would say "In the late 1940s, when many countries in Europe had long since entered their fertility transition, the Synthetic Fertility Index (ISF) in the country was about 6, the highest among European countries. " (INSTAT, 2014: 41).

4. Demographic growth during the years of the communist regime

Under the communist regime, during the years 1945-1990, the country's population grew significantly for the two main currents of population growth. First, it was external migration which was strictly prohibited by the communist regime (Vullnetari, 2012: 62; King, 2010), and second, the high level of fertility in the country (INSTAT, 2014: 17). One of the key demographic aspects, longevity, would have its significance for demographic growth in this historical period. Between 1950 and 1989, life expectancy at birth increased from 51.9 to 67.9 years for men and from 51.3 to 73.9 years for women (INSTAT, 2014: 21). This factor would greatly affect the level of population growth in the decades of the communist regime, and resulted in a decrease in the mortality rate, a process that had begun in the 1930s (INSTAT, 2014: 17).

But the main contributor to the natural growth of the population came from the high level of fertility (Hoxha, 2017: 95-87), which was a demographic phenomenon inherited from later periods that would continue as such until the 1960s (INSTAT, 2014: 41). The communist regime pursued strong policies to maintain and strengthen this phenomenon throughout the years of its activity. In the sense of this political approach "On October 10, 1950, the Presidium of the People's Assembly issued a decree on the assistance of mothers with many children and single mothers, with the aim of encouraging the birth of as many children as possible" (Hoxha, 2017: 85). This phenomenon would be presented by INSTAT in 2014 when it underlined that "Throughout that period, the government aimed to use all its resources and promote the continuous growth of the population." (INSTAT, 2014: 41).

The government's contribution to mothers with many children came in two forms, the first being the immediate support given only once for each birth after the third child, and the permanent support given each month after the birth of the fourth child. Both types of assistance were provided progressively, for the fourth birth the payment was higher than for the third birth, for the fifth birth it was higher than for the fourth birth, and so on (Hoxha, 2017: 85- 86).

Another way that the communist regime followed, to increase the level of fertility were moral incentives. For this purpose in 1950, the order 'Glory to mother' and the medal of 'Mother' were created, while in 1955 the honorary title 'Mother heroine' was created (Hoxha, 2017: 86). This title was given to mothers who had "born, raised and educated well" 10 children or more "with the motivation" in order to reward and encourage the birth, growth and good education of many children." (Hoxha, 2017: 86).

At the same time, in order to encourage births, the government pursued a policy of financial penalization. In 1951 the government issued a decree on the taxation of bachelors, widows without children, and divorce, which obliged these categories of people to pay dues as long as they were not married and had no children. Seven years later, in 1958, this decree was amended to include married couples without children (Hoxha, 2017: 86).

As a result of these policies during the 50s, when most of Europe experienced a further decline in fertility rates, Albania experienced an increase in the average number of children per woman (INSTAT, 2014: 41). The population began to increase significantly as a result of the high fertility rate and in 1955 it reached 61,300 births. This figure was very high compared to 36,683 children born in 1942 (Hoxha, 2017: 86). This phenomenon would be noticed by INSTAT, according to which "Since the 1960s, the ISF [Synthetic Fertilization Index] reached a maximum of almost 7 children per woman" (INSTAT, 2014: 41).

Population growth as a result of the increase in the ISF index would be accompanied by the phenomenon of declining infant mortality. In the period 1950-1970, the number of deaths in children aged 0-4 years constituted approximately half of the total deaths nationally, and only in 1955 the number of deaths for children aged 0-4 years was 12 192 children (Hoxha, 2017: 87). While between 1960 and 1965 the birth rate began to decline, with a drop in the ISF from 6.9 to 5.6 (INSTAT, 2014: 41). However, the infant mortality rate also decreased (Hoxha, 2017), which balanced the decline of the ISF in the indicators of the general population growth.

After the 1970s, the ISF again fell rapidly, which expressed in years would be 5.2 in 1970, 3.6 in 1980 and 3 in 1990 (INSTAT, 2014: 41). The decline in the ISF index was evident despite the government's pro-birth policy and the high degree of control over people's lives. This resulted in the fact that fertility decreased by more than 50 percent during the period 1960-1990 (INSTAT, 2014: 41). Hoxha would not share the same opinion, at least for the period 1960-1980 when he emphasized that "Fertility continued to increase, in 1968 it exceeded the limit of 70,000 births and, with the exception of two years that dropped just below this level, remained above that figure until 1980" (Hoxha, 2017: 86).

Referring again to Hoxha in the period 1960-1980, the total population increased by 1,007,685 people, or 1.6 times. In 1960, for the first time, the annual natural increase of the population exceeded the figure of 50,000 per year (Hoxha, 2017: 87). These differences between INSTAT in 2014 and Hoxha in 2017 can be explained by the phenomenon of infant mortality, which continued to fall in parallel with the fall of the ISF. But even this argument is not very convincing, because Hoxha talks about the increase of abortion cases, which according to him during the period 1960-80 were 209,173 such (Hoxha, 2017: 101). However, the population level would increase significantly during the communist regime at a rate of 2% per year (INSTAT, 2014: 17; Vullentari, 2007, 2012).

5. External migration during the years of the communist regime

The increase of the population of Albania during the years of the socialist system is also a result of the phenomenon of external migration. During the years 1945-1990, Albania would not experience any wave of population exodus to other countries, similar to previous or later periods (King and Vullnetari, 2003; Vullnetari, 2007; Vullnetari 2012).

As INSTAT would say in 2004 "With the establishment of the communist regime, after the Second World War, emigration from Albania was banned" (INSTAT, 2004: 9). This would prevent the decline of the population in the country due to external migration as is a feature of previous periods (King and Vullnetari, 2003). This phenomenon would be considered by the state 'national treason' and would be severely punished by the communist regime (Vullnetari, 2007; Hoxha, 2017). Referring to Idrizi, I., Godole, J. and Xhemalaj, F., in 2018, fleeing abroad "was considered as treason and consequently the most serious crime possible. According to Article 47 of the Criminal Code (1977), escape was punishable by imprisonment of not less than ten years until death. While family members, as a rule, were interned" (Idrizi, I., Godole, J. and Xhemalaj, F., 2018: 97)

As a result, the country showed one of the highest growth rates in post-war Europe, leading to an increase of 1, 218, 000 inhabitants in 1950 to a maximum of 3,182,000 in 1989 (INSTAT, 2014: 17). Referring to the census measurements of the communist regime, we can also determine the rate of population growth by decades, which states: in 1950 Albania was inhabited by 1.2 million inhabitants; in 1960 by 1.6 million inhabitants; in 1970 by 2.1 million inhabitants; in 1980 by almost 2.7 million inhabitants; and in 1990 Albania was inhabited by more than 3.2 million inhabitants (King and Vullnetari, 2003: 13; Kotmilo and Kotmilo, 2017; King, 2010).

6. Decrease in fertility rate in transition years

The population of Albania, in the years of transition, has experienced a significant decrease from 3,182,417 inhabitants in 1989 (INSTAT, 2014) to 2,845,955 inhabitants in 2019 (INSTAT, 2020). This population decline has come from two main factors: first, from the declining fertility rate; and second, as a consequence of international migration. Albania in transition is strongly involved in both of these phenomena (INSTAT, 2004; 2014; 2016-2020).

These factors of population dynamics would be distinguished by INSTAT in 2014 in the study 'Population Projections 2011-2031' where it would underline that "International migration continued and was scattered throughout the country, leading to a continuous decline in the population of Albania, especially in the border areas" and "All regions were involved in a low fertility trend, which no longer guarantees the demographic reproduction of the population in the future" (INSTAT, 2014: 13).

Another demographic problem, which indirectly affects the loss of the population of Albania, especially for the future, is the aging of the population in the years of transition (Vullnetari, 2007, 2010, 2012; INSTAT, 2004, 2014). INSTAT in 2014 would claim that "The combined effects of low birth rates and large-scale departures, mainly of young people, accelerated the aging rate of the population" (INSTAT, 2014: 13).

Referring to INSTAT periodic reports on population assessment during 2011-2020, we note a clear aging process of the population in the country, which has begun to be present in the demographic development of the country during the transition. According to Table 4 'Median age of the population' of the INSTAT report 'Population of Albania' on 1 January 2020, the median age in the last decade has increased rapidly. This indicator by years is presented: in 2011 it is 32.6 years old; in 2012 it is 33.2; in 2013 it goes to 33.7; in 2014 it reaches 34.2 years old; in 2015 he is 34.7 years old; in 2016 35.2 years old; in 2017 at 35.6 years old; in 2018 at 36.1 years old; whereas in 2019 36.7 years old; and in 2020 gold at 37.2 years (INSTAT, 2020).

One of the main contributors to the decrease of the population of Albania in the years of transition is the great decrease of the Synthetic Fertility Index. As we have presented above in this paper, the birth rate has been a characteristic of the Albanian population, especially in the period before the Second World War. This very important demographic phenomenon would continue until the 60s of the last century. But since then and especially "Since the 1990s, fertility has been reduced even more" (INSTAT, 2014: 41), although the average number of children

per woman remained among the highest compared to Europe until the year 2001" (INSTAT, 2014: 19).

According to INSTAT in 2004 "In terms of fertility, the child-to-woman index speaks of a downward trend from 3.3 in 1990 to 2.2 in 2000" (INSTAT, 2004: 32). This phenomenon would be distinguished by INSTAT when it stated that "the synthetic fertility index (ISF) fell at a rapid rate from 6.8 in 1960 to 2.3 in 2001." (INSTAT, 2014: 19). Which means that because of the historical tradition the population continued to grow, but according to INSTAT in 2014, which referred to the 'Health and Demographic Survey' in 2008, "fertility had declined below the replacement level" (INSTAT, 2014: 41).

From this year the birth rate in Albania is significantly lower than the replacement rate, which is the average number of children a woman will have to give birth to replace herself giving birth to a girl who must live to the age of its reproduction. In numerical terms, this indicator would be presented by INSTAT, according to which "Currently the Synthetic Fertility Index (ISF) is equal to 1.67" (INSTAT, 2014: 45).

The ISF indicator would continue to fall rapidly for the following years, and in 2011 it had dropped to the level of 1.6 (INSTAT, 2014: 5). As a result of this demographic phenomenon, the number of births in 2011 was less than half of the births in 1990, or as INSTAT would put it, at the time when we have the latest official direct statistics for this indicator "34,285 births [in 2011] compared to 82,125 births [in 1990]. " (INSTAT, 2014: 19), or 33,221 in 2015 (INSTAT, 2016) and about 32 thousand in 2016 (INSTAT, 2017).

The decline in the fertility rate can also be distinguished indirectly from the level of natural population growth, which is a direct factor of the population level. If we observe the periodic reports of INSTAT 'Population of Albania', we will notice that this indicator has decreased every year, during the third decade of transition, 2010-2020. To bring some examples, in 2017 this indicator decreased by 16.5% compared to 2015 (INSTAT, 2018), in 2018 it decreased by 17.4% compared to 2017 (INSTAT, 2019) and in 2019 decreased by 7.1% compared to a year ago (INSTAT, 2020). The decline of this indicator presents a decline in the level of natural population growth.

During the second decade of the transition, in the years 2001-2011, the decrease of this indicator would lower Albania from the ranking in the top 10 countries for fertility in Europe, while only four countries in Europe have birth rates of more than 2 children per woman, and they are Turkey, Ireland, Iceland and France. Albania in 2011 has a lower birth rate than some Western European countries such as Belgium, the Netherlands and the United Kingdom and some Northern countries such as Norway, Finland and Sweden (INSTAT, 2014: 48).

To have a clearer picture of how the main fertility indicators are presented in Albania in transition in relation to those of EU member states, we will refer to the sources of the European Union. Referring to the report 'Population statistics at regional level' of Eurostat in 2019, we will note that the overall fertility rate in the EU increased from 1.46 in 2001 to 1.58 in 2015 (Eurostat, 2019). The opposite happens in Albania, if in 2001 this indicator was at 2.3 (INSTAT, 2014: 19), "in 2011 it had dropped to 1.6" (INSTAT, 2014: 5). This is the largest decline compared to all European countries, most of which experienced positive developments in fertility, such as Latvia from 1.22 in 2001 to 1.70 in 2015 (Eurostat, 2019). Other member countries also had an increase in the fertility rate, for example in 2001 France had this indicator 1.96, but in 2019 together with Romania, and the United Kingdom have crossed the population replacement threshold of 2.1 (Eurostat, 2019).

A phenomenon similar to Albania, which has experienced a decline in this indicator "from 6.8 in 1960 to 2.3 in 2001" (INSTAT, 2014: 19), is Ireland, which in 1968 had an overall fertility rate of 3.77, in 2017 this indicator decreased to 1.77 (Eurostat, 2019). According to Eurostat, 5,103,165 babies were born in the European Union in 2015, compared to 5,062,948 in 2001 (Eurostat, 2019), while in Albania the number of babies born in 2015 was 32,715 (INSTAT, 2016), while in the beginning years 1990 were over 60 thousand births per year (INSTAT, 2014).

7. Demographic decline along the transition as a result of external migration

The decline of the population of Albania is also due to the reasons of external migration, which has been continuous and at a significant pace. Albania's post-communist transition has been characterized by a large population movement abroad, in search of better livelihood opportunities (INSTAT, 2014; King and Vullnetari, 2003; King, 2010).

The departures were massive in the first two-three years, and if we want to express it in figures we can say that about 220,000 emigrants left Albania, between 1989 and March 1992 or 300,000 between 1989 and December 1992 (INSTAT, 2004: 34). External migration trends would continue, and they would be directed mainly to neighboring countries, as INSTAT would refer to 1995 "the number of emigrants may have been between 450,000 and 500,000 (3/5 lived in Greece, 1/5 in Italy and 1/5 in Western Europe) ", while "In 2002, about 750,000 lived abroad" (INSTAT, 2004: 34). At the end of the time period for which INSTAT analyzed it can be said that "approximately 710 000 individuals" left Albania only between 1989-2001 (INSTAT, 2004: 36).

This phenomenon would also be noticed by the World Bank in 2007, according to which "In 2001, about 600,000 to 700,000, or one fifth of the local population of Albania, were estimated to live outside the country, mainly in Greece and Italy" (BB, 2007: 2).

The phenomenon of external migration would continue in the second decade of transition. INSTAT, would emphasize that emigration is one of the main reasons for the decrease of the population in Albania in the period between 2001 and 2011 (INSTAT, 2014: 31). If we refer again to INSTAT in 2014, "another 573 thousand more people left the country than entered it" (INSTAT, 2014: 5), for the period 2001-2011. Which means that about 17% of the population of Albania has left the country in this time period (INSTAT, 2014).

These high levels of migration can also be seen if we refer to figure 19, 'Indirect calculation: Net migration and number of returned migrants, by age group and gender' and figure 20 'Indirect estimate: Age and gender of number of migrants' (INSTAT, 2014: 33). According to INSTAT in 2014, which referred to OECD data, the most preferred destination countries for Albanian emigrants are Italy and Greece, followed by the US, the United Kingdom and Germany. A number of 47% of Albanian emigrants live in Italy, making this country the most sought after destination, closely followed by Greece, with 43 percent of Albanian emigrants. In third place, the United States of America is ranked by margin (INSTAT, 2014: 35).

The Vullnetari would distinguish four strong external migration flows in this period (Vullnetari, 2007: 31-35). It would define the migration of 1990, as the first influx, which included about 5 thousand Albanians who entered the foreign embassies in Tirana and departed by boat to Italy and by land in Greece, in a total of 20 thousand Albanians (Vullnetari, 2007: 31-32). The second influx, according to the Vullnetari, was 1991 when after the Italian state repatriated about 20,000 migrants who left by boat, Greece became the most preferred place for migration. In this year alone, about 100 thousand Albanians migrated to Greece, while for the period 1991-1992 the figure went to 300 thousand (Vullnetari, 2007: 33).

The third influx is concentrated in the years 1993-1996, which generally continued in Greece where it is estimated that about 90% of the emigrants of this period were concentrated. According to Vullnetari, in the mid-1990s about 400 thousand Albanians had migrated (Vullnetari, 2007: 33). According to her, the 1997 pyramid crisis would bring the third influx of external migration. Initially 10,600 Albanian migrants would be accepted by the Italian state, but then the sinking of a migrant ship would close this practice, and migration would be strengthened towards Greece and other EU countries, such as France, Germany and Belgium, but also towards the United Kingdom and the United States. The fourth flow of migration, according to the Vullnetari, would extend to the years 2000-2007, where the scope of its study ends. According to the Vullnetari in 2012, during the

period 1990-2011, about 1.5 million Albanians left Albania (Vullnetari, 20012: 15).

But the situation of high migration is evident in the following years, according to the INSTAT Annual Report 'Population of Albania, 1 January 2015', it results that the net migration has turned out to be 18,046 people (INSTAT, 2015), and according to the same report of in 2020 this indicator includes 23, 082 inhabitants. Referring to these annual reports, we will see that the same trend has continued until 2019, which was expressed by an average of net migration of 20 thousand migrants, and in total for the whole decade about 200 thousand Albanians left Albania. For many reasons this figure processed from INSTAT data is inaccurate "as there are few incentives for them [migrants] to register their departure with local authorities, [hence] there is no reliable measurement of the number of individuals who have left Albania. " (INSTAT, 2014: 31).

If we refer to the World Bank in 2018 in the annual report 'Regular Economic Report for the Western Balkans' the situation is the same. According to this report, more than 40% of the Albanian population has emigrated during the years of transition and Albania ranks second in the region, after Bosnia-Herzegovina for the highest level of emigration (WB, 2018). What is most troubling, according to this report, is that those who are migrating are qualified and highly educated people, as well as women. As would be noted in the report:

> "In some countries, such as Albania, Kosovo and Bosnia and Herzegovina, more than 40 percent of the resident population has emigrated. The main destinations of emigrants from the region in 2015 were Austria, Germany, Greece, Italy and Switzerland. Emigrants are mostly of working age and with higher education, while the share of women in the total number of emigrants is increasing more and more" (WB, 2018: 15).

Other studies also present this severe demographic phenomenon, such as the Bank of Albania in 2018 in the study 'Remittances: a support for development', which would emphasize that "Albania after the '90s was dominated by migration cycles, of which can be considered intense, irregular and evolving, as a result of the combined action of economic and political driving factors "(BoA, 2018: 10). According to the Bank of Albania, which studies the phenomenon of migration in reference to remittances sent by migrants to their families, the presence of a migrant population scattered around the world is about 1.2 million inhabitants, which means that it is almost half the population. who currently lives in the country (BoA, 2018: 5).

The high level of emigration can not be accurately determined by statistical measurements of domestic institutions. Many authors have noted this fact, starting with the World Bank in 2007, according to which data provided to its population

missions in 2005 show that most districts report that their population approximates the levels calculated in in 2000, before the last census, while underlining that "The total population in 2000 was estimated at 3,961 million while the census brought a large correction of this number, to 3,069 million due to increased immigration." (BB, 2007: 9).

This phenomenon would be acknowledged by INSTAT itself, according to which "resident Albanians are not systematically registered when they leave the country" (INSTAT, 2014: 31). In this sense, beyond the figures presented above we will try to distinguish it more clearly from the reports of the host countries of this emigration. Referring to the evaluation data 'Residence permits, statistics for the first permits issued during the year' Eurostat presents that in 2018 alone a total of 62,500 residence permits were issued to Albanians working and living in the European Union, of which over 50 thousand permits for a period longer than one year, which express about 80% of them. Compared to a year ago, the number of long-term residence permits has increased by 17% (Eurostat, 2019).

According to Eurostat, 15% of other residence permits issued for the first time are issued for a period of 6 to 11 months. While 2280 permits, or about 4% of them, are issued for a period of 3 to 5 months. Countries with the highest number of residence permits issued to Albanians are neighboring countries, such as Italy with 23,147 permits and Greece with 16,936 permits, which represent over 60% of the total permits issued by EU countries (Eurostat, 2019).

The countries with the highest number of residence permits after Germany, which ranks third after Italy and Greece, rank the United Kingdom with over 3000 permits issued in the last year, France with 2143, Sweden with over 1500, and Croatia with 1088. More than half of residence permits are issued for family reasons, but in recent years there has also been an increase in residence permits issued for study or employment reasons, which marked an increase of more than 70% compared to with a year ago (Eurostat, 2019).

The above data from Eurostat, in addition to confirming the international migration trend presented by INSTAT statistics, show that Albania will continue to lose population in the future as a result of external migration and the tendency of emigrants to seek longer residence permits, which shows that their intention is not to return to Albania for a long period of time.

To assess external migration during the third decade we turned to Monitor Magazine, which analyzed the issue from INSTAT data. According to Monitor, INSTAT conducted a large emigration survey, with a sample of 20 thousand families, in the period April-July 2019. According to this survey, during the years 2011-2019, 360 thousand people or 13% of the resident population left Albania. in 2011. The biggest concern that comes from the data collected by this survey is the fact that in the last decade the phenomenon of external migration has expanded to the emigration of the whole family.

According to Monitor, which analyzes the data collected by INSTAT "During the last 10 years, 6.6% of families have left the country, a total of 49,500, while in the years 2001-2011 4.4% of units had left" (RM, 2020). This situation is the same as the foreign emigration during the years 1912-1939, which we talked about earlier in this paper. Even in that period, the first phase of migration was individual, while the second was familial (King and Vullnetari, 2003).

From Monitor Magazine we get some more serious statistics, in terms of external migration. Even in this analysis she refers to INSTAT statistics, which she has further processed. According to Monitor, INSTAT used the comparison of two populations, the resident population and that according to the civil registry, and found that in 2020, 1.6 million people live outside Albania (RM, 2021). And if we compare it with 1.08 million that were from the result of the 2011 census (INSTAT, 2004), it turns out that this decade another 600 thousand citizens have left Albania.

8. Conclusions and recommendations

Population loss in the years of transition is not a phenomenon linked in the cause-and-effect chain to the time in which this phenomenon occurred. The history of the period of existence of the Albanian State, but also before, since the 15th century, shows us that this phenomenon has been present in the Albanian society of each historical period.

This very harmful phenomenon for the society, as it is clearly seen in the paper, has been present in all historical periods and is related to political instability and / or economic crises. Since the second half of the 15th century, when the territories inhabited by Albanians fell under the rule of the Ottoman Empire, Albanians have fled their lands, to escape the consequences of the political instability of the time or economic crises.

The paper finds and brings historical examples of external migration: of the 15th-17th century, as a result of political instability from the Ottoman occupation of the country; during the years 1912 and 1923, as a result of political instability due to the declaration of Independence of the country and the First World War, as well as the decline of the agricultural economy, which was the main economy of the country, and the lack of industry or other productive economies; which extends during the years 1923-1939, and comes as a result of the economic backwardness and political uncertainty of this time space; which belongs to the years 1939-1945, which came as a result of the Second World War and the political instability that accompanied the establishment of the communist system in Albania.

The paper concludes that even during the communist regime, 1945-1991, Albanian society has reacted to the economic crisis by reducing the fertility rate,

thus affecting the reduced growth of the population. Although external migration has not been numerically influential, due to political austerity, the natural growth rate has declined since the 1960s as a result of the economic crisis brought about by the central planning economy. In this context, it can also be said that, although Albanian society was under strong political repression by the communist regime, the political situation in the country did not undergo any political instability to produce significant external migration.

The strong political instability of the first years of transition, as a result of the fall of the communist regime, would bring about a strong wave of foreign emigration during the years 1990-1992. This external migration would be divided into two waves, according to the respective crises: the first belongs to the fall of the communist system; and the second victory of the Socialists in the elections of 1991. A third, very powerful wave would come after the events of 1997 which produced a high political instability in that period. At this high level of migration, and consequently in reducing the demographic level of the country would greatly affect the economic crisis faced by the country.

The steady decline in population in the three decades of transition, as a result of falling below the replacement level, is argued by the low growth rates of the country, especially in relation to the expectations of the society that is transiting from a planning society. centralized economy towards a free market economy society. In this aspect, external migration has also had an impact, which has removed from Albania the most specific age groups that lead to population growth.

The paper recommends more in-depth studies on this very important topic in terms of social and national development. The paper also recommends the drafting of other studies related to the relationship between demographics and territory, as well as the impact of the model that shapes this relationship with: urban / territorial / spatial situation of the country, and its impact on the urban quality of life of citizens; the social structure and political model of the country; pre-university education and other social infrastructures in the inhabited centers of the country; engineering infrastructures of residential centers; university education; the economic model of the country and the family economies of the citizens, etc.

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Albania's urban and territorial dimension was a product of the savage communist past and the difficult transition of the country

The impact of the communist past and transition reforms on the urban development of the country

Dr. Gentian KAPRATA
gentian.kaprata@uet.edu.al

Abstract

Albania of the fourth decade of transition presents a series of problems related to the urban and territorial development. This paper analyzes the initial causes of urban and territorial problems, which are correlated to the savage communist past and beginnings of the political and economic transition of the country. At the end of the communist regime, Albania was one of the countries of the socialist camp with the highest level of implementation of the ideology, principles and practices of Stalinist socialism, which made the Albanian political transition very difficult. Lack of democratic heritage, high level of indoctrination of society and especially the ruling elite of the transition, were the main reasons for this delay. The economic transition of the country also presented a strong challenge. The central planning economy, in the last years of its implementation, would fail in many respects. This would bring, not only an extreme poverty of Albanian families in the moments of transition, but also a real lack of economic activities, which in a private management could bring more employment to the population in the future. This general context of the transition would reflect the same difficulties in the transition of territorial governance, as an integral part

of the transition as a whole. The liberal and democratization reforms pursued in the early years would include land ownership, buildings, housing, urban planning and development processes. As a consequent, the country has experienced a high decline in the resident population, as a result of foreign emigration. But what influenced the strong changes of the urban, territorial and spatial dimension of the country, was internal migration. This massive internal migration would reshape the territorial model of population distribution across national territory, the spatial structure of the inhabited centers and the urban quality of life in Albanian cities. There are four most important preconditions that would produce this massive internal migration, which originate from the savage communist past and the political and economic transition reforms: the inability of the territorial government to understand its new role in urban and territorial issues; the decline of basic public services (education, health) as a result of the departure of 'nominees' from the party-state in cities different from those of their origin; loss of employment of citizens in state-owned, bankrupt, closed or in-the- process –of-privatization enterprises; free movement of citizens and freedom to choose residence. Two would be the main financiers of this construction development that shaped the urban and territorial model of the country, which originate from the political and economic transition reforms: income provided by interaction in the free market of real estate from citizens who had privatized state-owned housing in their use; remittances provided in emigration, after allowing the free movement of citizens outside the national territory.

***Keywords**: concentration of power, political transition, economic transition, territorial governance, urban development, internal migration, forced residency, voluntary residency, liberal reform*

1. Methodology and methodological limitations

The methodology of this paper is based on the analytical one. Through analytical methodology and based on rational argumentation it has become possible to explain the phenomenon of the impact of the communist past and the transition reforms to the urban and territorial development of the country. Also, through analytical methodology is made possible the cause- effect relationship of the variables studied, such as the model of communism and Albanian transition reforms and their impact on the urban and territorial development of the country.

The methods used in this paper are qualitative. This paper theoretically assesses the impact that the characteristics and features of the communist regime and the transition reforms have produced on the way the urban and territorial dimension of the country has developed. This is accomplished using secondary sources of

Albanian authors who have spoken on these topics, and evaluation documents from International and National Institutions.

Since the methodology used is rational analytical, this paper is based mainly on theoretical arguments. In this sense, concrete measurements or primary sources derived directly from the researcher are missing. However, the paper has tried to overcome this limitation based on studies by the most important Albanian authors in these fields. As well as reports and evaluations drafted by credible national and international institutions.

2. Purpose, question and hypothesis

The purpose of the paper: The main purpose of this paper is to analyze the impact of the communist past and the transition reforms, on urban and territorial development of the country. **Research question:** What are the ways in which, the communist past and the transition reforms of the country, influenced the urban and territorial development issues? **Hypothezis:** The depth of implementation of the communist system in Albania and the difficulty of the transition to democracy, determined the urban and territorial dimension of the country.

3. Operational definition of terms

Territorial governance: means the governing activity of those functions, duties and legal responsibilities related to the territorial and urban development of the country. They include: drafting and approving instruments of territorial planning and development (territorial and urban policies, plans and regulations, according to their classification and level of governance); development control (construction permit); territory control (protection of territory from informal construction).

Urban Development: means the entirety of processes of the interaction of people with the territory for the purpose of development. It is the product of all the interventions of specific people, companies and various organizations under the leading and guiding role of the governing authorities.

4. Introduction

In the early 1990s, Albania experienced a leap from a country of Stalinist socialism and a central planning economy to a country of liberal democracy and a free market economy. This transition was not easy for a society that was, for 46 years,

organized and functioning under a very concentrated dictatorship of political and economic power.

This paper aims to observe the transition in urban and territorial issues along with the political and economic transition. It presents the specific characteristics and features of the socialist system in Albania, compared to other countries of the Socialist Camp, which would affect the country's transitional processes in the first years of Albanian post-communism.

There are two main reasons why the paper aims to observe together these components of the overall transition of the country. First, both the political and economic transition, as well as the transition in dealing with urban and territorial issues, must be carried out by the same social mindset, which was the product of the savagery of the former communist regime. This means that, since both of these thematic transcendences were inspired and developed by the same society and socio-political elite, then both of these transcendences will present the same symptoms. And the second reason (cause) is the fact that the progress of urban and territorial issues in the first moments of transition would depend on other political and economic reforms in the country.

As it will be presented in the paper, Albania of the first moments in political and economic transition would be in a very unfavorable situation to make an easy transitioning. This was greatly influenced by: the high level of Party-State control over other social, political and constitutional institutions; non-existent historical heritage in the democracy of the Albanian society; the mentality formed and ingrained in communism, of society and especially of the political elite that led the first reforms; the deep level of implementation of the central planning economy; the extraordinary economic situation of the country, before the liberalization and privatization reforms; the bankruptcy of socialist enterprises and the high level of unemployment that this created; implementation of liberalization and privatization reforms, not because of a deep understanding of them by the political elite, but as an obligation by the International Institutions, etc.

The difficult transition and especially its causes (the savage communist past) would affect the way the territory would develop in the first years of the transition. Territorial governance presented great difficulties in understanding its new role, from a government that had everything in hand (land owner, authorizing and controlling urban and territorial development, financing this development), into a government that must take care that all already private operations in the territory have a unified product that brings a good urban quality of life to citizens.

Political (human rights, including free movement and land ownership) and economic (liberalization of the construction, real estate and housing ownership) reforms that the first governments pursued in Albania also had an impact. These would be the preconditions and causes of a strong emigration movement that would

accompany the first years of the transition, and would reshape the demographic-territorial model of the country. This would have its impact on the way of urban development of Albanian inhabited centers, because these migrants would build new houses and buildings in the new settlements.

The paper begins with a presentation of the general situation of the country's entry into the transition to democracy and the transition of urbanization processes, which would create the preconditions for further development of the urban and territorial dimension of the country in the years of transition that would follow. It will focus on describing the high level of statism and socialist understanding of society and the ruling elite, as well as the failure of many centralized economic planning devices; which acted as a deterrent to a smooth transition to liberal democracy and a free market economy.

The paper will continue with the presentation of liberalization and privatization reforms that affected the territorial governance, the demographic-territorial model of the country and the way of urban development. It will further focus on the political and economic preconditions for shaping the construction sector (territorial governance and urban / territorial development) under the new conditions. The paper will close with a modest presentation of the conclusions it has reached and the recommendations it offers.

5. High level of statism as a deterrent to rapid political transition

At the end of the year 1990, Albania broke away from the communist totalitarian regime and began the journey towards a democratic system, allowing the country to open up to political pluralism through the creation of the first opposition party, the Democratic Party of Albania.

Fuga in 2001 would maintain that:

> "The Stalinist regime in Albania, after ruling completely in the social and political life of the country, after calling for help all the energies and virtues of its citizens, after justifying its power through a magnificent and heroic ideological discourse, ended more banally, ordinary and dull as it can ever be done" (Fuga, 2001: 12).

It was this year's student movement that shamed the ruling communist caste, changed the course of the political system in Albania and marked the end of the model of totalitarian dictatorship and the introduction of Albania into the model of multi-party democracies (Krasniqi, 2009: 235). Albanian communism had self-presented itself as one of the fiercest in the Socialist Camp (Biberaj, 2000; Gjura, 2003, 2015; Krasniqi, 2009). As a result, efforts to change and reform it would be

more difficult than in other countries, both politically and economically. According to Biberaj in 2000 "[Albania is] going through a process of multiple transitions: political transition from one party to many parties, economic transition from a planned economy to a market economy and the transition of national security to an international security regime" (Biberaj, 2000: 15).

The high level of party control over other state and constitutional political institutions is evident from the first moments of entering the transition, because the decision to allow political parties was taken in the Central Committee of the ALP (PPSH). Krasniqi in 2009 would underline that:

> "The very fact that the last decision of the Central Committee and the Politburo [Political Bureau] was public and unmasked on the label of constitutional and state institutions is a proof that at the last moment the ALP (PPSH) accepted what was known for 45 years, that the Albanian state was de facto governed by it" (Krasniqi, 2009: 235).

This characteristic would also be presented by Gjuraj when he would underline that "communism in Albania took a very specific form, putting Enverism at the center of official political thought for several decades." (Gjuraj, 2015). A way of expressing this fact in practice would be introduced in January 1991 when the regime issued a decree sanctioning 6 months to 3 years imprisonment for all those who insulted, accused or committed public acts against the name or symbols of the communist dictator Enver Hoxha (Krasniqi, 2009: 237).

After the establishment of the Democratic Party, a number of other parties were created and the Labor Party of Albania lost its exclusive role in Albanian politics and as a determinant in social dynamics (Biberaj, 2000; Krasniqi, 2009; Gjuraj, 2003, 2015).

6. The profound failure of the centralized economic planning economy as an inhibitor of economic transition

In March 1992, the Democratic Party of Albania and a group of other parties in coalition with it won political elections and the right to govern the country (Biberaj, 2000; Krasniqi, 2008). Its basic task was to transition the country from a one-party regime of the central planning economy to a system of liberal democracy, the rule of law and a free market economy (Biberaj, 2000; Meksi, 1992, 1997).

The political transition was accompanied by profound changes in the economic and social context of Albania. During this period, a series of changes were undertaken in the political and economic environment of the country (Çili, 2013;

Civici, 2013; Meksi, 2015), which directly influenced the spatial and territorial development of Albania as a country and its cities (Misja and Misja, 2004; Aliaj, 2008; Imami et al., 2008). Through these strong political, social and economic changes, the country entered the phase of transition from the Stalinist dictatorship of a centrally planned state-run economy to a liberal free market economy democracy (Krasniqi, 2009; Gjuraj, 2015).

The economic situation of the country in the period 1990-1992 was very difficult and was expressed through long queues to buy basic foods, which were lacking in their dominance (Meksi, 2015). Gjuraj would also present this situation when, while talking about all the countries of the Socialist Camp, he would underline that "Long lines of people characterized every former communist country. Also, the same situation prevailed in the Albanian society for a very long time, economic difficulties and backwardness, lack of food items" (Gjuraj, 2003: 41).

The closure of many economic enterprises and the payment of workers with 80% of the wage without work, technological obsolescence and lack of investment for the renewal of technologies of productive enterprises, were another aspect that had hit hard the productive economy of the socialist country (Meksi, 1997; Civici, 2013). Even the few economic production enterprises that remained in operation from the socialist period, such as hydropower plants, reservoirs, airports and some mines, needed significant investments to be used profitably in market economy conditions (Meksi, 2015). INSTAT would also talk about this phenomenon, underlining that the productive economy "was seriously damaged during the '80s" (INSTAT, 2004: 47).

To create a concentrated image of the economic situation inherited from the communist system, we will refer to the debate of the last socialist President Ramiz Alia in a meeting with representatives of the striking students of the University of Tirana on December 11, 1990, which as an authentic document speaks of the situation of the Albanian economy. Brought by the Prime Minister of that period, Aleksandër Meksi, Aliaj would say to the students that "The economic situation, as I said publicly even in the meeting with the youth, when it was on November 23, is difficult" (Meksi, 2015 p. 134). What would support our argument is the fact that Aliaj in this meeting would also admit that "One of the basic reasons for this is that we have outdated production techniques and technology" (Meksi, 2015).

Civici had the same assessment, when he would underline that "The mediocre socio-economic results of the communist legacy quickly became the natural allies of the post-communist reformers" (Civici, 2013). This was happening at a time when the structure of the Albanian economy had to change completely and that it should be the private sector and free enterprise who would realize these productive investments (Meksi, 2015: 133). In a narrow context, Meksi as one of the closest witnesses to the situation would underline "This was the economic situation of

the country, where the state treasury had no more than 2.5 million USD and several hundred million debts to Western countries and firms, but also to former communist countries, when the economy was paralyzed and the situation in the country continued to deteriorate" (Meksi, 2015: 137).

7. Difficulties and obstacles encountered in the first months of the transition

The first pluralist elections in the country were held on March 31, 1991 and were won by the Albanian Labor Party (Fuga, 2003: 75), a year later, on March 22, 1992, general parliamentary elections were held again, which were won the Democratic Party of Albania and its allies (Krasniqi, 2009; Fuga, 2003).
The political conditions for a transition to democracy were the most difficult in the countries of the socialist camp that had embarked on this path, not only in the economic context but especially in the context of political heritage (Fuga, 2003). A very serious definition of which Gjuraj would present to us, when he underlined that "The premises from where the democratic transition in Albania started have been unfavorable, starting from the lack of democratic tradition in the country, extreme self-isolation for decades, lack of free media" (Gjuraj, 2015).

In regards to the lack of democratic tradition in the country, "The change of the system did not bring the change of mentality"(Krasniqi, 2008: 229). But in particular the ruling elite of the DP, most of whom came from academic circles, had no political experience and radiated a great difference between their theoretical ideas and the chances for practical realism (Krasniqi, 2008: 230).

Reforms in the service of transition began in this intermediate period of governance between two political parties, one of which had maintained a monopoly of power for 46 years, while the other had just emerged as a need for political pluralism in the country (Meksi, 2015; Fuga, 2003).

Although the two parties are hostile to each other, and rivals throughout the transition, the DP and SP would have the same strategic approach to Albania's journey to West. This would require liberal reforms, and as Civici points out, "the end of the Euro-Atlantic integration tunnel became a powerful driver of economic and financial reform" (Civici, 2013).

However, coexistence in the first year of the transition was not easy between the two parties, which had opposing positions regarding the country's Constitution. This came as a result of the paradox of developments between December 12, 1990 and April 29, 1991, when even though political pluralism was accepted, the political system functioned with the 1976 Constitution (Krasniqi, 2009).

During this period of Constitutional transition, political events on the ground moved in a new direction, which Krasniqi would describe as "legally unconstitutional" (Krasniqi, 2009: 236). On April 29, 1991, the two main populist parties, the Labor Party and the Democratic Party, after close and intensive cooperation, voted for the entry into force of the basic principles of the new political system, through a package of laws called the 'Main Constitutional Provisions' (Krasniqi, 2009: 238).

In accordance with this changed reality, Alexander Meksi would prove that "During the intermediate year April 1991-March 1992 it was possible to lay the foundations of a new state with the first elements of a market economy, thanks to the position-opposition consensus and especially for the drafting of Constitutional Provisions, which enabled the economic, legislative and institutional reform in the following years" (Meksi, 2015: 143).

8. The first reforms of the first democratic government and their impact on urban issues

The Meksi Government 1992-1997 established the legal and institutional framework for the sanctioning of the entrepreneurial initiative and for the establishment and functioning of the private land and buildings market (Çili, 2013). This was made possible by strong and direct assistance from the International Monetary Fund (IMF), shortly after the vote of confidence in the first Democratic Government, as Meksi would testify:

> "In the meeting room of the Government on April 28, 1992, a working meeting was held with the envoy of the International Monetary Fund Anuph Singh, who assisted the Albanian Government, to be informed about the details of the Government Program. This action plan had to be approved by the IMF to provide the financial and economic support of international financial institutions and friendly governments, which was so necessary to pull the country out of the economic and financial collapse to which it had been led for 46 years by the communist regime" (Meksi, 2015: 137).

Gjuraj would also speak about the support of internationals, and the necessity of their contribution in the years of transition, when he would underline that "After 1990, Albania recognized and accepted the role of international factors in domestic developments, launching difficult reforms "imposed" by the West, cooperation with foreign states and organizations, implication and influence from international events and developments" (Gjuraj, 2015).

Civici would also present the government's commitment to the economic 'lessons' of international institutions, when he underlined that "we have rigorously implemented the specific recommendations and recipes the IMF and the World Bank for the Albanian economy of in regards to the privatization of the economy and its opening" (Civici, 2013).

For a short period of several months, in addition to concrete measures and actions, the entire legal and institutional basis was prepared to begin the most difficult and complex reforms that would be undertaken in any place of the former socialist camp (Biberaj, 2000; Lami, 2013; Civici, 2013). It consisted of the abolition of the 80 percent rule, the liberalization of prices of all food items, the abolition of subsidies to state-owned enterprises, the liberalization of the exchange rate, the liberalization and privatization of transport, trade and construction, as well as other measures in the field of legislation and liberalization of the economy (Biberaj, 2000; Lami, 2013; Meksi, 2015). As Çili would advertise, "Through the Meksi government, [the Democratic Party] made major economic reforms in the first phase. Privatized on a large scale, removed many of the institutions and practices left by the centralized state; opened the markets and so on" (Çili, 2013: 42).

The implementation of a liberal policy, in favor of the privatization of many state sectors and industries and the opening of the economy to international markets, brought the restructuring of the economy in line with the trends of the international economy (Biberaj, 2000: 294-297).

Many low-tech companies went bankrupt in global competition, while other companies whose products were still competitive in the market continued to survive. According to Biberaj, there was another reason which had to do with the fact that "the government was forced to keep large companies operating at a loss" for fear that closing them would worsen the economic situation (Biberaj, 2000: 296).

Whatever the reasons, this process had an impact especially on small towns, with a one-sided economic base, which due to job losses suffered large population reductions, thus leading to the degradation of the stock of housing, urban units and the general territorial structure of cities (IHS Alumni, et al., 1998; Imami et al., 2008). The abandonment of cities by citizens creates a series of problems related to the urban administration of these cities, which are mainly related to the misunderstanding of the new role of government in urban and territorial development issues.

General political and economic reforms proceeded rapidly and had their impact on the infant free market economy in Albania (Çili, 2013; Biberaj, 2000; Lami, 2013). As Meksi would underline "during the remaining months of '92, for the good fortune of the Albanians, the [economic liberalization] Reform took its

an upper trajectory and its achievements were felt by all, as well as the difficulties of this great upheaval and, especially, in the creation of unemployment" (Meksi, 2015: 137).

These reforms also had components in the real estate market and the construction and housing sectors. The construction sector, almost completely privatized, began to be structured into a series of small and medium enterprises, which began to operate in separate market segments (Misja and Misja, 2004).

Thus began the first development and construction activities in the territory, which included the private sector, which during the transition years would take dominance in the construction industry and the real estate sector (WB, 2007; Imami et al., 2008). The difficult tasks posed by the beginning of the transition could not be solved outside a free market economy that is realized by the self-operation of economic mechanisms, by a regular legal system, by free competition, and by the elimination of state bureaucracy in the economy, which together would enable the integration of the country's economy into the world economy (Biberaj, 2000; Lami, 2013; Meksi, 2015).

The transition required the establishment of political and economic institutions completely different from those of the state of the pluralist dictatorship, unknown and unheard until then by the Albanian society in a country completely isolated to the world, like Albania in the early 90s (Gjuraj, 2015; Civici, 2013). These required new laws, new structures and people with a democratic mentality and chosen in terms of values and skills. As the Prime Minister of the time, Mr. Alexander Meksi would state:

> "We committed ourselves to their implementation [of the liberal reforms] that lasted for years, and even continues today, and the results were felt in the beginning. I want to emphasize here that without the help of the IMF and in particular the World Bank, reform for us would have been an almost impossible undertaking. The assistance consisted of financial support and structural reforms, drafting of sector strategies, projects and leadership in specific sectors" (Meksi, 2015: 143).

On this political and economic reform, liberalization and privatization context was developed the construction sector and all its formative components, starting from sectoral legislation, strategic territorial planning, urban planning, to territorial control to allow construction development and informal construction. The latter was a basic social phenomenon that accompanied and often dominated the construction sector, while it was the dominant form of expression of conceptual differences and practical activity in the territory between society and governance during the transition (IHS Alumni et al., 1998; Faja, 2008; Imami et al., 2008; Aliaj, 2008; WB, 2007).

9. Political and economic preconditions for shaping the construction sector in the new conditions

Changes in the political and economic sphere through reforms and legislation had major impacts in many areas of interaction of individuals in society (Biberaj, 2000; Lami, 2013). Restrictions on freedoms for individuals under the communist regime, in addition to economic poverty, had produced regression in many areas of social and national development (Meksi, 2015; Fuga, 2003, 2004), and the need for development required gigantic efforts (Biberaj, 2000; Krasniqi, 2008; Lami, 2013).

This specificity of the Albanian society, compared to other countries of the socialist camp, would be noticed by Gjuraj, who would emphasize that:

> "Albanians faced immediately after the '90s the consequences of their historic delays in building the state and democratic institutions. The fall of the communist regime was accompanied by the collapse of the state, at all levels, thus creating a comprehensive legal and institutional vacuum." (Gjuraj, 2015).

One of these vacuums was also in the two main public sectors, health and education. These two basic services for life and social health, like many others, were provided by the communist state based on a network of structures scattered throughout the inhabited territories and specialists generally brought from major urban centers (Kotmilo and Kotmilo, 2017).

The fall of the communist system was also accompanied by the departure from the deep mountainous areas north, northeast, southeast and south by doctors and teachers who had been sent there by the state. New political and economic balances could not force specialists in these fields to stay in those places where they had been 'appointed' by the employer and the sole political party-state authority (Fuga, 2004). The fall of the communist system was also accompanied by the departure from the deep mountainous areas north, northeast, southeast and south of doctors and teachers who had been sent there by the state. New political and economic balances could not force specialists in these fields to stay in those places where they had been 'appointed' by the employer and the sole authority, the political party-state (Fuga, 2004).

On the other hand the liberal economic reforms pursued in the first years of post-communism abolished subsidies for loss-making economic enterprises, and payments of 80% to employees of those enterprises who had no raw materials, or who had gone bankrupt due to technological age (Biberaj, 2000: 287-299; Meksi, 2015). This led to the eventual closure of many economic activities in many

inhabited centers and consequently the loss of jobs for many residents of these areas (Civici, 2013; Biberaj, 2000).

Both of these events, the loss of basic services and employment would sever the logical connection of citizens with their places of origin. Abolition of state control over the free movement of people, established by DCM no. 361, ON 1.11.1977 'On the Residence Permit of Citizens' (PPL, 1945-1979: 108), made the state's coercive bond with the citizen regarding the choice of residence to be severed (King and Vullnetari, 2003; Vullnetari 2007). This was made possible by the amendments to the Constitutional Law in 1993, where according to Article 22 of these amendments the free movement of citizens was legal (Vullnetari, 2012: 66). Residents now felt free to choose their place of residence, where they could better meet their living conditions.

10. The first reforms that shaped the way of urban development of the country in transition.

The creation of freedom to choose one's place of residence was accompanied by the creation of the opportunity to consume this basic freedom of the individual in a society of liberal democracy (Biberaj, 2000). During this period, two economic opportunities were introduced, or rather economic incentives, to finance the change of the previous residence, which was forced by the state with a new residence. First, in 1992, the Albanian Parliament approved law no. 7652, on 23. 12. 1992 'On the privatization of state-owned housing' (Official Gazette, 1993) through which it privatized about 230 thousand apartments.

A liberalizing reform, this, in the roughness of the transition that had just begun, from a centralized state planning economy, where the state had absolute ownership over land and dominance over apartment ownership, to a free market economy where private ownership had to the same constitutional value as state ownership. In line with this, Meksi would write that "At the end of '92, the privatization of housing was carried out, which opened great horizons to the construction activity, making housing construction an important branch of the economy, understandably along with agriculture" (Meksi, 2015: 137).

This large-scale privatization reform created private ownership for 230,000 Albanian families, for the first time after a 46-year period where, referring to the 1976 Constitution, land ownership was entirely state-owned, and housing was largely state-owned, although private ownership also existed. (PPL, 1945-1979).

In the field of housing and the real estate market, the privatization of land and state-owned housing created the conditions for families and individuals to exchange this commodity in the market, providing a source of income (Misja and

Misja, 2004). If we refer to Meks, this state wealth transferred to the ownership of Albanian families was worth about four billion dollars (Meksi, 1992, 2015). This income was used, firstly, to finance the construction or purchase of an apartment in a new residence which would provide you with a better quality of life than that in the place of origin.

Albania's opening to the democratic west was accompanied by a high level of foreign emigration, which would bring large amounts of remittances to Albania (WB, 2007; Vullnetari, 2012; BoA, 2018). This phenomenon would be identified by INSTAT, according to which in the years of transition emigrants "transfer [to families] a total amount equal to 25% of Albania's GDP" (INSTAT, 2004: 47).

This financial income in the form of remittances would be used primarily to finance the purchase or construction of a new home in the areas where these families migrated. The almost negligible role of the state in providing social housing (Misja and Misja, 2004), made families provide housing with their own means (Aliaj, 2008), where an important contribution was played by the income of emigrants abroad (Volunteer, 2012; BSH, 2018). According to the World Bank, "37 percent of all households that (1) purchased or built a dwelling (2) reconstructed or renovated their dwelling reported that their construction activities were largely financed by remittances." (WB, 2007: 25).

This brought consequences in different dimensions, but one of the most important was that the Albanian cities, observed from the general national approach, lost the physiognomy of comparative uniformity. Prior to the 1990s, the regime, through legislative tightening and urbanization policies, had managed to keep territorial Albania organized in similar cities in terms of territorial size and number of inhabitants (Misja and Misja, 2004; Faja, 2008; Kotmilo and Kotmilo, 2017).

11. The first urban products and the new role of the state in urban issues.

Thus began the process of requalification of the territorial dimension of the country, which will be presented in only three diametrically opposed typologies of inhabited centers. Territorial and urban Albania already consisted of either large or overcrowded cities with high residential densities; or from small, sparsely populated, low-density cities; or from new towns created by the intensive urbanization of existing villages (Fuga, 2012). Reinforced by the lack of regional development policies, strong changes occurred in the settlement system (Faja, 2008; Aliaj, 2008). Rural and urban areas on the outskirts of the country, which experienced a decline in economic activity, lost population, while major cities with

more developed economic base increased the number of inhabitants (IHS Alumni, et al., 1998; Imami et al., 2008; Aliaj, 2008; WB, 2007).

These changes that took place after 1990 created the preconditions for a reformulation of the role of the state, which can no longer be the sole decision-maker in matters of making and rebuilding the city. Urban reality would be the product of the interventions of people, particular citizens, companies, enterprises and various organizations living, operating and working in the city (Imami, et al., 2008; IHS Alumni, et al., 1998). Like the IHS Alumni, et al. would emphasize:

> "The role of the state, built in this new political and economic context, would be to take care that the results of all these private and individual actions in the urban territory turn into a city with a pleasant environment, full of life and work. The state, now, can only influence and guide the individual decisions of city dwellers" (IHS Alumni, et al, 1998: 3).

But these developments also brought their negative aspects regarding the level of the country's population and their distribution throughout the national territory (Misja and Misja, 2004; Imami, et al., 2008). First, Albania would lose population as a result of external migration, as the World Bank would point out in the 'Urban Sector Assessment in Albania' in 2007, "In the first ten years of transition, Albania's population decreased by 3.6 percent because the population took advantage of the freedom to travel abroad, and escaped the economic and political crises in the country" (WB, 2007).

This social phenomenon would be noticed by INSTAT in 2004, according to which "approximately 710,000 individuals" left Albania in the period of 1989-2001 (INSTAT, 2004: 36). The decrease of the population level continued in the following years, INSTAT in 2014 would underline that "Emigration is one of the main reasons for the decrease of population in Albania in the period between 2001 and 2011." (INSTAT, 2014: 31). According to this institution, "the number of emigrants for the period 2001-2011 is estimated at over 480,000 people." (INSTAT, 2014: 35).

On the other hand, the Albanian population was involved in a significant displacement within the country, as a result of internal migration (King and Vullnetari, 2003; King, 2010, Vullnetari, 2007, 2010; WB, 2007). Referring to the World Bank "The most obvious indicator of the redistribution of the population within the country is urbanization, with a population in cities that increased from 35 to 42 percent in the period between the censuses [1989-2001]" (WB, 2007). This 10-year period was characterized by absolute freedom to meet housing needs in those areas where a higher quality of life could be ensured (Misja and Misja, 2004).

Large emigration movements characterized the northern and southeastern areas of Albania in the direction of large cities such as Tirana, Durres, Elbasan. Almost the entire central and western territory of Albania was affected by new and unstructured constructions in the urban dimension (INSTAT, 2004). INSTAT would also state: "From rural areas, approximately 900,000 people migrated to urban areas inland as well as to other countries." (INSTAT, 2004: 10). This phenomenon would continue in the following years, where referring to INSTAT in 2014 "Movements at the city and village level, in the same period [2001-2011] mark a figure of 280,863 individuals" (INSTAT, 2014: 12).

12. The inability of the state to take on the new role in urban affairs as the main reason for the numerous urban problems

This new reality was greatly influenced by the way governments deal with urban issues, which came as a result of their non-adaptation to the new role they should have in this new reality (IHS Alumni, et al., 1998; Imami, et al., 2008; Aliaj, 2008). Within a period of a few years there was a complete detachment of the principles and methodology of centralized economic development policies and regional, territorial and urban planning (Faja, 2008).

Transitional governments would not understand their new role in relation to the territorial governance sector in this new political and economic reality. The fall of the communist regime and the deep liberal reforms pursued in the first years of transition in the sector of territorial developments would create the conditions for what Faja would postulate in 2008: "Socialist codes, rules and dogmas were overthrown and the way was opened for a new architecture, free from communist ideology and political dictatorship" (Faja, 2008: 18).

This governing process violated the legitimacy of economic and spatial development policies, creating problems regarding the territorial structure of the country (Misja and Misja, 2004), the urban situation of cities (Aliaj, 2008; Faja, 2008; Fuga, 2004), and the quality of urban living of citizens (Imami et al., 2008; Fuga, 2012).

Unfortunately, the freedom gained was not used to change much of the negative products of communist ideology and dictatorship in the territorial and urban dimension of Albania (Imami et al., 2008). Due to the inability and unwillingness of transitional governments to adapt concrete political positions, legislation, policies and programs in the field of territorial development to the principles of liberal democracy, urban and territorial problems and imbalances changed shape but reinforced a very harmful urban lifestyle for citizens (Imami et al., 2008; Aliaj, 2008; WB, 2007). Simply put, territorial governments did not understand, accept, and appropriate this new role of theirs (IHS Aumni et al., 1998; Imami et al., 2008).

It is these territorial and urban problems and imbalances that on the one hand came as a physical result of internal and external migratory movements (INSTAT, 2004, 2014; King and Vullnetari, 2003; Vullnetari, 2007, 2012), and on the other hand shaped the territorial model of the country.

Another aspect that is directly related to the lack of understanding and acceptance of the new role of government is the failure of transitional governments to restructure themselves. Transitional governments failed to decentralize part of their governance scope to local government units (Fuga, 2012, 2019; IHS Alumni et al., 1998; Imami et al., 2008; WB, 2007). Although efforts were not lacking, they failed to redevelop themselves towards multi-level governance, as one of the basic features of the new system.

This was the formative context of urbanization that produced this territorial model we have today and the relationship between this model and the models of other important sectors of social and national development. It is based on the change of the socio-political system, from a monist regime of central planning economy to a system of liberal democracy of free market economy and a wide range of liberal reforms in different sectors of the country that were followed in the first years of this epochal system change (Meksi, 1997, 2015, 2019; Biberaj, 2000; Lami, 2013; Aliaj, 2008; Civici, 2013).

The dynamics of shaping this territorial model are based on two diametrically opposed relations that were established during the years of transition with the territory. On the one hand the relationship of individuals, society and certain groups of it, who expressed themselves in the territory producing a development of extraordinary proportions (WB, 2007, 2018; IHS Alumni et al., 1998; Imami et al., 2008) and on the other hand the governments that failed to unify this development activity in "a city with a pleasant environment, full of life and work" (IHS Alumni, et al., 1998: 3).

13. Conclusions and recommendations

Albania at the end of the communist regime was one of the countries with the highest level of implementation of the ideology and principles of Stalinist socialism, among the countries of the socialist camp. Albanian communism had 'enverism' at the center of political thought, while the Party-State control over the other constitutional and political institutions of the country was of a very high level. Moreover, the new political elite of the country, like the whole society, lacked an open mindset towards the new system also due to the lack of democratic tradition. Extreme self-isolation and lack of free media would further complicate the political transition from a society under a monist dictatorship to an organized and functioning society in a pluralistic system of liberal democracy.

The economic transition of the country also presented deep difficulties. In the last years of the communist regime the central planning economy would fail in many respects. The communist government itself acknowledged this failure due to outdated technologies, lack of raw materials and energy, which had led to the mass closure of many economic enterprises. This would bring, not only an extreme poverty of Albanian families in the moments of transition, but also a real lack of those economic activities, the administration of which would have to be transitioned from a state direction to a private administration. This shortage would produce large-scale unemployment in the first years of the transition and beyond.

This general context of the transition would reflect the same difficulties in the transition of territorial governance, as an integral part of the political and economic transition of the country. The strong communist mentality inherited from the previous communist regime also determined the way in which the political, economic and urban affairs transition was carried out.

But also, the liberal and democratizing reforms pursued in the early years, would also include the land ownership sectors, buildings, housing, and urban planning and development processes. As a result, the country has experienced a high decline in the resident population in the country, as a result of foreign emigration. But what influenced the strong changes of the urban, territorial and spatial dimension of the country, is the process of demographic-territorial remodeling of the country, the spatial structure of the inhabited centers and the urban situation of the Albanian cities. All of this came as a result of the inevitable internal migration, especially from the northern, northeastern, south-eastern and southern cities, towns and villages of the country towards the capital.

The paper concludes that, four would be the most important preconditions that would affect the mass internal migration, and in this sense in the way of urban and territorial development of the country, which originate from the savage communist past and difficult transition of the country:

i. the inability of the territorial government to understand its new role in urban and territorial affairs, in line with the new democratic, decentralized and liberalizing contexts in terms of land and building ownership / housing, as well as private intermediaries in the processes of urban and territorial development;
ii. the removal of state coercion for the connection between the citizen and the city, in regards to 'party-appointed' nominees in cities and towns other than those of their origin; what brought about the lack of basic vital services for the inhabitants of small towns, such as education and health;
iii. lifting the state constraint on the connection between the citizen and the city, regarding their employment in state-owned enterprises, bankrupt, closed or in the process of privatization;

iv. Lifting the state constraint on the connection between the citizen and the city, regarding the free movement of citizens in relation to the free choice of residence.

The paper concludes that there would be two main financiers of this construction and urban development that shaped the way of urban and territorial development of the country, which originate from the political and economic transition of the country:

i. income provided by the interaction in the already free real estate market, as 230 thousand Albanian families had become owners of state-owned apartments and had them in their use;
ii. Remittances provided in emigration, after allowing the free movement of citizens even outside the national territory which was accompanied by large departures of citizens in the first years of transition.

The paper recommends other more detailed studies on this topic. It also recommends conducting further studies in the field of the relationship between territorial governance and the political ideology of the governing parties; analysis of the urban and territorial reality of the country and territorial governance; the demographic-territorial model of the country, in different time periods of the Albanian state; comparative analysis between the demographic-territorial model of the country with those of the EU member states, or the EU itself, etc.

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About the use of the coordinate transfer from the local system to the official coordinate system and vice versa (Bulqiza mine as a case study)

Prof. Asoc. Dr. Gafur MUKA
European University of Tirana

Abstract

The chrome mine in Bulqiza has been exploited since 1948. The exploitation of the mine required the creation of a graphic documentation in which all the constructions of the mine are visualized. The visualization is created in three planes (horizontal, vertical and in profile) and initially referred to a local coordinate system. Although the Bulqiza mine was connected to the official coordinate system (Gauss-Kryger system at that time) in 1972, the application of the system continued due to the large amount of work required to convert from the local coordinate system to the official system (GK). This year (January 2022), due to the concession of the mine to a foreign company, the creation of a calculation model for the transformation of coordinates from the local to the official coordinate system was required. Since the official geodata portal ASIG (State Authority for Geospatial Information) provides the possibility to obtain coordinates in the three official coordinate systems used in our country (Gauss Kryger, UTM and KRGJSH), we deal with the creation and evaluation of the following model of transformation from local system to GK. Moreover, the georeferencing of images is produced in order to obtain, through digitization, geodata that allow to recreate all the graphic documentation in the official coordinate system.

Key words: *Chrome mine Bulqiza, graphic documentation, coordinate system, local coordinate system, official coordinate system, computational model, georeferencing of images.*

Presentation of the problem

Since 1948, when the exploitation of the Bulqiza chrome mine started, a very extensive graphic documentation (maps, vertical projections and profiles) has been created until today, referring to a local coordinate system [1]. This system is designed to be oriented to the magnetic meridian (X-axis). Normal to this axis is the Y-axis, obtained by rotating the X-axis 90 degrees counterclockwise in the horizontal plane, and normal to the XOY plane is the z-axis. The coordinates of the origin of this system are assumed to be Y = 5000,000 m, X = 5000,000 m in the plan while the magnetic declination, which is the angle between the direction of the magnetic meridian of the area (x-axis for the local system) and that of the mean meridian (x-axis for the official system), is 6'30 ". This is also the rotation angle of the local system, so the direction of the magnetic meridian coincides with the direction of the mean meridian. Figure 2 shows that the rotation is clockwise.

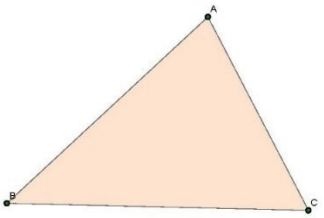
In 1972, the Bulqiza mining area was connected to the official coordinate system (at that time, the Gauss-Kryger system), but because of the large amount of work required to convert the coordinates from the local system to the Gauss-Kryger system, the preparation of documentation continued in the local system [1]. Since January 2022, the Bulqiza mine (North Zone) has been concessioned by a foreign company, which requires that all graphic documentation be referred to the GK system. We would like to point out that this system is one of the official coordinate systems that was used in the country until 2010 [6]. For the transformation of coordinates from the GK system to the UTM and KRGJSH coordinate systems, the program offered by the ASIG geoportal is used [6]. This situation requires the construction of a computational model for the transformation of coordinates from the local system to the GK system and vice versa.

In order to obtain all data in GK, UTM and KRGJSH coordinate systems during digitization, georeferencing of images in these systems is required [4]

Model building and evaluation

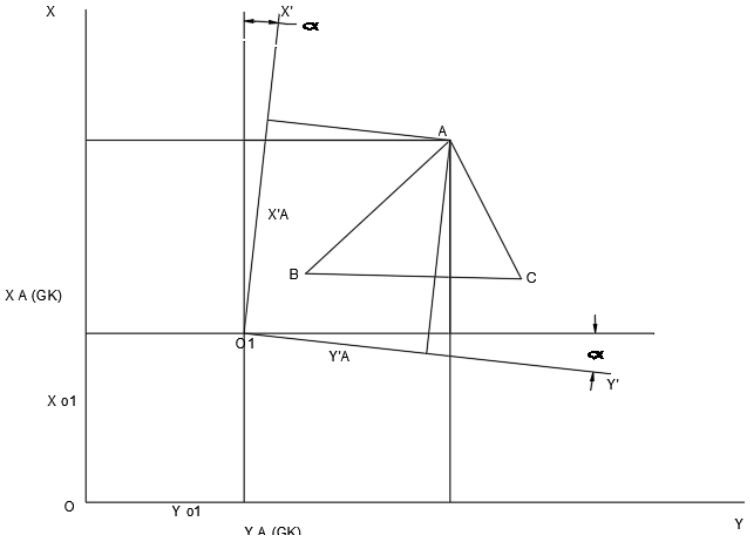
For the transformation of coordinates from the local system to the GK system and vice versa, the following formulas are derived, based on the existance of three points (A, B, C) that have coordinates in both systems (Fig. 1).[1]

FIG 1 The points with coordinates in both systems



The scheme implemented for deriving the formulas is shown in fig. 2

FIG 2 The scheme implemented for deriving the formulas (computational model)



The coordinates of points A, B, C are given in the table (tab 1):

Pont	Y Lok	X Lok	Y GK	X GK
A (Antena)	3978.323	5536.142	4434268.200	4594929.580
B	4690.52	5661.085	4434980.845	4595153.097
C	5375.941	5070.183	4435665.223	4594560.819

The derived formulas are:

a) For the transformation from the local system to the GK system

$$Y(GK) = Y(lok)^* \cos(\alpha) + X(lok)^* \sin(\alpha) + YO1 \quad (1)$$

$$X(GK) = X(lok)^* \cos(\alpha) - Y(lok)^* \sin(\alpha) + XO1$$

b) For the transformation from the GK system to the Local system

$$YO1 = YA-(Y'A^* \cos(\alpha)+X'A^* \sin(\alpha)) \quad (2)$$

$$YO1 = XA-(X'A^* \cos(\alpha)+Y'A^* \sin(\alpha))$$

Using these formulas, the coordinates of the points are transformed as in the following tables (examples):

Transformation according to formula (1)

cos (α)	Y'	sin (α)	X'	Konst	Y (GK)	sin (α)	Y'	cos (α)	X'	Konst	X GK	Pika
0.999998205	4707.968	0.001894586	5885.16	4430279.624	4434998.733	0.001894586	4707.968	0.999998205	5885.16	4589500.874	4595377.104	P2
0.999998205	4856.27	0.001894586	5812.658	4430279.624	4435146.898	0.001894586	4856.27	0.999998205	5812.658	4589500.874	4595304.321	P3
0.999998205	4220	0.001894586	5805	4430279.624	4434510.614	0.001894586	4220	0.999998205	5805	4589500.874	4595297.868	3754

Transformation according to the formulas (2)

cos (α)	Y (GK)	sin (α)	X (GK)	Konst	Y'	sin (α)	Y (GK)	cos (α)	X (GK)	Konst	X'	Pika
0.999998205	4434998.733	0.001894586	4595377.104	4421576.468	**4707.968**	0.001894586	4434998.733	0.999998205	4595377.104	4597886.183	**5885.161**	P2
0.999998205	4435146.898	0.001894586	4595304.321	4421576.468	**4856.271**	0.001894586	4435146.898	0.999998205	4595304.321	4597886.183	**5812.658**	P3
0.999998205	4434510.614	0.001894586	4595297.868	4421576.468	**4220.000**	0.001894586	4434510.614	0.999998205	4595297.868	4597886.183	**5805.000**	3754
0.999998205	4434540.579	0.001894586	4595089.111	4421576.468	**4250.360**	0.001894586	4434540.579	0.999998205	4595089.111	4597886.183	**5596.300**	3575
0.999998205	4434540.579	0.001894586	4595089.111	4421576.468	**4250.360**	0.001894586	4434540.579	0.999998205	4595089.111	4597886.183	**5596.300**	3576/1

After determining the coordinates, the problem of calculating their accuracy arose.

To solve the problem, the location coordinates for 65 drilling holes were transformed in the GK, the location grid points of the 1: 2000 scale maps were transformed, the maps were geo-referenced, the 3754 drilling point was marked, and measurements were made in the Klos traverse bank.While the results of these activities were adequate, we did not consider them to be sufficient.

Therefore, based on these products, their accuracy was evaluated based on known points. From this assessment it emerged that the system is characterized by two levels of accuracy. The first plane includes the area of a circle of radius 1 km whose center corresponds to the intersection of the three medians of the sides of the triangle of the given points, while the second plane includes the area between the circumference of a circle of radius 2 km and the circumference of the previous circle of radius 1 km, that have the same center (Fig. 3). In the first case, the error is in the range of 10-25 mm, while in the second case the accuracy decreases and the error is in the range of 25-45 mm.

FIG 3 The levels of accuracy of the computational model

For creating new points and making measurements in the relative system, it is recommended to use the points P1, P2, P3 and P4 (local coordinate grid) near the shafts 2 and 3 (Fig. 4). [1]

In the same way as these points, other points can be defined inside the circle with a radius of 1 km or inside the area between the perimeter of the circle with a radius of 1 km and that with a radius of 2 km.

FIG 4 Local coordinate grid

Map georeferencing and create data with digitization

In the conditions of existence of a large amount of graphic documentation of Bulqiza mine, created with reference to the local coordinate system, it is necessary to create data in the official coordinate system. To solve this problem, georeferencing of maps (originally referenced in the local system) should be carried out in the official coordinate system. The georeferencing was done using the ArcGIS 10.7 program.

Fig. 5 shows the georeferencing of the map at a scale of 1:2000. After georeferencing, shapefiles can be created that contain the coordinates of the points in the official coordinate system.

Fig. 6 shows the digitized points on the georeferenced map. Fig. 7 shows the attribute table listing the coordinates of the points in the official Gauss-Kryger system.

FIG 5 Georeferenced Map

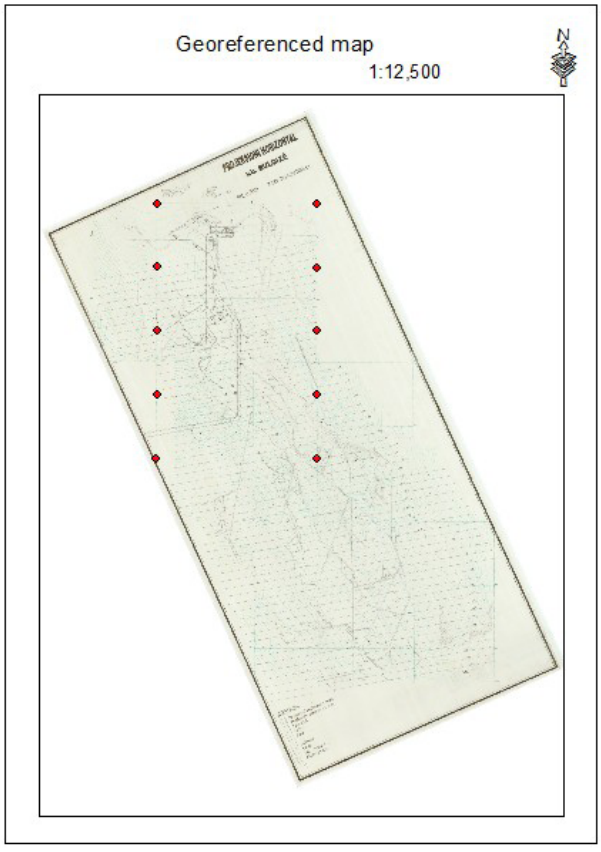


FIG. 6 Points, whose coordinates are determined by digitization

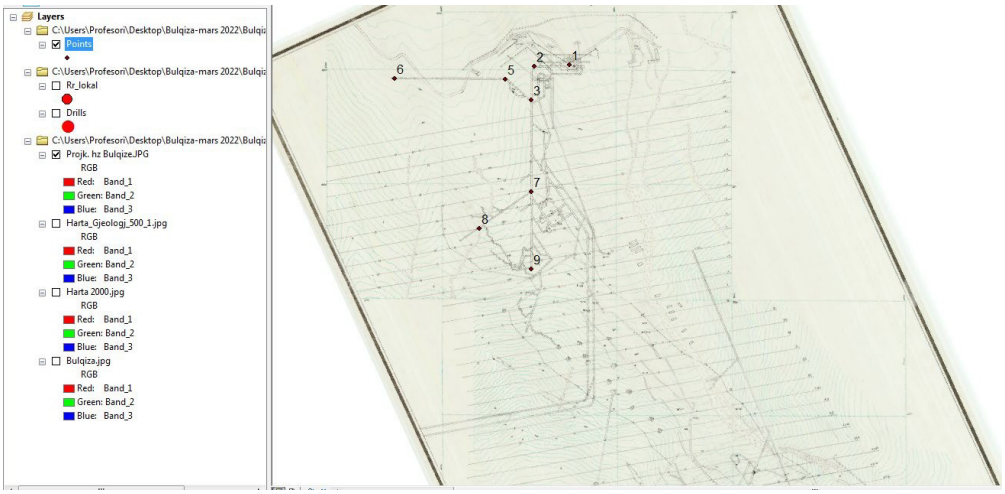


FIG. 7 Attribute table with coordinates of points in the official system (GK) created by digitization from the map, made with reference to the local coordinate system.

Table

Points

FID	Shape *	Id	Y	X
0	Point	1	4435129.541	4595309.871
1	Point	2	4435007.832	4595304.579
2	Point	3	4434997.249	4595188.162
3	Point	5	4434907.29	4595259.6
4	Point	6	4434523.644	4595262.245
5	Point	7	4434997.249	4594870.661
6	Point	8	4434817.332	4594743.661
7	Point	9	4434997.249	4594603.432

Conclusions & Recomandations

1. To create a coordinate transformation model, at least three points with known coordinates must be available in both systems.
2. It is recommended to use the constructed model only after its accuracy is evaluated.

3. From the assessment of the computational model for the transformation of coordinates from the local system to the GK system and vice versa.emerged that the system is characterized by two levels of accuracy
4. For all cases lying outside the circle with a radius of 2 km, it is recommended to derive the transformation formulas with reference to the three points known in both systems
5. To obtain more results confirming the formulas used, can measure the local coordinates of a lot of points starting from two points (inside the circle of radius 1 km) whose local coordinates were determined by the transformation formulas.
6. Georeferencing of maps in the official coordinate system allows data creation in this system by transformation models for only 4 points whose coordinates must be known in both coordinate systems.

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Increasing public trust through technology, eVoting case Albania

Dr. Erdet KËLLIÇI
European University of Tirana

Abstract

Technology has become a mandatory tool for each of us, making everyone dependent on electronic devices and software applications to stay connected and use services. Producers, integrators and public institutions are aiming to introduce technology on a wide scale regarding country population, trying to make most of the populations part of this community. Albania has started the process of shifting form standard workflow of having service at a fix location to online services in both public and private sector. AKSHI with e-Albania platform is promoting online services to most of services offered by government institution. Still there is a gap in the targeted population to use the services due to their capabilities to use information technologies and lack of suitable devices to do so. Albanian Central Election Commission introduced for the first time in elections history countrywide electronic identification using biometric technology and piloting electronic voting. This paper aims to show the result obtained when sensitive services like election are fully supported by technology including everyone that can vote without having a targeted population. The trust of the voters, institutions, organizations and stack holders toward technology in the voting process is analyzed based on real data and facts to support the outcome of this paper.

Keywords: *electronic voting, integrity, elections, technology, biometric identification, cyber security*

Introduction

Parliament elections and local elections have been always followed by declaration regarding the secrecy and the security of the vote. Information technology or electronic systems can be utilized in the election process such as voter registration, voter authentication, granting vote, accelerate the vote counting, and provides access for voters with physical disabilities (Maurer and Barrat, 2016), A countrywide election process happens in Albania each two years but there are cases where partial elections are held more often. The institution that manages and is responsible for election is "Central Election Commission" and is dependent from the Albanian Parliament. The mission of CEC is to make sure that anyone who has the right to vote will have the possibility to do so, the vote will be secret, and each vote will be counted without changing its result. The purpose of this paper is to identify the benefits and the weakness of the usage of technology in election process with the focus on Electronic Voting and counting. In Albania now we have the possibility to evaluate the impact of the technology in voting process because of the use with success of this technology during parliamentary election of 25 April 2021 and partial election for municipality Mayer of 6 March 2022. The information technology approach will increase the participation of the citizen to democracy in the developing countries and it is called e-democracy Amelin et al. (2016). Furthermore, the hybrid e-voting also supports vote verification Ben-Nun et al. (2012). In both of this elections CEC implemented electronic voting in both rural and metropolitan areas for testing the capacity of voters to use this modern device for electronic voting and furthermore identify any obstacles that may be present in the field for this modernization in election processes. The use of technology in elections must address these key elements as listed below:

- Everyone that has the voting right must be able to vote independently without being blocked by technology. This includes the voters with special needs.
- Each vote must be secret and there won't be any possibility to connect the vote with the voter.
- The device used for the voting process must have the ability to be simple to use, simple to install and with an intuitive interface to facilitate the voting process.
- The counting process should be auditable, and any ballot can be investigated accordingly in case an audit is needed.
- Cyber security issues must be addressed and mitigated prior, during and after the voting processes.
- The project should be economically feasible and must last at list for 5 years.

Due to the importance of the processes all these issues should be accordingly addressed, and the solution must fulfill fully each element so the process of voting and counting will be transparent, trustable and at any time auditable.

Literature review

Voting is a very delicate process, and its accuracy identifies the level of the democracy a state has reached so far. Electronic voting poses a great challenge to the authority that organize and implement this kind of voting especially which level of security these systems could provide and how it offers and protects the privacy of its users (Khan et al., 2015) and (Wang et al., 2013). There are a lot of studies that analyze the security of the votes and state that the integrity of the ballot is very critical (Bernhard et al. 2017). When we analyze the electronic voting system and electronic voting devices the first thing that is required to do is to store them in patterns in a safe way which are required for better investigations (Yahyaoui et al., 2020) that may help to increase the credibility of the electronic device and electronic systems. By doing so the trust toward technology will be increased for both users and stack holders of the process. Security of the device and securing access to it that can use a secure method like two ways authentication method using a password and a device that can be a mobile device, a token key or a card. Furthermore, the information located in the device must be encrypted to disallow access of unauthorized persons or organizations. Encryption is a reversible method of encrypting data that requires a key to decrypt. Encryption can be used in conjunction with encryption, which provides another level of confidentiality (Sun et al., 2018)

Methodology

My approach to identify the effect of technology implementation in election process is by taking several variable data before the implementation of the technology and comparing them with the variables produced after the implementation of this technology. These data are measured again and the comparison between them shows the real effect this technology has on the process of the elections. The data are analyzed based on the publications that CEC has on its website and data taken from IT directorate for this research.

In this study I focus on analyzing intangible and tangible benefits of the use of technology in election projects. I have studied and collected data from CEC that is the responsible entity for each election process in Albania. I have taken in

the consideration the technical details of the solution implemented in Albania. A general overview for the use of technologies in the election process is made for the countries of the region and worldwide.

Analyzing the security techniques implemented to secure device information toward cyber security threats is an important aspect that is taken in consideration by this paper.

Institution Challenge

CEC is responsible for organizing the election processes in Albania according to the election code that is subject to change time to time. CEC has 84 full time employees that are responsible for preparing and organizing each election process. During the election period from 3-6 months CEC hire part time employs to help the institution during the election process. CEC hire about 280 part time employees during election time. CEC successfully introduced technology in the election for biometric identification and electronic voting and counting in 2021 parliamentary elections. This countrywide implementation of technology in elections challenged ICT Directorate that is the responsible for the implementation of technology in election process and election data processing and publication. Before the implementation of the biometric identification the voters were identified using printed lists and they signed beside their name in this list. This process was manual and not the best way to identify the real identity of the voter.

The identification though a printed voter list had several problems to be addressed:

- The process was manual, and the identification of the voter identity was made by the commission by examining its id card or passport. This is not an accurate way to identify the identity of a person. Nowadays technology allows the correct identification of the identity of a person.
- One of the most important data that is processed and displayed publicly during an election process is the percentage of participation in election. The processing of this data is preferable in real time or as often as possible. By using voter list the reporting of the number of voting participation was impossible to be communicated automatically and periodically.
- Processing the data in real time was impossible.
- Process of finding and identifying the voter was time consuming.

Regarding the voting process some findings are as follows:
Depending on the ballot complexity the voter may not fully understand how to

fill in the ballot paper and doing so the vote will not express his will or me become an invalid vote.

A lot of effort is made to input security elements including paper quality, special marks, hidden marks, special ink and other elements to increase the security of each ballot paper so no false ballots can be produced. This increase of ballot complexity increases the price of the ballot paper and overall value of the election process costs.

Mistakes during the printing of the ballot cannot be unmade by doing so in some areas the voting process cannot take place until the mistake is fixed.

Ink stamps for each ballot are needed in each polling center, increasing operative costs and delaying the voting sessions.

Each vote should be counted by a counting commission in a secure and surveyed area. During this process human interpretation of the vote is done. This way of counting each vote brings to argues regarding signs used to vote, place of signs and writing inside the voting ballot. This delays the numbering process and increases tensions between members of the counting group.

After each ballot box is counted the result of the count is written on a designed paper and handed out to the operator to enter the figure into the system. This process may contain human errors during entering or writing the figures.

Due to these reasons CEC and political parties agreed on modernizing the voting system by introducing electronic technology to modernize the process. The modernization of the use of the technology in the election process should be done carefully selecting appropriate device with an eye to operational and fixed costs. Technology should address all security issues especially concerning cyber security issues that may happen during the voting and counting process.

Technical Solution

The prerequisite of implementing electronic voting and counting to satisfy all parties are as follows:

- The voting process will be done through a touch screen with suitable dimensions for the voting process based on the voting ballot configuration that will be like the paper ballot.
- Electronic Voting and Counting Devices (EVCD) shall provide electronic voting as well as the calculation of the result at the level of one Polling Station after the closing of the voting process in each PS respectively.
- Securely and anonymously store the votes but simultaneously reproduce the hard copy confirmation/in paper for the vote of each voter by making it available respectively for personal verification.

- Establish the auxiliary technological infrastructure to document/audit the security and accuracy of the vote at each Polling Station.

To fulfil the first request, the company that have offered the solution has produced industrial device using a tablet with 17" touch screen embedded in a suitable form for easier installation as shown in figure 1.

FIGURE 1

Source: www.kqz.gov.al

The device has an android operating system installed in it. This system is modified from the factory to fulfil the security requirements needed for the device. Based on the size of the screen a ballot can designed easily and can be like the voting paper as shown in figure 2.

FIGURE 2

Source: www.kqz.gov.al

To fulfil the second request, the company that have offered the solution has created a software to calculate each electronic vote during the voting process and print a detailed report with the result of voting immediately after the closing of the

election. The result is printed in clear text, and it also has a QR code that can be scan for future use. The QR code is encrypted to secure no change in result during transmission of the data through an encrypted QR code.

To fulfil the third request, the company that have offered the solution implemented a mixing system of each electronic vote stored into the device memory. This system changed the datetime of all electronic votes each time a voting session ended and furthermore it used a random name for the vote file. By doing so all the files had the same timestamp as the last electronic vote. In this way is impossible to check the ordering of the file based on name or timestamp. At the end of each voting session a printer prints the vote in hard copy and cast it into a ballot box as shown in figure 3.

FIGURE 3

Source: www.kqz.gov.al

An audit can be performed by counting the votes into the ballot box that are in hard copy version to be sur that the electronic result match the result of the printed votes that are into the ballot box. This ensure that the machine cannot produce fake reports with wrong results other than what is voted.

To fulfil the fourth request, the company that have offered the solution implemented a logging system that write each event into a log file. This log can be analysed and can be treated as audit log for identifying every event produced by the device.

As already mentioned above the proposed device is classified as modified tabled with a modified android system according (Agasi, O. 2015) stated that there is no complete solution to prevent mobile security problems. This brings a big challenge toward the successful implementation of the solution that will satisfy all security requirements.

Data Analyses

Electronic voting was implanted during parliamentary election on 24 April 2021 in Administrative Zone 40 corresponding to the administrative unit nr. 10 of Tirana. This administrative unit has 32 polling stations grouped into 5 polling stations in the territory of the administrative zone. CEC decided to put two voting machines in each PS to minimize the technical problems that may happened due to electronic device functionality and availability. Table 1 shows a comparison of data between previous elections that were conducted using the traditional way through paper and the data that are provided using electronic voting for the same ZAZ.

TABLE 1

	Parliamentary Elections 2017	Parliamentary Elections 2021	Difference %
Participation in election	12428	12096	2.6%
Valid Votes	12171	11976	1.6%
Blank/Invalid votes	255	120	53%

Source: https://kqz.gov.al/zgjedhje-per-kuvendin/

From the data above provided for the same ZAZ is clear that the new way of voting from traditional to electronic voting did not impact the participation of the voters in the voting process for parliamentary election. The difference is insufficient only 2.6%, so we can conclude that the technology did not pose any barrier to the voters. The age of voters is between the range of the 18-100 year old and their education varies from basic primary school to heigh education level. Based on this data we can conclude that the technology used is easy to use and the way that the information is displayed is intuitive. The equipment is easy to use for a wide age range and for a wide range of education.

Analyzing data regarding invalid votes or blank votes we can conclude that during the electronic voting we have only blank votes that are the votes that the voter intentionally wants to leave blank. Meanwhile in traditional voting we don't know if the voter left them intentionally blank, voted wrong making the vote invalid or the counting commission somehow classified this vote as invalid or blank. The difference is 53% leads to arguments why this difference is so big. Maybe the voting during the parliamentary election of 2017 was more complicated and harder to fill than the one of 2021 parliamentary election. In this case I made another research analyzing the percentage overall blank/invalid votes in all Albanian territory during the elections of 2021 with the ones in ZAZ 40 to see if there is any difference. The result is shown in table 2.

TABLE 2

Parliamentary Elections 2017	Total Voters	Blank/Invalid votes	%
Countrywide	1662274	83059	5
ZAZ 40	12096	120	1

Source: https://kqz.gov.al/results/results2021/results2021.htm

Based on table 2 information is clear that the electronic voting is more accurate and expresses better the intension of the voter enabling him not to mismatch the vote or make mistakes that may invalidate the ballot itself. The electronic voting method removes the "middlemen" from the process. There is no more need for counting groups to count the ballots and decide the validity of them.

Conclusions

Electronic voting is a good solution especially for the counties that have issues with voting processes and yang democracies. This way of voting can help produce accurate results electronically and immediately after finishing the voting process. This will bring into elimination of human errors or human prediction of the ballot.

In many cases the technology is seen as a barrier to access information and services from part of the population mainly older people but from this paper I have identified that when the product is easy and intuitive to use than the technology can help offering a secure and convenient service.

Since the process and result depends totally on the electronic systems security of the devices and system itself must be taken in consideration, any data breach can lead to the loss of the credibility of the system and in loss of invested money for purchasing the system.

The user interface must be simple, intuitive and with further possibilities to offer voting for people with special needs. The device itself must be easy to install for facilitating the setup of the voting center during the voting day.

Specialized and trained personnel must be available at each voting place to help in case of any technical issue. This also includes some contingency devices that must be located near to the voting places.

To avoid cyber-attacks the devices must operate without being connected to the internet, however at the closing of the voting center the device can connect just for transmitting the voting results. The transmission must be encrypted and through a secure network, preferable private APN to avoid transmission of data through public internet or access points.

For this specific case logistics plays a special role because there is a need to deliver the devices to several locations that are in different geographic areas.

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Backup & Data Recovery in Cloud Computing: A Systematic Mapping Study

Msc. Roland PLAKA

Abstract

Context: Digital data is being stored in large quan- tities in Cloud, requiring data backup and recovery services. Due to many factors such as disasters and other disruptive events, the risk of data loss is huge. Therefore, backup and data recovery are essential and effective in improvement of system availability and maintaining Business Continuity. Nevertheless, the process to achieve the goal of business uninterrupted faces many challenges regarding data security, integrity and failure prediction. Objective: This paper has the following goals: analyzing system- atically the current published research and presenting the most common factors leading to the need of Disaster Recovery and backup plan; investigating and identifying the adopted solutions and techniques to prevent data loss; and lastly, investigating the influence Data Recovery and Backup has in terms of business continuity and identifying the privacy and security issues regard- ing disaster recovery process. Method: A systematic mapping study was conducted, in which 45 papers, dated from 2010 to 2020 were evaluated. Results: A set of 45 papers is selected from an initial search of 250 papers, including 10 papers from snowball sampling, following the references from some paper of interest. These results are categorized based on the relevant research questions, such as causes of disasters, data loss, business continuity, and security and privacy issues. Conclusion: An overview of the topic is presented by investigating and identifying the following features: challenges, issues, solutions, techniques, factors, and effects regarding the backup and recovery process.

***Keywords**: Cloud Computing, Backup, Data Recovery, Disas- ter Recovery, Data loss, Business Continuity, Data Security, Data Privacy.*

I. Introduction

In today's globalized world, the notion of Cloud Computing is becoming a remarkably familiar approach in terms of scope and services to be provided. As we know, most of the data and applications are found and stored digitally, all over the world, on-premise hardware, or off-premise computing. This means, that the possibilities of data storage in the cloud can be endless, but so are also the data. The amount of data is heavily increasing day by day, and the necessity to store these data in the cloud comes in a straight proportion to it. Therefore, Cloud Computing services varies in different types based on demand and requirements.

In this paper, our focus will be to investigate Backup and Data Recovery, as they play an essential and significant role when it comes to Cloud Computing and the offered services. Since most of the data are sensitive and incredibly important in various domains, the need for a Backup and Recovery plan is vital. And no matter in what perspective or level we start to analyze, (e.g. personal data, sensitive data public data, confidential data, etc.) whether they are translated as qualitative or quantitative, at some point, the need for the backup will be crucial. Especially when it comes to big companies and organizations where data is "life-and-death" to their existence.

The risk of data loss is relatively high regardless of the cloud environment, provider, services, or architecture. No matter if the data are stored in a Public or Private Cloud, data can still be corrupted at any stage. Therefore, to maintain the data safety, control, and accessibility it is required a strategy, including a backup and disaster recovery plan.

A disaster recovery plan can be the best solution for a disaster event, whether it is man-made or natural type. Since these disasters can lead to hazards and devastating damage to a system, as a result, data availability and accessibility can be compromised. We have identified 4 types of disasters based on their nature: Climate Disaster; Intended Disruption; Loss of Utilities and Services; Equipment or system failure. Besides, if one of these disasters happens and data gets corrupted or damaged, it can lead to a full data loss.

Therefore, the need for some mechanisms and methods of backup and data recovery is a priority for many customers who have trusted the data on the cloud. And the purpose of these recovery techniques is to ensure the customers and businesses to collect the information from any backup server, when server fails to provide the data to the user.

In recent years, there has been an increased interest in Backup and Data Recovery, however, when we get to look at the literature there is relatively a low amount

of research and papers regarding the topic. Hence, in this paper, we will focus on highlighting and discussing the found research, done on backup and disaster recovery in cloud computing. The main issue that we have encountered related to disaster recovery in cloud computing is the concern to provide an effective plan that ensures high data reliability and security. Nevertheless, an overview of the most important key factors regarding the topic, will be discussed and be found in this paper.

For a wide overview of the Backup and Data Recovery in Cloud Computing research area, we have used the systematic mapping study approach [1] to collect data, analyze and interpret results, regarding the scope of interest and the evidence collected in the papers.

This paper is organized as follows: in Section II is shown related work; Section III presents background and motivation for the study; In Section IV we describe the systematic mapping study approach from the selection of the papers to classifying and lastly analyzing the results for each research question; in Section V we show the results we gathered for answering research questions; and finally, Section VI draws conclusions and outlines related to our systematic mapping study.

II. Related work

Our work attempts to conduct a systematic mapping study on backup and data recovery in cloud computing. In correspondence with [2] we identified the main factors and challenges of DR in cloud computing. It concludes that data DR services must ensure high data reliability and flexibility through an effective and practical DR plan that sustain growth for any organization. According to the authors, the most critical issues relevant to DR in cloud computing focus on cloud data storage, cost, security, lack of latency and redundancy. Different strategies attempt to manage the data recovery process. They also highlighted that natural and man-made disasters can result in costly service interruptions.

In the literature survey of [3] they found many techniques that have their unique ways to create backup and recovery. We illustrated these techniques in Tab 4. The experimental results, done by [4] shows that many organizations and companies have utilized disaster recovery solutions to minimize the downtime and data loss incurred when catastrophes take place. All these approaches aim to provide the best performance.

Organizations are subjected to hazards that might interrupt options. From the point of Service Provider, client satisfaction is among the major objective, while from the business aspect, recovery means being able to perform business functions without affecting continuity. DR services should assist business continuity, enabling

applications to quickly come back online after a disaster happens (Alshammari et al.,2016).

III. Background and motivation

In this section we emphasize the importance of data backup and recovery in cloud computing.

Data are valuable nowadays and if are lost, may cause a negative impact on the organization financial costs and time to regain it, so protecting important data, are required efficient countermeasures. During this decade cloud computing has become a new technological option to provide services and cloud providers are gaining even more popularity due to the increasing amount of data. The expanded usage of cloud computing services increments the need of more storage, backup and recovery.

Backup is defined as a duplication of any data, file, application and operating system that can be used in case of a data loss or restoration, while recovery is the set of techniques used to collect data from any backup server, when data are previously lost from the server or invalid to use.

Disasters effect both the client and the cloud side, hence it is crucial to have a disaster recovery plan. As it is mentioned by (A. Arul Mary, K. Chitra) when "disaster happens in customer side means backup will be stored in the cloud, but disaster happens in the cloud means data will be lost. So, disaster recovery process is urgently needed. But quality and security are the key issues in the information recovery process" [5].

Even though there are still many technological gaps, for many organizations, cloud computing is a flexible, cost- effectively, reliable and scalable solution to provide a safe data backup and recovery. The organizations must identify the major probable failures that can cause a disaster for them, then prepare a disaster recovery plan (DRP) and data backup.

DRP is a document that prepares and helps organizations to protect and prevent damages from a disaster. This plan usually addresses any type of disaster, however, it is customized based on the needs of the organization where the most important elements included are related to identifying and assessing disaster risks and determine the critical applications and resources.

This is crucial for their continuity, in order to protect themselves and employees from natural and man-made errors. Various techniques are proposed for this purpose, i.e. moving from single cloud to multi-cloud environment is considered as an empirical solution, however it has some legal issues to implement because of data security, privacy and authorization.

IV. Systematic mapping study

In this paper we present a systematic mapping approach adopted by [6]. Our study will be an overview in terms of solution, challenges, factors, security, and privacy, based in backup and data recovery literature. The methodology we embraced consists in four essential steps, however, Fig 1. describes best our process steps and outcomes.

- Identifying RQs.
- Searching for primary studies.
- Classification scheme of the relevant papers.
- Analyzing data and answering RQs.

FIG. 1. Systematic mapping process adopted by Peterson et al (2008).

A. Identifying research questions

The first step, and probably the most significant, is identifying and defining research questions [7]. As we mentioned earlier, our purpose is to have an overview of backup and data recovery, to understand its importance, to identify some challenges and solutions and how it affects different environments and domains in the context of cloud computing.

After we have discussed and evaluated some issues, we were able to formulate and define four research questions.

RQ1. What are the most common factors that can lead to the need of a Disaster Recovery and Backup plan?

- There are many factors that negatively influence a cloud environment and therefore they can lead to the necessity of a backup and data recovery. However, our focus is to present the most common factors that usually are identified, leading to such situation and needs.

RQ2. What are the methods and solutions used to prevent a full data loss?

- Various methods and solutions are presented nowadays to prevent data loss and avoid further damage for the data in the cloud. Our aim of the question is to investigate the most used solutions adopted for the backup and disaster recovery in order to identify some strategies that in many domains are needed.

RQ3. How will the Backup and Recovery process influence the business continuity?

- Since businesses are the most affected environments in a case of disaster and data loss in cloud, our objective is to investigate the influence these factors have in terms of business continuity.

RQ4. Which are the security and privacy measures in the data recovery?

- Our purpose of the last question is to investigate the finished process of data recovery in terms of security and privacy. How these aspects are covered and identifying the provided solutions are for this case.

TAB 1. The conducted search strings.

IEEE Xplore
("Backup" AND "Data Recovery") AND ("Cloud")

Scopus
(("Backup" AND "Data AND Recovery") AND ("Cloud"))

B. Searching for primary studies

The goal of this step is to create and conduct a search sting into the digital databases. The following digital databases were used in the search: IEEE Xplore and Scopus. After adopting many different strings we ended by evaluating the above mentioned. The same string that is used in IEEE database is used also for Scopus, however, a slightly automatic change has been made by the database. Since both strings work

perfectly on their respective database, and the results are suitable, the final result of the strings is conducted, and shown in Table 1.

a) Inclusion Criteria:

- The study must address an overview on Backup and Data Recovery in Cloud Computing.
- The study must have been published in the last 10 years, (i.e. 2010-2020).
- The study must have been published as a full document, in English (conference paper, journal paper, article).

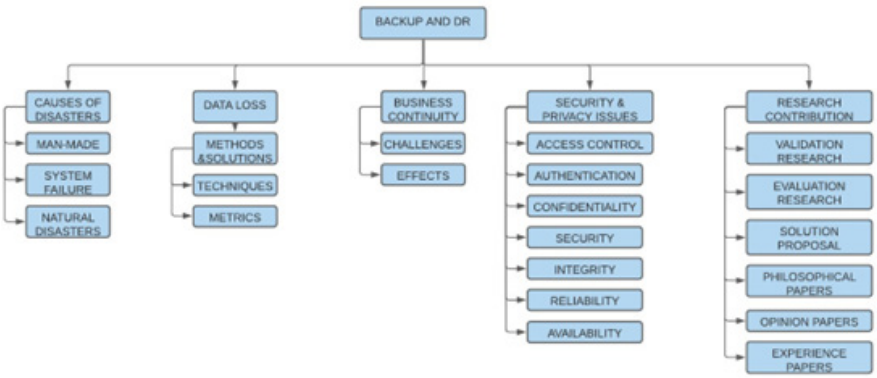
b) Exclusion Criteria:

- Papers which are outside the context of cloud computing.
- Papers which have not enough data/information to pro- vide an understanding of the case.
- Papers which evaluate the topic on a non-related perspec- tive.

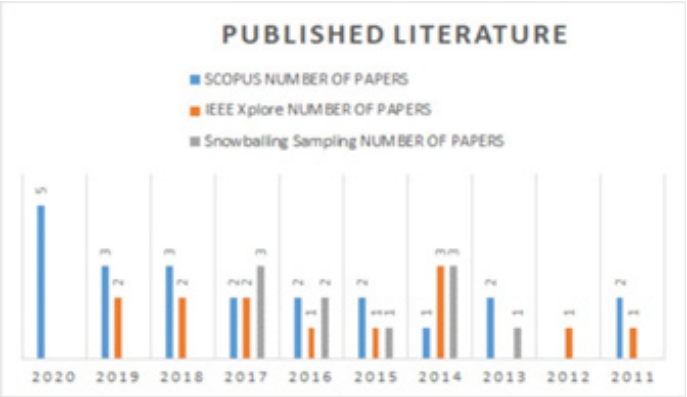
TAB 2. Databases and initial papers

Digital Database		Stage 1.	Stage 2.	Stage 3.
Scopus		156 papers	30 papers	16 papers
IEEE Xplore		94 papers	28 papers	19 papers
	Total	**250 papers**	**58 papers**	**35 papers**
Added 10 papers following the references from some paper of interest In total we had **45 papers**				

FIG 2. Classification Scheme



GRAPH 1. Published papers in 2011 - 2020 timeline



As it can be seen by the Graph 1. our selected papers are divided between 2011 to 2020 as per year 2010 there were no papers that interested us, related to the topic and content.

Most of the literature is published this year, 2020, and we must say that based on the classification by research type, our selected primary studies are published as a Solution Proposal with a total of 24 papers. In Tab 3. is shown the detailed classification based on the category and with their respective number of papers.

TAB 3. Primary studies classification by research type

Category	Paper Inxed	Nr. of Papers
Validation Research	e1,e7,p1,p14,p16,p28,p31,p34,p45	9
Evaluation Research	e3,e5,e6,e7,e9,p17,p21,p26,p27,p35	10
Solution Proposal	e2,e4,e9,e10,p2,p3,p4,p5,p8,p9,p10,p12,p13,p15 ,p24,p32,p34,p37,p38,p42,p44,p45,p46,p47	24
Philosophical Papers	e8,p18,p29,p30,p39,p41	6
Opinion Papers	p30,p39	2
Experience Papers	p29	1

C. Screening

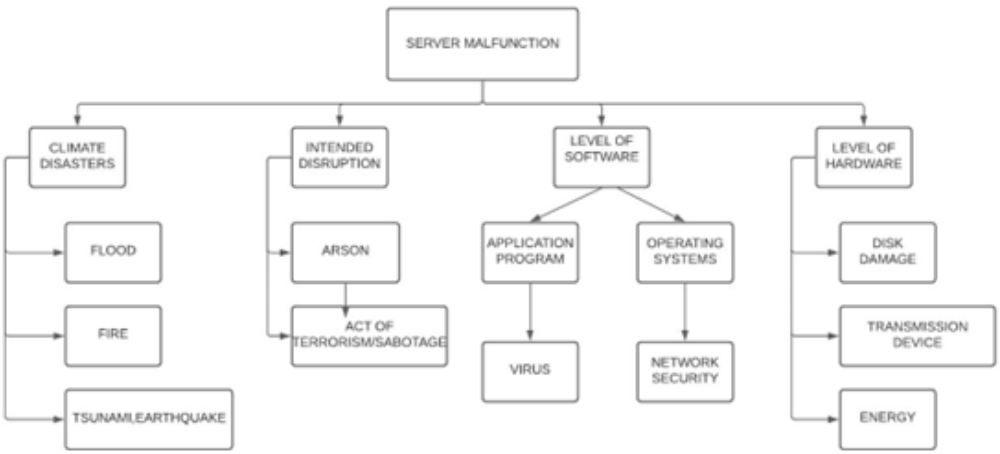
- Stage 1: The definition of search string in both databases gave us in total 250 papers.
- Stage 2: Applying inclusion and exclusion criteria in title, abstract and keywords we reduced the number of papers into 58 papers. Duplicated papers were avoided also.
- Stage 3: Next, we selected the remaining papers based on conclusion and often other sections as we found important to our study. In total we have 35 papers to read as a full text.

Lastly, we found and added 10 papers to our list, following the references from some paper of interest. At the end, each paper has been indexed with a ”random name” as a matter of ease. i.e., p1, p2... for primary studies papers (selected by the two databases) and e1, e2... for the snowball sampling (selected by following the references of the previous papers).

D. Classification scheme for the relevant papers

In order to create the classification scheme (shown in Fig 2.) we have categorized different ”sections/topics”, based on their similarities. However, a category is created as a result of the key focus related to our RQs. The top level, which is the root, is our main topic. And the other categories are influenced by our analysis and the need to answer our research questions. The first thing we applied was keywording. It was applied to titles, keywords and abstracts, however, most of the time some of these sections had poor quality leading us moving to the next sections of the papers. So this process was done in the full text of every relevant paper. After we finished this process we started to evaluate and define the contribution for paper regarding our study. About the research contributions, we have previously shown in tab 3. For RQ1, which shows the causes of disasters, three categories were identified: Man-made disasters, Natural disasters, and System failure. Then, for RQ2, related to data loss we have identified some methods and solutions and two sub-categories were created: techniques and metrics. Next, for RQ3 regarding business continuity we have identified and discussed about challenges, solutions, techniques and the effects they have in BC. Lastly, for RQ4 we have listed some security and privacy issues based on the risks.

FIG 3. Factors that lead to a Disaster Recovery and Backup plan



V. Results

The selected papers for this study are 45 papers. From which 35 papers have been selected as a result of our screening procedure and applying inclusion and exclusion criteria, and 10 papers are added following the reference of our papers of interest. The distribution by year is shown in Graph 1.

A. Results of RQ1

RQ1: What are the most common factors that can lead to the need of a Disaster Recovery and Backup plan?

Disaster Recovery plans are a set of procedures and policies used to restore the high priority processes of a system after a disaster. In addition, DRP is vital to define and ensure all the responsibilities that everyone should follow when a disaster happens, to enable the restoration of these processes and data. This process helps to minimize impact and damages and recover data when a loss occurs, by responding on time. A well-trained staff, necessary resources and assets makes the perfect combination to withstand and prevent a catastrophic failure of the system.

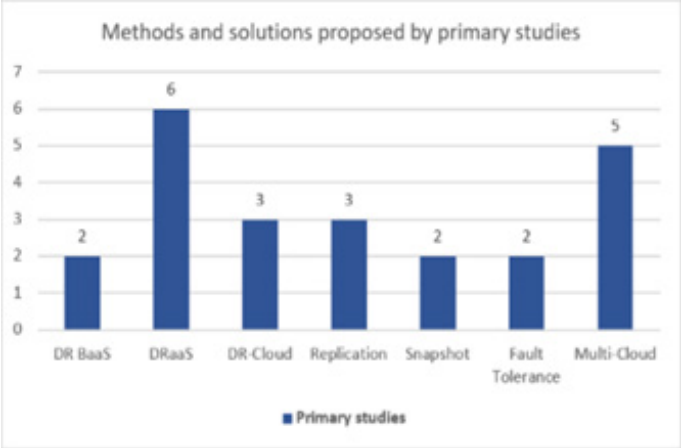
Above all, organizations should apply routine controls to prevent these factors before they occur unexpectedly. Disaster Recovery and backup still are not on effortless way of backing up cloud data into devices, due to lack of control over cloud assets. Generally, customers store sensitive data on single clouds, but recovery and data backup consume huge storage by replicating data to multiple data centers. For this reason, depending on single clouds contains the above-mentioned risks. These factors are shown in Fig 3. and can lead to disruption of the services, data loss even can cause a collapse of the entire system [8]. Fig 3. has been created as a result of analysing the following papers: [p1], [p3], [p4], [p9], [p13], [p21], [p29], [p35], [p41].

B. Results of RQ2

RQ2: What are the methods and solutions used to prevent a full data loss?

During our study we have noticed many solutions that have been discussed and proposed as a method or a strategy that will ensure zero data loss and a quick recovery process [9]. However, we came in the conclusion that none of these methods/solutions will be 100% efficient in every aspect, especially when it comes to reliability and security of data after a recovery process.

GRAPH 2. Adopted solutions and methods to prevent data loss



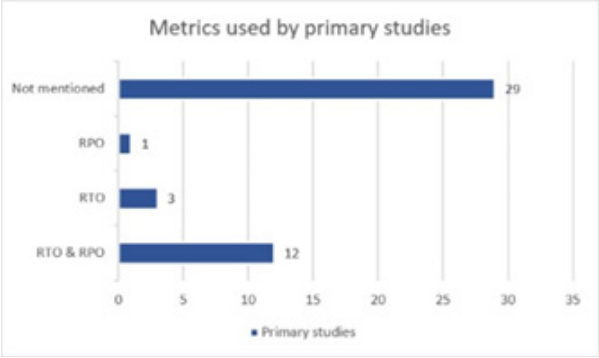
TAB 4. Existing techniques to backup data

Recovery mechanisms	*Studies*						
	e3	**e5**	**e6**	**e8**	**p16**	**p30**	**p39**
RAID		x					x
HAIL		x		x			
HSDRT			x		x	x	x
ERGOT			x		x	x	x
LINUX BOX			x		x	x	x
PCS			x		x	x	
RACS		x		x			
Cold and Hot backup	x				x	x	x
DeepSky		x		x			

An important recommendation to prevent data loss and meet a variety of needs such as availability, business continuity and disaster recovery is to engage in a Multi-Cloud strategy. But, if we must mention some used strategies in our analysis, we can also highlight replication and snapshot in different environments. However, as we can see from Graph 2, the most discussed solution in terms of disaster recovery as a way to prevent data loss is the introduction and adoption of a service model known as Disaster-Recovery-as-a-Service (DRaaS) [10]. The rest of the solutions are shown in the graph 3.

When it comes to techniques, the most common one is plain backup. As it is one of our focuses, we must say that some papers have described it as a not convenient technique due to security and reliability problems. And in order to overcome these problems, there are addressed data backup and recovery mechanisms and techniques in a more safe and effective system [11]. These techniques are shown in tab 4.

GRAPH 3. RTO & RPO metrics used in the studies



Disaster Recovery and Backup plan consists of some pa- rameters, but the fundamentals are defined as metrics, and the most common are RTO and RPO. These metrics are used to measure the recovery level which should be a focus when describing a disaster recovery plan in terms of tiers.

- RTO – Recovery time object; The time of the physical system recovery after a disaster happened.
- RPO – Recovery point object; The latest backup before the disaster. Meaning the quantity of data loss [12].

C. Results of RQ3

RQ3: How will the Backup and Recovery process influence the business continuity?

Business Continuity (BC) is a methodology and concept to manage elements that allow a business to function normally during and after a disaster [8]. In order to have maintain business continuity it is necessary to have a clear plan and strategy regarding a disaster event and data recovery. The plan must allow the organization to achieve the following services [8].

- Immediate & Proper response to disruptive events
- Reduce business impact
- Ensure business continuity services
- Reduce business impact

As we already can understand that BC is a very important requirement for any organization whose data are stored in cloud, we also must mention that it has its challenges. And often these challenges can be fatal for a business if a proper solution and technique is not immediately found and adopt.

After reviewing 13 papers related and discussing about Business Continuity in terms of Cloud Computing, we found the following challenges in Disaster Recovery that can influ- ence negatively in BC. These challenges are shown in tab 5.

TAB 5. Challenges in Disaster Recovery that influence BC

Challenges	Papers								
	e2	e4	e9	p1	p19	p21	p29	p39	p41
Dependency		x			x	x	x		x
Cost		x			x	x	x		x
Failure Detection	x	x		x	x	x	x	x	x
Security Detection	x			x	x	x	x		x
Replication Latency	x				x	x	x		x
Data Storage	x		x		x	x	x		x
Lack of Redundancy		x	x		x	x	x		x

However, along with the challenges, every paper hasmentioned at least one solution and techniques that could improve the disaster recovery plan and maintain a flexible and effective business continuity.

Solutions presented in papers:

- Block Replication.
- Cloud-Based DR.
- Local Backup.
- Multi-Cloud strategy.
- Replication of backup in multiple data centers.
- Pipelined Replication.
- Hot Standby (Active/Active).

All these solutions and many more are discussed in [e2] [p10] [p12] [e9] [e4], helping in terms of business continuity in different aspects. I.e., Block Replication will ensure to achieve zero RTO and negligible RTO [8] [9]; Local Backup will have minimal cost and ensure peace of mind [12]; Multi-Cloud environment will minimize the risk of availability failure, loss of data and privacy [13]; Hot Standby (Active/Active) is a synchronous real-time replication in based in database backup and ensures both RTO RPO to be zero, meaning 0 data loss [14].

In terms of adopted techniques, we can say the most common and mentioned one is Linux Box. However, techniques can be different based on the issue and challenge [15], [16], [17], [18], [19], [20], [21], I.e., if the challenge is Data storage and lack of redundancy, a suggested technique by [p29] is using an inter private cloud and multiple backups. Using monitoring units, encryption, scrambling and shuffling techniques can also be a solution for failure and security challenges.

In overall, as a conclusion for every paper related to BC, backup and disaster recovery in mentioned as a vital requirement to ensure the organization functionality

even during or after a disaster or disruptive event. It might be heavy in terms of costs; however, it guaranties the ability to work uninterruptedly regardless the nature of the disruption. A business continuity plan provides guidance to IT staff to follow the emergency plan, to recover and resume the business functionality and operations [8].

If business continuity is not ensured, the organization will have massive negative effects, such as, losses of receipts, business reputation, market share, etc. And often, it can lead to the worst-case scenario which is the collapse of the entire organization.

At this stage we can all evaluate the importance of the Backup plan and data recovery, and how it influences the business continuity. On the end, businesses are forced to make the decisions between cost, speed and effectiveness of recovery.

D. Results of RQ4

RQ4: Which are the security and privacy measures in the data recovery?

TAB 5. Security and privacy issues to data recovery

Access Control	p5, p13, p14, p28, p24
Authentication	p5, p13, p14, p15, p30, p31, p32, p39
Confidentiality	p2, p5, p12, p13, p14, p19, p21, p41
Security	p1, p29, p41, p3, p5, p13, p14, p15, p16, p12, p21, p30, p26
Integrity	p15, p32, p5, p12, p13, p14, p15
Reliability	p15, p17, p5, p2, p4, p12
Availability	p16, p12, p13, p19, p21

Data recovery is mentioned as one of the most critical security issue in cloud computing. DR process should be distributed over multiple sites for full data recovery. Recovery techniques and mechanisms help to collect information from the backup server when a crash happens. To provide cloud services there is a need to satisfy the clients about the reliability of their data. Ensuring a full DR is not an easy task for SP. The main concern is solving the problems of data access and authorization for multiple users. In this paper, we will present the most common security issues.

- Access control means full protection of data.
- Integrity is the process of verifying the data stored in the cloud.
- Confidentiality is related to fault-tolerance and access controls protocols.

When users join the network, authentication on the cloud server must be unique. Successful authentication means access to web services. Security matters occur due to insufficient certification, authorization, audit control, week encryption

algorithms, and unstable data centers (Alshammari et al.,2016). Privacy concerns are related to reliability and authorization controls to protect users.

Users hesitate to upload their critical data to the cloud servers because they don't believe that cloud service providers can guarantee privacy protection (Song et al.,2011).

Privacy protection is a crucial issue for providing personal data recovery services. On the other hand, encryption based data protection is proposed as a solution to solve this problem. It is important that data transfer between user and machine be secure. The privacy should be preserved by not leaking the data during the integrity verification process [11].

VI. Conclusion

In this paper we introduce a Systematic Mapping Study on Backup and Data Recovery in Cloud Computing. The timeline of the study is from 2010 to 2020, and we were able to extract the data from a total of 45 papers. In where 35 papers have been selected as a result of screening process by applying inclusion and exclusion criteria, and the other 10 papers were added following the references from some paper of interest. The initial number of papers was 250, obtained from IEEE Xplore and Scopus.

Regarding the RQs, there are 9 papers that discuss about causes of disasters as the main factor that lead to the need of DR and Backup plan. Then, related to the solutions and techniques proposed by 16 papers, we were able to list some of them where the most discussed one was Disaster Recovery-as-a-Service as a model and service to adopt, and followed by Multi-Cloud strategy which guaranties quick recovery and business continuity.

In addition to BC, we followed and identified a chain of factors such as challenges, solutions, and techniques influencing in the overall backup an DR plan process.

Lastly, regarding the most important issues in data recovery we can mention Security (discussed in 13 papers), Authenti- cation & Confidentiality (discussed in 8 papers), and followed by Integrity (discussed in 7 papers). However, some other important issues consist of Reliability, Availability and to the Access of Control.

All these aspects are treated as issues and gaps, in which is required more improvement in order to have a complete and successful data recovery.

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Production of electrical energy from renewable sources of energy in Albania

Prof. Dr. Angjelin SHTJEFNI
European University of Tirana
E-mail: angjelin.shtjefni@uet.edu.al

MSc. Hasimin KEÇI
European University of Tirana
E-mail: hasimin.keci@uet.edu.al

Abstract

Nowadays the issue of energy is becoming more and more discussed in the public. In the academical system this topic is getting more and attention than before. And this the right thing. In the Republic of Albania, we are passing through an energetical crisis. We produce the electrical energy using water resources. This indicates that we depend on a lot of form weather conditions. During the end of fall and during the winter we produce electrical energy more than we need and we sell it with lower prices, from the other side during the spring and summer, due to the drought, we cannot produce the necessary electrical energy that we need. As a result, to fulfill the needs of the country, we are obliged to buy the electrical energy that we need with a higher price than we sell it. And we are now talking about the best case: the case that we have a good situation of rainfalls. But do we have other opportunities to produce electrical energy form other sources? Of course, we have. Due to its geographical position and climate, Albania has a lot of opportunities to produce the energy that it needs using other renewable energy sources as: sun, wind, and geothermal sources. In this study I am going to give a panorama of our needs for energy. In this study I am going to present where can we produce energy from these sources. I am also going to present also other opportunities of building new plants to produce energy using water,

and how can we produce more energy combining two sources like for example water and sun. Generally to heat buildings we use conventional sources of energy (coal, gas or diesel). Instead of these sources, we can use renewable sources of energy. I am going to compare the costs for the heating of different buildings using diesel from one side and solar panels and geothermal sources from the other side.

1. General concepts on energetics

Energy in general and electricity in particular are the basis of a country's development and civilization.

The first attempts to generate electricity in Albania were made by an Austrian engineer in the city of Korça, around 1921, who proposed the installation of a diesel power plant to produce direct electricity.

The power system has been developed in several stages of growth:

- The first stage, until 1950, was to repair all the damage and destruction caused by the war.
- The second stage, during the 50s to 60s when the construction of the first small and medium works began, such as the hydropower plants of Selita, Ulza, Bistrica, Shkopet, the first power plants in Tirana, Vlora, Maliq, Kuçova , Cërrik, near important industrial works, of the time, when needed, not only electricity, but also technological steam.
- In the third period after the 70s, the construction of large hydropower and thermal power plants began, to respond to the demands of large electricity consumers, which were built in this period, such as those built on the Drin River.
- The fourth period, after the 80s, began to study the qualitative problems for the use of the power system to increase the safety of its work, the 400 kw line was built for the parallel connection of the system of our country with that of Greece, was conducts studies to optimize the operation of lakes, hydropower plants, especially that of Fierza.

In all these stages of development the following criteria were taken into account:

a. First to use the reserves of the country's energy resources
b. Second, that the rates of electricity development be higher than those of other sectors of the economy
c. Third, that the use of electricity be introduced as wide and deep as possible in all sectors of life and the economy.

There are various energy sources in nature which we classify:
a) In non-renewable energy sources
- Organic fuels
- Nuclear energy

b) In renewable energy sources
- Hydropower
- Helioenergy
- Wind energy
- Geothermal energy

The development of renewable energy sources is important for any country because it helps the country meet at least two of its strategic objectives:

1. security of supply and
2. sustainability

However, Albania is a special case, because most of the electricity generation is provided by large and medium hydropower plants. There are 5 sectors that help us better understand the distribution of energy consumption.

1) Industry sector
2) Transport sector
3) Housing sector
4) Services sector
5) Agriculture sector

The distribution of the contribution for all sectors is given in the following table:

Sector	Consume	Consume %
Industry	413.4 ktoe	20.25
Transport	828 ktoe	40.53
Buildings	484 ktoe	23.69
Services	204.5 ktoe	10.01
Agriculture	112.56 ktoe	5.52

Total energy consumption has a value of 2042.46 ktoe.

Energy intensity in Albania is the highest in the region, after Bulgaria. Consequently, the energy sector in Albania will continue to face two important challenges:

1) maintaining this intensity at medium levels and
2) increase energy consumption per capita

In recent years, energy strategies and policies have been used in Albania as well. The objective of these strategies is based on several advantages:

a. security of supply through a better use and utilization of energy resources
b. energy diversification
c. increasing competition and protecting the environment.

Given the growing energy need, the depletion of fossil fuel resources and the impact they have on the environment and human health, a global change in energy production and consumption is becoming increasingly necessary. For these reasons, it would be important to intervene with policies that aim not only to reduce energy consumption and curb the demand for energy resources, but also to enable a wider use of less polluting energy resources, such as also accelerate technological change. In this context, renewable sources represent a solution both to achieve the objective of reducing the price of greenhouse gases, as well as to reduce economic dependence on oil-producing countries.

Albania is a small country on the continent of Europe, and quite rich in renewable resources. Our country has one of the highest percentages of energy produced from renewable energy sources - 95% of the energy produced is produced from renewable sources. According to various sources and statistics, Albania has not had a defined policy in support of renewable resources. In 2013, energy legislation was enriched with facilitation provisions for renewable energy sources. A support tariff was set for electricity produced from renewable energy sources by hydropower plants with an installed capacity of more than 15 MW. These facilities also include priority network access. However this law was never put into practice due to the lack of supporting provisions. The only expectation relates to low-power hydropower plants installed, so there is no support scheme implemented in Albania for other renewable energy sources such as solar and wind. Some positive changes were made in 2017 opening up a positive outlook.

2. Hydropower in Albania

Based on the considerable water resources, Albania ranks among the richest countries in Europe. In an area of 28,748 km2 Albania has a hydrographic distribution with a water area of approximately 44,000 km2 or 57% more than the official territorial area. The topography of our country is characterized by a

difficult relief and a large hydropower reserve. More than 95% of electricity and approximately 20-23% of primary sources in Albania are based on hydropower. This makes the country's economy vulnerable to changes in hydrological conditions.

For 2025, an increase of 2.31 MWh is expected according to IEA estimates, which is the lowest growth in the region. The presence of the largest and most important lakes in the Balkans (lake systems of Prespa, Ohrid and Shkodra), with an area of 270 and 425 km2, respectively, as well as the intensive melting of snow, etc., creates a stable water wealth. of energetic importance as well. Albania's hydrographic network includes 11 rivers which have a large number of tributaries, with a total catchment area of 20,000 km2. There are another 125 rivers with a small total catchment area. Buna is one of the largest and most important rivers of the Mediterranean Sea. Albania's hydrographic network has over 110 important water sources, such as: Syri i Kaltër, Shën Naumi, etc.

In the rational use of hydropower, a significant impact has the introduction of new technologies with more effective production of aggregates and equipment of hydropower plants, especially small ones, where the problems have been very large. Some of the observed problems are: low production efficiencies, low equipment service life, etc.

In order to determine the competitive energy values that can be produced in the hydropower cascade, for every 1 m3 of water taken from the reservoir at the top, the water levels in the other cascades of HPPs must be taken into account.

There are four defining cases:

- The reservoirs of all HPPs are full, so the water brought by the river can not be stored in any of the reservoirs, which means that: if the energy production capacity of this water is not used by the cascade, then due to lack of capacity productive, this water will be wasted. For this, the value of water that can not be stored in the reservoir can be considered equal to "zero". The energy produced with this water is accepted at "zero cost" of water.
- The reservoir at the top is full, while the reservoirs of other HPPs are not full. In this case, the energy "value" of water taken from the reservoir at the top of the cascade is determined by the value of water in the following reservoirs (in the sense that: in these reservoirs, it is possible to store for later use an amount of water that brings the river). Energy value C2 + C3
- HPP on top with unsaturated aggregates. Other HPPs saturated by side streams and HPPs at the top. Energy value C1
- The reservoirs of all three hydropower plants are not full. In this case the values of water in operation, is defined as the value of water in all hydropower plants. Energy value C1 + C2 + C3

Skavica Project

An initiative to optimize electricity production in Albania, in order to improve the supply of electricity to consumers is the construction of a hydropower plant in Skavica, in the northeast of the country on the border with northern Macedonia. The construction of this hydropower plant has been planned since 1960.

The feasibility study for this hydropower plant has been done with the help of the European Union and the European Bank for Reconstruction and Development. The Skavica hydropower plant is designed for an energy production of 915 GWh, but studies have found that production from the Koman and Fierza hydropower plants downstream will increase by 80 GWh. They have a capacity of 600 MW and 500 MW respectively. The last in line is Vau i Dejës with a capacity of 260 MW.

According to the feasibility study this project will have the following benefits:

a. capacity from renewable energy sources will be increased by 119MW
b. 915 GWh / year energy produced by this hydropower plant and additional production in Koman
c. 70,000 households benefiting from electricity generation
d. a population of 100,000 inhabitants benefit from flood protection measures
e. 10,000 ha of rural / agricultural land are protected from floods
f. the total beneficiary population is 2,100,000 inhabitants

The construction of this hydropower plant will start next year and will last 4 (four) years. The construction of this work will cost 500 million euros, 350 million euros will be invested directly in the work and 150 million euros in the infrastructure of the surrounding areas. This work will be built with direct financing of the Albanian government in the amount of 16.2%, with loans in the amount of 83.2% and with grants in the amount of 0.6%.

3. Wind energy in Albania

Wind energy is another alternative that can help alleviate energy shortages in Albania. However studies show that challenges have been encountered in the use of wind energy due to the lack of data on models that would facilitate the assessment of its potential.

Italian companies are interested in investing in wind energy in Albania because of the favorable policies that our country has used. Italy's "Marsgelia" group has expressed interest in developing wind collectors in northern Albania, which will have the capacity to produce up to 410 megawatts of energy.

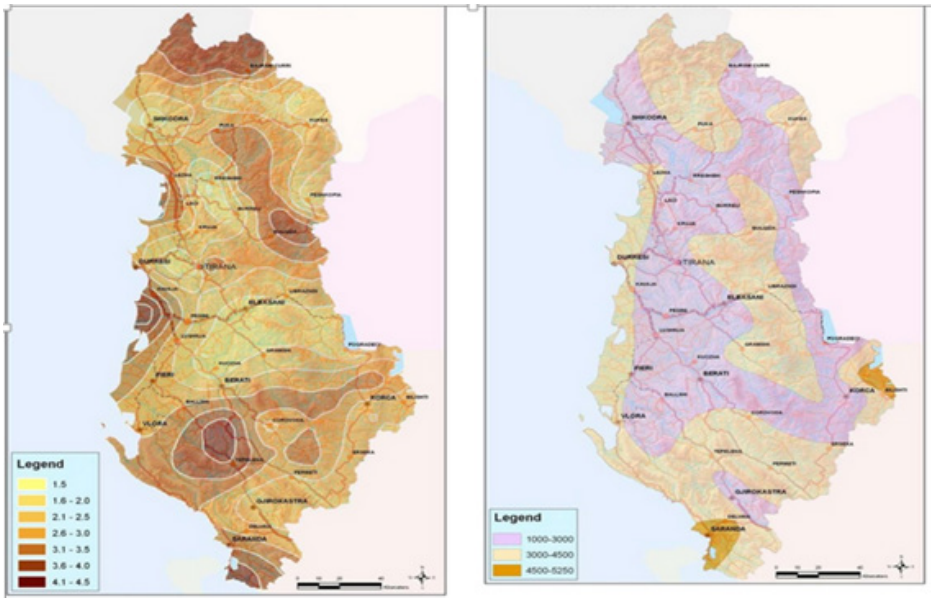
Wind farms can meet the hydroelectric power in Albania with lower initial investment costs compared to that of hydroelectric and solar energy. The high demand for wind energy from Italy shows that wind energy can really give us a positive outlook.

In an analysis of energy production are studied about 11 wind cultivators that are licensed in Albania. Wind cultivators were located at altitudes of 60, 55, 50 and 45 meters, so they could measure the change in wind speed at different altitudes. Many areas have been discovered in Albania, such as Shkodra (Velipoja), Kukës, Lezhë (Shengjin Island, Tale, Balldre), Durrës (Ishëm, P. Romano), Kavaja (Kryevidh), Fier (Seman), Karavasta (Hoxhara, Hoxhara 2), Vlora (Akerni), Saranda, Korça and Tepelena. The main wind directions are northwest-southeast and southwest-northeast, with a dominant direction towards the earth. Albania has a coastline from north to south for about 345 km where part is a coastal lowland while the rest is located very close to the mountains.

In order to assess the usability of Albania's fields, the following constraints (positive and negative) must be taken into account:

1. Altitude above sea level (area lower than 1800 m);
2. Natural or protected areas;
3. Road network (keeping gravel roads less than 5 km);
4. Power supply system (distance from the power supply system less than 10 km)

FIG. 1 - Average wind speed and the amount of annual hours in the territory of Albania



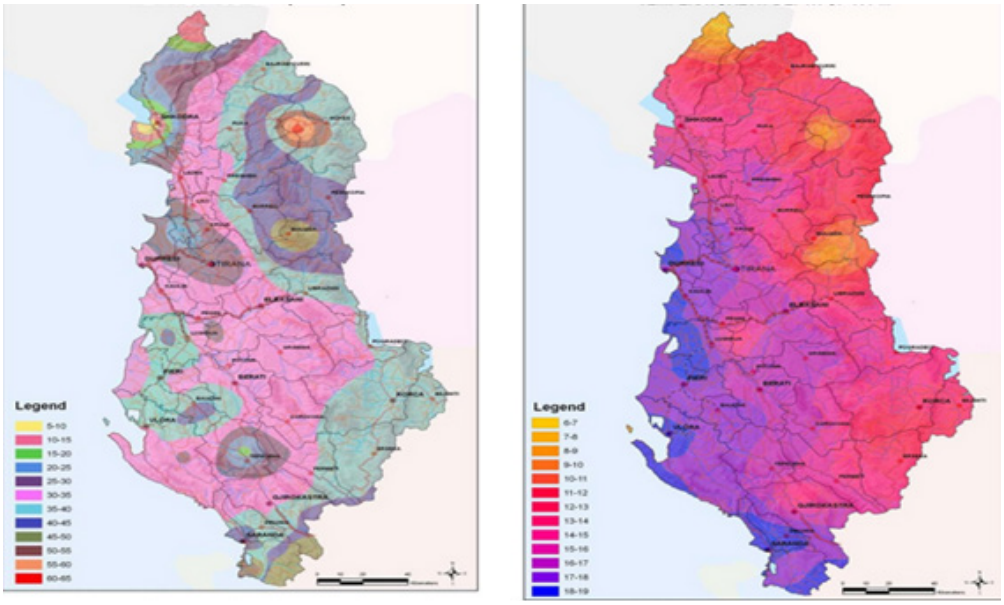
4 .Geothermal energy in Albania

Albania represents a country with real low enthalpy geothermal energy potential, which can be used for economic purposes. The use of thermal springs or wells is facilitated by the fact that they are generally located in urban areas.

There are several geothermal areas in Albania:

- Kruja geothermal area.
- Ardenica geothermal area.
- Peshkopi geothermal area.

FIG.2 - Heat and temperature flow at a depth of 100 m



Geothermal heating / cooling systems have high economic efficiency and are environmentally friendly. For these reasons, geothermal systems are being used more and more in advanced countries, but they are also found in the countries of the region, in Greece, Montenegro, Serbia, Slovenia, etc. Their energy-economic contribution lies in several directions:

a. In improving the country's energy balance. It is for this reason that many countries support funding for the installation of these geothermal systems.
b. In saving fuel and electricity, realizing heating and cooling of buildings at a lower cost.

The environmentally friendly nature of geothermal heating / cooling systems stands in two directions:

1. To reduce to a minimum the release of carbon dioxide
2. In not polluting the environment with the ashes of coal, hydrocarbons, etc.

5. Solar energy in Albania

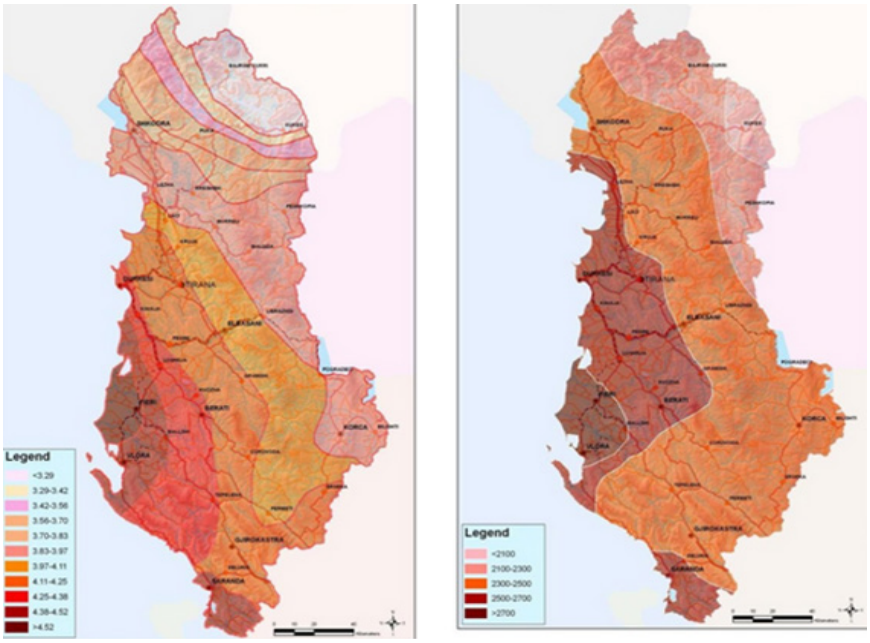
Solar energy is a suitable alternative to conventional energy sources. Despite the fact that the provision (benefit) of solar energy requires large capital investments, it offers cheap energy with minimal risk to the environment.

In 2005 a group conducted a solar "test" in Albania with the help of the Austrian government. The group's objective was to develop a specification scheme for small-scale sales of solar panels and solar collectors.

The specific objectives of the group were:

- to set up a quality control scheme.
- to perform test systems on solar collectors.
- to produce consulting services to the general public.
- to raise awareness among the government, business and public of Albania.

FIG.3 - Average daily solar radiation and average hours of sunshine in Albania



The development of technologies for the use of solar energy is not mentioned at all in the strategies, nor in other government documents, therefore the PV system for the same reason will not be an important resource in the near future. Indeed, in relation to photovoltaic installations there are only a few small installations at some railway stations, with power less than 1 kw.

The Energy Regulatory Entity has granted the company Statkraft Renewables Albania a license with a term of 25 years, for the activity of electricity generation from the floating photovoltaic plant on the reservoir of HEC Banja. In a decision a few days ago, the ERE underlined that the documentation submitted by the company was completed, but the application for a 30-year license could not be met in conditions when according to the feasibility study, the lifespan of the panels is 25 years. From the feasibility study designed for the floating photovoltaic plant of the Company "Statkraft Renewables Albania" sh.p.k. it turns out that the lifespan of a panel does not exceed 25 years "is stated in the decision, arguing the duration of the license.

The photovoltaic plant above the Banja HPP will have an installed capacity of 2MW and will be built at a cost of about 2.5 million euros. Statkraft has signed a contract with another Norwegian company such as Ocean Sun, to apply their innovative technology related to the construction of the floating park.

Another project that is expected to take place is the construction of a photovoltaic plant in Vaun e Dejës. The plant will be built on the reservoir of the Vau i Dejës hydropower plant which is owned by KESH and represents an important development in the innovation of green technology using the rich solar resources of Albania and avoiding the use of limited land terrains.

The EBRD loan of 9.1 million euros will be provided to a specialized KESH tool that will be used for the construction of the project. It is the first financing of this kind from an international financial institution and will contribute to the commercialization of KESH, one of the largest state-owned companies in Albania.

The project reveals Albania's ambition to develop its solar capabilities following two successful EBRD-supported tenders that have resulted in highly competitive tariffs; 140 MV in Karavasta and 100 MV of the Hospital project.

The EBRD has also mobilized € 315,830 to assist in the preparation of the green project and implementation scheme with the support of the Austrian Government (DRIVE Fund) and the Taiwan-EBRD Technical Cooperation Fund.

6. An economic analysis

For comparison, the same buildings have been treated which can be heated by different heating systems. The comparison will be made between the boiler

heating system and the geothermal systems. The geothermal systems analyzed are schematic; vertical heat exchanger - water-water geothermal heat pump. Water-water heat pumps with a heating capacity of 73.84 kw were selected, which have an electric power of 27.3 kw, having a performance coefficient of 2.70. The vertical exchangers are placed in well batteries with a depth of 100 m, the exchangers are calculated with a length of 100 w / m. Water with a flow of 3.05 l / sec for each pump circulates through the vertical U-shaped exchanger. The water circulation pumps in the exchanger have an electric motor with a power of 7.5 kw and a water lifting height of 120 m.

TABLE 1 – Annual consume of electrical energy

			Heat pumps			Circulation pumps		
Name	Work hours	Instaled power [in kw]	Quantity of heat pumps	Electrical power of pumps [in kw]	Annual consume of electrical energy [in kw]	Nr of pumps	Electrical power [in kw]	Annual consume of electrical energy [in kw]
MINISTRY OF EDUCATION								
CITY OF THE STUDENTS	3,624	5,526	75	2,049	7,425,576	75	7.5	2,038,500
Building of PUT	2,114	1,190	16	437	923,818	16	7.5	253,680
Faculty of Civil Engineering	2,114	637	9	246	520,044	9	7.5	142,695
Total for Ministry of Education		7,353	100	2,732	8,869,438	100	7.5	2,434,875
MINISTRY OF HEALTH								
Hospital QSU	3,624	7,858	108	2,948	10,683,552	108	7.5	2,935,440
Sanatorium of Tirana	3,624	1,600	22	601	2,178,024	22	7.5	597,960
Hospital of Shkodra	3,624	2,556	35	956	3,464,544	35	7.5	951,300
Sanatorium of Shkodra	3,624	151	2	55	199,320	2	7.5	54,360
Hospital of Durrës	3,624	1,510	21	574	2,080,176	21	7.5	570,780
Hospital of Korça	3,624	3,600	49	1,339	4,852,536	49	7.5	1,331,820
Hospital of Berat	3,624	1,628	22	601	2,178,024	22	7.5	597,960
Hospital of Lezha	3,624	800	11	301	1,090,824	11	7.5	298,980
Polyclinic of Durrës	2,718	250	4	109	296,262	4	7.5	81,540

Polyclinic of Berat	2,718	407	6	164	445,752	6	7.5	122,310
Total for Ministry of Health	34,428	20,360	280	7,648	27,453,065	280		7,542,450
TOTAL		27,360	380	9,481	36,321,446	380		9,977,325

TABLE 2 – Annual cost

			Annual cost	
Name	Annual consume of electrical energy [in kwh]	Price without VAT [in lekë/kwh]	[In lekë]	[In euro]
Ministry of Education	11,303,256	14.4	162,766,880	1,323,308
Ministry of Health	34,995,515	14.4	503,935,416	4,130,618
TOTAL	46,298,771		666,702,296	5,453,926

TABLE 3 – Annual consume and costs using burning materials

Annual consumption of electrical energy (in kWh)	Annual cost of electrical energy		Consume and annual costs of burning materials			
	[in lekë]	[in euro]	Burning material	Quantity [in ton]	Annual cost [in lekë]	[in euro]
46,298,771	666,702,296	5,453,926	Coal Solar Fuel	3,334 5,134 4,257.75	16,003,200 308,807,000 668,466,750	130,092 2,504,637 5,434,676
			Total		992,545,950	8,069,405

TABLE 4 – Balance

SYSTEM OF HEATING	Annual Cost	
	Lekë	Euro
With furnace	992,545,950	8,069,405
Geothermal	666,702,296	5,453,926
Savings by using geothermal system	325,843,654	2,384,521

These data not only argue the high energy and economic efficiency of the use of geothermal heating / cooling systems, which has made them today at the top of the systems applied in advanced countries, but also allow two recommendations to be made for the implementation of in Albania:

- First, they must be primary systems in new public and private construction, in conditions where technically feasible

- Second, to have priority during the reconstruction of existing systems in public buildings such as schools, dormitories, hospitals and offices

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