



**Africa-Europe BioClimatic buildings for
XXI century**

**REVIEW OF HOUSING NEEDS,
CONSTRUCTION PRACTICES &
URBANISATION TRENDS IN
NORTH-WEST AFRICA & EUROPE**



ABC 21 project

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Executive summary

The situation of housing demand and supply is facing a lack of up-to-date statistical data both in African and European countries. This gap in housing statistics is partly linked to an outdated estimate of housing stocks, but also to the complexity of methods for projecting real housing needs.

In both Africa and Europe, though with quite different economic and social background conditions, the demand for housing remains high while the supply remains limited in quantity and often inadequate in quality, even in Europe, where large parts of the housing stock suffer of poor thermal performance.

In some countries in North Africa (Egypt, Tunisia and Morocco) and West Africa (Ghana, Liberia, Senegal), UN-Habitat has supported the development of housing profiles. In these documents, data are compiled on housing stocks, demand, supply and demand projections in 2050.

The urban and rural housing stock in Egypt is estimated at 24.2 million units. Between 1996 and 2006, housing production is estimated at 390,000 units. The housing needs between 1996 and 2015 were estimated at 3,161,298 units. Projected housing needs between 2016 and 2030 are estimated at 8,208,733 units (source UN Habitat Egypt Housing profile, CAPMAS, 2006 census).

In 2004, Tunisia had 2,500,830 housing units. The country's annual housing production was 252,000 units in 2010. In 2018, its housing needs were estimated at 109,350 units per year for the whole country (source: UN Habitat, Tunisia Housing profile). In 2000, the census estimated Ghana's housing stock at 2,181,975 units. The annual needs were estimated at 133,000 units (source: UN Habitat Housing Profile) The 2008 census estimated the urban housing stock in Liberia at 327,000. The projected housing needs in 2030 are 694,000 urban units (source: UN Habitat Liberia Housing Profile)

In Senegal, the number of housing units was estimated at 1,590,692 units (source: CAH F, 2018). In 2015, the housing deficit was estimated at 322,000 units nationwide. The housing supply never exceeds 5,000 units per year. (source: UN Habitat Housing profile (PEEB, June 2021). In 2014, Morocco had 8,864,385 housing units. Housing production in 2006 was 88,000 units (source: Higher Planning Commission: Housing in Morocco, 2011).

While housing stocks in West and North African countries are significant, the projected housing needs between now and 2030 for all the countries show that most of the housing to be built will be in the coming years.

The current housing deficit in Africa accounts for at least 51 millions units with large variation across countries. The large housing deficit in Africa can be viewed as both a huge challenge and a tremendous opportunity to expand economic activity and create millions jobs.

The housing supply often corresponds to construction programs announced by governments but that often fail to be completed.

Over time, housing supply policies have evolved and there has been no shortage of initiatives to try to address the deficit. These initiatives are often carried out by government programs (in most African countries), community programs or associations carried out by cities (in Europe)

The following table indicate the situation of housing backlog in several countries in Africa.

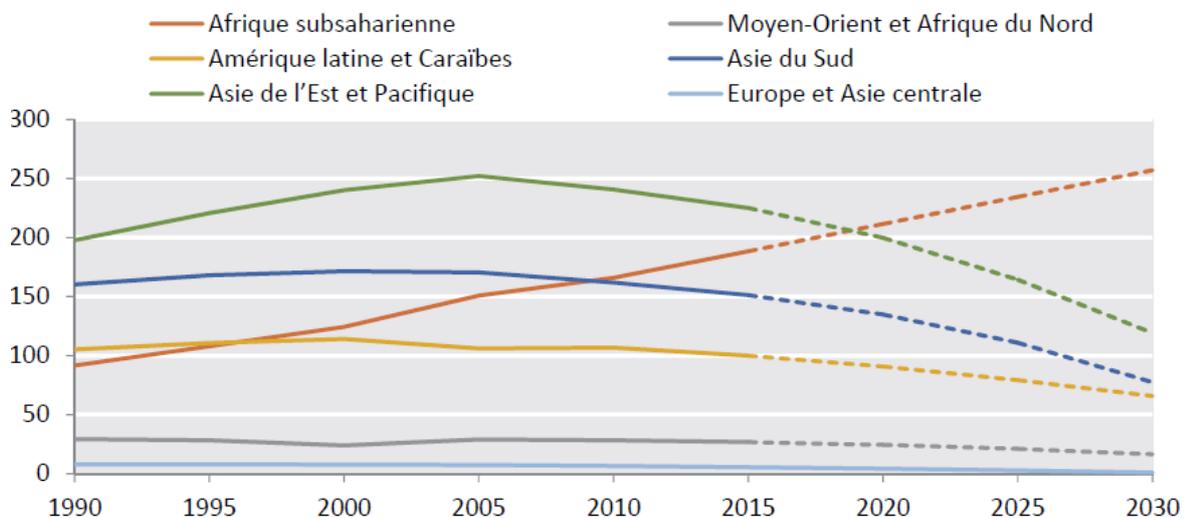
Housing backlog and urbanization in Africa (Extract)

Country	Housing backlog	Urbanization rate (2000- 2015)	Urban share 2015 (%)
Algeria	1200 000	2.76	70.7
Bénin	50 000	3.90	44.0
Burkina Faso	100 000	6.33	29.9
Cabo Verde	82 000	2.29	65.5
Cote d'Ivoire	600 000	3.31	54.2
Egypte	3 500 000	1.70	43.1
Ghana	1700 000	3.78	54.0
Guinea	140 000	3.51	37.2
Liberia	200 000	3.72	49.7
Libya	350 000	1.52	78.6
Mali	400 000	5.35	39.9
Mauritania	50 000	4.03	59.9
Morocco	600 000	1.92	60.2
Niger	100 000	4.72	18.7
Nigeria	17 000 000	4.78	47.8
Senegal	125 000	3.32	43.7
Sierra Leone	166 000	3.58	39.9
Togo	250 000	3.88	40.0
Tunisia	0	1.43	66.8

Source: El hadj M. Bah, Issa Faye, Zekebweliwal F. Geh in Housing Market Dynamics in Africa

The consequence of this situation is the proliferation of slums and anarchic urbanization in Africa. This graph shows the population living in slums in different regions:

Slam Populations (per million) for diffrenrent African regions, according to UN estimations in 2014



: ONU, 2014.

In Europe, the crucial challenge is the need for a large program for deep renovation and solutions for „energy poverty“and the homeless social problem.

In Europe, the energy quality of housing has been addressed in terms of regulations for newly built stock, but improvements are still needed, in particular for taking care of summer comfort and energy use in a warming climate and the pace of renovation of existing stock is far beyond what is needed to meet climate protection. In Africa, the issue is beginning to emerge through new building codes incorporating energy efficiency standards, low carbon materials, incentives, etc.

Construction shows different faces in Africa and Europe. In Africa, self-building plays an important role as an affordable and quick way to access to shelter and property. In many cases, self-builders do not hire an architect (80% of cases in countries like Senegal). Construction carried out by a qualified company remains very limited. The sector is yet to be consolidated and structured in Africa.

Most of construction is done through an informal incremental process indeed, self-built or auto construction is the predominant method of housing development for many low and middle-income households in many Sub Saharan Africa countries today.

In Europe, the industrialization of the sector has boosted standard-based production of components and, partly, of housing. Nevertheless, the ageing housing stock requires energy renovation to meet the climate change challenge.

Today, the issues of the deficit in the supply and in quality and its multiple dimensions (indoor air quality and comfort, low energy use, embedded energy and carbon emissions, promotion of local good quality jobs...) might find answers in a revival with new tools of bioclimatic architecture, the use of low-carbon materials, a upskill of construction centered on local communities local and a strong process of true „greening“ of industrialised production.

In Europe, renovation remains the most important policy challenge, together with tackling the territorial wastes and geo-morphological risks generated by the over-urbanization carried on in Industrial era and especially after WW2. In Africa, most of the housing stock is to be built in the coming decades in order to fulfill the needs of a population expected to double in size in a few decades, and the rapid urbanisation processes might take profit of the EU experience in order to avoid some of the mistakes done in EU in regards of a wise use of land, soil and landscape.

The urbanization trend is much contrasted between developed countries (Europe) and developing countries (Africa). The vast majority of people in developing countries live in rural areas, whereas in developed countries, the vast majority live in urban areas.

In 2018, according to the World Urbanization Prospects 2018 revision, it was estimated that three times as many urban dwellers live in the less developed regions as in the more developed regions (3.2 billion versus 1.0 billion). That year, the less developed regions accounted for 76 percent of the world's urban population and 84 percent of the total world population.

By 2050, with 5.6 billion urban dwellers, the less developed regions are expected to have 83 percent of the world's urban population and 87 percent of the total world population.

Europe, with nearly three-quarters of its population living in urban areas in 2018, is expected to reach 80 percent urban by 2040 and nearly 85 percent by 2050.

Africa, on the other hand, remains predominantly rural, with over 40 percent of its population living in urban areas in 2018. Urban percentages for Africa are projected to reach 59 percent by mid-century.

What appears as a fact in Europe and Africa is that urbanization problems result in housing deficit for city dwellers. The social housing formulas experimented elsewhere in the past have proven to be ineffective to satisfy the housing needs of most people.

Financing access to housing remains a major problem for Africa and Europe. Government, community, and associative initiatives are very diverse but each one has its limits.

A key impediment of the supply of affordable housing in Africa is the lack of finance for developers. Lack of equity to finance for construction and housing development is a major barrier for faced by developers, particularly small and medium size property developers. The financial crisis of 2008 also had a significant impact in the construction industry.

Promoting alternative sources of developers finance is crucial for increasing the stock of affordable housing supply in Africa.

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1. Introduction

While EU population may be stable or slightly shrinking in the next decades, Africa's population has grown at a very fast pace in the past decades, increasing on average by 2, 53 % annually between 1950 and 2015. This fast growth is expected to continue in the next four decades. According to projections by United Nations, Africa's population will grow from 1.18 billion in 2015 to 2.44 billion in 2050. Which means that Africa's population is projected to overtake Europe, South America, and North America's combined. Nigeria, in particular, is projected to contribute 8 percent of the world's population growth by 2050 (212 million out of 2.5 billion).

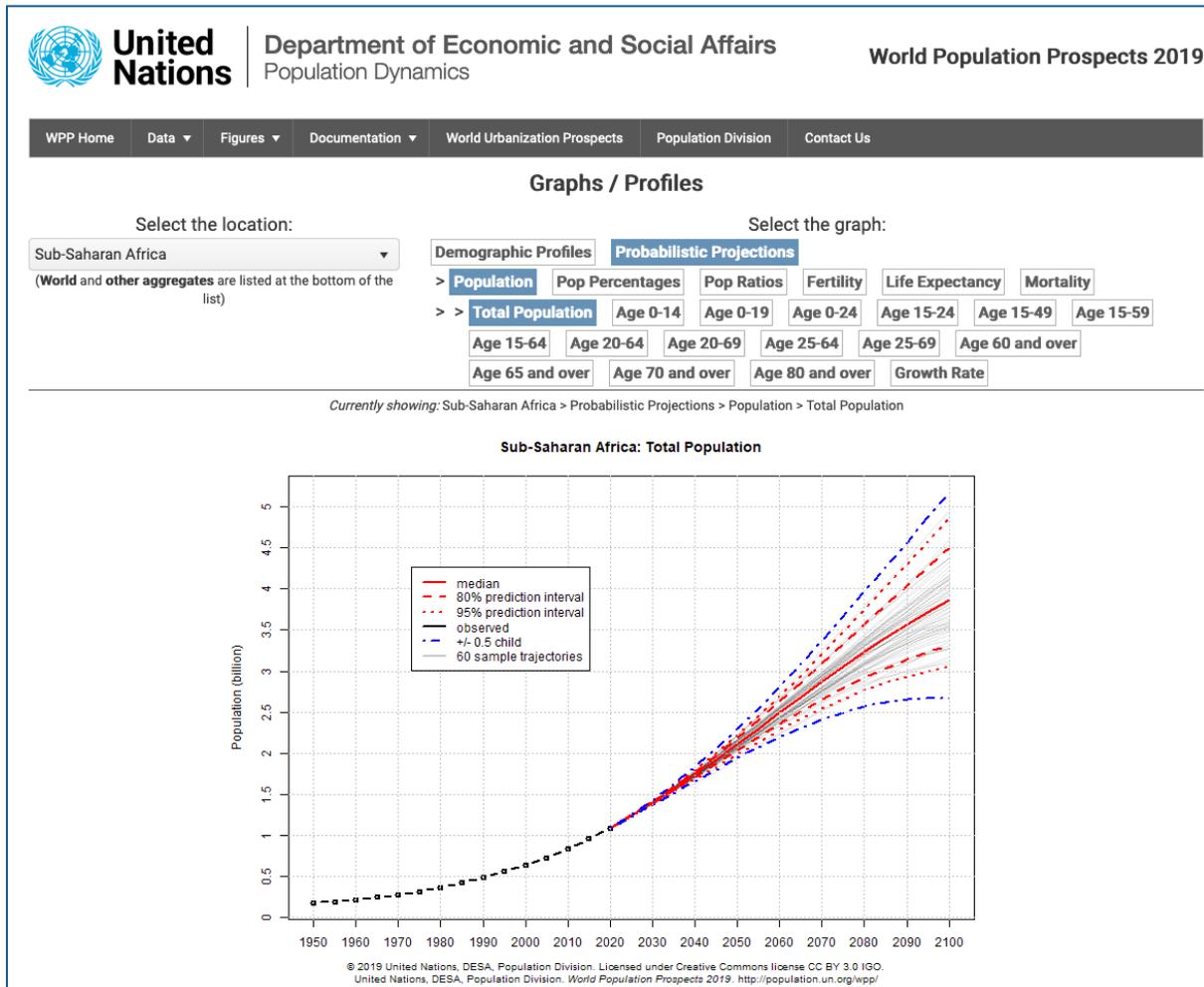


Figure 1: Current Sub Saharan Africa Probabilistic Projections

Currently showing: Western Europe > Probabilistic Projections > Population > Total Population

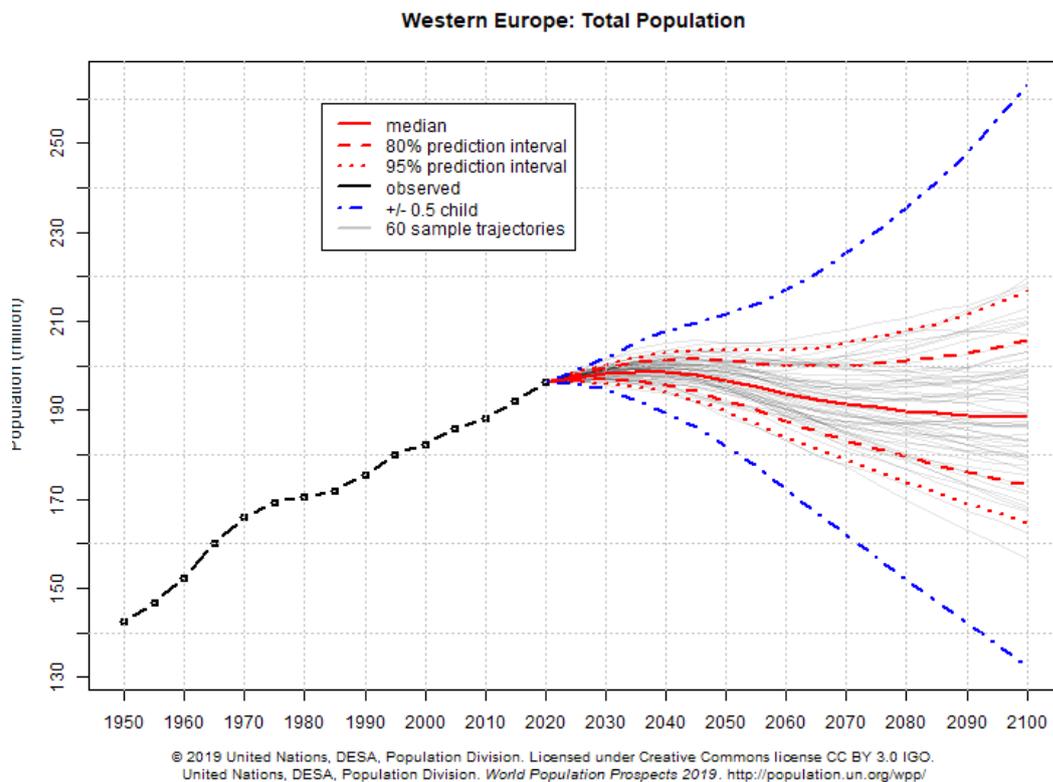


Figure 2: Current showing Western Europe Probabilistic projection population

Sub-Saharan Africa (SSA) is experiencing rapid urbanization as well as a growing slum population. By 2050, it is expected to have 1.2 billion urban dwellers, while 4.5 million new inhabitants will be living in informal settlements each year (“Stocktaking of the Housing Sector in Sub-Saharan Africa. Challenges and Opportunities” 2015). A large fraction of those informal settlements can be defined as „slums“, that is „characterized by housing units with five main deficiencies: 1) no improved water source; 2) a lack of improved sanitation; 3) impermanent or unsound physical structure; 4) insufficient living space and incidence of overcrowding; and 5) no claim to secure tenure. “

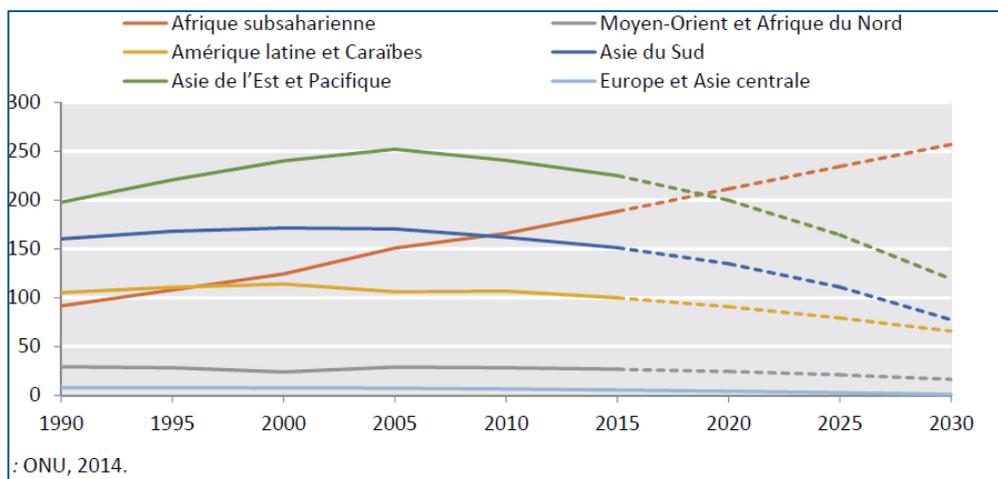


Figure 3: Slum Populations (per million) for different African regions, according to UN estimations in 2014

This urban and population growth will go alongside with an increasingly large demand for housing, especially in urban areas. A closer look at the reality shows some similarities in the

housing issue across countries: acuteness of the crisis, importance of phenomena varying essentially according to the country's circumstances, history, climate, culture, and economy.

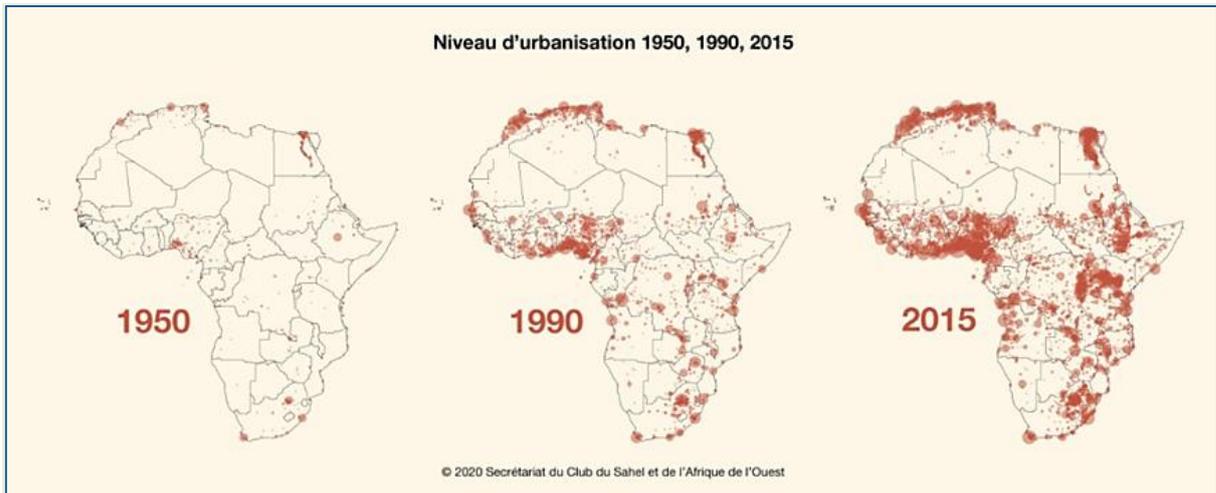


Figure 4: Level of urbanisation in Africa in years 1950, 1990 & 2015.

In Africa, many households struggle to afford formal housing and access mortgages. These constraints are compounded by heavy regulatory requirements and an accumulated lack of basic infrastructure. It would take 50 years to build infrastructure for already inhabited areas, according to the 2015 World Bank report (“Stocktaking of the Housing Sector in Sub-Saharan Africa. Challenges and Opportunities” 2015)

To increase access to housing, countries need to remove some of the constraints on housing providers, including access to credit, serviced land, etc.

The development of decent and sustainable housing is critical both for its impact on living standards and for its central role in economic development.

The impact on living standards is significant. In addition to its immediate importance, decent housing improves the health of the occupants and allows children to do their homework properly. It frees up women's time and enables them to participate in the labor market.

Quite worryingly the Covid pandemic has added evidence to how „slum residents face a disproportionate burden of ill-health“ (Ahmed et al. 2020).



Figure 5: Slums

The role of housing in economic development may not be sufficiently acknowledged. Investment in housing is often viewed as risky because of speculative property bubbles and financial instability. Yet in developed economies, housing is by far the most important tangible asset. The household private wealth in Britain, for example, totals fifteen trillion dollars,

including five and a half trillion dollars in real estate, mainly housing. Overall, the national process of asset accumulation is therefore fundamentally dependent on investment in housing. This does not go without problems as e.g. pointed out in (Cohen 2021a):

Moreover, it would be a mistake to ignore the role that housing plays as an investment vehicle (both to benefit from prospective value appreciation and to access often lucrative public subsidies), as a means of generating competitive social advantage (especially in societies characterized by marked inequalities in income and wealth), as a signifier of status and aspirational identity.

Housing also influences economic development through its effect on the labor market. Construction creates jobs, especially since housing construction is generally more labor-intensive than other types of construction (such as public infrastructure and commercial buildings) and much more so than the manufacture of local materials which are imported in Africa.

At the same time the ratio of material costs versus labour cost may be quite different in Europe and Africa. E.g. the price of construction materials such as cement is surprisingly high in Africa.

The cited World Bank report (“Stocktaking of the Housing Sector in Sub-Saharan Africa. Challenges and Opportunities” 2015), analysing the issue of „local“vs. imported construction materials, states:

“The majority of SSA homes are currently self-built with materials that may be “temporary” or “traditional” or “semi-permanent.” These materials vary in every country, but typically include mud, wood, plants, straw, clay, and sheet metal. Such materials often do not live up to formal building standards, but are inexpensive and abundant and thus form the core of most informal, affordable homes in SSA. While these materials are not preferred by many governments, experience shows that they can be durable in addition to being inexpensive and locally sourced.”

While unskilled labor is abundant and fairly cheap in some Africa countries, skilled construction workers are in very short supply. This is the result of decades of underinvestment in buildings and the small contribution of construction activities to GDP. This shortage is evidenced by the large number of foreign skilled construction workers imported. Some government has often withdrawn from the training of skilled manual workers and companies limit training because of the historically unstable nature of demand. In addition, this might be a quite negative consequence of having mostly abandoned traditional architecture, favouring imported techniques that do not meet the site-specific necessities and do not match the local experience and skills, evolved over centuries.

This report is prepared as part of the Africa-Europe BioClimatic Collaboration for The 21 Century (ABC 21) platform, which has received a grant from the European Union under its H2020 program. This grant has funded a number of activities to advance the development of bioclimatic approaches to improve the building energy performance by 2030.

This report was prepared by the *Direction de l'Environnement et des Etablissements Classés* (Environment and Classified Establishments), which is also the leader of Group 2 (WP2). The report corresponds to the deliverable of Activity 2.1: Review of housing needs, construction practices and urbanization trends in North West Africa and Europe.

In this report, the following issues are addressed:

- ✓ The housing situation in North and West Africa and in Europe
- ✓ The construction sector situation in North and West Africa and in Europe
- ✓ Current issues in the construction and housing sector
- ✓ The policy challenges of housing
- ✓ The challenges of urbanization in North and West Africa and in Europe

To prepare this document, the author has essentially used data from various reports published by different national, regional and international bodies and structures with a certain reputation. We consider their content to be reliable for the purposes of illustrating the statements made in this report.

The content of this report may be incomplete due to the fact that data related to housing and urban planning in general is very incomplete and not always updated regularly. Therefore, the content of this report is the sole responsibility of its author.

2. Housing situation in NW-Africa and in Europe

2.1 Housing stock

The estimation of housing stocks, demand and supply is extremely challenging, especially in African countries. Data are very rarely updated as this depends on population and housing censuses, which are not undertaken regularly. Nevertheless, some data could be collected through various studies such as the profiles established by UN-Habitat for some countries.

In several African countries, the situation is as follows:

The urban and rural housing stock in Egypt is estimated at 24.2 million units. Between 1996 and 2006, housing production is estimated at 390,000 units. The housing needs between 1996 and 2015 were estimated at 3,161,298 units. Projected housing needs between 2016 and 2030 are estimated at 8,208,733 units (source UN Habitat Egypt Housing profile, CAPMAS, 2006 census).

In 2004, Tunisia had 2,500,830 housing units. The country's annual housing production was 252,000 units in 2010. In 2018, its housing needs were estimated at 109,350 units per year for the whole country (source: UN Habitat, Tunisia Housing profile). In 2000, the census estimated Ghana's housing stock at 2,181,975 units. The annual needs were estimated at 133,000 units (source: UN Habitat Housing Profile) The 2008 census estimated the urban housing stock in Liberia at 327,000. The projected housing needs in 2030 are 694,000 urban units (source: UN Habitat Liberia Housing Profile)

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While housing stocks in West and North African countries are significant, the projected housing needs between now and 2030 for all the countries show that most of the housing to be built will be in the coming years.

The current housing deficit in Africa accounts for at least 51 millions units with large variation across countries. This deficit shows that Africa needs to build a lot in the coming years. The housing supply often corresponds to construction programs announced by governments but that often fail to be completed. Table 1 indicates the situation of housing backlog in several countries in Africa.

Table 1 Housing backlog and urbanization in Africa (Extract)

Country	Housing backlog	Urbanization rate (2000- 2015)	Urban share 2015 (%)
Algeria	1200 000	2.76	70.7
Bénin	50 000	3.90	44.0
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Senegal	125 000	3.32	43.7
Sierra Leone	166 000	3.58	39.9
Togo	250 000	3.88	40.0
Tunisia	0	1.43	66.8

Source: El hadj M. Bah, Issa Faye, Zekebweliwal F. Geh in Housing Market Dynamics in Africa

The high demand for all countries and the largely insufficient supply of housing is indicative of a certain crisis in the housing sector, connected to several reasons:

- Demographic changes
- New household formation
- Migration from rural to urban areas.
- Low production capacity as shown in the table below

Table 2 Installed production capacity in various Sub Saharan African Countries

Million tons per annum	
Country	Installed capacity
Nigeria	42.7
South Africa	21.4
Ethiopia	15.1
Kenya	8.9
Senegal	8
Ghana	6.7
Tanzania	3.7
Zambia	3.2
Cameroon	3.1
Uganda	2.6
Côte d'Ivoire	2.5
Angola	2.5
Benin	2.1
Mozambique	1.9
Togo	1.8
Zimbabwe	1.7
Guinea	1.1
Total sub-Saharan Africa	133.3

Source: Ecobank 2015

In Europe, the housing stock is generally high for all countries, unlike in African countries. Table 3 gives the situation in Europe. In spite of the housing stocks in Europe being high, there are large differences in terms of how different income groups and geographic areas have access to adequate housing. (Pittini 2019):

In 2017, 10,2% of households in the EU spent over 40% of their disposable income on housing costs, but this share increases to 37.8% when considering households at risk of poverty. While a 2018 study by the High-Level Task Force (HLTF) estimated that the investment gap in affordable housing stands at €57 billion per year, public investment in the sector that could boost the supply keeps falling.”

Table 3: Housing stock in Europe

Country	Population (million)	Total housing stock in 2017	Housing completion in 2017	Units managed by associations in 2017	Housing Units completed by housing association in 2017
Austria	8.8	4,652,000	55,000	923,000	16,600
Belgium	11.3	5,464,000	50,419	316,000	
Bulgaria	7.0	3,951,000	2,205		
Cyprus	0.8	452,000	2,993		
Czech Republic	10.5	4,366,000	3,826,000	28,575	650,000
Denmark	5.7	2,815,000	24,519	589,707	1,903
Estonia	1.3	706,000	5,890		
Finland	4.4	2,680,000	34,700	317,000	
France	66.7	35,80 million	430,000	5,2 Million	
Germany	82.5	41,968,100	275,350	1,210,000	27,000
Greece	10.7	6521 000	6,125		
Ireland	4.8	1,974,000	19,271		
Italy	60.5	31,000,000			
Luxembourg	0.5	227,000	3,856	2,000	
Netherlands	17.1	7,700,000	2,280,000	62,982	17,322
Slovakia	5.4	1,914,897			
Slovenia	2.0	845,400	3,044	4,000	
SPAIN	46.6	25,600,000	54,600		
Sweden	10.1	4,900,000	34,830		
United Kingdom	66.1	28,740,000	193,000		
Norway	5.26	2,548,000	34,486	642,000	

Source: (Pittini 2019)

The social housing supply depends hence mostly on local initiatives such as those from local authorities and other actors.

At the beginning of the 21st century, several local authorities aimed at increasing the social housing supply for low-income people, single-parent families, the elderly and poor households, with different intensities and outcomes (see Figure 6).



Figure 6. The share of social housing in various European cities. Source: (Pittini 2019)

2.2 Typologies of existing housing

Buildings for residential use can be classified in large universal typologies, which could be individual house, collective building, temporary, spontaneous, informal, habitat, etc. Nevertheless, as Philip L. Wagner says, in ist foreword to (AMOS RAPOPORT, for an anthropology of the house)

Not only do they [dwellings] commonly contribute much to the distinctive character of landscapes, they also stand as the concrete expressions of a complex interaction among cultural skills and norms, climatic conditions, and the potentialities of natural materials”. »

Thus, within these broad typological categories there is an infinite diversity of types and forms depending on the geographical, historical, social, climatic, political context, etc... This is why the Senegalese house is different from the Spanish house, or the Togolese house. The Senegalese house itself cannot precisely define a type of habitat since its form and its use vary from the North to the South of the country.



Figure 7. Houses in Greece, the Netherlands and Mali, Source Google image

Some typological concepts that are widely present in Europe, such as apartment buildings, also exist in North and West Africa, with a more recent history that is often linked to Western influence since colonization. The rapid urbanization of some African cities has not allowed time for the transformation of traditional rural typologies into denser urban typologies and has favored the importation of Western housing models to quickly meet the growing demand for housing. Nevertheless, certain forms of housing are specific to Africa and continue to exist, such as the housing of the medinas in North Africa (which means "old city" as opposed to the new European-style city) and the concessions in West Africa.

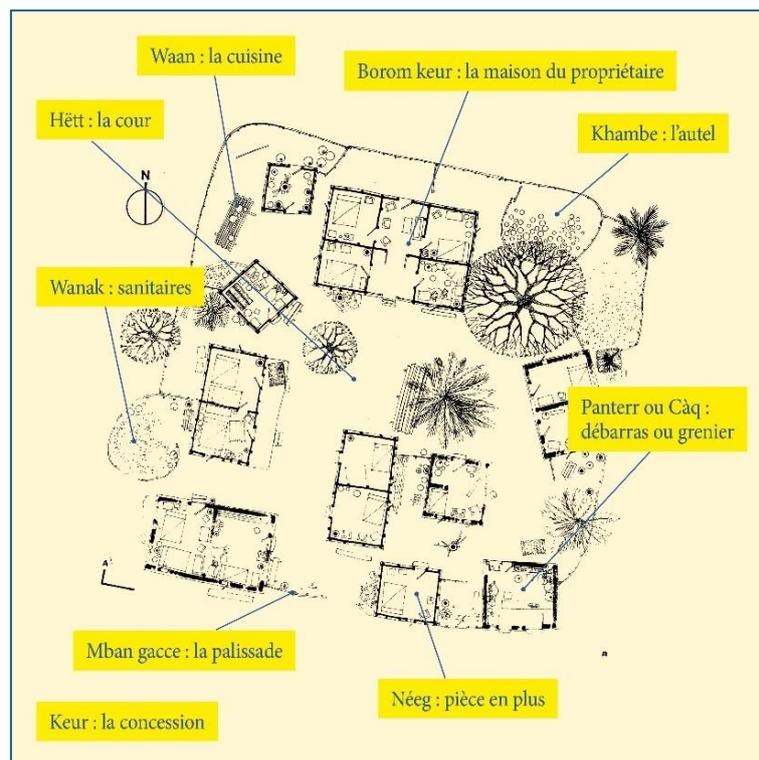


Figure 8. Traditional Lebou concession, Senegal. Source: Habiter Dakar, 2020

2.3 Housing Characteristics

In his book *House Form and Culture*, Dunod, 1972, Amos Rapoport considers that "All housing needs to achieve four objectives in order to be successful:

- ✓ It needs to be socially and culturally valid.
- ✓ It should be sufficiently economical to ensure that the greatest number can afford it.
- ✓ It should ensure the maintenance of the health of the occupants.
- ✓ There should be a minimum of maintenance over the life of the building."

Social and Cultural Value

As far as the social and cultural value of housing is concerned, there is a weakening due to the standardization of housing, whether in Europe, North Africa, or West Africa. The form and type of housing is the result of a multitude of material, social and environmental constraints and of choices for delivering housing quality within those boundary conditions. In the last decades the material constraints have been – apparently - largely reduced, and choice has

become excessive. It seems difficult to find the constraints that are necessary to create houses with meaningful forms.

From this point of view, the environmental and social constraints imposed today, and even more so in the future, by climate change and physical limitation of resources, e.g. sand and the quality needed for construction (Bendixen et al. 2019) and minerals (“The Role of Critical Minerals in Clean Energy Transitions” 2021) might be beneficial to the architectural quality of buildings, their social and cultural belonging, and their attractiveness and for urban design.



Figure 9 Involvement of inhabitants during the annual renovation of the walls of the great mosque of Djenné, Mali, ©Minusma / Sophie Ravier

Affordability

Easy access to housing through simple, transparent procedures and a wide price range adapted to people's capacities is the primary condition to meet this basic need. Nevertheless, it seems important to also consider the stability of this access. Indeed, quality housing built on a piece of land without a title deed will remain precarious and will give its inhabitants a feeling of uncertainty that may hinder their access to other components of society, such as work for example. Housing stability also allows for the development of a greater sense of belonging and encourages occupants to undertake home improvements. Affordability is also measured today by the ability of households, in their homes, to meet their energy needs to maintain household comfort: cooling, heating, cooking, lighting, etc.

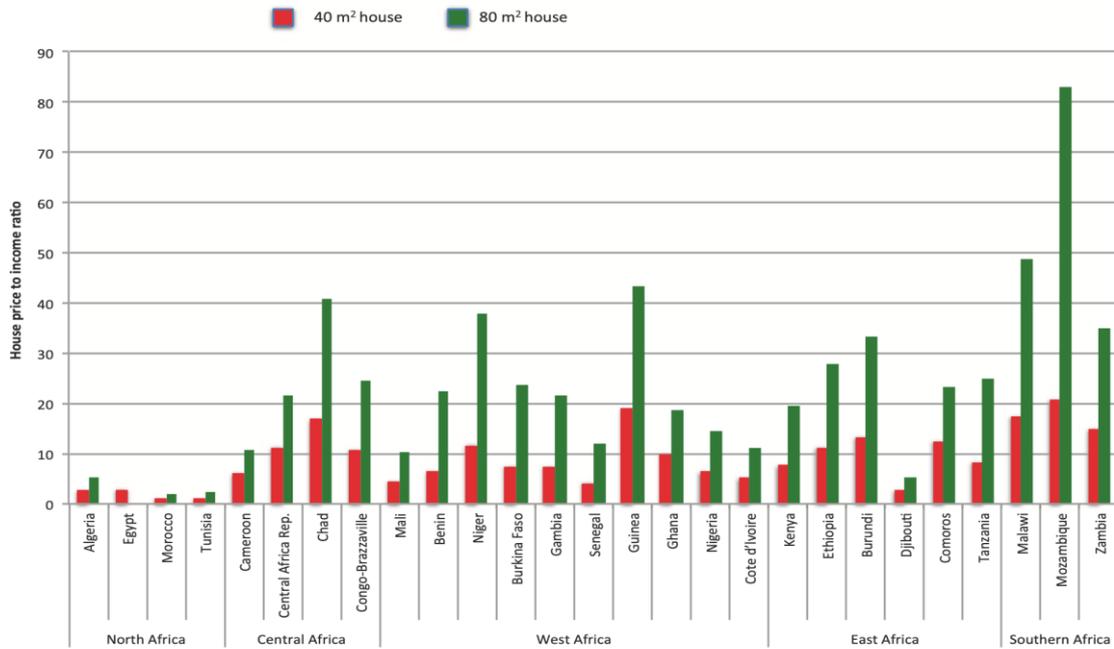


Figure 10: Ratio of House price to Income in various African Countries, by region, in 2015. Source: (Bah, Faye, and Geh 2018b)

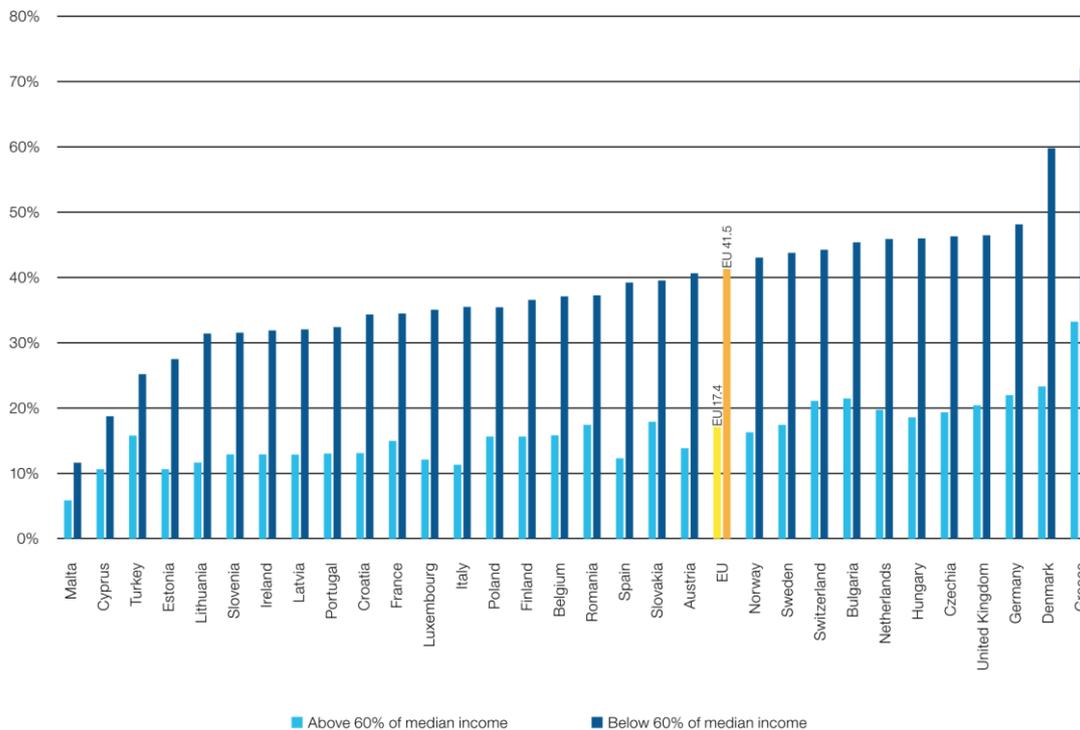


Figure 11. Share of housing costs in disposable household income – 2017 (by income group). Source: European Union Statistics on Income and Living Conditions (EU-SILC), quoted by (Pittini 2019).

Reasons for high construction costs in Africa may be traced to various factors including e.g. cost of materials and land regulation. E.g. the price of construction materials such as cement is quite high in Africa.

The World Bank report (“Stocktaking of the Housing Sector in Sub-Saharan Africa. Challenges and Opportunities” 2015), analysing the issue of local vs. imported construction materials, states:

The majority of SSA homes are currently self-built with materials that may be “temporary” or “traditional” or “semi-permanent.” These materials vary in every country, but typically include mud, wood, plants, straw, clay, and sheet metal. Such materials often do not live up to formal building standards, but are inexpensive and abundant and thus form the core of most informal, affordable homes in SSA. While these materials are not preferred by many governments, experience shows that they can be durable in addition to being inexpensive and locally sourced.

The same report discusses reasons how regulation on minimum plot size and restrictions on density have influence on cost of housing:

On average, the minimum plot size for residential property in Africa is 262 m², ranging from a high of 500 m² in countries such as Angola, Eritrea, and Guinea-Bissau to a low of 60 m² in Djibouti and Morocco. High standards, for minimum plot sizes in particular, have a significant effect on housing costs and affordability as plot size can significantly inflate construction costs.

Many of these standards in Africa are still based on regulations created under colonial rule and were originally instituted for use only within areas of the colonial city that were inhabited by “non-natives”. In many cases, urban planning and density restrictions from the colonial era have not been updated to reflect current needs.

Using examples from Ghana, South Africa, and Tanzania, Silva concludes that the urban planning concept and the amended regulations adopted in many former British colonies are ill suited for the needs and realities of these countries today. [...] There are also emotional and cultural factors that need to be taken into account and which require a mentality change. In the majority of African countries, people have a sentimental relationship with land. In some African communities, the size of land owned reflects someone’s wealth and may confer him a certain status in the society. This cultural factor is nonnegligible constraint to the revision of certain standards.”

An important and often underestimated way for reducing costs is by careful design. It is worth quoting again. The World Bank report (Bah, Faye, and Geh 2018a)

“The value of architectural design is often neglected in the conception of affordable housing development projects. Although the services of an architect may be expensive for a small project of a few housing units, the benefits generally outweigh the costs for large projects. An optimized architectural design can lower construction costs significantly, not only by reducing the quantity of material used but also by minimizing material waste. The 2016 winner of the Pritzker prize in architecture, the Chilean Alejandro Aravena, has demonstrated how good design can be used to build low- cost, functional houses.”

Table 4. Construction costs in Africa as reported in (Bah, Faye, and Geh 2018a). Price per square meter in US \$ (2011 exchange rates)

Country	Single story detached house average quality masonry (brick or block or timber frame)	Two-story attached house, mass market center unit in terrace row of four units	Low-rise apartment mass market, concrete frame, brick or block infill walk-up	High rise apartment average quality concrete frame brick or block infill
Morocco	173	161	161	185
Mali	196	223	403	456
Tunisia	251	299	334	348
Benin	278	479	589	747
Niger	306	494	943	627
Burkina	313	493	886	1250
Egypt	319	-	335	302
Gambia	373	543	238	509
Senegal	477	668	689	785
Algéria	548	548	466	535
Guinea	549	631	652	694
Ghana	595	554	537	496
Nigeria	617	705	975	1429
Cote d'Ivoire	626	678	1007	1272

Source : World Bank : International Comparison Program 2011

Protecting the residents

One of the fundamental characteristics of a house is its role as a protective shelter for humans. Thus, a house protects people from rain, sun, heat, cold, wind, etc. In an era of energy abundance these concerns (especially those related to thermal comfort) were quickly and easily solved by using energy for heating and cooling.

Today, it is clear that this era is coming to an end and that the manufacture of housing should rather consider implementing efficient construction techniques to meet these requirements than adding energy-consuming devices as a solution. Most European countries have implemented a series of more or less effective environmental requirements for the building sector over the recent or past years.

In Africa, the problem is twofold: on the one hand, there are almost no energy requirements for the construction and renovation of buildings, and on the other hand, countries are subject to massive importation of Western architectural typologies that are unsuited to the local climate and way of life (large glass facades, flat roofs, etc.) and therefore require greater energy consumption to guarantee a minimum level of living comfort. Climate change is adding further challenge and design and construction should be based on explicit consideration of future climate patterns. ABC21 project will analyse methodologies for the production of local weather files for 2050 and 2080 from the general climate models.

Maintenance and life span

It appears that this fourth objective can be interpreted differently depending on different points of view and what one considers to be the life span of a building. The lifespan of housing can be radically different depending on the culture from which it originates. Nomadic Fulani people

(one of the largest ethnic groups in the Sahel and West Africa) with traditional lifestyles live in their homes for a few weeks before moving to another location.

In the United Kingdom, the lifespan of a house built on emphyteutic lease is theoretically ninety-nine years. In other European or African cultures, on the other hand, the house is passed on from generation to generation, undergoing dismemberment and regrouping.

2.4 Housing tenure

The data in the table below show that rental housing is an important tenure option in many countries. In areas where rental housing is the least common, homeownership is universal due to the large numbers of self-built households or workers who benefit from employer-provided housing.

Table 4: Housing tenure in selected Sub Saharan Africa countries

Country	Owner occupied	Rental in %	Other in %
Ghana (urban areas, 2008)	26.1	40.9	31.7
Nigeria (national; 2006)	70.83	22.72	6.45
Morocco	79	32	
Mauritania	80.6	13.7	5.7
Senegal (national, 2004)	75.7	17.0	7.3

Source: UN Habitat Housing Profile in Stocktaking of the housing sector in Sub Saharan Africa The World Bank

In general, public provision of rental housing is limited and increasingly dwindling. In some countries, however, housing for civil servants (including university staff, teachers, health workers, etc.) is routinely provided by their employers, which along with the promise of income stability and pensions are strong benefits despite the prevalence of low salaries.

Few developers are willing to embark on building rental real estate. Most African governments began halting investments in rental housing during the mid-1980's, as the approach was disfavored for its inefficiency. Much of the existing rental stock consists of institutional housing built by government ministries, local authorities, or major industries for their workers.

Formal rental housing is also out of reach of most of the urban poor. In Nigeria, 60-70 percent of low-income households are not able to afford the least expensive rental accommodation on the open market (around US\$1,200 per year in major cities).

Rent control has been quite common for formal and public rental units. An extreme example is Ghana, where rent control was instituted in 1943 and only removed in the 1990s. Its effects were just as would be expected from experience elsewhere: landlords removed buildings from residential use, maintenance was withdrawn, the new investment was slowed, and other means to increase the net present value of the rent were eventually instigated (in Ghana's case, demanding up to three years' rent in advance). Large upfront payments disqualify those without savings for a lump sum payment). The large amount of rent advances disqualifies those who have no savings.

Overall, rent control has exacerbated the investment problem in formal rental housing, and in some cases has made rents higher. The latter situation has been observed recently in Senegal where the government has made some moves to reduce rents through legislation. As a result,

landlords have simply terminated tenancy agreements on the grounds that they need to renovate their property. Once the contract is terminated, they decide to raise the rent.

Where housing is rarely sold, some rental stock emerges from owner-occupied accommodations. Instead of selling the unit, which is infeasible or unfavorable in some Sub-Saharan countries, the dwelling is rented out. For example, some of the institutional housing has been let out by their new owners who could not afford to maintain it.

Subletting arrangements can provide affordable rental housing and generate income. Rental rooms are also provided by owner-occupiers (or even renters) as extra rooms or buildings adjacent to their own dwelling. Many users performed modifications to government-built housing to provide extra rooms for renting as a supplementary income source.

In Europe, the most common situation is owner occupation: 69.4% of the dwelling occupants are owners, and 30.6% are tenants. However, this hides wide variations in the distribution of housing tenure across countries. Home ownership rates are high in southern European countries. In most English-speaking and Nordic countries, Belgium and the Netherlands, homeowners with mortgages are the most common case. Switzerland and Germany are the only two countries where renting is more common than owning (OECD, 2016).

While taking into account that there are significant differences between countries, on average, since 2007, the share of owners with mortgages has increased at the expense of pure owners, and the share of population living in rented dwellings with a market price rent has increased while the share of the population living in a dwelling with a reduced-price rent has decreased (Eurostat, SILC).

In general terms, the probability that the household owns the dwelling (with or without an outstanding mortgage) increases with income (OECD, 2016). However, in countries such as Greece or those in Central and Eastern Europe, home ownership rates are very high even among poor households, reflecting the general structure of the housing market. The table below gives indications of the tenure status of the housing stock in Europe.

Table 5: Main residences by tenure status (%) and size of social sector (2001 to 2006) by country

Country	Occupying property	Private rental	Social rental	Social stock
The Netherlands	54	11	35	2,400,000
Austria	55	20	25	800,000
Denmark	52	17	21	530,000
Sweden	59	21	20	780,000
England	70	11	18	3,983,000
France	56	20	17	4,230,000
Ireland	80	11	9	143,000
Germany	46	49	6	1,800,000
Hungary	92	4	4	167,000
Italy	69	11	5	1,000,000
Greece	74	20	0	0
Spain	82	10	1	141,000
Portugal	75	18	3	160,000

Source: (Whitehead and Scanlon 2007).

When it comes to the size of households occupying dwellings, the data are very different across regions. In Europe, the average household size in 2019 is 2.3 persons living under the same roof, ranging from 2 persons for Sweden to 2.9 for Slovenia. Within these countries,

disparities are more or less strong, with 3.5% of German households having more than 5 people, compared with 14.1% in Poland.

By way of comparison, in Dakar (Senegal), large families (more than 10 people) represent 34% of households, while single persons represent only about 5.7% of households. Moreover, the average household size in Dakar is 8.2 persons. That being said, the size of housing is rarely in line with the number of people living there and approximately 44% of housing is considered over-occupied in Dakar (source: Senegal Housing Sector Profile, 2012, pp. 8-9)

2.5 Supply and demand in the housing sector

The housing demand estimation is therefore based on projected population and household composition. In Africa, the housing crisis is twofold. On the one hand, the housing stock is of poor quality and the habitability rules are very poorly met in most cases. These rules include the surface area of the rooms and the height under the ceiling, the ventilation and lighting conditions, the need for satisfactory heating or cooling, access to drinking water, electrical equipment, and insulation. On the other hand, the housing stock is insufficient, and millions of Africans find home in the streets or live in very poor housing conditions. According to the most recent census conducted in 2013, 225 million people were living in an African slum, i.e. about 50% of the continent's urban population.

There are many persistent challenges that affect the demand for housing in the WAEMU area. Indeed, the high levels of informality in the economy represent an obstacle to access to housing finance for low- and irregular-income households. Existing regulations are also an important factor when analyzing access to finance.

The qualitative and quantitative crisis is worsening as demand is growing faster than supply. Demographic growth coupled with a massive rural exodus (3% annual urban growth according to the UN) would require an unprecedented construction effort. Unfortunately, the housing supply is rigid by nature (very long production cycle) and this is accentuated in Africa because of political instability, poor access to credit, a complex regulatory framework, etc. Each year, unmet demand results in overcrowding of existing housing and an increase in homelessness.

The development of a social housing stock has long been seen as the most effective way out of this vicious circle which undermines the economic development of the region. In Morocco, 517 631 housing units were built during the ten last years as a part of social housing.at 250 000MAD. Table7 shows the targets that a number of African governments have set themselves to meet the demand for housing.

Table 6: Social housing plans in some African states.

Country	Government targets for social housing production over 3 or 5 years	Price of housing on the formal market (CFA , before tax)
Benin	10,000	9,000,000
Burkina	10,000	8,000,000
Côte d'Ivoire	100,000	10,000,000
GuineaBissau	-	-
Mali	20,000	8,000,000
Niger	20,000	7,000,000
Senegal	100,000	12,000,000
Togo	540	11,000,000

Source: State of affordable housing in the WAEMU region, Affordable Housing Institute

This policy has struggled to produce results due to a lack of funding and limited affordability for the working classes who need it most.

As an alternative or complement to these insufficient public policies, only innovation can solve the housing crisis in Africa. Entrepreneurs in the sector are facing many challenges, including improving the allocation of capital, building at lower costs, and making the buy-sell-let market more fluid.

Two scenarios must therefore be considered. Either innovation remains marginal in the housing sector and housing will remain a major problem that can cause environmental and health problems that may even jeopardize the continent's economic development. Or innovation in the African real estate sector will become a strong sustainable response to the many existing challenges. In this second case, housing would become an important driver for the solution to other problems facing Africa (education, health, employment, etc.)

Housing affordability is a precondition for mass household investment in housing. Affordability can only be assessed in relation to the level of income and the budget portion that ordinary households are willing to spend on housing.

Unit construction costs per house depend partly on building standards, partly on input costs, and partly on how the construction sector is organized.

The housing deficit is difficult to measure in Africa because of the limitations of data collected in most countries in West Africa but also because of the increase in the minimum housing standard resulting from the increase in per capita income. This deficit is estimated at 3.5 million dwellings per year for the whole region.

Housing supply is also difficult to quantify. Indeed, about 80% of the land and real estate production comes from the informal sector and self-building. However, since the 1990s, a certain number of construction programs have been undertaken, whether government programs or public-private partnerships.

There are important supply-side constraints such as the accelerating level of urbanization, the high cost of building materials, the difficulty of obtaining serviced land and the financing difficulties faced by developers. However, the main barriers to access to housing are on the demand side, particularly in terms of eligibility, financing and use of land as collateral.

Indeed, despite administrative and land reforms - for example, the Sheida reform, adopted in Niger in 2006, which reduced costs and administrative procedures - it is still difficult to obtain properly titled land. Steps for obtaining title deeds and building permits are still long and costly. Access to property and legal security remain key issues for housing finance e.g. in all West African Economic and Monetary Union (WAEMU) countries.

In Europe, a number of countries have identified a deficit in the supply of new housing compared to the demand induced by the formation of new households and demographic changes. Furthermore, even if the cumulative national housing stock is sufficiently developed, housing shortages in attractive urban areas are significant for the whole country due to rural-urban migration.

In Ireland, according to Housing Agency estimates (Housing Agency, 2015), an average annual supply of 21 000 units per year would be needed for the 2015-2017 period, but in 2015 new construction was only 12 666 units.

In the UK, despite a moderate increase in supply in 2015, the market is still suffering from a housing shortage, with supply lagging behind demand for decades. In order to make up the shortfall in the long term and to keep up with population growth, it has been suggested that between 225 000 and 275 000 additional dwellings are needed each year in England. This contrasts with the 141 000 completed in 2016 and has serious implications for housing affordability, particularly for low- and middle-income households.

Much of Sweden faces a housing shortage, mainly in the metropolitan areas, as the country has one of the highest urbanization levels in the EU. Overall, 255 of the 290 municipalities report a shortage of housing, especially for young people, newcomers and older people who are looking for an apartment more suited to their needs. About 710 000 new dwellings will be needed in the next 10 years.

In Austria, due to strong population increases, mainly because of immigration, the demand for housing remains very high in urban areas. Although production rates increased significantly in 2015 and 2016, there is still a gap between demand and supply in the social and affordable housing segment.

One explanation for the low responsiveness of overall housing supply in the EU is that building land is scarce and prices are rising. In Luxembourg, for example, one of the key issues at the moment is to identify and mobilize land for affordable housing provision, and the government is working on an agreement with municipalities around this objective. In Ireland, work has been undertaken to identify sites, including public properties, that housing authorities can access, but no coordinated plan has been developed to translate these sites into active development programs.

In Europe, renovation (to reduce energy needs and increase thermal comfort) and adaptation of existing buildings to new needs (e.g. reducing the size of apartments to obtain a greater number of dwellings seem to be an important way to meet the above challenge (Cohen 2021b).

Thermal renovation should be deep (reduction of energy needs for heating and cooling of 70 to 90%) every time it is undertaken, in order to avoid locking in the buildings in a high consumption state for many decades, before they can undergo a new renovation cycle (see Figure 12). Deep renovation has been proven to be technically achievable and affordable in a number of projects (see e.g. <http://eu-gugle.eu/pilot-cities/milano/> and (Pagliano et al. 2016))

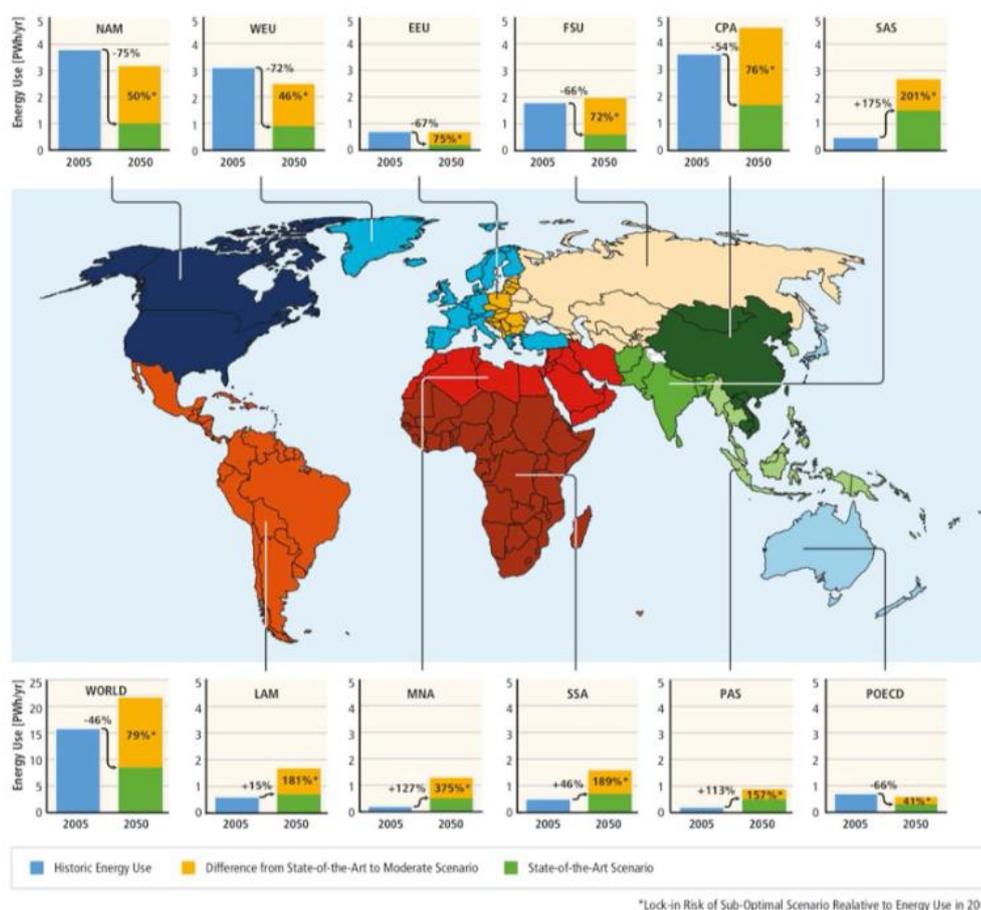


Figure 12 . Lock-in effect due to failure to apply the best technologies in new buildings and renovation projects. Source: (Lucon & Ürge-Vorsatz, 2014)

2.6 Inventory of housing actors

Public institutions: ministries, agencies, and semi-public companies

These institutions are responsible for land use planning, subdivision and land servicing, and land registration, and their action is essential before construction can begin. The availability of land and the production of a large number of serviced plots can be severely impacted in the event of a malfunction at the level of these actors.

Project owners

They can be public or private. They are the ones who place the order for housing. Depending on the country, the proportion of public versus private may vary.

Developers

They include private and public companies in charge of producing housing. In other countries, municipalities, local authorities, and foundations may be housing production developers.

Construction companies and craftsmen / artisans

They come in different sizes. There are very large companies, in Africa often foreign, with very large financial and technological capacities. They are most often in charge of large real estate

production markets. The medium-sized companies, with simple technical means and moderately qualified human resources, are involved in the production of housing for individuals or in small real estate markets of a few dozen homes. Some companies work solely in the production of materials, both local and imported and processed.

Alongside these entities, there are the laborers who have very few qualifications and technical means and who often work for the self-construction sector (in Africa). Medium-sized companies look for their workforce among this category.

Project managers

They are trained as architects, consulting engineers, technical control offices, urban planners, and surveyors.

In Africa, large and medium-sized companies make the most use of the services of architects and engineers in their construction projects. Some individuals, due to the constraints of certain government entities, exceptionally call upon the services of architects and engineers to obtain a building permit. Self-builders rarely use the services of architects because they often cannot afford them.

Control laboratories

They perform the function of control on the materials used in the construction or raw materials used in the production of materials. In developed countries, these laboratories play a role in the material certification and the standardization process. In emerging countries, controls are a challenge and local materials are difficult to standardize which creates difficulties in their use in the formal construction sector

Banks and insurance companies

They provide financing for construction operations but also the necessary coverage against risk through the insurance policies they issue to developers

2.7 General trends in housing

Africa faces a chronic housing challenge that goes beyond deficits in the formal housing supply. Housing production is likely to remain informal for a long time. The rapid population growth coupled with the urban transition will continue to increase the demand for housing in Africa. This growth in demand will occur mainly in the informal lower spectrum of the market. The existing available data does not provide policy makers with sufficiently detailed information about the distribution and condition of existing stock, level of occupancy and overcrowding, and future housing demand from formal to the various tiers of informal housing, including slums.

Informal housing represents a spectrum of different shelter location, conditions and tenure statuses. Informal housing is not necessarily equal to slum housing conditions.

The definition of informality allows for wide variation in the type and quality of housing as shown in the figure below



Figure 13: A continuum of informality in the housing
 Source: World Bank data in Stocktaking of the Housing sector in Sub-Saharan Africa: Challenges and opportunities, 2015

The housing stocks of Sierra Leone and Sudan have at least one or more conditions associated with slums, nearly half of the housing stock of Sierra Leone (47.2%) has just one deprivation, while by contrast in Sudan, about 67 percent of housing units have *at least* two or three deprivations. In Ghana for example, 96.7 percent of households have access to a durable shelter, but only 83% have access to improved water and 76% have improved sanitation (UN-Habitat 2008). The findings suggest that the quality of the existing housing stock in a number of countries can be improved rapidly with targeted interventions to improve particular areas of deficiency.

House prices are one of the key determinants of housing affordability also in Europe. Data published by Eurostat in spring 2017 (see Eurostat, House price statistics) show that house prices, as measured by the house price index, increased in the fourth quarter of 2016 by 4.1% in the euro area and by 4.7% in the EU compared to the same quarter of the previous year. Although still well below the growth recorded in 2006, this represents the highest annual growth rate since 2009. However, data show different trends across EU countries. Among the Member States for which data are available, the highest annual increases in house prices in the fourth quarter of 2016 were recorded in the Czech Republic (+11.0%), Hungary (+9.7%) and Lithuania (+9.5%), while prices remained stable in Italy (+0.1%).

National house price indices can hide significant variations in the regional level of house prices. In most countries, house prices are highest near capital cities.

In this context, an increasing number of local authorities/cities are proposing solutions in substitution/complement of national policies. They free up low-cost land for social/affordable housing; require private developers to contribute to the development of affordable housing and social infrastructure; bring vacant space back into use; promote initiatives to increase social inclusion, education, and employment opportunities in poor neighborhoods; improve mixity; and provide housing in cooperation with non-profit housing actors.

A significant reduction in construction (and renovation) activity has taken place in a number of countries since 2000. Across the EU, residential construction averaged about 3.7 percent of countries' GDP, down from about 6 percent in 2006 (Eurostat). After nine years of crisis, the overall picture in the EU for housing supply has remained relatively constant since 2008 (with a few exceptions such as Sweden, where construction has increased. In Sweden, around 710 000 new homes will be needed over the next 10 years. Construction has increased significantly

over the past three years, with preliminary figures of 63,000 new units started in 2016 and a forecast of 67,000 units in 2017. According to experts, the main obstacle to an even higher construction rate is a problem of labour shortage. According to Eurostat, Sweden has the highest house construction prices in the EU and competition in this sector is weak. Despite an initial decline after the 2008 global economic crisis, house prices started to rise again in 2009 and have continued to rise since then, while most other EU countries recorded a fall in their prices over the same period. The indebtedness of private households has also increased.).

In addition, in some countries there is currently a shortage of construction workers and/or companies (EMF, 2016). More importantly, high construction costs can be a major challenge to the provision of affordable housing. According to data on construction price levels (Eurostat), the most expensive countries in terms of construction investment after Switzerland are the Scandinavian countries, followed by Germany, France, the Netherlands, and Austria. In some of these countries, where building quality standards and regulations are already very high, affordable housing providers are increasingly concerned about the cost of construction and are trying to find ways to reduce it. For example, the Swedish municipal housing companies have established a framework agreement (“Kombohus”) for the construction of energy-efficient and affordable adapted houses at a 25 per cent reduction in construction cost. In Austria, there is an ongoing debate about whether to include smaller dwellings and/or dwellings with a lower level of amenities in new construction.

A number of countries, particularly in Eastern Europe, have relatively fewer problems in terms of overall housing affordability (price/rent). Unfortunately, inadequate housing quality remains a major problem in many of these countries, with a potentially huge negative impact on health. This became more apparent during this year 2021 with the Covid-19 pandemic.

The phenomenon of “poor homeowners” in some European countries implies that a large part of the existing housing stock is in desperate need of maintenance and upgrade (renovation), which the residents cannot afford without public subsidies (e.g. Bulgaria Estonia, Romania).

Large subsidy programs to promote renovation are in force in certain countries since decades, e.g. in Italy, but in many cases with insufficient requirements on quality and on reduction of energy needs has been shown by a Report 11/2020 of the *European Court of Auditors*,

Furthermore some renovation incentives are funded via state debt, hence transferring the financial burden to future generations, others are funded via a levy on energy prices, and energy efficiency obligations for energy utilities, based on Art.7 and 7 bis of EPBD (Rosenow and Bayer 2017) (Erba and Pagliano 2021). Direttiva europea sull'Efficienza Energetica (2018, recast della Direttiva 2012) Lettre d'information «Certificats d'économies d'énergie», Paris, Ministère de la Transition Écologique et Solidaire, aprile 2020, daté 2019).

In addition, a poor energy performance can have a significant impact on the utility cost and contribute to poverty.

However, fuel poverty is a complex issue. For example, in the UK, social rented housing is significantly more energy efficient than other types of housing. Despite this, 22% of social rented households report being unable to adequately conserve heat in their poorly insulated or uninsulated homes. This is a higher proportion than for private owners or tenants.



Figure 14: Invented a little over a century ago, the electric air conditioners cover here the facade of a building in Belgrade.

Source: MARTIN MOXTER / WESTEND61 / PHOTONONSTOP, Le Monde.

In the European Union, almost one in 10 households (9.4%) is not able to preserve the heat of their home. Although the proportion of households in fuel poverty has remained relatively stable across Europe at around 10%, there are significant variations both between countries and in terms of changes over time.

Paradoxically enough, the highest levels of energy poverty are currently found in Southern and South Eastern Europe. In Bulgaria, Greece, Cyprus and Portugal, more than 20% of all households report being unable to keep their homes warm. While some of these high rates are certainly a result of the quality and energy efficiency of housing, recent increase in fuel poor households in countries such as Greece, Italy and Spain can, at least in part, be explained by the worsening social and economic conditions caused by the financial crisis and austerity measures. The lowest levels of fuel poverty are found in Scandinavia and other Northern and Central European countries, including Germany, the Netherlands and Austria. In these countries, less than 5% of all households say they are unable to keep their homes warm.

Despite a growing awareness of the issue of energy poverty, the problem and its health often remains neglected.

Energy performance contracting (or EPC) is a procurement method to reduce the operating costs and environmental impacts of buildings that housing companies might use. Under an EPC, an energy services company (ESCO) with technical expertise provides a complete building retrofit, which may include boiler replacement, insulation and cooling systems, and lighting and temperature controls, as well as the integration of energy data management software and on-site renewable energy generation systems.

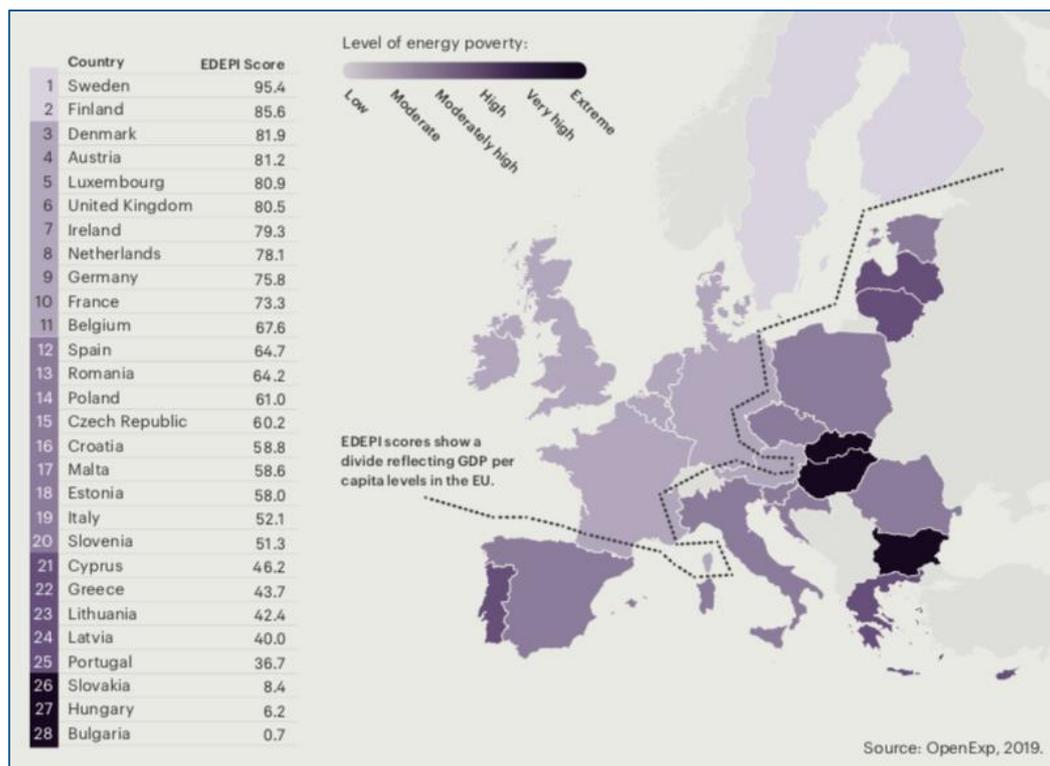


Figure 15: Energy poverty levels in Europe.
Source: Saheb, Y et al. (2019), European Energy Poverty Index: Assessing Europe's Energy Inequality, OpenExp, Paris.

A common limitation is the lack of awareness and expertise in the implementation of EPCs and the energy performance guarantee model, particularly for housing lessors subject to public procurement rules. For housing lessors subject to public procurement rules, specific guidance on how to use the different forms of procurement will be needed.

The need for renovation is much greater in Europe than in Africa, which has not yet built most of its housing stock.

3. Construction sector situation in NW-Africa & in the EU

3.1 Scope of self-construction

Throughout Africa, the building and public works sector has undergone significant development as a result of people's socioeconomic evolution, the emergence of new players in the sector (developers, companies, cement manufacturers), the orientation of savings towards housing acquisition, and the effect of public policies.

This sector has contributed increasingly to the development of many countries. For example, in Morocco, the sector contributes for the GDP by 6,1%. The sector is the most labour intensive sector. It employs 1,138 536 workers (Immobilier 2020: Eléments de prospective: MHUAE, Maroc).

Housing construction has many similarities across African countries. In rural areas, construction is based on local materials and simple techniques. In urban areas, imported materials such as steel and cement have been adopted in a Western-like architecture.

Despite an effort to standardize quality, the construction sector in Africa remains globally affected by:

- A lack of standards and regulations that take into account current issues such as building performance, comfort, etc. However, the efforts underway in some countries or sub-regional organizations that have either chosen to integrate provisions related to energy efficiency in buildings into existing building codes or to develop new regulations, labels or certifications are to be commended;
- Poorly enforced standards.



Figure 16: Urban landscape in the city of Dakar.
Credit: Moustapha Mbengue, ©Habiter Dakar, 2020

In Senegal, the average price per square meter built varies from region to region and by building type. It can range from US\$ 1,300 per square meter for a building to US\$ 3,120 for a luxury single-family home (PEEB, 2019: analysis of the construction sector in Senegal).

This self-construction thus plays a major role in housing production in Africa compared to the structured production by formal companies.

Companies operating in Africa generally have unit costs of construction that are prohibitive for ordinary African households. These high costs explain the difficulties in meeting housing needs. For example, Ghana's largest housing construction company reports having built about 3 500 houses in the last decade.

Small private construction companies in the formal sector, which raise funds on the capital market to purchase plots and build houses that meet architectural standards by hiring skilled workers and a few labourers, are largely absent. In contrast, ordinary urban housing is largely self-built based on personal plans. This compounds the atypical character of houses and the challenge in evaluating them.

The cost of formal construction is high relative to household incomes due to factors like the high cost of formal building materials and inefficient building regulations and processes. Buildings that are delivered by the formal construction sector and meet all applicable planning and permitting standards are much less common than those built informally are. Instead, the informal building materials and construction sector dominates home construction.

Most homes are self-built or built by informal contractors using inexpensive materials, do not meet formal building standards, and are constructed incrementally over extended periods of time.

The use of imported materials has led to a sharp increase in energy costs to produce them but has also led to an increase in the cost of housing.

3.2 Construction practices

(Formal) construction practices in Europe and Africa are largely dominated by the use of cement concrete. Cement is the most produced and consumed material in the world and it also contributes largely to greenhouse gas emissions at a rate of 4 to 8% (source: *La vie du ciment en Afrique : Matière grise de l'urbain*, Armelle CHOPLIN, Métis Presse, 2020).

Popularized in the 1960s, it has been increasingly used since then. In Europe its omnipresence is less visible, a large number of buildings having been built before its invention, and the architectural diversity remains in appearance. However, In Africa, it goes in hand with the urban explosion, to the point of making the actors and the population forget that it did not always exist. In West Africa, it is no longer a simple material but a symbol of success and middle-class status. It is associated with the active urban as opposed to the passive rural, with "hard" construction as opposed to traditional construction, which has consequently become "fragile".



Figure 17: In West Africa, concrete towers are constantly being built, like this one in Eko Atlantic City, Lagos, in 2016

Source: in 2016. PIUS UTOMI EKPEI / AFP, Le Monde

Yet cement concrete has many drawbacks including environmental ones: producing cement in West Africa raises many questions as you need to extract limestone in the middle of the savanna, take massive amounts of sand from the lagoon, sometimes import clinker from Indonesia and gypsum from Spain and often release particles and carbon dioxide that will end up in the ozone layer" (A. CHOPLIN)."

In addition to its carbon impact during manufacture, cement concrete as used in West and North Africa is poorly adapted to the climate of these regions. While this material has great structural properties, it is quite poor in terms of hygrothermal performance.

Despite the increasing use of concrete, African architecture uses a wide range of materials. The choice of materials is strongly linked to local traditions but also to the sourcing or importing opportunities.

The choice of materials depends on many factors: region where construction happens, accessibility of the material, cost, destination... Local materials are an alternative that has been considered for several decades to alleviate the difficulties experienced by city dwellers to build a decent home at a reduced cost and to reduce the import of construction materials that are expensive for many developing countries.

To promote this alternative, production factors are critical: raw materials, production techniques, qualified work force for production and implementation. It is also necessary that the techniques used allow sufficient production to feed the demand with competitive costs.

The issue of green and energy transition, currently underway, questions a lot the building envelope design, materials and construction techniques used in civil engineering. The available local materials can be an interesting alternative, if the production channels are modernized, through a value chain approach.

In addition, in the context of energy efficiency and green transition, bioclimatic design approaches must be integrated into the architecture and planning of urban environments under development. Apart from the widely used concrete and cement brick masonry, other materials used include:

- ✓ **Raw earth:** according to several implementation techniques (pisé, adobe brick or banco, Compressed Earth Brick, Cob);
- ✓ **Terracotta:** used during colonization in the form of bricks and tiles, it was abandoned in the early 1970s. a few units have been built in recent years;
- ✓ **Plant fibres:** Typha on the Senegal river or reeds in Morocco and Egypt; they are mainly used for roofing, chips to enrich raw earth or to produce insulating panels or wattle- and daub fort he cob;
- ✓ **Wood:** used in regions where the resource is abundant;
- ✓ **Stone:** used in regions where the resource is available.



Figure 18: Typha stubble, Typha false ceiling and CEB

These materials are also found in Europe and all over the world with very varied implementations and forms. These bio-sourced materials used since time immemorial, associated until now with a vernacular architecture style, are now experiencing a very promising contemporary revival. Their global presence allows for the mixing of techniques and exchanges or transfers of skills between different regions. The French company Le Goff, for example, trains thatcher's in the Senegal River region with the association TypHAS (*Typha Herbignac Action Sénégal*). Elsewhere in Senegal, the Japanese architect Toshiko Mori has used her experience with traditional Japanese bamboo structures to create a contemporary cultural centre made from local materials.

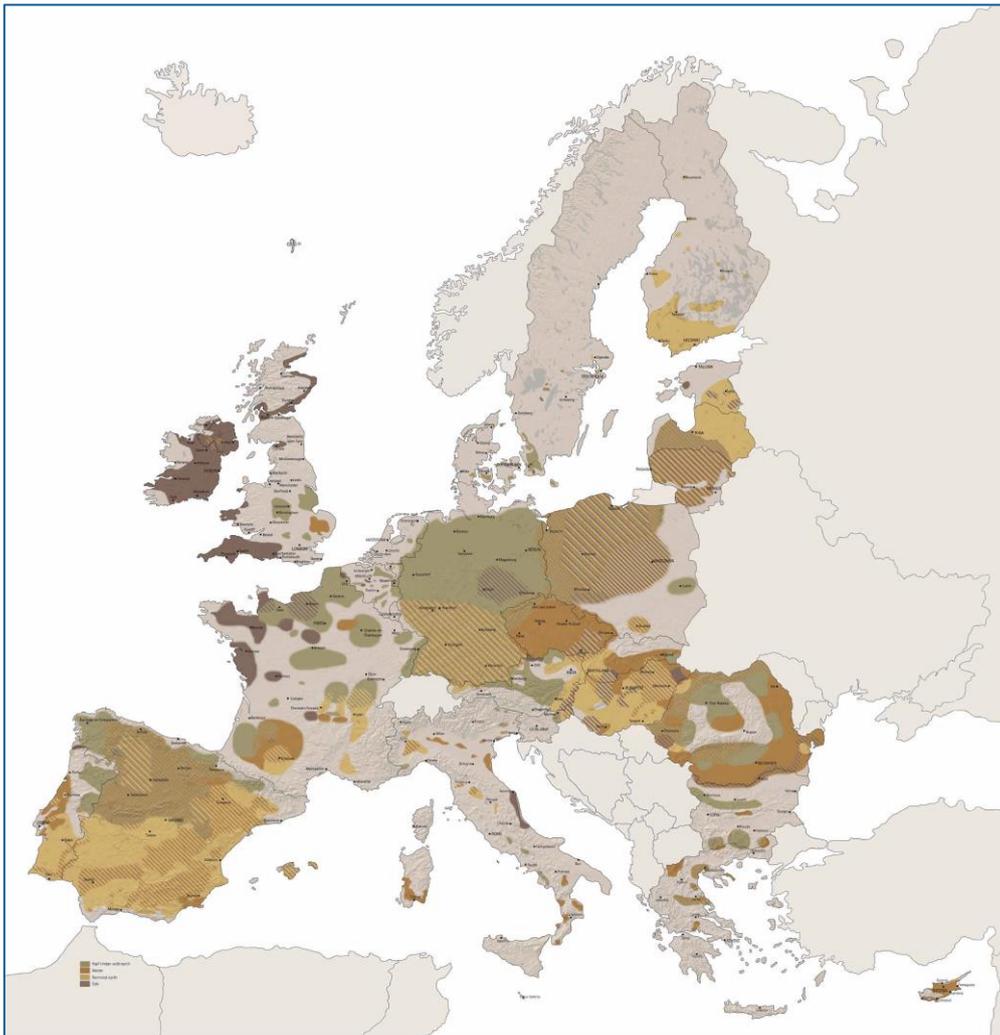


Figure 19: Presence of raw earth constructions in Europe, Terra Incognita 2011

The use of materials based on plant fibres has a major ecological interest as part of the insulation solutions for construction, both in terms of improvement of the interior comfort for the constructions but also in terms of energy saving "of use" by decreasing the consumption for buildings equipped with air conditioning. An analysis of the CO₂ emissions reduction has been carried out.

As an example, the rehabilitation of an administrative building, using 100 RAC-type air conditioners, with an electrical consumption of 0.7 kilowatt hours each, having 1000 hours of use per year, with Typha-based insulating materials that would have an impact of 30% on energy consumption, would represent a reduction of 14.7 tons of CO₂ per year, knowing that,

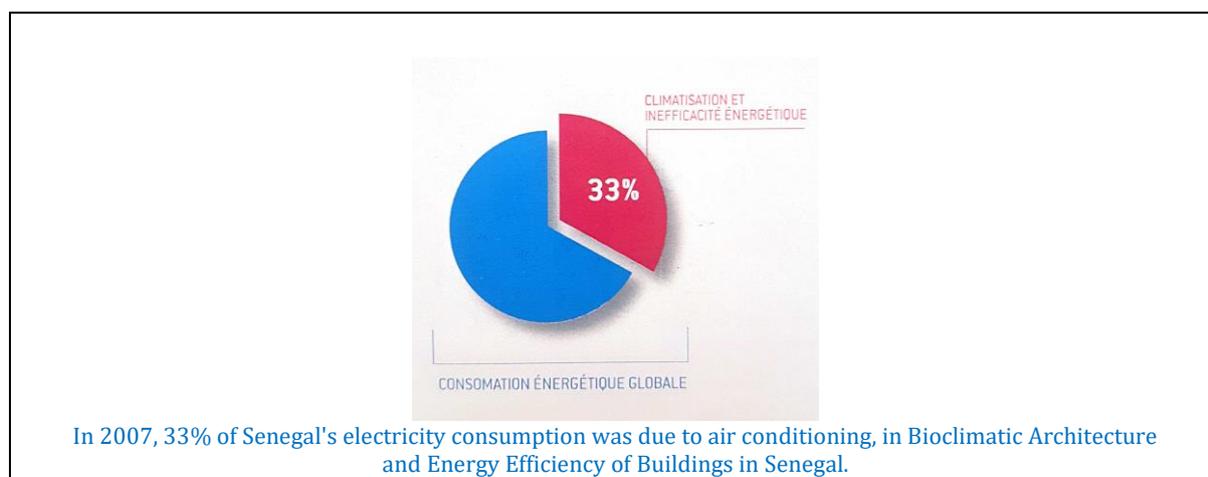
according to the Senegalese power mix (90% diesel, 10% hydroelectricity), one megawatt hour consumed corresponds to 0.7 tons of CO₂ emissions.

The development of this type of material, which uses little hydraulic binder, and so does not require cooking, and locally available resources, also has an ecological interest in terms of reducing energy consumption and CO₂ emissions during production, implementation and recycling at the end of its useful life. This is particularly interesting in the case of a substitution of imported insulation materials.

It is also the case for constructive solutions that, without having recourse to insulation systems would use substitute materials to existing materials while improving their thermal insulation properties.

This is why the development of solutions using Typha-earth blocks to replace concrete blocks for walls, and Typha-earth hollow brick solutions to replace concrete hollow bricks in floor and beam roof solutions, seem to be very relevant.

We have made a comparison of these solutions based on a summary estimate of the energy consumed and the quantities of CO₂ emitted for each solution. We focus on a case of material production in the Dakar region. Only the impact of the material production is evaluated. The energy consumed and the amount of CO₂ for the production of the Typha-earth products correspond only to the transport of the Typha from Saint-Louis to Dakar. The energy consumed for the production of concrete products corresponds only to the cement manufacture. The transport distance of the other raw materials (sand, gravel or earth) is considered equivalent, as the resources are generally located in the same area. (Box)



In Europe, the construction business using bio-based materials has increased everywhere and is becoming more and more professional. These materials represent an increasingly important part of the construction market and are now an area of focus in public debates regarding construction issues.

In Africa, they are still widely used in rural areas but are suffering from their vernacular image and artisanal character in urban areas and are therefore totally excluded from urban development. However, some programs and policies aim at boosting and professionalizing these sectors. The PNEEB/TYPHA project in the Senegal River region, for example, seeks to develop the Typha resource by transforming it into insulation panels.

3.3 Architectural practices

The dynamics observed in the construction practices in North and West Africa show that climate contexts are barely taken into account. In order to address the urgent climate change challenges, it is necessary to reintroduce adapted construction models based on bioclimatic and vernacular architecture and the use of local bio and/or geo-source materials.

Nevertheless, sustainable architecture is not only based on the use of ecological materials, but it also defines a more global approach to construction, from the relationship to the climatic environment to its coherence with the built or natural environment, including its degree of adherence by the inhabitant and its capacity for resilience.

Relationship to the climatic and built environment:

The ecological efficiency of a building relies mainly on the knowledge of the climate in which it is located and certain common sense in the architectural design. The orientation of the ideal home will be different depending on whether one wants to capture the climatic elements: sun, wind, humidity or protect oneself from them. The interior organization follows the same logic: cold / warm rooms open / closed.

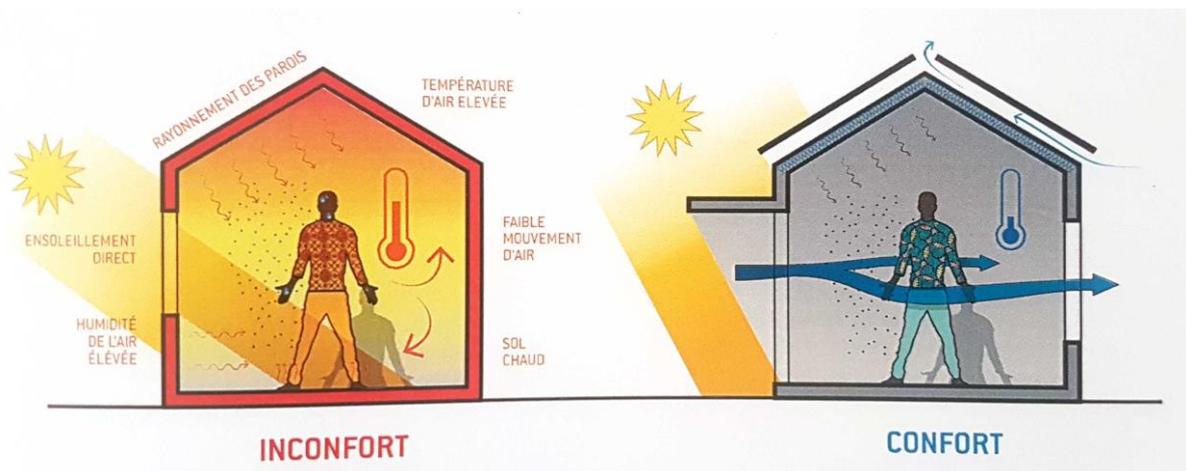


Figure 20: Notion of hygrothermal comfort in tropical zones, in Bioclimatic Architecture and Energy Efficiency of Buildings in Senegal.

Resilience capacity:

The solidity of the building, i.e. the quality of its implementation and the durability of the materials, and its resilience, i.e. its ability to accommodate changes in lifestyle or needs (in the case of housing) contribute significantly to the extension of the building life and therefore to reduce the carbon footprint of the construction sector. Thus, the incremental approach, consisting of "*working by adding to a project using many small incremental changes instead of a few (extensively planned) large jumps*", (source Wikipedia) is a promising way of thinking in cases where funding is difficult to access.

Adhesion by the resident

Taking into account local social characteristics in the house design contributes to the residents' quality of life. "For example, let's look at the consequences of the various ways of eating meals on the shape of the house. It is quite different to have a regular family meal in a separate dining

room or to eat in the kitchen; to eat as a family or separately, everyone eating when they want; or to eat at home or not. "The customs or lack of customs regarding meals still play an important role in shaping the attitudes of children, and to this extent the home is still an instrument of character formation. " (A. RAPOPORT).

In Europe, standardization in order to adapt to the greatest number of people can be a factor of diversity impoverishment in the housing typology. One can then ask whether this homogenization of housing participates in the standardization of cultures by becoming a mold in which the inhabitants melt.

In Africa, the arrival of concrete in the 1960s led to the importation of Western-style housing models into the housing sector. These houses, disconnected from the household needs and local lifestyles, were imposed as ready-made and easy to implement solutions, symbols of modernity. The continent city rapid urban development requires urgent solutions, encouraging the adoption of exogenous models and leaving no time for the invention of typologies adapted to local specificities.

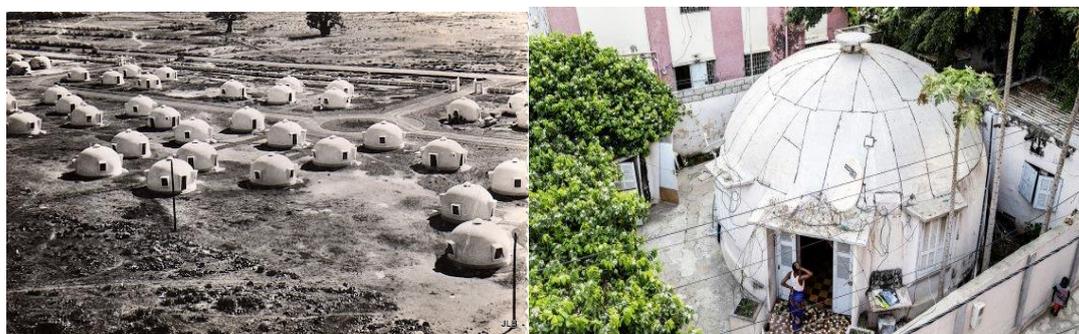


Figure 21 : The balloon houses of the American Wallace Neff yesterday and in Dakar today

Reconciling all these design constraints with the rules of construction of natural materials is critical for ecological housing construction. This is the major role of designers and particularly architects and housing actors. On this point, Europe, North and West Africa are not equal. To get an idea, there are more than 130 schools of architecture in Europe, compared to about 35 in North Africa and only 7 in West Africa (source: Wikipedia).

4. Current issues in the construction and housing sector

4.1 Energy consumption and greenhouse gas emissions (CO₂)

The inappropriate use of energy in housing creates an environmental and social problem. In addition to increasing bills that many people find increasingly difficult to pay, heating and cooling homes produces greenhouse gases. The implementation of the Paris Climate Agreement as the globally agreed upon Sustainable Development Goals are coordinated at the EU level. In addition, EU guidelines influence the regulatory framework of Member States and the financing of energy efficiency in housing, as well as energy governance, which has an impact on the development of renewable energies and strategies for measuring and combating fuel poverty.

Buildings play an important role in the society and environment in which we live, work, and interact. In the transition to a low-carbon and resilient system, as well as a sustainable society, buildings play a dominant role in energy use and are among the largest sources of greenhouse gas (GHG) emissions in most countries.

New buildings will be a major source of future emissions, especially in rapidly developing economies with growing populations, where much of the construction will take place by 2050. Yet in many high-income countries, the existing building stock will account for most of the building area in 2050.

In 2019, final energy consumption remained at the same level as in 2018 according to the latest Global ABC report. Carbon dioxide emissions from building use have increased to their highest level yet: nearly 10 Gt of CO₂ or 28% of total global energy-related emissions.

If we add the emissions from building construction, we go from 28% to 38% compared to 39% in 2018 (decrease due to the drop in construction activities with the Covid-19 pandemic and increase in emissions due to transportation and other sectors compared to those related to buildings).

In addition, it is recognised that buildings use 55% of global electricity consumption. According to the IEA, the energy consumed in residential buildings accounts for 22% while the construction industry consumes 5%. CO₂ emissions from non-residential buildings account for 11%, residential buildings for 6% and the construction sector for 10%. The estimates of emissions from buildings and the construction industry made by the International Energy Agency in 2019 are as follows:

Table 7: Estimates of emissions from building and construction sector industry

Sector	2019 (MtCO ₂)	Share
Building use phase	3,953	
Coal	496	
Oil	939	9% direct emissions
Natural gas	1,663	
Electricity and heat	6,855	19% indirect emissions
Building construction	130	
Construction energy use	130	

Material manufacturing	3,480	
Cement and steel manufacturing for construction	2,038	10% Indirect building and construction value chain emission
Other	1,301	
Building and construction value chain	13,512	38% of total energy related emission

Source IEA 2020b: IEA Buildings operation and construction emissions estimates, 2019

These estimates show that the building business and the production of construction materials are responsible for much of the building and construction emissions. Cement and steel production are responsible for most of the emissions from building materials production. The high-energy consumption and greenhouse gas emissions from buildings are largely due to the increased use of air conditioning.

In the face of recurring heat waves, air conditioning is becoming more and more indispensable: it improves living conditions as well as economic productivity. However, adverse environmental effects offset the instant relief it provides. In Europe, an average of 20% of households have air conditioning.

The human contribution to the greenhouse effect is mainly due to CO₂ emissions of fossil origin, whereas the carbon contribution will include fossil and biogenic CO₂. Current calculations of the environmental impact of construction products (FDES) and their contribution to climate change only take into account GHG emissions of fossil origin. This contribution is expressed in CO₂ equivalent.

Indeed, to be climate neutral, what is possible is either to do nothing (which limits our activities), or to compensate negatively for all the positive emissions we have had. These “negative emissions”, or storage, when we are interested in construction, means using most often bio-based materials.

Let us take for example a building with a wood structure and hybrid wood concrete floors. A quantification of the amount of carbon in the building will show that a large amount of carbon is stored in the building and that the production of the floor concrete has emitted a significant amount of CO₂ into the atmosphere. For the balance to be zero, the amount of wood just needs to contain an amount of carbon equivalent to that of the CO₂ emitted during the production of the concrete. One cubic meter of wood contains about 1 ton of CO₂. One cubic meter of concrete emits about 300 kg of CO₂. If for each cubic meter of wood the building contains less than three cubic meters of concrete, we can call it zero carbon.

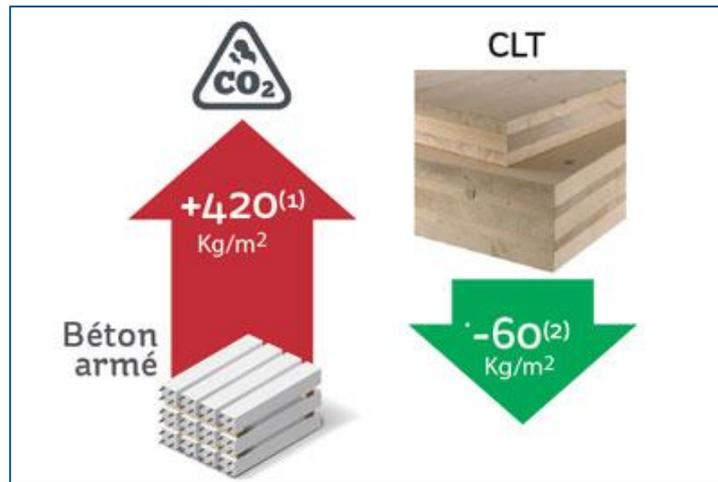


Figure 22: Carbon footprint for 1m2 of collective housing construction, photo credit: Woodeum

However, an assessment will show that the production of one cubic meter of concrete releases into the atmosphere about 300 kg of fossil CO₂ at the time the material was produced but will show that the storage of carbon contained in the wood occurred long before construction, when the tree was growing in the forest.

The transformation of a tree, which was initially in the forest, within a building did not indeed remove CO₂ from the atmosphere. Thus, at the time when the house was being built, the building contributes to climate change because of the CO₂ emissions of the concrete.

4.2 Renovation

The EU Commission has launched a major renovation program to improve the energy performance of buildings. The Commission intends to at least double renovation rates over the next ten years and ensure that the renovations carried out result in increased efficiency in energy and resource use. These efforts will improve the quality of life for residents and users of these buildings, reduce greenhouse gas emissions in Europe, stimulate digital transformation, and increase the reuse and recycling of materials. By 2030, 35 million buildings are expected to be renovated and up to 160,000 additional green jobs created in the construction sector.

In Europe, buildings are responsible for about 40% of the EU's energy consumption and 36% of greenhouse gas emissions. Yet only 1% of the building stock is renovated with energy efficiency each year, so effective action is key to make Europe climate neutral by 2050. As almost 34 million Europeans cannot afford to heat their homes, public policies that promote energy-efficient renovation are also a response to fuel poverty, have a positive impact on the health and well-being of vulnerable people and help reduce their energy bills. The Commission has also published recommendation to Member States on tackling fuel poverty.

These figures reflect, on the one hand, the poor insulation of three quarters of dwellings and tertiary buildings in Europe, which makes them energy intensive. On the other hand, the fact that the energy used to bring heat is still largely based on fossil fuels, mainly gas, but domestic fuel oil.

The executive vice-president for the European Green Deal, Frans Timmermans, said: "We want everyone in Europe to have a home they can light, heat, or cool without breaking the bank or breaking the planet. The Renovation Wave will improve the places where we work,

live and study, while reducing our impact on the environment and providing jobs for thousands of Europeans. We need better buildings if we want to build back better.” »

For Kadri Simson, Energy Commissioner: “The green recovery starts at home. With the Renovation Wave we will tackle the many barriers that today make renovation complex, expensive and time consuming, holding back much needed action. We will propose better ways to measure renovation benefits, minimum energy performance standards, more EU funding and technical assistance, encourage green mortgages and support more renewables in heating and cooling. This will be a game changer for homeowners, tenants and public authorities. »

The European strategy will prioritize action in three areas: decarbonisation of heating and cooling; tackling energy poverty and worst performing buildings; and renovation of public buildings such as schools, hospitals, and administrative buildings. The Commission proposes to break down existing barriers throughout the renovation chain – from the conception of a project to its funding and completion - with a set of policy measures, funding tools and technical assistance instruments.

The strategy will include the following lead actions:

- ✔ Stronger **regulations, standards, and information on the energy performance of buildings to set better incentives for public and private sector renovations**; including a phased introduction of mandatory minimum energy performance standards for existing buildings, updated rules for Energy Performance Certificates, and a possible extension of building renovation requirements for the public sector;
- ✔ Ensuring accessible and **well-targeted funding**, including through the 'Renovate' and 'Power Up' Flagships in the Recovery and Resilience Facility, simplified rules for combining different funding streams, and multiple incentives for private financing;
- ✔ **Increasing capacity** to prepare and implement renovation projects, from technical assistance to national and local authorities through training and skills development for workers in **new green jobs**;
- ✔ Expanding the market for **sustainable construction products and services**, including the integration of new materials and nature-based solutions, and revised legislation on marketing of construction products and material reuse and recovery targets;
- ✔ Creating a **New European Bauhaus**, an interdisciplinary project co-steered by an advisory board of external experts including scientists, architects, designers, artists, planners, and civil society;
- ✔ Developing **neighbourhood-based approaches** for local communities to integrate renewable and digital solutions and create zero-energy districts, where consumers sell energy to the grid

The COVID-19 crisis has turned the spotlight on our buildings, their importance in our daily lives and their fragilities. Throughout the pandemic, the home has been the focal point of daily life for millions of Europeans: an office for those teleworking, a makeshift nursery or classroom for children and pupils, for many a hub for online shopping or entertainment.

Investing in buildings can inject a much-needed stimulus into the construction sector and the macro-economy. Renovation works are labour-intensive, create jobs and investments rooted in often local supply chains, generate demand for highly energy-efficient equipment, increase climate resilience and bring long-term value to properties.

To achieve the at least 55% emissions reduction target for 2030, proposed by the Commission in September 2020, the EU must reduce buildings' greenhouse gas emissions by 60%, their energy consumption by 14%, and the energy consumption of heating and cooling by 18%.

European policy and funding has already had a positive impact on the energy efficiency of new buildings, which now consume only half the energy of those built over 20 years ago. However, 85% of buildings in the EU were built over 20 years ago, and 85-95% are expected to still be standing in 2050. The Renovation Wave is needed to bring them up to similar standards.

The review of the Renewable Energy Directive in June 2021 will consider strengthening the renewable heating and cooling target and introducing a minimum renewable energy level in buildings. The Commission will also review how the EU budget resources alongside the EU Emissions Trading System revenues could be used to fund national energy efficiency and savings schemes targeting lower income populations. The Eco-design Framework will be further developed to provide efficient products for use in buildings and promote their use.

The Renovation Wave is not only about making the existing buildings more energy efficient and climate neutral. It can trigger a large-scale transformation of our cities and built environment. It can be an opportunity to start a forward-looking process to match sustainability with style.

To meet its climate goals, the European Union must double the renovation rate of its residential and tertiary buildings. Sweden has already achieved almost complete decarbonisation of the sector.

To achieve the climate objectives set out in the European Green Deal, the Commission wants to launch a large-scale building renovation operation. The emissions reduction to be achieved in the residential and tertiary sector would be at least 60% by 2030 compared to 2015, which would imply at least a doubling of the rate of annual renovations (currently 1% of the stock)

The Commission insists, on the one hand, on the need to carry out "deep" renovations (generating energy savings of at least 60%), the current level of which is much too low (estimated at 0.2% of the stock per year) and, on the other hand, on the substitution of fossil fuels by renewable energies (green electricity and biomass).

While many states are on target, some are more successful than others are, and their rankings reflect more proactive policies and mechanisms that are more effective. In order to embark on the "renovation wave" pushed by the Commission, it is in the interest of Member States to look at what works and what does not in their neighbours and to learn from it.

Various initiatives have been developed in Europe with satisfactory results: In Sweden, for the last ten years, CO₂ emissions from housing have been practically zero. Several elements explain this success. First, it should be noted that in the aftermath of the first oil crisis, Sweden, which is particularly exposed given its climate conditions, adopted building standards that are much more demanding than elsewhere in Europe (to a level that France only instituted in 2012). As a result, two decades later, as new homes were built, the average performance of its housing stock was already well above the European average.

Second, the country adopted a high carbon tax, which disqualified fossil fuels in favour of electricity and, above all, urban heating networks, which are now mainly wood-fired. This tax, introduced in 1991 and already amounting to 40 euros per ton of CO₂ in 1996 (a level comparable to that of France today, 46 euros), rose to 100 euros in 2004 and has reached 125 euros today. This has resulted in an energy mix for home heating in which fossil fuels have become completely marginal, unlike in other EU countries.

The differences observed in the other countries (18 kg of CO₂ per year and per square meter of housing in France, compared to 26 kg in Germany after climate correction) also reflect energy mixes that are more or less carbon intensive. In France, wood and electricity provide respectively 32% and 11% of the heating needs of housing, compared to 6% and 2% in Germany. Conversely, gas and fuel oil contribute 37% and 15% respectively in France, compared to 52% and 28% in Germany.

In France and the Netherlands, housing has the same level of CO₂ emissions, while in the latter country the share of fossil fuels is much higher. Gas, oil, and coal account for 86% of heat consumption, compared to 53% in France. The reason is that housing in the Netherlands is much better insulated. Their average energy consumption is now around 100 kWh per square meter per year, compared to 160 in France (after climate adjustment).

Les initiatives réglementaires de tarification carbone dans le monde en 2017

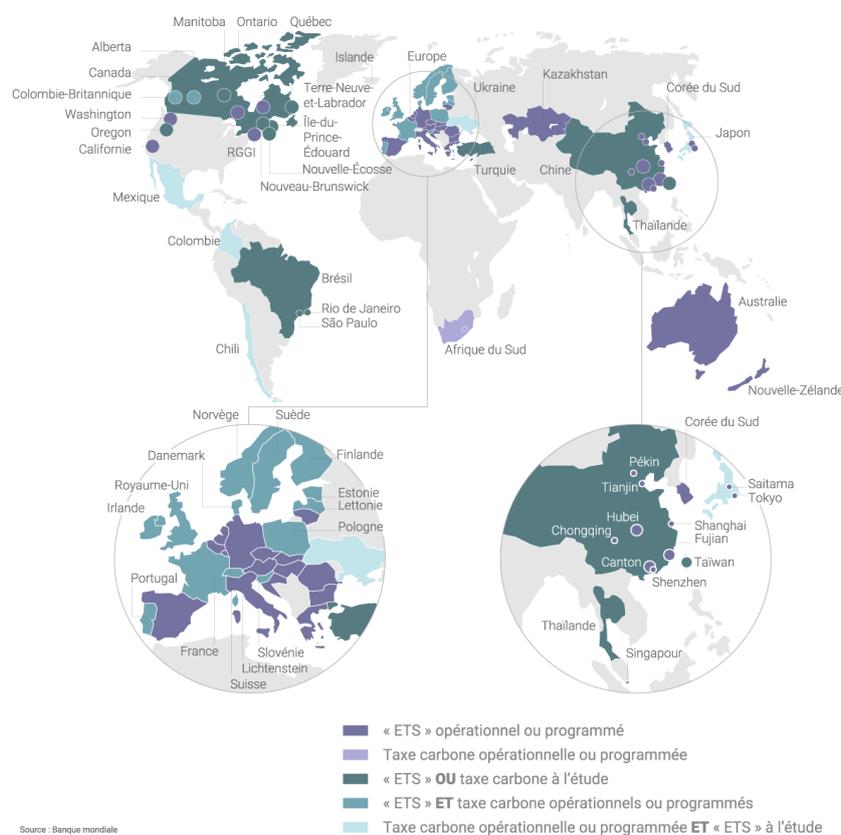


Figure 23: Regulatory carbon pricing initiatives around the world in 2017

Nevertheless, Sweden is far ahead, with nearly 60 kWh per square meter per year. With this level of energy efficiency in housing, Sweden has been able to move away from the use of fossil fuels in this sector. Conversely, despite a mix that is much less carbon intensive than in the Netherlands, Germany or the United Kingdom, France has very modest results in terms of emissions because its housing stock is the most energy-intensive

Even if the harsh winters in Northern Europe are a stronger incentive to insulate homes than in the South, as this has a significant impact on household energy bills, it has been shown that Sweden and the Netherlands nevertheless have higher energy prices than France for fossil gas, heating oil and electricity.

These higher prices reinforce the incentive for energy efficiency in these countries. Moreover, it is because housing in these countries is more energy efficient that households can afford to pay higher energy taxes.

This is a virtuous circle that is difficult to initiate: when, conversely, the energy efficiency of their homes does not improve enough, households, starting with low-income ones, are not inclined to accept a tax increase on fossil fuels, even though this would accelerate the switch to low-carbon solutions.

Hence the need to increase public investment in housing thermal renovation in order to support private investment by households, with priority given to those of low income means and by aiming for in-depth renovations, as recommended by the European Commission.

To encourage renovation work while minimizing the budget effort, France and the United Kingdom rely heavily on obligation mechanisms for energy suppliers, but whose costs are ultimately passed on to households (energy saving certificates in France, or Energy Company Obligations in the United Kingdom).

Moreover, renovation operations are split into multiple "gestures" that are not always consistent with each other, and often lead to poor results. Germany, on the other hand, focuses on a policy of renovation loans that are both advantageous and subject to high conditionalities. The KfW public bank requires borrowing households to provide technical advice and the subsidy of loans is linked to work performance.

And where the French zero-interest eco-loan is limited to 30,000 euros repayable in 15 years, KfW offers a loan of up to 120,000 euros repayable in 30 years. As in France, this system remains optional, which explains the disappointing results. The German home energy consumption is lower than on the other side of the Rhine, but still well above the European average.

This result suggests that incentives, even when accompanied by an intelligent support system and demanding criteria, as the Federal Republic has done, are not enough. Just as the French and British examples show that, an obligation system is not very productive if it is poorly targeted and designed.

In France, the Citizens' Climate Convention - an experiment that interested the whole of Europe - drew the following conclusion: impose a house renovation obligation, starting with the most energy-intensive, and support households technically and financially, with a good dose of subsidies for low-income households. This would ultimately have an effect not only on emissions, but also on employment and public health, by eliminating the "thermal sieves".

In any case, Europeans will not reduce their building emissions by 60% in ten years without tightening their standards for new and existing buildings, without putting a lot of public money on the table to implement them, and without a serious review of their carbon taxes.

In Africa, energy retrofits are not very developed in the construction sector. Only the rehabilitation and maintenance of the buildings are common.

In recent years, some initiatives have emerged that focus on improving the energy performance of buildings. These initiatives are very varied in the different countries of North and West Africa.

4. Decarbonization

Spending on energy-efficient buildings increased in 2019 for the first time in the past three years. Construction investment for energy efficiency in global markets increased to US\$152 billion in 2019, a 3% increase over 2018. However, this remains a small proportion of the US\$5.8 trillion spent on construction. Investment in energy efficiency therefore lags behind investment in the sector as a whole, and so additional efforts are needed to decarbonize buildings. Indeed, in the buildings sector, for every \$1 spent on energy efficiency, \$37 is spent on conventional building approaches.

Today, there are positive signs across the investment sector that building decarbonization and energy efficiency are taking hold in investment strategies.

Financial institutions and real estate companies have realized the strong growth potential and investment opportunities available through sustainable building investments. For example, of the 1,005 real estate companies, developers, REITs, and funds representing more than \$4.1 trillion in assets under management that were reported to the Global ESG Benchmark for Real Assets (GRESB) in 2019, 90% are aligning their projects with green building rating standards for construction. Indeed, green buildings represent one of the largest global investment opportunities of the next decade, estimated by the International Finance Corporation (IFC) at \$24.7 trillion by 2030.

Governments play an important role in unlocking this opportunity, especially today. While the global pandemic poses many challenges, it is also a moment of paradigm shift: that is, systematically including building decarbonization measures in retrofit programs. These measures can dramatically increase retrofit rates, channel investment into zero-carbon buildings, create jobs, and increase real estate values.

Strategies to make net zero energy and zero carbon buildings are a key component of the global decarbonization strategy and must become the primary form of building construction in all economies by 2050.

These initiatives include the Green Building Council's Net Zero Carbon Commitment. Six states, 27 cities, and 79 companies have committed to creating net zero buildings by 2050 or sooner.

The World Business Council for Sustainable Development's Carbon Framework, the C40 Clean Building, the Forum; Architecture 2030's Achieving Zero; the Corporate Science Target Initiative signed on to reduce carbon emissions beyond their own operations by including other indirect carbon emissions in their carbon reduction action plans.

In addition, in 2020, GlobalABC released the Africa Roadmap for Buildings and Construction, which outlines the goals, timelines, and key actions needed to achieve a zero, efficient, and resilient building stock between now and 2050 around the world. These commitments, along with the above commitments, are to be implemented as part of the effort to create a net zero carbon construction sector.

4.4 Financing

The best nonprofit housing systems are supported by stable, long-term financing. Spending limits and deficit rules for member states are set at the EU level through the Stability and Growth Pact. VAT levels for housing are defined within a framework established at EU level. The EU also has a say in negotiating new international banking rules. These limitations and classifications have a real impact on investment in social and affordable housing in Europe.

Similarly, markets are failing to provide affordable housing to households that are not directly labeled as “disadvantaged people or socially disadvantaged groups”.

In the EU, market rules are defined at the EU level. Since 2005, the European Commission has had to limit social housing to its function as a service of general economic interest for “disadvantaged people or socially disadvantaged groups”. Moreover, with housing markets at the epicenter of the great financial crisis, they are now subject to agreed recommendations at EU level.

The crisis could have been a turning point showing the importance of investing in affordable and non-speculative housing. However, so far there has been little overall change in social housing policies. In general, with a few exceptions, social landlords are facing a decline in public funding and are relying more on private funding. Countries with a long tradition of social renting have shown greater resilience (such as Austria and France) and have not seen a decrease in the share of social housing; however, there is an emerging trend towards a more residual role (such as in the Netherlands). However, countries with a weak social housing culture (Central and Eastern Europe) or where public finances have been particularly constrained (e.g., Greece, Ireland, Italy, and Portugal) are struggling to find ways to invest in provision and maintenance as well as in the necessary social measures.

4.5 Sustainable housing policies

According to the Abbé Pierre- FEANTSA Foundation's fourth report on poor housing in Europe 2019, Europe has 221,326,200 households. As of January 1, 2017, the EU population was 511.5 million. 7,303,765 households were in arrears on rent or mortgage payments (3.3%). 23,017,824 households were in excessive effort rate(10?4%). More than 40% of income was spent on housing expenses. 17,263,444 households had difficulties in maintaining adequate housing temperature. 34,748,213 (15.7%) of households were in damp housing. 8,853,048 (4%) of households were in severe housing deprivation. 31,206,994 households with housing in particularly polluted areas. An unknown number of homeless people. \$5,800 billion invested in the housing and construction sector. \$152 billion invested in the energy efficiency sector in 2019.

In Australia, the strategy is focused on housing supply with an emphasis on the rental system. Several incentives have been provided to increase the production of affordable housing through land mobilization, the introduction of planning requirements or land use regulations,

the reduction of production costs through the adaptation of sector standards, and the introduction of special offers of affordable housing with reduced amenities or a reduced floor.

In Belgium, all social housing should have insulating glass in Flanders, roof insulation and low energy heating by 2020. Social housing has shifted to public interest housing in order to promote social mixity (Wallonia).

In Bulgaria, prices have increased by more than 300% for residential housing with generally poor quality. There has also been a renovation problem for the 40- to 50-year-old stock. Energy insecurity is widespread and growing.

Housing policy has become more sustainable since 2017 with municipal housing allocations to vulnerable people, the disabled and single-parent families. Heating subsidies as well as renovation programs for collective buildings have been launched, as well as specific housing estates.

In Croatia, policies are geared towards improving the quality of the existing stock and access to rental housing, building subsidized housing, and granting loans to households for construction, renovation, and purchase.

In Cyprus, house vacancies are high, price inflation is very high and fuel poverty has become a reality. The country has developed a long-term policy for families to have access to housing by subsidizing rentals and providing housing in specific developments, land for self-construction and subsidizing the purchase and construction of housing.

In the Czech Republic, there is a large amount of rental housing, rising prices, and a growing number of homeless and excluded people. Policy is focused on regulation, increased dedicated investment, stock improvement the by integrating energy efficiency, increased access.

In Denmark, construction costs are considered very high. The policy is based on housing renovation that takes into account the environment and energy efficiency.

In Estonia, homeownership is high, access to housing is increasing, and there is an overabundance of housing in rural areas, as well as a high use of energy resources. The policy is focused on homeownership with three basic financial instruments: tax deduction of mortgage interest, state guarantees on housing loans, subsistence benefits (renovation).

In Finland, 45% of the housing stock consists of apartments in buildings and 40% of subsidized social housing. The demand for housing is increasing, with high construction costs and rising prices. The availability of building land is low, which reduces the supply of housing in major cities.

The housing policy is based on:

- Housing acquisitions financed by subsidized loans from municipal housing companies, other enterprises, and non-profit foundations;
- Housing allowances for rent, maintenance, heating, water supply;
- National strategy to end homelessness in the long term.

In France, the housing stock increases by an average of 1% per year. The action of social landlords is very positive in construction and renovation.

West Africa has 110 million inhabitants. The housing deficit is estimate at 3.5 million units per year.

Housing credit improved by CFA F 30 billion per yaer between 2005 and 2012. It rose from 122.2 billion CFA francs in 2012 to 203.7 billion CFA francs in 2013. However, the market has remained underdeveloped with the share of housing credit still considered low.

The other initiatives taken consist of creating housing banks that dominate the housing credit market. Existing commercial banks are limited to credit to decentralized financial systems.

New housing programs are emerging that are more innovative with housing cooperatives. The land registry digization provides better information on land availability.

In North Africa, as in West Africa, the political choice is based more on the quantity than on the quality of housing. Indeed, requirements aimed at increasing the energy performance of building have been almost absent in regulations.

Self- construction, with no architect assistance, is very common. The buikding i soften redeveloped after a few months following ist construction to allow for more rooms without concern for enrgy performance.

5. The policy challenges of housing

5.1 Housing Production

UN-Habitat suggests the self-build model is “perhaps the only housing approach common to all African countries that is affordable at the household level.” Informal channels are the dominant housing delivery system across the region. The informal sector supplies well over the majority of demand in Nigeria (80 percent), Ghana (90 percent), Senegal (80 percent). Most of the housing stock in South Sudan, Togo, Swaziland, Senegal, among others, is self-built. In other countries, all affordable housing is produced informally such as in Liberia.

High standards on building materials and length of procedures to obtain building permit increase construction costs. This encourages the creation of informal housing and leads to inefficient urban spatial development. Many governments often insist on using formal building technologies that not be locally sourced, cost-effective or sustainable.

The added costs are also driven by outdated building regulations that are materials-specific rather than performance-based.

This is the case of many countries in SSA in that such regulations do not adapt to alternative technologies or building techniques, limiting the use of readily available local materials which are proven to be sustainable and safe when used properly local building.

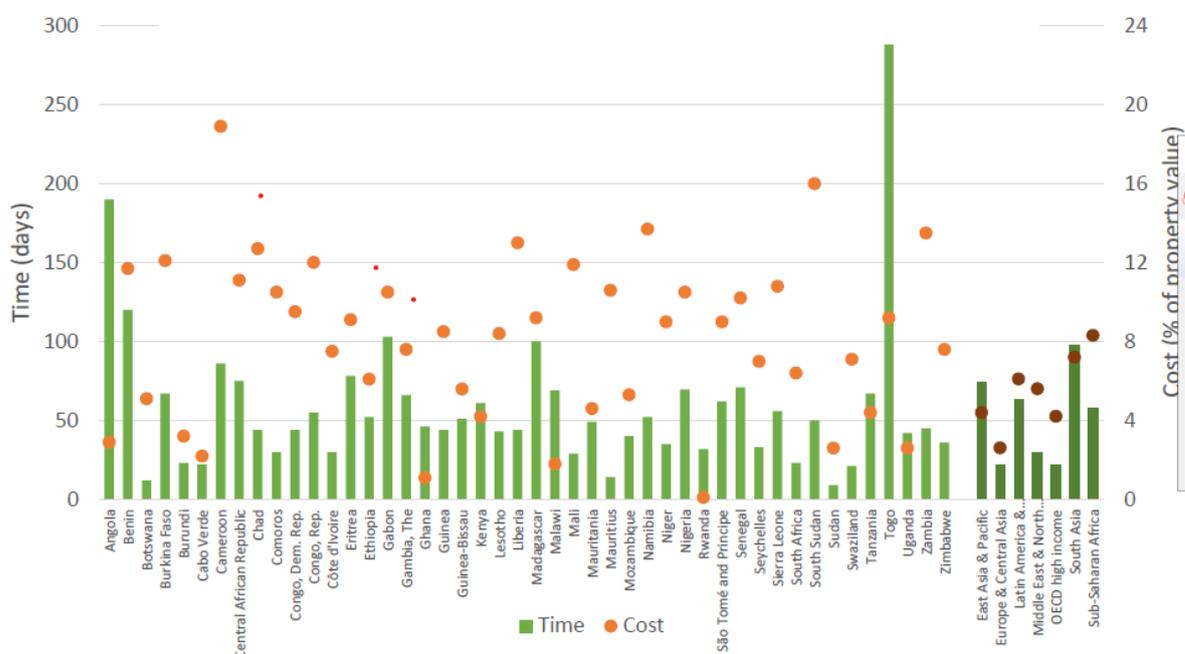
Table 9: Registering property inefficient land administration in Africa

	Procedures (number)	Time (days)	Cost (% of property value)	Quality of the land administration index (0–30)
Africa	6.3	57.1	8.1	8.3
North Africa	6.2	47.2	4.9	9.7
Central Africa	5.9	61.4	12.5	6.4
East Africa	7.1	44.2	6.2	9.5
West Africa	6.2	68.8	8.7	6.9
Southern Africa	6.1	54.7	7.6	10.4
Latin America and Caribbean	7.0	63.0	6.1	11.5
South Asia	6.4	97.6	7.2	7.6
OECD high-income countries	4.7	21.8	4.2	22.7

Source: Based on data from World Bank Doing Business 2016

Registering property in SSA is generally more time consuming and costly (relative to property value) while dealing with construction permits quick but still costly (relative to income per capita).

The figure 27 below depicts the average time and cost to register property in Sub Saharan Countries and international benchmarks.



Source: World Bank 2015b.

Figure 27: Average time and cost to register property in Sub Saharan Africa countries and international benchmarks

The overall mean for SSA is 57.5 days and 8.3 percent of property value, which is over twice that of Eupe/Asia (32 days and 2.6 percent of property value) and OECD high –

income countries (21.8 days and 4.2 percent. While SSA does rank the highest among regions for the number of days to register property, it does entail the highest cost as a percent of property value.

In the EU, housing policies have traditionally focused on:

- Availability of appropriate housing and management and maintenance services for low-income households;
- Affordability, including reducing the burden of housing costs for low-income households;
- Quality, including raising standards for new construction or promoting maintenance and renovation to provide adequate housing for low-income households.

EU member states address housing availability, affordability, and quality concerns differently. They choose different ways to achieve similar goals. The objectives as well as the means have evolved significantly over time.

The history of European housing policies illustrates the full range of housing policy instruments. Direct state control of housing quality is one means. By the end of the nineteenth century, Western European governments had already undertaken demolition programs and introduced legislation on building standards to combat the harmful effects of slums on public health. However, demolitions and higher standards have had little impact on increasing availability and affordability for low-income households.

Rent regulation, which was introduced in some countries during World War I, was more widely practiced during the 1930s and became almost universal in Europe after 1945. This policy has evolved in northern and western Europe - but not in the Mediterranean countries - from the 1960s onward and was largely repealed in the second half of the 1980s, at least for new housing.

While rent regulation may have ensured that the affordability goal was achieved, it often led to a decline in housing quality and affordability, because of reduced investment by landlords, as MacLennan (1997) indicates.

The suspension of rent market mechanisms to provide housing for low-income households has led in many countries to a shift from market to non-market housing (hereafter referred to as the "social housing sector").

The social housing supply in Europe began in Sweden, Denmark, Austria, Germany, France, the Netherlands, and the United Kingdom at the turn of the century. In some countries, such as Denmark, Germany and France, this supply has always been dominated by a diverse set of non-profit providers. In the United Kingdom and the Netherlands, the main role in the social housing supply has been given to municipalities. The sector grew steadily during the first half of the century, except in the Mediterranean and Belgium, and then expanded considerably from 1950 to 1980, with the reconstruction and establishment of the welfare state. Until then in Europe, the social sector mechanism was based on high subsidies (usually 30 to 50 percent of the investment cost) for new housing, which was then rented at below-market rents. The quality of the projects was subject to building standards (while the quality of the "environment" was often disastrously neglected) and affordability for low-income households was ensured by below-market rents and housing allowances linked to social priorities, as discussed by Priemus (1997).

Social housing supply and market displacement are not the only means of ensuring availability, affordability, and quality for low-income households. Nor are high investment subsidies, or housing-related subsidies, the only means of promoting the social housing sector. Some countries, particularly in the Mediterranean, have sought to achieve social housing objectives through market expansion or access measures. In Greece, for example, there is no social housing sector but rather state support, in the form of

subsidized loans and tax breaks, for low-income homeowners. MacLennan and Stephens (1996) have observed that, while developing social housing, some countries such as Germany have also adopted a more tenure-neutral approach to the means of achieving social housing objectives and have also provided subsidies for low-income homeowners since the 1950s, as in Finland and Belgium. Since the early 1980s, programs to assist low-income homeowners have become more widespread, especially in the area of housing rehabilitation and neighborhood regeneration, partly in response to dissatisfaction with the long-term outcomes of social housing solutions. The market supply of affordable (subsidized) low-income housing has increased in Europe over the past decade.

Homelessness is the most obvious consequence of the failure of European housing policies to adapt to economic and social change. The increasing concentration of poor households in deprived neighborhoods, whether in the social or private rental sector, is another failure that threatens both social cohesion and economic competitiveness. These acute problems do not account for all difficulties facing European housing. The shortcomings of "affordability" measures, the slow progress in meeting special housing needs in some places, the inequitable distribution of subsidies, and other problems are still of great importance.

While not all of these problems are resource-related, improved planning and management certainly have a role to play in improving outcomes. The general trend is to reduce housing subsidies. The housing problem needs to be reexamined, but it is no longer limited to availability and affordability: the benefits of a more effective correlation with other funding, management, and investment measures must be acknowledged.

5.2 Barriers to housing production

Various government strategies have been implemented to increase the housing supply, such as mass housing delivery programs. These affordable housing programs have used public-private partnership efforts and numerous models of private financing initiatives.

These programs have faced several obstacles such as right of ownership on state-owned land, lengthy administrative procedures such as certificates of occupancy, access to financing for informal incomes, high registration fees, logistical challenges, shortage of skilled workers, and regulations.

Other constraints to housing provision exist more generally in all African and European countries. These constraints to housing production are:

The unavailability of land for housing

The relatively small size of the land resource base, coupled with its historical and current ownership pattern, is a serious constraint to housing. The high price of land has been identified as one of the main obstacles to housing production. This high land price is the result of a shortage of serviced land by governments, municipalities, etc. Specific land use policies, strategies and action plans related to acquisition must be developed by governments to make land available for housing.

High infrastructure costs

Another limiting factor to private and public sector housing production is the high cost of investment in land infrastructure, particularly where development is remote from existing infrastructure. The developer bears the full high investment cost of providing water and road infrastructure to a new site, to the development of the plots without any future benefits for

connections made from this infrastructure to other sites by other individuals or developers. This high cost of infrastructure has a significant impact on the final price of the serviced land and, ultimately, on the cost of housing for the consumer. Therefore, there is a need to re-examine the high initial cost of land infrastructure and to develop a common approach to utility provision for new settlements. The cost of infrastructure represents about 25-30% of housing expenditure. It is a critical factor in the provision of low-cost housing. Authorities have ignored this area and developers are now offering the same, increasing the cost of homes. Wherever this infrastructure is not taken into account by the developer so as not to increase the cost of the housing plot, a slum is formed.

The increase in urban-rural migration

The strong migration observed everywhere from rural to urban areas has not only put significant pressure on the housing supply but has also led to serious problems of all kinds. At the macro level, a major challenge is the need to promote economic development policies that will reduce the urbanization rate by providing more employment opportunities in rural areas.

Inadequate financing mechanisms for social housing

Lack of access to finance affects the housing supply. Formal sector developers are mainly financed by depository banks at excessively high interest rates and with strict conditions. Low-income homebuilders seek financing from informal sources such as savings institutions, traditional lenders, friends, or family to build their homes. Classified as microcredit organizations, these sources are convenient and accessible. They operate on the basis of third-party guarantees and rely on peer pressure to ensure repayment.

However, they are unsecured and hardly accumulate the scale of funds required for large-scale impact in housing provision.

While a review of the housing credit sector suggests a reasonable supply of financial institutions, access for low-income households appears limited. In particular, the poorest income households are excluded from the formal credit sector. This is partly due to rigid eligibility criteria for borrowing that require regular income flows and security of tenure. Therefore, appropriate mechanisms for financing low-income households need to be leveraged, with a particular focus on more realistic eligibility criteria and lower interest rates.

In addition, the institutional mechanism for administering low-interest financing to low-income households should be reviewed. Given that housing is one of the most important basic human rights, special attention should be paid to the housing needs of the most vulnerable. While some housing assistance is provided through government housing incentives, the access mechanism for these incentives remains largely unstructured. As a result, benefits could be unintentionally diverted to higher income groups. Therefore, it is important that clear incentive schemes be developed to specifically target low-income households.

Inadequate administrative and legislative framework

Analysis of the housing supply situation has revealed a very disproportionate production of "low-income" housing in recent years. Therefore, public sector housing institutions should urgently consider strategies to increase the provision of affordable housing to low-income people, including grants recipients and the poorest people. However, any national housing strategy and action plan should consider methods to effectively recover capital and recurring costs from subsidized housing recipients. In addition, strategies must be considered for the efficient and effective management of existing public rental housing to ensure the financial

sustainability of the public sector housing delivery system. Housing policy will need to reconsider streamlining all public and para-public organizations to ensure the efficient provision of housing to all consumers. In this regard, special attention should be given to re-establishing an institutional mechanism to facilitate a permanent dialogue between the different agencies and projects involved in housing, especially for low-income households.

Cumbersome regulatory approval process

The lengthy and complicated regulatory approval process undermines the efficiency of the housing delivery system. While some measures instituted by governments are necessary, they tend to lengthen the regulatory process for obtaining land subdivision development approvals and building permits. In particular, the significant delay caused by government referral agencies with respect to planning, permitting, and titling approvals has serious financial implications for private developers and ultimately hurts the final price for housing consumers.

Lack of integrated planning in housing programs

In the absence of an explicit national development plan, housing subdivisions simply involve the provision of sites and services, houses, and the allocation of a portion of the land as open space. This has forced residents to travel relatively long distances to access services such as daycare, transportation, and shopping. As a result, the need for integrated planning of housing projects, whereby residents have a comprehensive set of community facilities, is paramount to neighborhood development and sustainability. In essence, government planning agencies should play a more proactive role in the housing development process. Housing needs must therefore be continuously assessed in terms of need prioritization.

Inadequate housing information system

The lack of information is a deep concern because any successful housing policy must be based on a reliable housing information system. Therefore, it is essential that financial and human resources be allocated to facilitate the development of a comprehensive, accessible, up-to-date, and transparent housing market database. In addition, a database containing qualitative and quantitative information on housing will also help measure policy performance.



Figure 24: “One Family - One Roof” Senegalese project’s Website

Limited private sector participation

The analysis of the housing situation confirmed that private sector participation has always been limited, particularly in the social housing production. Public-private partnerships in

housing provision is also lacking, despite several government efforts, including through tax incentives. The relatively high cost of undeveloped land, stringent requirements, and cumbersome regulatory approval process are some of the deterrents cited for low private sector participation. Therefore, strategies should be developed to promote greater private sector participation as well as to address the issue of public-private partnerships in housing provision, with particular attention to low-income groups.

Inefficiencies in home construction

With materials and labor accounting for almost equal proportions of the cost of building houses, it is essential that both be affordable, readily available, and efficiently used. Particular attention should be paid to developing strategies and action plans that would encourage the availability and use of building materials, especially local materials that are low carbon in production. The weak industrialization of construction, especially in African countries, the lack of a regulatory body, mandatory standards, and a legally binding building code have contributed to the overall poor performance of contractors. This was reflected in long construction times and poor quality of house construction. Thus, in order to ensure that the proposed housing policy is comprehensive, it is essential that construction quality management be appropriately addressed. In this regard, capacity building through training; housing contractor registration and licensing; and appropriate building or construction codes should be considered. These regulations must take into account emerging issues such as climate change and housing prices.

The challenges of access to housing

The housing supply is primarily for the middle- and high-income segment of the population who can either pay cash or access mortgage financing from banks. The low-income segment alone, however, offers a critical growth opportunity for developers and investors if they are innovative enough. Because long-term financing for housing development is not available, housing producers try to recoup their funds as quickly as possible. In these circumstances, the development of non-mortgage housing finance products, such as housing microfinance, could be explored.

Policy and regulatory tasks

In many cases, laws that make it difficult for landowners to access housing. These regulations are responsible for lengthy administrative procedures for obtaining certificates of occupancy, title deeds and building permits. In addition, the law often does not ensure security of title and the cost remains prohibitive, while access to titled and registered land is problematic and restrictive.

Taxes and Fees

The tax levies on housing provision and development are a huge burden. Value added tax (VAT), which is deducted at many stages of building approval, adds up to 30% to the total cost of a house. This does not include title fees and stamp duties, ultimately putting home sale prices out of reach for low-income recipients.

Property registration and building approval

Property registration and building approval are generally slow, cumbersome, and expensive. This lengthy process has a negative impact on housing prices, but also on housing provision by private companies.

Limited skilled labor

The lack of sufficient capacity hinders housing production. This is reflected in the number of homes produced but also their quality. In some continents, such as Europe, there is a significant shortage of skilled labor.

Importation of building materials

The continuous importation of building materials, especially by African countries from developed countries, makes housing production more expensive. About 60% of the building materials needed for housing construction are imported. This is an important factor in the high cost of construction.

Market transformation initiatives

Some bottom-up, grassroots initiatives can be noted in many African cities. The *Fédération Sénégalaise des Habitants* (FSH) in Senegal, for example, is made up of nearly 3,800 residents organized in more than 160 savings groups. It federates its members to make their voices heard by public authorities and to defend their interests in terms of access to decent and sustainable housing. This pooling of resources makes it possible to set up a working capital fund for (re)construction and access to housing, which aims to be sustainable (Mitlin, 2008). It both requires and creates awareness among the Federation members that together they have greater power to act. UrbaSEN is its support NGO made up of urban development professionals from Senegal. (<https://www.revue-urbanites.fr/urbanites-africaines-chabot-keita-varnai/>)

In Europe, residents' cooperatives aim to offer their members the best possible housing conditions at a lower cost. Considered as "the third way for housing", halfway between renting and buying, they are very developed in some countries, particularly in Switzerland.

5.3 The production costs of housing

In order to fill the affordable housing deficit and deliver a large scale housing developments African's construction sector need to undergo an extensive transformation towards industrialization. This industrialization can be a way to reduce the production costs of housing. This industrialization can be assessed differently in different countries.

In some developed countries, the goal of industrialization is to substitute high cost labor with capital by increasing the usage of automation and equipment. Obviously, this may not be the type of industrialization one. Would like to experience in Africa, hearing in mind the need for the continent to take advantage of the demographic dividend.

While addressing the large youth unemployment. In fact, one of the key developmental challenge of African countries today is how to create jobs for the large shares of unemployed or underemployed youth population and thus improve the livelihood of African people.

This calls for housing construction policies that are biased towards more labor-intensive technologies. Prefabrication of complex structures using automation is thus not a viable option for Africa.

The goal of industrialized construction in Africa could consist in producing at massive scale in shorter periods of time, at lower costs, while taking into account the countries stage of development and particularities, including features such as an abundance of unskilled labor and a shortage of capital.

6. Challenges of urbanization in NW-Africa and in Europe

In 2018, an estimated 55.3% of the world's population lived in urban agglomerations. By 2030, urban areas are expected to be home to 60% of the world's population, and one in three people will live in cities with at least half a million people.

Understanding the key urbanization trends likely to develop in the coming years is critical to the implementation of housing and sustainable development agendas by 2030, including Sustainable Development Goal 11, to make cities and human settlements inclusive, safe, resilient, and sustainable.

6.1 Urbanization issues

At the turn of the century in 2000, there were 371 cities with 1 million inhabitants or more worldwide. By 2018, the number of cities with at least 1 million inhabitants had grown to 548 and in 2030, a projected 706 cities will have at least 1 million residents.

In 2018, 48 cities had populations between 5 and 10 million. By 2030, 10 of these are projected to become megacities. Projections indicate that 28 additional cities will cross the 5 million mark between 2018 and 2030. In 2030, 66 cities are projected to have between 5 and 10 million inhabitants.

Cities with more than 10 million inhabitants are often termed “megacities”. Globally, the number of megacities is projected to rise from 33 in 2018 to 43 in 2030. The table below shows the urbanization trends for the three regions studied (North Africa, West Africa, and Europe)

Table 8: Urban and rural population, proportion urban and average annual rate of change of the proportion urban

Year	Urban population (X1000)				Proportion urban (%)				Average annual rate of change (%)
	1990	2018	2030	2050	1990	2018	2030	2050	2015-2020
World	2,290,231	4,219,810	5,167,193	6,679,687	43	55	60	68	1.9
Africa	200,111	547,602	824,014	1,488,920	32	43	48	59	3.6
Northern Africa	64,574	123,644	157,849	230,584	46	52	55	64	2.2
Western Africa	54,499	177,189	277,949	516,635	30	46	54	64	4.0
Europe	504,665	552,911	572,890	598,857	70	74	77	84	0.3

Source: World Urbanization Prospects 2018 (extract)

Most of this urban growth in African cities will occur in slums. These slums are characterized by housing units with five main deficiencies: 1) no improved water source; 2) a lack of improved sanitation; 3) precarious housing; 4) insufficient living space and incidence of overcrowding; 5) no claim to secure tenure.

The majority of the world's slum dwellers will live in African cities, whereas all other regions are experiencing a rapid decline in the prevalence of slums.

The UN estimates more than 200 million people in the Africa region live in slums (UN-Habitat 2014). Slum populations are growing at 4.5 percent annually, a rate which will double the population in 15 years (Marx et al. 2013).

The expansion of slums in Africa will be driven by migration from rural areas to urban centers, population growth, and the formation of new households which will drive housing need and the current lack of infrastructure for both the existing and anticipated future housing stock.

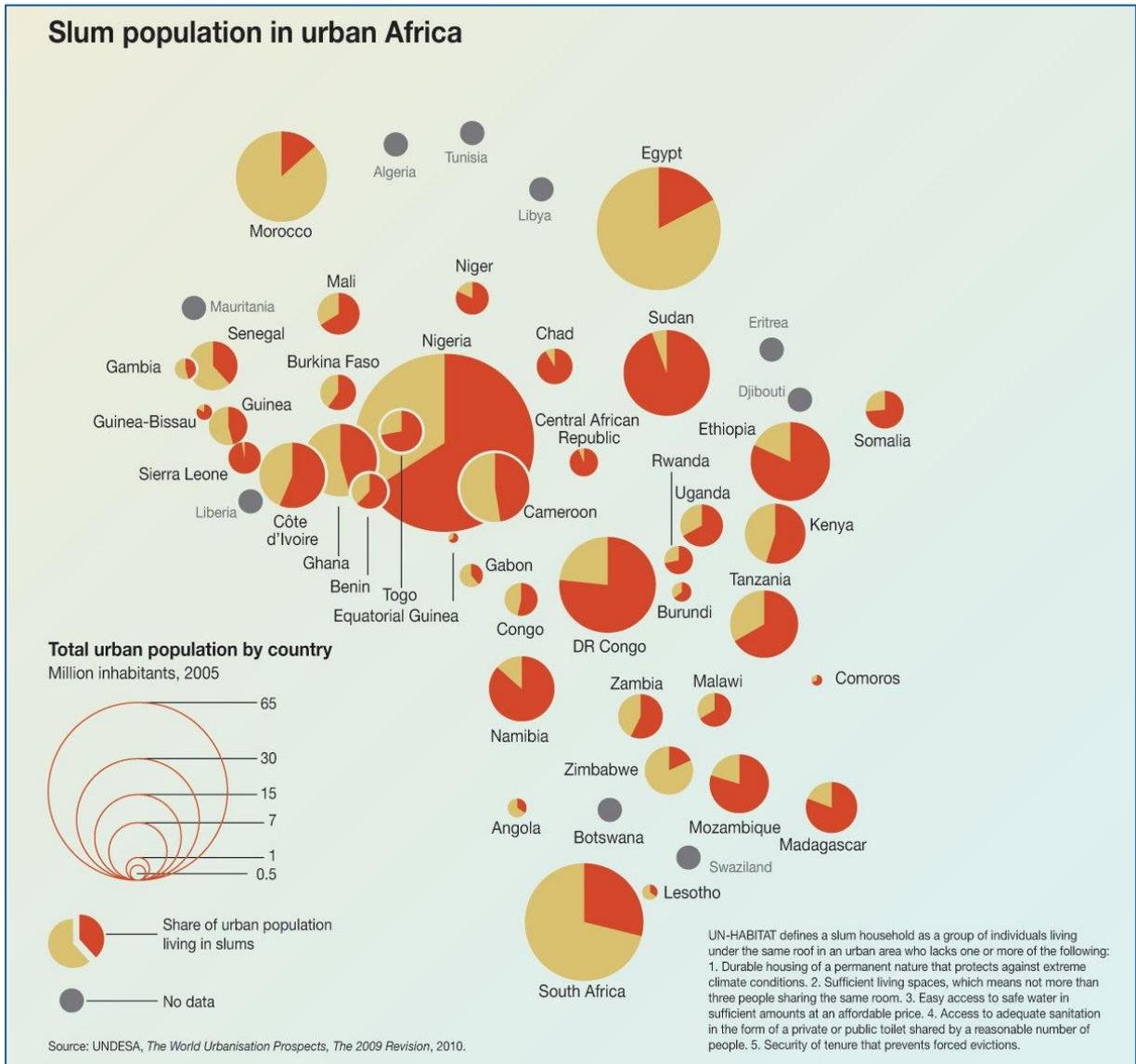


Figure 25: Slum population in Urban Africa

In North Africa, the population increased from just under 200 million in 2010 to 202.7 million in 2011, of which 104.4 million (51.5 percent) were in areas classified as urban. Because most part of North Africa is desert and dry land, cities are very unevenly spread. Most settlements are found along the southern Mediterranean coastal edge and in the Nile Valley and Delta. Specifically, the latter two regions alone account for 35 percent of North Africa's urban dwellers. Egypt alone, with its 82.5 million inhabitants, contributes more than 40 percent of the total population of this part of the continent.



Figure 26: Makoko slum, Lagos, Nigeria.

Source: World urbanization prospects The 2011 Revision UNDESA, New York 2012 State of African Cities (2014), UN- HABITAT

The share of rural-urban migration in urban population growth has become negligible compared to what it was in the last two decades of the 20th century. Most of the North African population now lives in urban areas, with the exception of Egypt (43.4 percent) and Sudan (33.1 percent). As a result, more moderate growth rates of around two percent per year, reflecting primarily natural urban growth, are now the norm in countries with predominantly urban populations. At the national level, these rates are expected to fall to 1.7 percent per year by 2030.

Table 9: Urban and rural Population of North Africa (2000-2050)

Population of North Africa	2000	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050
Total (X100)	169,535	184,384	199,511	215,377	231,210	245,756	259,029	271,092	282,024	291,715	299,888
Urban (X1000)	82,079	91,896	102,249	113,307	125,030	136,873	148,941	161,152	173,175	184,850	195,877
Urban (%)	48.4	49.8	51.2	52.6	54.1	55.7	57.5	59.4	61.4	63.4	65.3
Rural (%)	51.6	50.2	48.8	47.4	45.9	44.3	42.5	40.6	38.6	36.6	34.7

Source: The world Urbanization Projects The 2011 revision in State of African cities in 2014

The West African subregion had a total population of 312.2 million in 2011, of which 140.1 million (44.9 percent) lived in areas classified as urban. Its population became predominantly urban (with 196 million urban dwellers) just after 2020. West Africa is just second to East Africa as the most rapidly urbanizing subregion in the entire continent. Its urban population share is projected to increase from 44.9 percent in 2011 to 65.7 percent in 2050. The table below shows the urbanization trend in this subregion.

Table 12: Population of West Africa (2000-2050)

Table 10: Population of West Africa (2000-2050)

West Africa Population [2000 to 2050]	2000	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050
Urban (X100)	90,777	110,832	134,810	163,104	195,879	233,022	274,819	321,401	372,864	428,878	488,886
Urban (%)	38.5	41.1	44.3	47.1	49.9	52.7	56.4	58.1	60.7	63.2	65.7
Rural (%)	61.5	58.6	56.7	52.9	50.1	47.3	44.5	41.09	39.3	35.8	34.3

Source: The world Urbanization Propects The 2011 revision in State of african cities in 2014

All countries in the West African subregion will find themselves grappling with accelerating rates of urban expansion and the concomitant rise in demand for affordable housing and services. Here, the city population is now increasing more through natural growth and rural-urban migration. The average national level of urbanization in the Western subregion is not as high as in North Africa.

A major feature of urbanization in West Africa since the 1990s has been the rapid city expansion rate in the coastal belt, which constitutes 10 percent of its total are

Table 11: proportion of the population living in slums in West Afrca (%)

Country	1990	1995	2000	2005	2007
Benin	79.3	76.8	74.3	71.8	70.8
Burkina Faso	78.8	72.4	65.9	59.5	59.5
Cape Verde	-	-	-	-	-
Côte d'Ivoire	53.4	54.3	55.3	56.2	56.6
The Gambia	-	-	-	45.4	42.9
Ghana	65	58.8	52.1	45.4	-
Guinea	80.4	68.8	57.3	45.7	-
Guinea Bissau	-	-	-	-	-
Liberia	-	-	-	-	-
Mali	94.2	84.8	75.4	65.9	-
Mauritania	-	-	-	-	-
Niger	83.6	83.1	82.6	82.1	-
Nigeria	77.3	73.5	69.6	55.8	-
Senegal	70.6	59.9	48.9	38.1	-
Sierra Leone	-	-	-	-	97.0
Togo	-	-	-	62.1	-

Source: State of African cities in UN Habitat, 2014

United Nations data show that there are 1,017 urban areas in West Africa with more than 10,000 inhabitants, 104 of which have more than 100,000 inhabitants each, and an estimated 481 new areas have become urban in the meantime.

6.2 Urbanizing patterns

The urbanization trend is very contrasted between developed countries (Europe) and developing countries (Africa). The vast majority of people in developing countries live in rural areas, whereas in developed countries, the vast majority live in urban areas.

In 2018, according to the World Urbanization Prospects 2018 revision, it was estimated that three times as many urban dwellers live in the less developed regions as in the more developed regions (3.2 billion versus 1.0 billion). That year, the less developed regions accounted for 76 percent of the world's urban population and 84 percent of the total world population.

By 2050, with 5.6 billion urban dwellers, the less developed regions are expected to have 83 percent of the world's urban population and 87 percent of the total world population. Europe, with nearly three-quarters of its population living in urban areas in 2018, is expected to reach 80 percent urban by 2040 and nearly 85 percent by 2050.

Africa, on the other hand, remains predominantly rural, with over 40 percent of its population living in urban areas in 2018. Urban percentages for Africa are projected to reach 59 percent by mid-century.

The urban growth observed in Africa has three causes:

- ✓ Natural population growth with an excess of births over deaths;
- ✓ Migration from rural areas to urban centers, which mainly affects young people or from developing countries to developed countries;
- ✓ Reclassification of areas with the incorporation of spaces on the outskirts of cities into the urban space. In this way, the spaces classified as rural areas become urban areas with their population (urban sprawl);

Because of an ancient settlement system, in which cities have developed relatively continuously with spatial interaction modes governed by slow speeds and therefore under strong proximity constraints, Europe is a region of small cities in the world spaced on average about 15 km apart.

As a result, almost half of the population lives in agglomerations of less than 500,000 inhabitants, and Europe is clearly different from other continents in this respect. Conversely, the proportion of the population living in large cities of more than 5 million inhabitants hardly reaches 5%, whereas it reaches 10 to 15% in other regions of the world with the same urbanization rates (where at least three quarters of the population is urban). These proportions will undoubtedly be reached rapidly in the next two or three decades by Asian and even African countries, which are in the process of accelerated urbanization.

What is behind the expansion of European cities is the relative concentration of social and productive forms, urban sprawl with land artificialization.

The proportion of built-up areas varies greatly across Europe. In France, the share of built-up areas accounts for 5% of the total land area, compared with 15% in the Netherlands and Belgium, 9% in Germany, 7.5% in the United Kingdom and 2.5% in Spain.

Overall, in Europe, the increase in built-up areas between 2000 and 2006 was 2.7%. This urban sprawl may be the result of several factors, including policies to support real estate acquisitions and the industrialization of construction. Failure to plan and manage the expansion

of urban areas will lead to serious resilience trends such as housing affordability, traffic congestion, and limited access to labor markets and public spaces, natural risk to communities, loss of the natural environment and ecosystems, lack of basic services.

6.3 Urbanization Challenges

In Africa, the fundamental urbanization challenges are fourfold:

- Contribute to economic growth with priority given to infrastructure. This economic growth means decent and productive jobs;
- Improving city governance by developing partnerships, decentralizing responsibilities, managing the impact on the environment and access to basic services;
- Developing and implementing realistic urban strategies; this requires good planning and strong urban growth management;
- Helping the poorest populations to find better housing through access to serviced land, financing, and massive self production of housing.

In fact, in the large African cities, there is a great imbalance between the urban growth rate and the city economic assimilation opportunities. This is where urban crisis originates and is visible in many ways, including: insufficient and expensive housing, increasingly challenging transportation, insufficient facilities unable to meet the growing population needs, environmental degradation and pollution with unbreathable air. All of these are the ingredients for diseases and make urban life increasingly difficult. African cities are currently experiencing serious crises marked by unemployment, housing, and security issues.

6.4 Urban growth and the housing issue

What appears as a fact in Europe and Africa is that urbanization problems result in housing deficit for city dwellers. The social housing formulas experimented elsewhere in the past have proven to be ineffective to satisfy the housing needs of most people. In Bamako (Mali), between 1976 and 1987, the population growth rate exceeded that of housing: 4.2% against 3.3% (Antoine 1996)

Dakar (Senegal) is no exception with urbanization rate not going in hand with population growth (Tokindang 1998). The city has not been sufficiently prepared to welcome a large population flow, which has gradually degraded the city dwellers' living conditions. In Cotonou (Benin), the housing problem has resulted in the occupation of areas unsuitable for habitation, with a growing number of unhealthy dwellings and homeless people who are now the outcasts of urban society.

Despite the absence of an effective urban policy, city dwellers have been able to activate "social networks" to enable the majority to have access to housing. Thus, newly arrived migrants, as well as city dwellers with housing problems, are mostly taken care of either by their relationship networks, or by relatives or friends. As a result, household size has increased and so has the burden on the working people, which must devote more resources to the sustain the whole household.

To address this issue, housing policies have been adopted by some governments and municipal authorities.

In Dakar, for example, the solution adopted includes several stages. From 1960 to the early 1970s, parastatal housing was planned through the *Société Immobilière du Cap-Vert* (SICAP), the *Office des Habitats à Loyer Modéré* (OHLM) and financial support from the *Caisse Centrale de Coopération Economique* (CCCE). The State was taking care of land servicing while the National Development Bank of Senegal (BNDS) was granting credits to complement the CCCE contribution.

During the 1970s, given the inadequate housing production by these parastatal companies, the State refocused its housing policy and encouraged households to build their own homes while prohibiting shacks. With the World Bank support, it launched the *Parcelles Assainies*, an improved plot program for low-income groups.

From the end of the seventies to the beginning of the eighties, the State created the Senegalese Housing Banque (BSH - *Banque Sénégalaise de l'Habitat*) whose mission was to refocus housing financing and to encourage private real estate development as well as the development of housing cooperatives. The structuring of companies such as SICAP and OHLM led the State, at the end of the 1980s, to give BSH a pivotal role in the new policy by involving households in savings mobilization housing.

The situation in Cotonou is no better than that of other African metropolises. Very little attention seems to have been paid by the various authorities to the housing problems from independence to now, even though there have been efforts in terms of residential building. Now having the city in the hands of the mayor in the decentralization process will perhaps trigger a revolution of the norms.

It is obvious that inadequate housing conditions lead to low morale and poor physical and mental health. According to some authors, the importance of housing also lies in its influence on human behavior and interpersonal relationships

In everyday life, housing issues directly influence people's development because of the significant effect on health. Thus, as early as the middle of the last century, Wilner (1956) classified the different types of diseases related to inadequate housing conditions into four categories: respiratory and childhood infections, digestive disorders, injuries caused by domestic accidents, and skin infections, all of which are due to deficient sanitation, ventilation, and airing systems.

6.5 Urbanization and climate change

Climate change is a challenge for cities with a wide range of consequences. Urban areas are both the major source of greenhouse gas emissions and home to the majority of the world's population that will be affected by climate change.

Urbanization is a sector to be taken into account in the objective of limiting temperatures to 1.5°C because of all the needs it generates (transportation, housing, basic services, etc.) and which all consume significant amounts of energy and consequently generate much of the GHG emissions.

City dwellers will have to face risks such as extreme heat, with a consequent increase in the need for air conditioning.

The effects of climate change may exacerbate the challenges and make it more difficult to address the persistent problems that cities already face, such as poverty, inequality, housing, and infrastructure deficits. Urban planning and design offers many opportunities to develop climate change mitigation and adaptation strategies that prevent the global average temperature from exceeding 1.5°C.

Many cities in Africa and Europe have conducted their greenhouse gas inventories and adopted plans to reduce their emissions through policy levers (planning, adoption of building codes, etc.), nature-based technical solutions that can sequester carbon and regulate local climate.

7. Conclusions

The following conclusions were reached in this report:

In relation to the state of housing demand and supply, complete and up-to-date statistics are lacking in North Africa, West Africa, and Europe. To fill this gap, countries' statistical services should be called upon to set up real databases on housing demand and supply.

The prerequisite would be to clearly define the methods for estimating this housing demand and supply. These databases should be updated based on a good definition of the types of housing, the quality of housing (on the basis of a certain number of criteria including cost, energy performance, etc.).

With regard to the construction sector, this study has shown that in North and West Africa, most of the housing needs are not yet met. A lot more construction will be needed in this part of Africa than in Europe in the decades to come. In Europe, on the other hand, most of the housing stock needed to meet the demand is already built. What the aging European housing stock actually needs is energy renovation.

In Africa, self-building is an important part of housing production because it is the fastest and cheapest way to access property. Housing is rarely built on the basis of environmental standards such as bioclimatic design, the use of ecological materials, the use of low-carbon energy sources and efficient equipment. This is reflected in the number of constructions carried out without a building permit, which allows to make sure that construction standards are complied with.

In Africa, the construction sector is generally hampered by the length and complexity of administrative procedures, the limited supply of serviced plots, the high cost of materials which are mainly imported, and the absence of a construction industry.

In terms of architecture, North and West Africa is characterized by a great evolution of architectural styles. Over time, Africa has moved away from local architecture that offered generally well-designed, comfortable, low-cost housing using local materials to embrace an architecture type that emphasizes Western-style construction systems with imported materials such as iron and cement. The types of housing built become less strong and comfortable due to the lack of mastery of the imposed construction techniques, forcing owners to resort to air conditioning.

With regard to financing, the study showed that both in Africa and in Europe, governments are still looking for the most innovative system to facilitate access to affordable housing. From one country to another, access to housing is facilitated through subsidies, tax credits, incentives, etc. Each of these has limitations, which shows that the issue of financing affordable housing must be addressed through a systemic approach.

In relation to urbanization issues, North and West Africa has a relatively faster urbanization rate than Europe, which has almost completed its urbanization process. This has led to the formation of too many slums, which is a challenge for all governments. The solution could lie in anticipatory policies for sustainable urban development with a strong environmental focus. This would imply the integration of the environmental dimension at all stages of the planning process as a founding element. This environmental approach to urban planning would be applied to operations related to development, subdivision, and urban renewal when developing the various urban planning documents.

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