

Sustainable Urban Development and the Challenge of Urban Risks in Algeria

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Abstract

Major hazards are one of the greatest challenges facing the cities of the 21st century, as a large part (more than 50%) of the world's population lives in cities.

Algeria does not escape this challenge. The rapid urbanization affecting the threatened areas, including the north of the country, results in increased human, material, economic and environmental challenges. These challenges have obvious effects on the urban fabric of the various cities.

If we follow the stages of the evolution of the urban system in Algeria, which has undergone profound transformations and major imbalances that are difficult to eliminate. These problems have reduced the chances of Algeria to achieve the objectives to which the bearers of the idea of sustainable development claim and makes the possibility of its exposure to destruction and ruin in case of natural or industrial disaster an issue that is not excluded and the examples are numerous as the earthquake of Boumerdes and Msila and the floods of Bab el oued and Ghardaia, in addition to the accidents resulting from human activities, such as the explosion that occurred in the industrial zone of Skikda and others.

This article deals with the various urban hazards that Algeria is experiencing, and the strategies used to cope with them in the light of a new concept, namely the sustainable development of cities. The various Algerian and urban areas, especially the large Algerian cities, most of which are installed on the coast? Is the knowledge of threats alone sufficient to meet the requirements of sustainable development, or are there other requirements? What have the reconstruction and preparedness documents brought in the field of the fight against major risks? What makes cities vulnerable to different hazards?

Key words: urban risks, sustainable development, issues, technological risks.

INTRODUCTION

The areas at risk include the large districts that make up the Algerian cities with high population density, which makes it difficult to manage the hazard when it occurs and increases the sensitivity of these areas to it and thus increases its severity.

The rapid urbanization that affects the threatened areas, especially the north of the country, leads to a duplication of human, material, economic and environmental challenges. These challenges have obvious effects on the urban fabrics of our various cities and expose them to the possibility of destruction and disappearance in case of natural disaster or as a result of human technological activity (such as the explosion that took place in the industrial zone of Skikda and others).

This article deals with the various major dangers that Algeria knows and the mechanisms of protection and prevention in the dimension of sustainability and good governance.

And deals especially with the answer brought by the laws and documents of development and reconstruction in front of the major risks.

THE EVOLUTION AND CHALLENGES OF THE URBAN SYSTEM IN ALGERIA

The Algerian urban system has undergone several profound transformations linked to historical developments and external influences. The resulting differences and imbalances have not been eliminated to date, but rather have become a deteriorating trend that has reduced Algeria's chances of achieving the objectives sought by the owners of the idea of sustainable development.

Algeria's urban system was once based on some of the large cities that were capitals of former empires, as well as prosperous commercial forums, or centers of cultural influence (Tlemcen, Tiaret, Bejaia, Constantine ...). The cities were mostly located in the back of the country, but after 1830 colonialism upset this ancient structure by concentrating the population on the coastal facades of the country and thus gave the region a different logic turned to the interest of the French economy in the first place.

After independence, Algeria has deepened the phenomenon of coastalization on its national territory, and the will of the state was intended to eradicate this phenomenon or at least to mitigate it.

The current structure of the urban system clearly shows three types of structuring:

In the north, at the level of a narrow coastal strip, the urban network is dense, and all sizes of cities are present, then a central region represents the highlands region, in which the network appears less closed and less dense, and the urban hierarchy begins to fade.

In the end, the great south, due to the great extension of the territory and the rigors and pressures of the climate, has contributed to the formation of an urban system linked in particular to the presence of water sources: the dispersed distribution of communities (oases, palaces) is subject to the marriage of this factor with the major transport hubs and the presence of an important groundwater basin.

In general, the structuring and development of the urban system confirms the continuation of the phenomenon of deforestation, which is a major challenge to achieve the dimensions of sustainable development and a major catalyst for the occurrence of urban hazards of all kinds.

CHARACTERISTICS OF THE NATIONAL

The national territory is characterized by the following features:

- One third of the total population of Algeria is concentrated in the northern region of the country, which is the first indicator expressing the extent of the imbalance in the distribution of the country's population.
- Aborting the coastal area due to the presence of 40% of the population on an area of 1.6% of the total area of the national soil, which adds another threat to the future of the country and its inhabitants.
- Concentration of urbanization and basic economic infrastructure, which represent the pillar of the national economy in the northern part of the country.
- The nature of human activity in the northern region.

All these factors contribute to increase the degree of vulnerability and fragility of the national territory and its exposure to various types of risks, which makes it a challenge and a bet against the achievement of sustainable development.

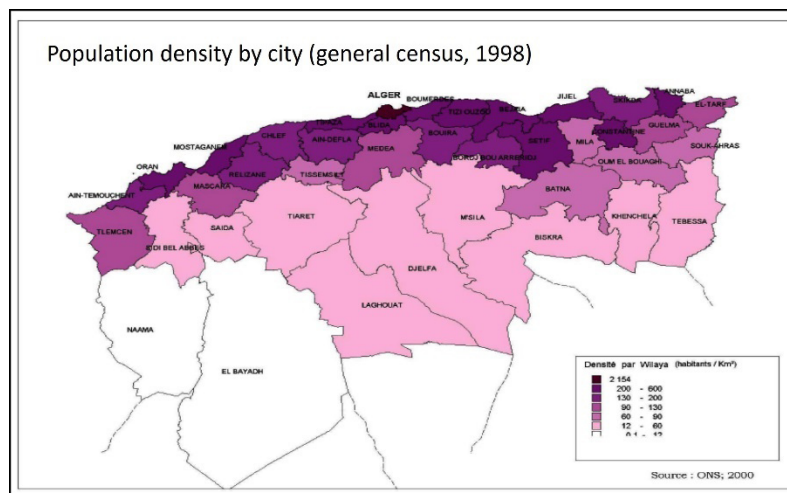


Figure 1. Population density across cities according to the 1998 census

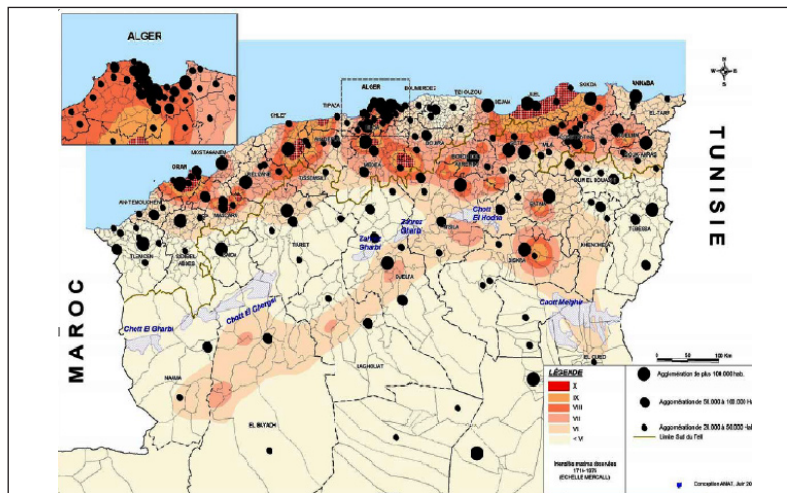


Figure 2. Urban cluster map and seismic risk

❖ *The anarchic constructions on the coast contribute to increase the degree of danger*

- 361 northern cities including 04 metropolises.
- Random urban expansion on vulnerable sites.
- Total lack of respect for construction rules.

Urban hazards result from difficult climatic and natural conditions, as well as technological accidents or scientific errors that threaten the high concentration of the population. Among the dangers that Algeria knows, we can note the following

- Earthquakes: earthquake of Boumerdes 21/05/2003
- Floods: Bab El Oued in November 2001 and Ghardaïa in 2007, with many cities drowning in the mud. Forest fires
- Landslides
- Demographic risk
- Danger of marine pollution.



Figure 3. The dangers that Algeria knows

PRINCIPLES OF SUSTAINABLE DEVELOPMENT IN ALGERIA

In the context of the mutations that urban risks know, it has become imperative to manage the risk before it turns into a disaster, which can take the form of floods, droughts, earthquakes, explosions, ... In order to face these challenges, it is necessary to adopt the basic principles of sustainable development as recommended by the United Nations Conference on Environment and Sustainable Development (UNCSD) held in Rio de Janeiro in June 1992, which identified some principles that can be developed to manage urban hazards and are based on: the principle of prevention, the principle of citizen participation in development and the citizen's right to obtain information

The first principle is the most important point of disaster management in case of worrying and potential risk.

With regard to the principle of citizen participation in decision-making: ensuring the partnership of all stakeholders, each at its own level, in accordance with organized frameworks (elected councils, associations, ...) is the best way to address and manage risks.

As for the principle of the citizen's right to information: every individual must legally obtain information relating to the conditions of the environment in which he or she lives and have the opportunity to contribute to decision-making. Urban risk management in the context of sustainable development depends on the involvement of all actors and civil society.

The issue in Algeria is the application of a principle based on two complementary and correlative levels:

- **The first level:** concerns the prevention of major risks, including the seismic risk affecting the northern regions, through the questioning of the legislative framework related to construction rules.
- **The second level:** aims to reduce the overall risks caused by natural disasters, especially earthquakes, and to protect urban communities, activities and economic structures that characterize the region most vulnerable to seismic risk, which is the hill area.

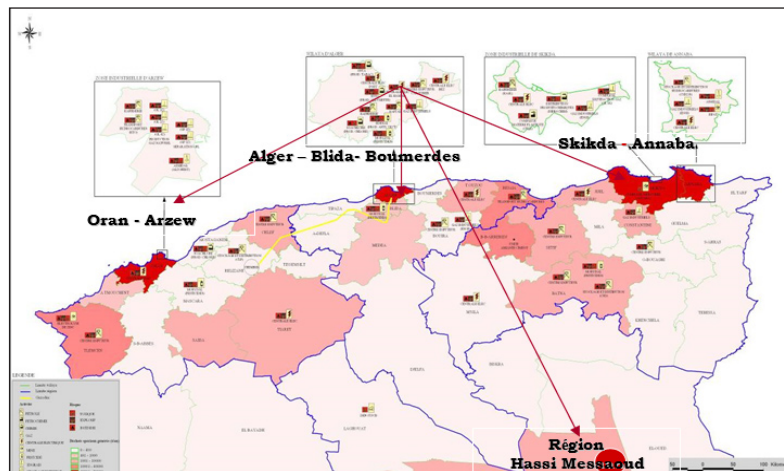


Figure 4. Distribution of industrial units at risk

This calls us to anticipate the risk by adopting the option of the Highlands and South (OHP, SUD), as part of a national policy of urban planning, policy related to the distribution of weight and burden of the northern band to regions less exposed to the risk of earthquakes, this option will support and strengthen the justice and social cohesion of the national soil during disasters caused by risks of all kinds, whether for the population or for the economic base, which is called the preparation in depth.

THE MOST IMPORTANT DANGERS THAT ALGERIA KNOWS

Presence of Industrial Units with Danger in the Industrial Zones

The dangers come mainly from human activities, and in a general way, the dangers for the population living near the industrial zones and usually endemic (for the Algerian cities) within the urban environments, are multiple and include:

- Fires and explosions in urban areas.
- Emission of toxic gases.
- Dumping of hazardous products.

These damages represent real factors of concern, but their evaluation was and remains difficult due to the lack of information, as well as the lack of quantitative and qualitative evaluation of the consequences of the risks. A comprehensive study of major industrial hazards is being prepared, which will pave the way for the development of technical standards and industrial safety and prevention standards.

Now, we can say that the two industrial areas of Skikda and Arzew hide behind them latent urban risks of great magnitude, and this is due to the nature and volume of products stored (fuel, refined materials, ...), which can lead to loss of life and property damage with radiation whose impact can reach tens of kilometers, the prohibition of construction of new buildings for residential use in a determined perimeter is strongly required for both regions, and it is a measure that should be applied at the level of all industrial regions at the national level.

It should be noted that there is a form of reconstruction reflected by 3000 houses built on pipelines, and among the states affected by the phenomenon, Biskra with 787 houses, Chlef with 442 houses, and Tebessa with 353 dwellings. These sites have been classified as red zones in the study that was conducted by the Ministry of Environment and Spatial Planning and added areas such as Arzew, Hassi Messaoud, Skikda, and Annaba, where the largest refineries of the energy and mining sector, the latter constitutes 80% of the risks and disasters, and they are examples of areas that require measures to prevent the permanent construction of buildings already completed.

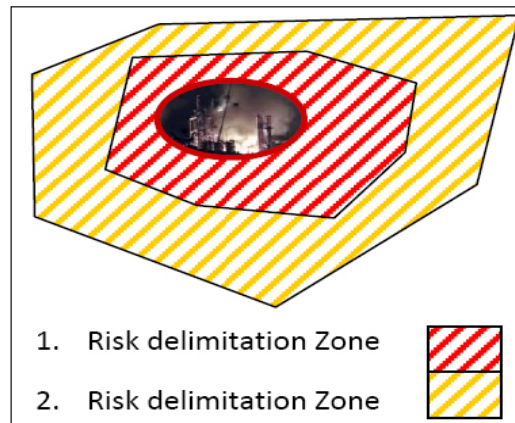


Figure 5. Delimitation of risk areas by urban planning tools

We, therefore, conclude that all risk areas (the metropolitan areas of the capital, Oran, Constantine, Annaba, Bejaia, Jijel, Chlef, and Ain Defla...) must do the following:

- Determine the different areas in which construction is prohibited.
- Determine the procedures for prevention, protection, and preservation against hazards.

This is done through the development of risk prevention plans (PPR) by the provisions of the law on major hazards and must be integrated into the tools of construction and development.

Hospital waste: "An urban hazard of current concern"

Hospital waste is one of the products neglected by the health sector because it can produce polluting risks.

Currently, and because most hospitals are located in urban centers, they emit fumes resulting from their combustion, which represent a great danger to public health throughout their life, that is, from the moment of their production until their final disposal or industrial recovery, because they are highly concentrated in harmful germs. It affects the residents living next to the health facilities if they are not moved and disposed of properly.

Before addressing the modalities and mechanisms of their elimination, it is appropriate to discuss their definition: What is hospital waste? Is all waste a source of danger?

They are unusable sanitary residues and include all wastes resulting from medical treatments (human or animal) and the resulting dangers can be real, tangible, or psychological, risks of intoxication and infection, mechanical or cancerous risks, and inefficient incineration and disinfection of waste can result in solid residues or gaseous substances that will present environmental and public health hazards, such as dioxide, which causes cancer of the liver, digestive tract, and blood, in addition to skin and heart disease.

It is, therefore, necessary to carry out special treatment of hospital waste to avoid the emergence of dangerous diseases in cities, and thus contribute to opening up prospects for sustainable urban development.

Natural and Technological Risks: "Policy for the Occurrence of Risk"

In urban projects, the formula of danger and how to cope with it was one of the last predictable concerns in the design of our urban spaces, until natural and technological disasters began to hit the major Algerian cities, among which we cite floods. Bab El-Oued, Boumerdès earthquake, petrochemical explosions in Skikda...etc., so that construction errors and mismanagement begin to cause great human losses known in the history of Algeria.

Since our legislation has passed to the status of situation legislation, it is the occurrence of these crises that determined the mandatory existence of regulatory laws for the control procedures of these under the law No. 20/04 of 25/12/2004 on the prevention and management of major risks and disasters in the context of sustainable development.

However, the culture of danger has not yet reached a broad awareness among those responsible for urban production (the State and the citizen), as is the case in most Algerian cities, but before addressing the diagnosis of the position of our cities in terms of natural resources and technological hazards, it must first:

➤ Introduce the meaning of danger

There is a risk related to the presence of hazards (natural or technological) and the presence of stakes (human or material) so that the urban center represents the most exposure to danger.

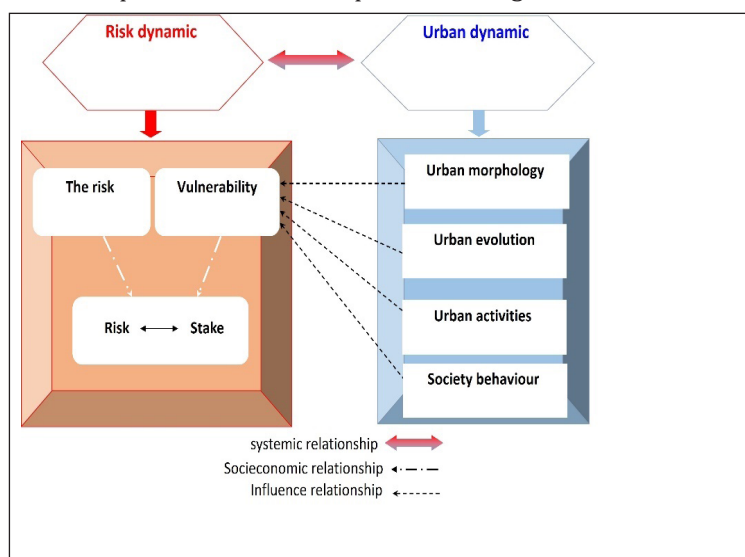


Figure 6. The dynamics of danger in the urban environment. Source: Sami Fatiha, 2012, p. 172.

THE MOST IMPRTANT SOLUTIONS TO ENSURE THE SUSTAINABILITY OF THE NATIONAL TERRITORY AND TO FACE URBAN HASARDS

Updating of the Urban Development Plans (PDAU) of the Cities with High Risks: "Urgent workshops are needed"

The urban planning and development tools that have been implemented in the normal course of the reconstruction of Algerian cities have not given much importance to exceptional and sudden accidents in time and space, and their negative effects, except in rare cases.

The attraction exerted by the north of the country on the population and the establishment of activities is a worrying and multiplying factor about the disasters that have succeeded one another and at close intervals over the last two decades.

In addition to earthquakes, coastal areas are subject to flooding, landslides, erosion, and forest fires whose consequences are amplified by human activity through the random establishment of works and basic works.

Therefore, the criteria for the realization of projects, whatever their nature, must, according to the above, be rethought in order to achieve maximum of prevention and protection against urban hazards and thus achieve one of the principles of sustainable development. These risks and effective prevention are the first steps to mitigate them.

Knowledge + Prevention = Risk mitigation → Achieving sustainability

The consideration of urban risks must be based on the identification of buildable areas in the building conditions related to them. In every region, city, or town, there is a possibility of various hazards, including those recorded relatively regularly, and therefore their occurrence can be predicted, but in most cases, they occur suddenly, and these hazards cause great devastation.

Integration of Hazard Maps

The serious effects left by natural disasters such as earthquakes and floods, rising waters, and erosion in its various forms pose great challenges to urbanization in Algeria in general and construction in particular. Therefore, a sustainable urban development strategy must be adopted.

This strategy or device based on the principle of prevention must include, in a mandatory way, the principle of selection of sites suitable for construction, and to this end, the problem of integration of hazard maps within the construction tools requires three levels: 1) construction of information, 2) integration of information 3) Taking into account information related to risks in urban projects.

Transfer and Transformation of Activities and Urbanization

The most important industrial activities are found in large gatherings and are located in urban fabrics or in the immediate vicinity where industry and population coexist, in addition to the old industrial and technological equipment, which increases the degree of danger that can lead to significant damage, both to the health of the population and the environment. The production and use of its materials has increased as the severity of major disasters has increased, especially in areas with high population concentrations.

In addition to the damage these activities cause to the population and the environment, they certainly impede the functioning of large cities (especially metropolitan cities) in the exercise of their political-administrative and leadership roles.

Transport of Hazardous Industrial Activities

The oil and gas, pharmaceutical, chemical, mechanical and other industries are relatively developed in Algeria, they are all sensitive to sudden leaks of hazardous and toxic materials. These industries are unfortunately located in the densest urban agglomerations of the national territory, and unfortunately, most of them have not been subject to environmental impact studies. Although industrial growth has developed since the sixties and seventies, but the laws related to it suffered from many gaps and loopholes.

Relocation of Dwellings Adjacent to Dangerous Industrial Environments

Some hazardous industrial units have been invaded by buildings, for example, the capital's refinery, whose protective perimeter has been reduced due to the increase in construction, which has reached the point of sticking to the walls of this institution.

As for the two industrial ports of Arzew and Skikda, which occupy respectively: 20% of the total area of the communes of Arzew, Batouia, Marsa El-Haj, and Ain El-Bayda, where most of them have an agricultural activity character while representing 21.19% of the total area of the communes of Skikda and Hamadi Karma.

These two poles are different from the traditional concept of industrial zones, either by their nature or their functions, since they are distinguished by the lack of clear demarcation between the areas turned into factories and public spaces. The gas in case of the explosion will create a radius of 5800 m and will thus reach the extent of its dangerousness for the residents of the neighboring districts.

The regions of Skikda and Arzew (according to the Ministry of Urbanism and Environment) were considered the most threatening in Algeria by the nature of the existing industrial activity, in addition to two other factors that aggravate the situation, namely, the high seismic risk that characterizes most of the northern region, as well as the random urban expansion around these areas.

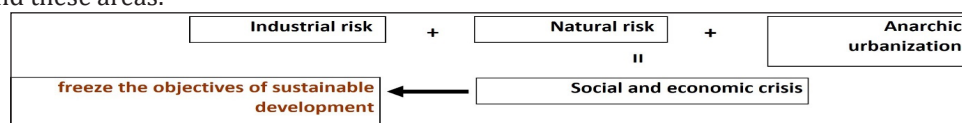


Figure 7. Mechanisms of disaster formation

These institutions are classified as high risk and are unfortunately not transferable to other regions because of their strategic position in the national economy.

While the limitation of these risks related to the nature of industrial activities requires a field survey of major risks by identifying all the sudden and possible accidents that can result from these sites and have immediate dangerous consequences on the population, workers, property, and environment, and knowledge of these risks must pass without doubt by the study of the damage it can cause, which we consider a fundamental key to any prevention policy against industrial risks.

It should also be noted that the structures for the transport of gaseous and liquid fuels also pose problems for certain areas. Several accidents have been recorded in the occurrence of cuts in oil and gas pipelines and their disasters have been fatal due to the presence of homes in the immediate vicinity, these high-pressure channels, for example, the gas channel in the city of Relizane, which 1500 families are threatened every day due to the possibility of a gas pipeline explosion or a rupture of high-pressure power lines, they must therefore be moved immediately.

Prevention of Industrial Risks in the Context of Achieving Sustainable Development

The survey process conducted by the Ministry of Lands, in which he counted 60 industrial establishments with major risks, which includes, as we have said above, a set of oil, gas, electrical activities producing tonite and chlorine ... etc., which generate multiple risks that are not immune to human error or mechanical and other failures, the reality of disasters related to industrial hazards came late: they are cited (Bohopel in India, which were caused by major leaks of very dangerous chemicals that killed 2,500 people and infected 50,000, and some disabled people who survive without forgetting the accidents of Chernobyl and Savesco-Toulouse), and in order to limit the effects of each industrial facility, the Ministry has stressed the absolute need to reformulate effective provisions for the prevention, control, and management of industrial risks with significant impacts.

In-Depth Reconstruction: The Process of Directing the Surplus Population to the Major Metropolises

The in-depth reconstruction of the national territory is linked to the application of the law relating to the protection and enhancement of the coastline, on the one hand, and on the other hand, to the adoption of the general options of the national policy of urban planning defined in the law on urban planning and sustainable development.

At the level of the coast, it is a question of reducing the pressures which it undergoes, by controlling the construction and by directing it towards the feet of the mounts, while at the level of the high plateaus, it is a question of reinforcing the qualification in terms of basic structures, in particular the urbanization.

- ❖ Reduction of the loads on the coastline: (Law 02-02 of 05/02/2002 on the protection and enhancement of the coastline)

The Algerian coast suffers from a major failure in its various resources, and to mitigate it, several steps must be taken. Some of the main points, including the prohibition of building on a strip estimated at 100 m, which can extend up to 300 m for reasons related to the sensitivity of the coastal center, limiting the longitudinal expansion of coastal municipalities to a maximum of three kilometers, and the distance between the municipalities estimated at 05 km, removing the illegitimacy of the two buildings together.

These mitigating factors are also related to all industrial establishments whose establishment on the coastline is prohibited in the future. As for the constructions and occupations of the ground related to the functions of economic activity, they are authorized only within the framework of the tools of development and reconstruction (PDAU, POS) on a littoral band of an extension of 03 km (these constructions are legalized as for the disloyal and harmful activities to the environment will be excluded in other places)

As for the road network, which puts additional pressure on the natural balance of the coastal environment, it is linked to the prohibition of any new project of asphalt roads parallel to the shoreline in a strip 800 m wide.

In addition to all this is the preparation of the option for the highlands and the south, where the program of transferring activities from the metropolitan areas of the north to the highlands and the south must be supported by the National Fund for Urban Development (FNAT), and the objective is to protect these dangerous activities from major risks such as earthquakes.

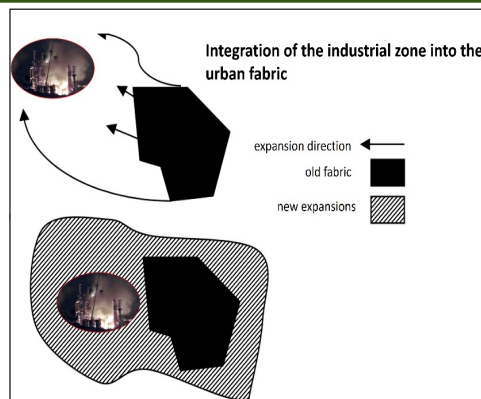


Figure 8. Mechanism of risk formation of industrial areas

Control of Establishments

As far as administrative authorization is concerned, it is the municipality that has the right to estimate the possible locations for industrial installations in the construction documents, the POS and the PDAU having stipulated that urban easements must be left, which are zones forbidden to construction, but the urban disasters that have crossed Algeria have demonstrated over time the lack of rigor and surveillance necessary to prevent urban hazards.

RESULTS AND DISCUSSION

The complexity of urban systems of large cities, the intensity of flows, and the heterogeneity of their built fabrics have become, today, catalysts for the occurrence of hazards that differ in their nature, their intensity, and their effects according to the different parts of the city. This division can be noted through some of the disasters that occurred in Algeria:

The city centers are characterized by extensive use of land by high-rise buildings (particularly at risk of fire and electronic failure), in addition to the presence of a high risk of pollution due to the high number of transport mechanisms.

Older neighborhoods and historic cores with a large stock of old buildings are exposed to fire and health risks, in addition to the risk of flooding in the case of the river site.

Urban areas are characterized by the presence of industrial areas, business and storage areas, and large development projects (airports, highways), which have several direct technological risks in addition to urban violence and security.

Coping with major risks has become today one of the most important challenges of urban development in the dimension of sustainability, that is why we emphasize the need for awareness and consciousness of this issue on the part of the various stakeholders of the city, including residents, users, decision-makers and managers. It hinders the development of any society and stops its growth.

Major risks are now a priority for city experts. The seriousness of the damage and losses are mostly due to conflicts in preparation, the non-observance of certain prevention rules, or simply human errors. Urban hazards have awakened many peoples of the world, including Algeria, and this since the incident of Skikda and Guelma, which marked a turning point in the policy of confronting risks.

How to reconcile risk and sustainable development in cities? Is the factor of population concentration in urban areas a catalyst for the occurrence of risks? In other words, is a danger inherent to the center and urban life?

All these questions deserve to be studied because knowing the risks alone is not enough to achieve sustainable development

- **For specialists and experts:** knowing the danger requires the evaluation of two factors: the possibility of the danger occurring and the degree of inherent stakes. The management of the risk which depends on the will to reduce its effects must include within it the principles of good regional governance (Regional Governance) as precaution and prudence, prevention, and the possibility of correcting at the source and this by providing tools of management at the higher level (the State) and the base (the commune). these tools will allow effectively control of the regional zones exposed to the dangers, but the principle of information and diffusion of the civil society remains always necessary to the success of any operation or strategy of prevention of the major dangers in its various natures.

- **For urban planners and those who are preparing for it:** the study imposes particular plans elaborated from the pairing of hazard maps, maps of stakes, and the matrix of indicators indicating the danger, supported by the tools of elaboration and reconstruction which specify: sectors of rehabilitation of buildings, distribution of strategic economic activities, identification of corridors and networks of an emergency evacuation, schemes Access to threatened sites.

As for the public functions, they require the existence of an ORSEC device with all the material and human means.

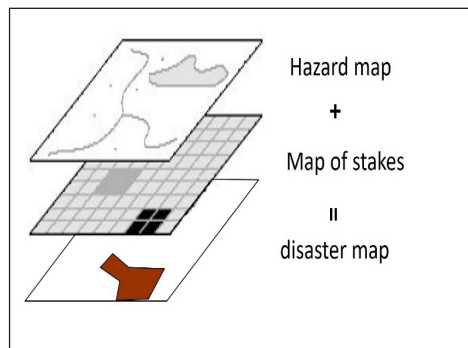


Figure 9. Risk indicators

CONCLUSION

The presence of means of protection against the risk does not necessarily mean insurance against it, because the sustainability of its work is the challenge facing the Algerian city, in the absence of feasible management methods and periodic maintenance of equipment made for the same purpose.

Just as the city, in its growth and expansion, has become the subject of a set of issues (walking and mobility, natural and technological hazards, common living spaces ...) this means a vision from another angle of the defects of the city, the correction is no longer enough, it must be accompanied by modernity in the perception and thinking, to be translated into the application and implementation.

The policy of protection against various hazards in Algeria is a project in which all skills are intertwined, which indeed requires a prior awareness on the part of all actors following the modalities of information and guidance related to the knowledge of the hazard, it exists and is preserved for the future, Therefore, the priority of the protection of this construction is the real bet of urban communities and their sustainability.

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