

# Managing the Urban Environment of Casablanca, Morocco

David J. Edelman

School of Planning, College of Design, Architecture, Art and Planning, University of Cincinnati, Cincinnati, USA

Email: edelmedj@ucmail.uc.edu

**How to cite this paper:** Edelman, D. J. (2023). Managing the Urban Environment of Casablanca, Morocco. *Current Urban Studies*, 11, 96-119.

<https://doi.org/10.4236/cus.2023.111006>

**Received:** February 3, 2023

**Accepted:** March 11, 2023

**Published:** March 14, 2023

Copyright © 2023 by author(s) and Scientific Research Publishing Inc. This work is licensed under the Creative Commons Attribution International License (CC BY 4.0).

<http://creativecommons.org/licenses/by/4.0/>



Open Access

---

## Abstract

This article brings the contemporary thinking and practice of Urban Environmental Management (UEM) to the solution of current and persistent environmental problems in Casablanca, Morocco. Casablanca is the largest city of Morocco and the country's economic and business center. Located on the Atlantic coast of the Chaouia plain in the central-western part of Morocco, the city has a population of about 3.71 million in the urban area and 4.27 million in Greater Casablanca, making it the most populous city in the Magreb region of North Africa (Morocco, Tunisia and Algeria), and the eighth largest city in the entire Arab world. It is also a polluted metropolis with serious urban problems related to its environmental issues. The article first considers the context of Casablanca, and then reviews issues of poverty alleviation, industry, energy, transportation, wastewater and solid waste, water and finance. Finally, it proposes a 5-year plan to help alleviate the city's urban environmental problems utilizing a real world Database and a limited budget.

## Keywords

Urban Environmental Management, UEM, City and Regional Planning

---

## 1. Introduction: Basic Research Information

Urban Environmental Management—UEM (Bartone, 1991; Lee, 1994; Leitman, n.d.) has been receiving increasing attention since 1970 in developing countries, where it has become an area of academic research, professional practice and donor concern. As a field, it is more like planning and engineering rather than geography, economics or sociology, and it represents an integrated view of environmental problems at city and regional levels. Such problems are multi-sectoral (e.g., manufacturing, services, household, etc.), multi-system (e.g., water supply, sanitation, transport, etc.), and multi-actor (e.g., government, NGO,

CBO and private). They require solutions of enormous complexity, and those professionals who coordinate the planning, implementation and management of the process must be able to communicate with experts from many disciplines and professions (e.g., biology, chemistry, engineering, city and regional planning, public administration, social sciences and law) (Edelman, Schuster, & Said, 2017). This article focuses on the practice of Urban Environmental Management in developing countries, which both face more immediate, critical problems than the developed world and have fewer resources to deal with them in a comprehensive manner. In the wake of the HABITAT III Conference in Quito, Ecuador in 2016, such studies contribute directly to understanding the urban environmental challenges inherent in achieving the objectives of the conference's final document: *The Quito Declaration on Sustainable Cities and Human Settlements for All* (HABITAT, 2016).

This study, then, is the report of a graduate-level workshop that took place in the School of Planning (SOP), College of Design, Architecture, Art, and Planning (DAAP), University of Cincinnati, USA from August through December 2022. The objective of the workshop was to prepare students to work overseas in data-poor environments as professional consulting planners. Several lectures were given to set the framework of the mixed class of fourteen domestic and international students to operate in seven collaborative sector-level working groups or teams preparing a 5-year Environmental Plan for Casablanca, Morocco utilizing a real-world database and a limited, but realistic budget (Edelman, 2023).

Casablanca is the largest city of Morocco and the country's economic and business center. Located on the Atlantic coast of the Chaouia plain in the central-western part of Morocco, the city has a population of about 3.71 million in the urban area and 4.27 million in Greater Casablanca, making it the most populous city in the Maghreb region of North Africa (Morocco, Tunisia and Algeria), and the eighth largest city in the entire Arab world.

Casablanca is Morocco's main port and is one of the largest artificial ports in the world. It is the second largest port in North Africa after Tangier-Med and is also home to the primary naval base for the Royal Moroccan Navy.

Considered a Global Financial Center, ranking 54<sup>th</sup> globally in the Global Financial Centers Index rankings for 2022, it outperforms many world cities such as New Delhi, Jakarta, Istanbul and Mexico City. Casablanca is also ranked among Emerging International Contenders, and it is the largest financial center in Africa. The leading Moroccan companies and many of the largest American and European corporations doing business in the country have their headquarters and main industrial facilities in Casablanca. Moreover, recent industrial statistics show Casablanca is the primary industrial zone of Morocco (Explore All Countries—Morocco, <https://www.cia.gov/the-world-factbook/countries/morocco>).

## 2. Poverty Alleviation

Before the French occupied Morocco in 1912, Casablanca was just a small town with a population of 20,000 people. After the French Colonization, new urban policies were implemented in Casablanca, which led to the construction of a new port. This new port became the main administrative and commercial center of the country and attracted a lot of European and rural migrants to the city, a majority of them being from the countryside of Morocco. This led to an increase in the population of the city to over 250,000 in 1936 and 700,000 in 1951. Even though the Jews and Europeans left Morocco after independence in 1956, the city continued to grow. Given that urbanization is one of the main causes of poverty, Casablanca's ongoing urbanization is another element contributing to the city's persistent poverty. This has led to multidimensional poverty, which affects both urban and rural areas in the housing, water, sanitation, food, and nutrition sectors. Urban children experience multidimensional poverty at a rate of 39.7%, whereas in rural regions, the rate rises to 68.7% (Madaar, 2021).

In Morocco, poverty is not usually thought to be a key issue the country faces. However, despite the appearance of wealth in their cities, around 1 in 5 citizens struggle with poverty every day. Data show that in Morocco, 19% of the population lives in poverty, spending less than \$4 per day (Morocco Poverty Rate 1984-2022, 2022). Poverty is most pronounced in rural areas where 36% live in unsuitable conditions, while 24% live below the poverty line in urban areas (Poverty & Equity Brief). The wide income inequality among the country's citizens highlights the level of disparity of economic and social growth as a country. It is observed that there is better stability in the regions where the government decides to invest, but this does not guarantee that social inequality will disappear or even decrease.

Casablanca is the second largest city with one of the densest populations in Morocco. The 2014 census reported 3.4 million residents, representing 11% of the country's total population. Around a quarter of the population of Casablanca is under the age of 15, making it a very young city with huge potential to grow and educate the young and upcoming workforce. Casablanca is an important financial center and is home to the country's main port, attracting businesses and workers alike. People from around the country come to Casablanca to find job opportunities in the bustling port and seek to escape rural poverty. Prior to COVID-19, poverty had been on the decline in Morocco, but the urban-rural gap in poverty rates continues to be large. Casablanca is considered a wealthy region due to the constant government investment and the economic development the city experiences, but poverty is still a persistent issue due to inequality of resources and marginalization of the lower class. The gap between rich and poor has gotten extreme, putting pressure on less fortunate citizens to scrape out a living. The concentration of wealth can be seen mainly in a handful of districts that share borders with the shanty towns.

Casablanca's economic development is struggling to keep up with the growing population, causing a rise in unemployment due to an oversaturated labor market. Compounding the unemployment issue, affordable housing is very difficult to find in Casablanca, pushing people to live in shanty towns where living conditions are appalling. Because of a lack of opportunity in rural parts of the country, the lower class is forced to live in deplorable conditions in the city, rather than return to the countryside with no hope of earning an income.

Following the Protectorate in 1912, people across Morocco came to Casablanca dreaming of opportunity and a better life. The city had a thriving population through the 1960's, 70's and 80's. However, housing was not given appropriate priority, and the city was not planned to account properly for the growing population. What we have in contemporary days is the result of decades of gentrification, with areas sectioned off to the wealthy Moroccans, who are able to buy desirable properties across the city, and designated districts for low-income families, segregating the city's rich vs poor. With rising unemployment and high demand for real estate, poor people don't have enough money to cover their rents and are left to live in the street or in overcrowded areas.

Casablanca is estimated to have 500 shanty towns (Connelly, 2014) where the poor live in overcrowded houses and miserable living conditions. These shanty towns are created as a consequence of the housing crisis and the lack of resources for families to cover their basic needs. Many believe that the housing crisis has come as a result of lack of planning and unorganized growth, with not enough thought given to where an expanding population would live. Shanty towns are estimated to have 111,500 families (Ibid.) living below the poverty line. These areas have limited access to water and high rates of illiteracy and high unemployment and are especially hazardous for children, where they have a much higher mortality rate than the rest of the country. Rampant with drug activity, these slums can be very unsafe places to live.

Currently, Morocco's yearly urban growth rate is between 3% and 4% (about 120,000 units). Even though the government is committed to creating "cities without slums," housing construction rates are insufficient, and new informal settlements keep growing. Similar to other nations, these communities are frequently situated in hazardous locations and comprise the poorest households (Ibid.)

No other city more aptly represents Morocco's economic "glory" than Casablanca, which is an economic hub, industrial center, and entryway to the outside world. Yet, its 3.7 million inhabitants are plagued by severe social inequality, and the COVID-19 pandemic has made hunger worse for many of them. In addition to the COVID-19 pandemic's issues, the nation had a severe drought in 2019 and 2020, which had a significant effect on the rural and agricultural sectors. The pervasive hunger in Morocco is where this effect is most noticeable (Madaar, 2021). Although Casablanca is in many ways a wonderful city, to be able to keep up with the economic development and growth the city needs, it

must create a plan that will fight poverty, income disparities, social inequality, and the marginalization of large parts of its population.

### 3. Industry

Prior to the entry of France, with its influence and investment, and, later, the establishment of the French Protectorate, Casablanca and Morocco as a whole had an industrial sector based solely on traditional methods. Goods, such as textiles, pottery, olive oil and others, were produced not in factories, but by traditional artisanal techniques. The agricultural sector was in a similar state, using outdated and rudimentary techniques on miniscule plots, with many farmers only able to carry out little more than subsistence farming (Perry, Clark, & Carey, 1962).

When French investment and development began to flow into Morocco, however, so did modern techniques and equipment. Nevertheless, while infrastructure was constructed, farms using modern techniques and equipment were established, and modern factories were constructed, all of this development was *not* done to bring Morocco's economy up to modern standards, and to enable it to eventually compete with already developed countries. The French were not aiming to create an equal out of Morocco; instead, *the goal was to develop specific industries in Morocco to turn the country into an important cog in the greater machine that was the franc zone*. Accordingly, French-led development was specifically targeted, only aimed at industries that could export either goods or raw materials that the French desired, or at supporting sectors, for example: infrastructure, namely roads, railroads, bridges, and ports. The result of all this development and modernization was a lopsided economy, one oddly with sections both highly modernized, and severely antiquated (Ibid.).

With the end of the French Protectorate, Morocco struggled to complete the modernization begun by the French, seeking to modernize fully, not just in the areas developed by the French, but the economy as a whole. However, this effort had several major obstacles to overcome upon independence, Morocco saw a severe flight of foreign capital, technicians, and entrepreneurs, creating a painful lack of trained personnel and capital. This was also not helped by the state of the educational system at that time either. Moreover, the southern former Spanish territories were far behind the north, and except for the Jewish population, very few Moroccans received any form of secondary education. Additionally, there was a need to convert the entire education system from the French language to Arabic, but this effort ran into two problems: a lack of Arabic textbooks and teachers, and a lack of scientific vocabulary in Arabic. Additionally, many important governmental, and other public positions, were filled by Frenchmen, as there were not enough trained Moroccans. In 1962, this issue was partly relieved by an agreement with France that provided technical and educational aid (Ibid.).

Casablanca, saw great growth during the Protectorate, with its economic development based on exports to France and reliance on imports from the franc

zone. Casablanca's port turned the city into a critical part of the Moroccan economy, as industries flocked to Casablanca for its ease of import. Exports also flowed out of Casablanca's port, notably phosphates. Until the port of Safi was enlarged in 1936, Casablanca had the only port in the country able to handle phosphates (Habti, n.d.).

In recent years, Morocco has steered many of its resources towards a number of different sectors that have been identified as having potential to help grow the economy, resulting in large investments in the automotive industry, aeronautics, and aerospace. With Casablanca accounting for 33% of the country's exports and employing 56% of the country's labor force, this has drawn some of the largest companies within these new industries such as the OCP Group, Renault, and TDM Aerospace (*Morocco Now*, 2021).

The challenge the country faces is the overwhelming concentration in exports. While Morocco has diversified its market and is able to export many different items, only a handful of firms produce these goods. The top 1% of exporters deal with 55% of the country's total exports, and the top 5% deal with 77% of the total exports. This equates to a total of 54 and 266 different firms respectfully. To deal with this problem, private companies should step up and take on a bigger role in the country (IFC, 2019).

#### 4. Energy

Energy has over the years become a major topic in many policy and development discussions in Morocco and the world. The rapid growth of Morocco's population, the increase in infrastructure, industrial growth, and improving quality of life has translated into a very high requirement for energy. This rapid growth in demand has called for some reforms and transformations in Morocco's energy sector. These have yielded excellent results in terms of improving the energy sector to provide energy in the right amount that will meet growing demand. Morocco currently holds the title of the global leader in the transformation of its energy sector into a more environmentally sustainable, secure, efficient, and financially feasible sector (*Morocco-Energy-Policy-MRV*, 2018).

The provision of energy in Morocco dates to the twentieth century when the French colonizers of Morocco engineered the production of electricity to help them extract raw materials, mainly phosphates, to improve the productivity of the mine, as well electrify the railway network which served as the transportation means for raw materials to the metropole (Saul, 2002). Moustakbal (2021) mentioned that somewhere around 1924, concessions were granted for electricity to be produced and distributed in Morocco.

Energy consumption in Morocco has been increasing rapidly since 1965. Population growth and the rapid advances in industrial and infrastructural development have caused increased consumption of energy in all forms. However, Morocco selected oil as its primary energy form in the 1960s and 1970s even though the country did not have any oil sources (Ibid.). Thus, oil formed 80% of

Morocco's energy mix in the 1980s (Mouline, 2012). Nevertheless, the oil crisis in 1971 caused Morocco to consider increasing the share of coal in its energy mix (Moustakbal, *op. cit.*). The country began to diversify its energy supply.

According to Amegroud (2015), Morocco launched a ruthless program to develop utility-scale renewable projects and make use of the wind resource in the extreme northern sector of the country. In December 1996, Morocco adopted the use of natural gas in generating power after the inauguration of the Maghreb-Europe gas pipeline (Ibid.).

Also, the Moroccan wind energy program was formulated and implemented by the Moroccan government to bridge the energy gap of the citizenry. The program was implemented and overseen by ONEE (Schinke, Klawitter, Zejli, Barra-di, Garcia, & Leidreiter, 2016). The aim of the program was to reach the government target of 2 GW of installed wind power by 2020.

With regards to hydropower, the Moroccan government set a target of 2 GW by 2020 (Alhamwi, Kleinhans, Weitemeyer, & Vogt, 2015). Given that 1300 MW are already installed, this target may seem less ambitious than the solar and wind targets. However, most of the current hydro stations need serious repairs. Also, the three government targets of 2 GW each for solar, wind, and hydro power are to lead to a share of 42% of installed power capacity from renewable energy in 2020. Based on findings from the energy strategy, renewable energy is expected to produce about 10% to 12% of the primary energy supply in 2020, while it provided only 5% in 2009.

Moreover, the Energy Efficiency Policy was implemented to help meet the energy demands of Morocco. The national energy strategy emphasizes the need to use energy efficiently. The strategy also recommends certain measures that are currently being undertaken, with some already implemented (Choukri, Naddami, & Hayani, 2017). The government has set a target to achieve a 12% energy efficiency gain by 2020 and 15% by 2030.

From a review of literature on the energy situation in Morocco, it is clear that the major challenge facing the energy sector in the country is its high dependence on non-renewable energy. Irrespective of the many development made in the production of renewable resources, the amount of energy generated from these renewable sources is still not sufficient to meet the increasing demand for energy. In addition to the financial burden on the Moroccan economy due to the importation, the environmental pollution from the use of coal is also a major challenge.

The action plans proposed here to address this challenge are formulated within the scope of the priorities adopted from the Morocco Energy Policy. These policies are as follows:

- Increase the share of renewable energy in electricity production to 52% of installed capacity by 2030.
- Substantially increase the use of natural gas by building the infrastructure needed to increase liquefied natural gas imports, replacing higher-emission

use of coal and oil.

- Substantially reduce fossil fuel subsidies and continue recent significant efforts towards this end.
- Increase demand-side energy efficiency to reduce domestic demand by 15% by 2030.

Based on these priorities, 5 projects have been proposed to address the energy challenges of Morocco as discussed earlier. *It is important to note that these projects are proposed to be implemented in Casablanca, the focus of this study:*

- Project 1: LED (ITALO 3) Street Lighting Expansion Project.
- Project 2: Landfill Gas to Energy Project.
- Project 3: Casablanca Photovoltaic Solar Plant.
- Project 4: Boujdour Wind Farm Project.
- Project 5: Casablanca Wave Power Project.

## 5. Transportation

As noted earlier, from the late 1970s through the 1990s, Morocco saw a sustained rural to urban migration. This rapid urbanization in combination with constant population growth has now been a pattern for the last few decades. The urban expansion of Casablanca has always been at a pace difficult for the planners to cope with. Urban plans were obsolete even before they could be adopted, much less implemented. This became a primary reason for uncontrolled growth and slums. For the first time, a 25-year plan was approved in 1984; the city then had an outline. Its main focus was to move away from the concentric pattern of development and resort to a multipolar, integrated pattern of development. Two of the most prominent themes in the proposals were addressing mobility issues and the implementation of mixed-use neighborhoods.

Unlike the urban authority in charge of executing the plan, there was no transportation authority to undertake implementation of the plans made to improve mobility. Lack of adequate infrastructure led to the failure of the master plan. Creation of new residential and commercial blocks was not viable, as planned mobility expansions were never constructed.

In 2004, the first Metropolitan Transportation Plan (MTP) was proposed to bridge the lack of travel infrastructure and public mobility needs. Later the MTP was set up to oversee the matter of transport planning in the Greater Casablanca Region.

As with any country that is or has fairly rapidly urbanized, car ownership has overwhelmed the capacities of roadway infrastructure. There are approximately 1.25 million personal automobiles registered in Casablanca, amounting to around 370 cars per thousand people. Although this certainly does not make Casablanca the most congested city in the world by any stretch of the imagination, nor does it approach the highest level of car ownership per capita, but the number of vehicles on the road has become a point of contention and has inhibited efficient mobility within the city. 42% of commuters use a personal car for their commute



to and from work or school.

The city does have taxis, large and small, as well as public transportation. Casabus, operated by Alsa (a Spanish transportation company), is the recently contracted public bus operator in Casablanca, which the city selected after the city council chose not to renew its contract with the previous operator M'dina. M'dina was the source of immense corruption and a complete failure. Beyond basic safety, service quality (route coverage, service frequency, and reliability) seems to have greatly improved and is expected to continue to do so.

The tram in Casablanca plays a large role in the local mobility of the population. It is a low-speed network with at-grade street crossings despite having a separate right of way. With roadway capacities being exceeded and bus service being not only impractical but actually potentially dangerous, there was a demand for higher level transit mobility solutions. The idea of implementing a metro had been under consideration long before the tram, but it got more serious attention around 2010. After a number of different factors were considered, it was deemed that a metro system would be too expensive and a number of alternatives were implemented, of which the Casatram is one. Finished in 2012, it consists of 2 routes amounting to 47.5 km (29.5 mi) and very quickly met its ridership goals. It actually exceeded them, reaching around 100,000 trips per day after just one year, 20,000 more than projected. As a result of this immediate success, it was announced that a metro route would be constructed. In the end, this was cancelled but shows that there was demand for the additional transit capacity. Since then, ridership has greatly increased, and the system in its current state is reaching its capacity.

Another alternative implemented to avoid the costs of the many-times-proposed metro is the Al Bidaoui (previously called TNR-Casablanca Mohammed V Airport). Finished in 1993 the popular suburban commuter rail provides connections to the seaport and to the airport, two major employment hubs. Having achieved higher ridership than expected, double the amount of equipment was ordered just a few years after service started, proving the importance of this route.

Casablanca is also a major hub in the national rail system. Train Navette Rapide connecting Casablanca-Kenitra. This section is an expansion north of the route that connects Marrakesh and Casablanca and has become a popular commuting corridor that gives Kenitra access to Casablanca and its seaport.

The Al Boraq is the first and only high speed rail network in Africa, connecting Casablanca, Rabat and Tangier along a previous intercity route. Completed in 2018, this massive project proclaimed Morocco as a modern and technologically advanced nation that was ready to conduct business with the world. With close proximity to Europe, ports, and now a fast connection between the two cities most likely to get foreign investment and the capital, this certainly seems potentially appealing. Opponents see this as a poor reason to spend such a large amount of money and feel as though there are many more internal issues that

are much more important than a fast train. Although this certainly will not benefit low-income populations, the high-speed rail is not just a luxury good for the wealthy. In examining the cost of a Casablanca to Tangier ticket as it compares to the dollar based on the average annual income of both Morocco and the United States, it costs just over \$30. This allows access to potential business or travel at a price that is not cost prohibitive for the majority of the Moroccan population.

The seaport of Casablanca is one of the most important features of the city simply because it is the main reason for its existence. The port sees 21.3 million tons of cargo annually on its 8 km (5 mi) long 1500-acre site capable of mooring 35 large cargo ships. Phosphates are the largest export from the port, with a processing plant located nearby. Many components for Renault/Dacias are also received at the port and sent to the various manufacturing sites around the country. Some bulk material is shipped through the port, but much of the freight traffic is containers. The container section of the port is nearing capacity, and, as part of the 2030 plan, other ports with more capacity to expand and spread wealth more evenly in the country are receiving far more investment. The port of Casablanca is now the second most productive port in the nation as major phosphate production has been constructed near Jorf Lasar, which now has the top spot. Because much of the cargo in the container terminal is not actually entering Morocco, there is not as much transportation connectivity as one would imagine, but there is a sizable rail yard and immediate access to arterial roadways.

Phosphates are Morocco's largest export, reaching MAD 78 billion (\$7 billion) in 2022 (Rahhou, 2022), making them the world's second largest exporter of phosphates, behind only China (Pistilli, 2022). This significant increase, however, is not as much an increase in production as a change in the political environment that has seen a dwindling availability of Chinese and Russian phosphates as a result of Russia's invasion of Ukraine.

ONCF, the state railroad of Morocco, historically had been the primary means of transporting phosphates to processing plants from mines. In 2014, however, OCP, the state-owned phosphate mining company, opened their newly constructed 187 km underground pipeline, vastly changing the logistics of transporting this material and increasing capacity immensely.

With the pipeline, ONCF was forced to diversify rather rapidly its freight customer portfolio. Although no other mine is currently poised to construct a pipeline, the possibility to do so is now on the table and needs to be planned for. Renault in Casablanca was one of the main ways in which the ONCF diversified. ONCF operates 8 trains daily moving mostly Sanderos to ports and into Africa. Despite their diversification, by far their largest client is still OCP. Being publicly traded, they are under pressure to remain at the forefront of transportation but seeing as they are the only freight railroad in the kingdom, and with no other phosphate pipeline as immediately feasible, there seems to be a relatively low

risk of their demise.

## 6. Wastewater and Solid Waste

Water is a scarce resource in Casablanca. This scarcity stems from the arid climate in parts of the region. Despite Casablanca's close proximity to the ocean, sources of fresh water are few and far between. The availability of water resources per individual has been declining rapidly for decades. Today, water resources per inhabitant are around 700 m<sup>3</sup> per capita per year. With 14 million people, approximately 35% of the population, having less than 500 m<sup>3</sup> per capita per year (Mandi & Ouzzani, 2013) has become serious. Water scarcity is becoming a permanent situation that can no longer be ignored leading the use of water in the region to be deliberate.

Historically, the treatment of solid waste and wastewater has been insufficient. In the 1980s, housing developments in areas on the periphery of Greater Casablanca were not connected to municipal sewers. Due to a lack of adequate municipal financing, primary and secondary sewers were not extended beyond the Greater Casablanca city center.

To help increase the percentage of Casablanca's population connected to proper sewer systems, those who lived in slums in the 1980s were relocated by the government into low-cost housing developments within the limits of the Greater Casablanca Urban Master Plan so that sewer lines could be provided. As slums were in areas of unfavorable topography and geographical conditions for the construction of sewer networks, moving slum dwellers was most cost effective.

Before the proposition of the Greater Casablanca Sewerage Project of 1987, all domestic and industrial wastewater in the Greater Casablanca area was discharged without treatment into the Atlantic Ocean at the coastline, polluting the coastal waters and beaches. This project, however, was developed with five main goals. These were to:

- “prevent further deterioration of the existing sewer systems in the Greater Casablanca area through an extensive rehabilitation program;
- keep abreast of the increasing domestic and industrial demand for sewerage and storm drainage;
- identify the least cost alternative for the treatment, disposal and possible reuse of wastewater and reduce the impact of wastewater discharge on the environment;
- provide for effective operation and maintenance of sewerage facilities and standardization in the quality of design and implementation of the sewer extension works, and
- promote the creation and development of appropriate institutional, financial and technical structures to manage sewerage services in urban centers.” (World Bank, 1987).

Despite the Greater Casablanca Sewerage Project of 1987's goals, surveys and studies from the mid-1990s showed a considerable delay in wastewater treat-

ment. These delays stem from the lack of basic infrastructure for sewage systems, a national connection rate of only 70%, and a low level of wastewater treatment. This low level of wastewater treatment is hampered by the many wastewater treatment plants (WWTP) that were out of operation (Chlaida et al., 2011). At this time, nearly half of the constructed WWTP were out of operation.

Over a decade later, the scarcity of fresh water remained a major issue in the region. With this, the reuse of wastewater was one of the major priorities of the National Sewage Treatment Plan of 2005 (Ibid). At this time, the increase of population led to an increase in wastewater discharge, and the wastewater treatment plants could not keep up with this increased discharge.

As of February 2021, the national sewage connection rate was 82%, a significant improvement from 70% in 2006. Even more impressive, the wastewater treatment rate has increased to 56% in 2020 compared to 7% in 2006 (El Morabit—Morocco World News, A., 2021). This stark increase in wastewater treatment is still a far cry from the goal of 100% treatment and reuse or recovery by 2030. With less than a decade left to increase the wastewater treatment to 100%, significant work will still need to be done.

Even though there has been extensive work done to increase the connection to sanitary sewers, many of Casablanca's residents still have limited access to clean water. Due to Morocco's geography and climate, fresh water is a scarce resource. Consequently, Morocco is also looking at creating new drinking water through desalinization and the reuse of water it already has through potable reuse of wastewater.

Proper solid waste management is threatening Morocco's largest city. As landfills continue to overflow on the outskirts of Casablanca at an unruly rate, the rest of the population is forced to deal with the consequences. Moroccans have also left solid waste to pile up in the dense urban streets and alleyways of the city, due to the improper disposal and collection of trash. These waste issues, now looming in their backyards, have been linked back to the government's lack of infrastructure and quiet stance towards solid waste in the past, in addition to their lack of suitable funding for restoring existing landfills and maintaining new ones. Although minimal efforts have been made in the past, solid waste continues to become an ever-growing health concern for its citizens, as it can cause an array of diseases ranging from skin irritation, allergies, asthma, and many other respiratory illnesses. Solid waste management needs to be addressed immediately in order to ensure that the people of Casablanca remain healthy. This entire process can be enhanced in a variety of ways, such as improving upon Morocco's traditional waste disposal methods, building new infrastructure, and revising the legal framework. However, if one thing is clear, it's that more resources must be employed in order to provide the necessary support for proper solid waste management within all of Greater Casablanca.

Today, almost 7 million tons of solid wastes are generated across the nation annually and over 50 percent of that waste is openly dumped. This long-term

issue is exacerbated by Casablanca's over 3 million residents, as they remain the largest contributor to Morocco's total solid waste generation (Dalberg Advisors, WWF Mediterranean Marine Initiative, 2019).

Additionally, it is clear that Casablanca needs to invest in appropriate infrastructure for better solid waste management and craft a more sustainable solution for its growing population. The proper collection and storage of solid waste is severely lacking and must be vastly improved in order to protect the safety of Morocco's environment and ensure that proper solid waste management practices are adopted. Currently, Morocco only recycles about 8% of its municipal solid waste, but it has targeted reaching 20% by 2030, according to a report presented at the European Union (The Climate Chance Observatory Team, 2020). In order to meet its recycling goals, Morocco will need to invest in new sorting centers. These centers will need to be staffed with workers who are trained to handle trash and recyclables in a safe and environmentally friendly manner (Makhfi, 2015). By establishing new sorting centers, Morocco can create jobs for thousands of its citizens and give a whole new meaning to the term "waste-picker."

Finally, Morocco still uses traditional approaches towards solid waste management by burying its waste in landfills. The main issue with this is that it takes up valuable land, which could be used for other purposes, and it can also lead to the environmental/physical health problems previously mentioned. Landfills can also become expensive to build and maintain, considering they only prolong the inevitable chance of reaching max capacity. There are not enough resources for a decentralized waste management plan, making it difficult for many municipalities within Morocco to have their own proper landfills.

Casablanca has begun exploring alternative methods, like incineration, to solve some of their longer-term issues. Incineration is another way of dealing with waste, and it has some advantages over landfills. Waste-to-energy plants, which use combustion technology to burn waste in order to generate usable energy such as steam, electricity and hot water, have proven to be effective in other countries with proper waste sorting methods already in place (Eliason, 2019). Also, it is limited in its viability for Casablanca because the majority of its solid waste is organic. Moreover, constructing one of these waste incineration plants is very costly and not likely within Casablanca's foreseeable future, since most of the waste produced there is still non-renewable. Morocco must first take the steps necessary to ensure public health by constructing new sorting centers near controlled landfills, revising the legal framework, and, ultimately, getting the citizens of Casablanca to make a better effort towards proper waste disposal methods.

## 7. Water

Casablanca is located on the arid, western coast of Morocco, and nearly 99% of the city's drinking water is transferred from other areas. For instance, ground-

water from Maamoura and surface water from the Bou Regreg Basin are exploited for Casablanca's water needs ([The Nature Conservancy, 2022](#)). Like most of Morocco, water demand exceeds available natural resources in Casablanca leading to increased water stress. With the growing intensity of climate change playing out in recent times as severe droughts in Morocco and putting more strain on available water resources, the need for robust and sustainable water management planning for Casablanca has never been as urgent as it is now.

About 31% of Morocco's drinking water comes from groundwater sources, while 69% of the country's drinking water comes from waterways, specifically seven (7) major rivers: the Loukkos, the Moulouya, the Sebou, the Bou Regreg, the Oum Er-Rbia, the Tensift and the Souss-Massa-Drâa. Except for the Loukkos River, all these rivers originate in the Atlas Mountains, meaning that most of Morocco's water is generated from snowmelt which exists in the mountains ([Jern, 2022](#)).

Further, Morocco's rainfall provides 140 billion cubic meters of water annually, but it is estimated that 118 billion cubic meters of this amount evaporate. So, only about 22 billion cubic meters are gathered for use, and from this amount, only 80% is economically exploitable, that is, 17.5 billion cubic meters ([Fanack Water, 2019](#)).

In addition, the natural water sources in the Greater Casablanca region are rivers with low water supply potential, including the Oued El Malleh, Oued N'fifikh, Oued Hassar, Oued Bouskoura and Oued Merzeg with 102.9 mm<sup>3</sup> of potential contributions ([Morocco Synthesis Report for Decision Makers, 2013](#)). Groundwater storage in the region is also on the decline and water tables are known to be in a marginal geographical situation, deeper than surface water sources, but not percolating deep enough for long-term recharge of aquifers. Also, while Casablanca receives about 400 mm to 500 mm of rainfall per annum, most of this is lost to high evaporation rates, and climate change predicts lesser amounts in the future.

Clearly, Casablanca, which is the capital of the Casablanca-Settat region, and home to almost 20% of Morocco's population and key industries, does not have sufficient natural water resources. The Moroccan government has attempted to alleviate this concern through inter-basin water transfer. The Oum Er-Rbia River, which is the second largest in Morocco after the Sebou River supports inter-basin water supply to Casablanca.

Within Morocco, industry uses about 6% of water resources, domestic categories use 8%, while the agricultural sector uses 86% ([Fanack Water, 2019](#)). Interestingly, the agricultural sector which employs 80% of the Moroccan rural population is both the largest water consumer and the largest contributor to water losses. The government has directly related agricultural irrigation to water loss as irrigation methods are inefficient, and older infrastructure is prone to leakage.

In the Casablanca region, water usage follows a similar pattern to country-wide water usage. However, Casablanca is an urban area which supports

about 32% of Morocco's production units and attracts 56% of industrial labor, and, as such, water use is higher for domestic and industrial purposes than in agriculture within the city (Mayors Summit, 2004). Nonetheless, the same Oum Er-Rbia River Basin supplies a wide agricultural area surrounding Casablanca's urban sectors, which presents a potential threat to Casablanca's urban water supply. With industrial expansion and intensified urban sprawl in the Casablanca area, greater migration of Morocco's population to the city is imminent, and with that, higher demand for water.

Currently, the three most produced crops in Morocco are sugar beet, wheat, and potatoes, all of which are water-intensive crops. In terms of reducing water stress from agriculture and irrigation, an option would be eliminating or swapping current water-intensive crops with those which are less water-intensive. Implementation and production of alternative crops with lower water demand can potentially reduce agricultural water consumption.

Water supply in Morocco has faced severe challenges in recent times. First, although Morocco's rainfall provides about 140 billion cubic meters of water annually, between evaporation and other economic factors, only 17.5 billion cubic meters are collected for use. Also, water reservoir levels plummeted from 62% in 2013 to 32% in 2022 thus reducing potential reservoir water storage from 15 billion cubic meters of water to just about 5 billion cubic meters. Additionally, sedimentation due to erosion and runoff from degraded land has reduced the storage capacity of dams significantly and contributed to water pollution concerns, while issues of water contamination and saltwater intrusion into freshwater aquifers further increase water-scarcity issues in Casablanca.

Related to runoff, Casablanca has a densely built-up environment and subsequently a lot of impermeable surfaces. This prevalence of impermeable surfaces contributes to poor groundwater regeneration in much of the city's sectors as runoff is encouraged and with that, the transport of pollutants. Although the city does not appear to show any signs of sinking due to this issue, it is still a major problem as it disrupts the natural ecological systems of the region and coastal environment.

Reduced rainfall over time due to climate change drives the intense droughts that have made less water available for use in Casablanca. Primary sectors such as water, agriculture and human health are expected to be impacted greatly by such droughts in the future leading to overall economic losses, livestock stress, reduced crop yield, as well as human casualties. It is estimated that Morocco experiences drought every 3 years on average (The Nature Conservancy, *op. cit.*).

Inefficient water use and significant water losses comprise another problem in Casablanca's water sector, and by extension Morocco's. Leakages in drinking and irrigation water transport and distribution networks are a challenge in Morocco as much of the country's water-based infrastructure need retrofitting and/or replacement due to deterioration. Water loss due to evaporation in reservoirs has also been highlighted as an area of concern that needs to be addressed.

Furthermore, over-extraction of groundwater has led to a drop in the water table of ground aquifers. In fact, only shallow aquifers are present in the Casablanca area, a situation further complicated by the highly urbanized nature of the city. The prevalence of impermeable surfaces in Casablanca impedes the natural regeneration of these aquifers and contributes more to contaminated water runoff.

According to The Nature Conservancy, most of Casablanca's water supply is affected by sedimentation and some nutrient pollution due to runoff from agricultural lands. This is understandable as agricultural lands surround the city and erosion is a main challenge in the region due to degraded land.

Other internal sources of potential water pollution in Casablanca include the Industrial and Domestic sectors. [Smahi et al. \(2013\)](#) investigated the environmental effect of landfills on Casablanca's groundwater quality and noticed an important qualitative degradation of the groundwater. The Casablanca landfill was one of the many uncontrolled and unlined dumping sites in Morocco at the time of the study. Groundwater has also been polluted by the use of pesticides, insecticides, rodenticides, fungicides, and herbicides.

In general, the government of Morocco has been very proactive about addressing water concerns. The passing of Law 10-95 in 1995 was a breakthrough in Moroccan water policy. Law 10 - 95's main objective is to rationalize water use, provide universal access to the resource, reduce disparities between cities and villages and ensure water security across the country ([Fanack Water, op. cit.](#)).

The following are some of the more specific action steps taken by the Moroccan government. The inter-basin water transfer plan is one of the Moroccan government's most proactive strategies to water management.

The scheme consists essentially of a water pipeline from the Northern "water-rich" region of Morocco to the Southern "water-scarce" regions of Moroccan deserts. As noted earlier, Casablanca is one of the areas in Morocco served by inter-basin water transfer, specifically transfers from the Oum Er-Rbia River, which is the second largest in Morocco.

In Casablanca, under the supervision of the National Office of Electricity and Drinking Water (ONEE), construction has begun on a 7 km pipeline which transfers water from Northern Casablanca to the Médiouna Reservoir in Southern Casablanca. This pipeline project hopes to "ensure optimal management of the available water resources at the Sidi Mohamed Ben Abdellah dam and the Oum Er Rbiaa basin."

Dams are effective at visibly controlling and managing large bodies of water as a resource. Their ability to provide more water storage capacity is essential in combating water scarcity in Morocco. As part of the 2020-2027 National Water Plan (PNE) which has an overall budget of about \$11 billion alongside its subset—the National Priority Program for Drinking Water and Irrigation (NPP), one large dam and twenty smaller ones are planned specifically for the Casab-



lanca-Settat region.

Seawater desalination and wastewater treatment and reuse have also been implemented as a strategy for water management in Morocco. Treatment of wastewater for reuse in agriculture is also being implemented in Morocco.

The proposed Casablanca Integrated Water Management Plan (CIWM) includes a 5-year integrated water management approach to regulate water use, conservation, recovery, and retention using green infrastructure, improved agricultural practices and government policies. This proposed integrated water management plan consists of 3 goals, *to reduce usage, increase availability, and rehabilitate the ecosystem*. Within these goals, five strategic guiding steps to the proposed Casablanca Integrated Water Management (CIWM) Plan are specified here.

These five guiding steps would be set out in a 5-year plan to address the fundamental water issues identified in Casablanca, and hopefully provide some guidance on water management in Morocco as a whole. The CIWM Plan, which aims at water conservation, improved accessibility to water and ecosystem restoration, is just what is needed in arid Casablanca, which is under extreme climate threat. The introduction of green water infrastructure combined with strong implementation of water conservation policies and optimization of existing infrastructure in response to water stressors will not only prove valuable in Casablanca but potentially set up the city as an example for other rapidly growing cities in developing countries to follow.

## 8. Finance

The role of the Finance Team was to assign a budget for projects to be undertaken in the next five years based on past funding and future government capacity. This team's methodology began with relating the Moroccan government structure to the country's financial sector and the economy. This was followed by research into the Moroccan GDP, Debt, Foreign Aid, Public Program Funding, and Financial Spending History. The budgets for Casablanca and Morocco are not widely publicized. Finding information about how the government directs money into external programs is a challenge. Despite recent efforts to increase government transparency, the documents released are still nonspecific. Information came from press releases, government sites, international development banks, and both local and international media.

In the twenty-first century, Morocco has put effort into economic growth and privatization of industries. Unfortunately, it experienced setbacks typical of a strong central government, primarily, that the structure was not there for small, medium, and large private enterprises to thrive, and decreasing central control decreases officials' power. When coupled with worldwide economic instability and droughts, Morocco's vibrant plan for economic success was generally unsuccessful.

After years of GDP increase from a diversifying economy and higher prices

for phosphates from Western Sahara, economic growth was on the decline (Britannica, n.d.). The government attempted to stimulate economic growth with heavy public investment, but it was limited by its debt to GDP ratio for standard loans and its relatively strong economic position for development bank loans. In 2019, the improvements were the result of a good crop year and the long-term impact of policies encouraging aeronautics and motor vehicle manufacturing.

Agriculture, accounting for almost 30% of Morocco's employment, 20% of GDP, and 35% of exports, is vulnerable to weather conditions (Oxford Business Group, 2020). Extended periods of drought decrease GDP and government revenues. In times of drought, Casablanca, which generally has adequate water and a different economic base, receives less government funding. Water access is of increasing concern for Morocco, as climate change reduces precipitation and increases risk for salt water to ruin groundwater.

*Currency:* Morocco, with a constitutional monarchy, uses the combination of a solid fixed exchange rate that is enhanced by governmental rule. This combination has led to a relatively stable macroeconomic economy (BTI Transformation Index, 2022). Add on top of this that Morocco has accumulated a significant amount of foreign exchange reserves, which padded its entry into the external monetary stage. The main effort for this monetary standardization and reform happened in 2006 when the floating exchange rate was introduced. As of January 2018, Morocco has had relatively solid exchange rates to the US Dollar and Euro, roughly 40 to 60 percentages of shares for each (Ibid.). This has helped Morocco be a stable entity for trade and allows Morocco to receive a significant amount of foreign aid relative to its neighboring countries.

*Banking:* Currently there are 24 banks operating in Morocco, of which the three largest domestic banks are Attijariwafa Bank, Groupe Banque Centrale Populaire and BMCE Bank of Africa; in 2018 these three banks owned assets totaling 64.3%. Morocco has a central bank, Bank al-Maghrib (BAM), which has regulatory and supervisor authority over all commercial banks. Bank al-Maghrib (BAM), is also controlled by the state. More recently, in 2019, the Bank al-Maghrib, upgraded policies to reach Basel III bank standards, which are set by international banking regulations to promote stability. The Basel III, introduced in 2008 after the Global Financial crisis, increases transparency and regulation and was created to decrease economic damage done when banks take on too much risk. Bank al-Maghrib (BAM), Morocco's central bank, is the main regulatory, policymaker and supervisor of commercial banks. Under new legislation passed in July 2019, the BAM can no longer accept instructions from the government or any other third party, thus strengthening its role and independence. In 2019, it upgraded its policy framework to meet the Basel III standards (Britannica, op. cit).

The government of Morocco is currently at a budget deficit of 5.9% (Aourraz & Fakir, 2021). The deficit is only projected to get larger in the coming years, as more loan repayments are due. Frequent instances of tax exemptions, tax eva-

sion, and fiscal fraud keep tax revenue from increasing, despite recent tax reform and increases (BTI Transformation Index, *op. cit.*).

There are both governmental and nongovernmental funding sources available for the proposed projects. Generally, Morocco is in a stable position politically, economically, and socially. It expands borrowing potential but reduces foreign aid. Most large infrastructure investments have been public-private partnerships. This is particularly common for city budgets, as they are almost entirely dependent on the federal government for funding, and larger programs come through the federal government, not the cities.

Official Development Assistance (ODA) is government aid that promotes economic development and welfare of developing countries. Generally, ODA goes towards causes that the donor finds valuable. Recently, ODA tended to be focused on green energy, human rights, health services and education. It is a safe assumption that the amount of ODA is stable from year to year (given its general trend of increasing), enabling projects related to the donor's focus to receive funding.

Foreign Direct Investment is investment across country borders by an investor or entity taking controlled ownership into another country. This may sound controversial, but it often is a way that advanced countries, in terms of a series of skills, technology or knowledge, can invest in another country (Oxford Business Group, 2020). 2018 saw Morocco's Foreign Direct Investment inflow increase by 31.3%. A significant portion of Foreign Direct Investment in Morocco comes in the form of financial services and insurance. The second largest category of Foreign Direct Investment received by Morocco is in the real estate sector, and fourth is the manufacturing sector. Interestingly enough, Ireland was the single largest investor in Morocco in 2018, and next was France. Regional partners that are close to Morocco also play a role in the economy. The United Arab Emirates was the largest Arab investor into the Kingdom of Morocco that year, accounting for 8.2% of all investment (Ibid.).

Multilateral Development Banks are organizations that organize monetary funds from donor organizations for borrowing member countries. Multilateral Development Banks help by giving advice and monetary funds to developing countries. The Multilateral Development Banks that serve this purpose include the World Bank, Inter-American Development Bank, Asian Development Bank, African Development Bank, and the European Bank of Reconstruction and Development. In 2022, the World Bank approved a loan of \$350 million to the Government of Morocco specifically for "blue economy" growth. A trending global investment sector, blue economy programs aim to develop institutional frameworks, improve natural resource management, and strengthen climate resilience (The World Bank, 2022).

Morocco's credit score per Standard & Poor's system and Fitch's is a BB+; Moody's is set at Ba1 (Trading Economics, n.d.). The credit score is stable and is projected to continue to be, despite future challenges in repayment of COVID-

19 business loans. Morocco is seen as just below investment grade, given that it is in a stable trade position and has minimal risk for the investor.

Morocco took out numerous loans from international lenders to stabilize the economy during the COVID-19 pandemic, including €200 million from the European Investment Bank, \$48 million from the World Bank, and \$100 million from the European Bank for Reconstruction and Development.

External debt had already doubled between 2010 and 2019, increasing by almost \$25 billion. Public debt was projected to rise by 10.2% between 2019 and 2020, a figure that ended up being even larger. External debt is owed only to lenders outside the country, internal debt to those inside the country, and public debt being obligation of payments by the national, state, or local government to both internal and external lenders. Between 2020 and 2022, central government debt is expected to rise to 77.8% of GDP (*BTI Transformation Index, op. cit.*). While this percentage is far less than that of Italy or the US, Morocco's credit rating is lower, and its GDP is considered to be less stable, particularly with several poor crop years.

For a long time, most of Morocco's economy operated through government owned and controlled enterprises. Following the recommendations of the EU, various development banks, and a general movement towards privatization, the central government began selling off economic sectors and industries in the early 1990s (*Britannica, op. cit.*). However, according to the Ministry of Privatization, some 65% of the 46 non-financial concerns and hotels were not able to find buyers, with the Valuation Authority setting overly high minimum prices (*European Commission, 2019*).

The King Mohammad VI Investment Fund, named for and partially funded by the current king, was established in 2021. The total budget of the fund has two parts: \$8.26 billion of state-guaranteed loans and \$4.96 billion allocated to a recovery fund (*Hatim, 2020*). The fund is supposed to encourage private investment in support of a variety of thematic priorities. Since Morocco has a parliamentary constitutional monarchy, on top of outside investment, private investment often comes in the form of support from the royal family and those in parliamentary positions.

The pattern emerging from previous sections is the desire for relative economic independence. Morocco wants to be producing enough power, food, water and phosphates for a favorable trade balance and reduced reliance on the global supply chain. Government spending accounts for half of the service economy, even with the privatization efforts. Services, including government and military expenditures, make up one-fourth of Morocco's GDP (*Britannica, op. cit.*). Defense spending increased by 6% between 2020 and 2021, likely to increase border security and maintain control over Western Sahara. 10,800 jobs, more than 40% of the promised increase, are within the defense sector (*Aourraz & Fakir, op. cit.*).

The Finance Team expressed early on that the government should not be

borrowing more money. Further borrowing risks destabilizing the economy, Morocco has many projects in all sectors underway. The government tends to choose many flashy projects rather than pick one reliable one. This results in good press and initial increases in investment, but it harms the country over the long-term. Instead, it is recommended that projects be funded through private partnerships or reallocations of funds for proposed or existing projects. Multiple projects have been started but left incomplete or halted for one reason or another.

Reallocating funding, getting ODA, or finding other creative methods are the best options. For a country in a poorer economic position, there is more “free” money available. For a city like Casablanca, one with economic success and relative peace, money needs to come from local taxes (not feasible under the current system), the federal government (already at capacity, with Casablanca likely receiving less extra funding than farming areas or areas experiencing severe climate conditions), or public private partnerships (an already established possibility).

Morocco is a great place for investment and is a solid borrower, but the parliamentary constitutional monarchy causes some tension with private investment entities. Morocco is a great candidate for receiving funding from Multilateral Development Banks and has strong parliamentary funding sources for technology advancement and improving efficiency for natural resource management. Nevertheless, Morocco’s most pressing internal and external financing programs are centered on public works projects relating to healthcare, transportation, and curbing unemployment rates through educational and professional training programs.

## Conflicts of Interest

The author declares no conflicts of interest regarding the publication of this paper.

## References

- Alhamwi, A., Kleinhans, D., Weitemyer, S., & Vogt, T. (2015). Moroccan National Energy Strategy Reviewed from a Meteorological Perspective. *Energy Strategy Reviews*, 6, 39-47. <https://doi.org/10.1016/j.esr.2015.02.002>
- Amegroud, T. (2015). *Morocco’s Power Sector Transition: Achievements and Potential*.
- Aourraz, R., & Fakir, I. (2021, December 16). *Morocco’s New Government Lays out Budget Priorities, But Can It Pay for Them?* MEI@75. <https://www.mei.edu/publications/moroccos-new-government-lays-out-budget-priorities-can-it-pay-them>
- Bartone, C. (1991). *Annotated Outline of a Report on Strategic Options for Managing the Urban Environment*. World Bank.
- Britannica (n.d.). *Economy of Morocco*. <https://www.britannica.com/place/Morocco/Economy>
- BTI Transformation Index (2022). *Morocco Country Report 2022*. <https://bti-project.org/en/reports/country-report/MAR>

- Chlaida, M., Brand, C., & Kraume, M. (2011). *Wastewater in the Peri-Urban Area of Great Casablanca (Morocco): Status Quo, Treatment and Potential Reuse in Urban Agriculture*.  
[https://www.researchgate.net/publication/296334315\\_Wastewater\\_in\\_the\\_Perri-Urban\\_Area\\_of\\_Great\\_Casablanca\\_Morocco\\_Status\\_Quo\\_Treatment\\_and\\_Potential\\_Reuse\\_in\\_Urban\\_Agriculture](https://www.researchgate.net/publication/296334315_Wastewater_in_the_Perri-Urban_Area_of_Great_Casablanca_Morocco_Status_Quo_Treatment_and_Potential_Reuse_in_Urban_Agriculture)
- Choukri, K., Naddami, A., & Hayani, S. (2017). Renewable Energy in Emergent Countries: Lessons from Energy Transition in Morocco. *Energy, Sustainability and Society*, 7, Article No. 25. <https://doi.org/10.1186/s13705-017-0131-2>
- Connelly, A. Casablanca La Grande Illusion (May 2014) from Casablanca: La Grande Illusion (cafebabel.com).
- Dalberg Advisors, WWF Mediterranean Marine Initiative (2019). *“Stop the Flood of Plastic: How Mediterranean Countries Can Save Their Sea” A Guide for Policy-Makers in Morocco*.
- Edelman, D. J. (2023). *Managing the Urban Environment—Casablanca, Morocco*. LAP Lambert Academic Publishing.
- Edelman, D. J., Schuster, M., & Said, J. (2017). Urban Environmental Management in Latin America, 1970-2017. *Current Urban Studies*, 17, 305-331.  
<https://doi.org/10.4236/cus.2017.53017>
- El Morabit—Morocco World News, A. (2021). *Minister: Morocco Has Built 153 Wastewater Treatment Plants since 2006*. <https://www.morocoworldnews.com>  
<https://www.morocoworldnews.com/2021/02/334667/minister-morocco-has-built-153-wastewater-treatment-plants-since-2006>
- Eliason, M. (2019, August 3). *Waste-to-Energy Facilities: A Potential Solution to Morocco’s Waste Management Problem*.  
<https://www.morocoworldnews.com/2019/08/279647/waste-to-energy-facilities-a-potential-solution-to-moroccos-waste-management-problem>
- European Commission (2019, December 20). *The EU Is Boosting Its Support to Morocco with New Programmes Worth €389 Million*.  
[https://ec.europa.eu/commission/presscorner/detail/en/IP\\_19\\_6810](https://ec.europa.eu/commission/presscorner/detail/en/IP_19_6810)
- Explore All Countries—Morocco.  
<https://www.cia.gov/the-world-factbook/countries/morocco>
- Fanack Water (2019, September 17). *Water Resources in Morocco*. Fanack Water.  
<https://water.fanack.com/morocco/water-resources-morocco>
- HABITAT (2016). Quito Declaration on Sustainable Cities and Human Settlements for All. In *Proceedings of the HABITAT III Conference*.  
<http://habitat3.org/wp-content/uploads/NUA-English.pdf>
- Habti, H. (n.d.). *OCP Group*. World Economic Forum.  
<https://www.weforum.org/organizations/ocp-group>
- Hatim, Y. (2020, November 27). *Moroccan Government Approves Creation of Mohammed VI Investment Fund*. Morocco World News.  
<https://www.morocoworldnews.com/2020/11/327241/moroccan-government-approves-creation-of-mohammed-vi-investment-fund>
- IFC International Finance Corporation (2019).  
<https://www.ifc.org/wps/wcm/connect/d0c0f18c-26b7-4861-b4c5-14896aaba7f1/201910-CPSD-Morocco-EN.pdf?MOD=AJPERES&CVID=m-LGA3X>
- Jern, M. (2022, April 3). *Can I Drink the Tap Water in Morocco?* Tapp Water.  
<https://tappwater.co/en/drink-tap-water-morocco-filter>

- Lee, Y.-S. (1994). *“Myths of Environmental Management and the Urban Poor” in Mega-City Growth and the Future*. United Nations University.
- Leitman, J. (n.d.). *Rapid Urban Environmental Assessment. Volume I: Methodology and Preliminary Findings*. UMP Discussion Paper 14, World Bank.
- Makhfi, J. A. (2015, October 21). *Morocco Trash Pickers Help Fight Climate Change*. <https://phys.org/news/2015-10-morocco-trash-pickers-climate.html>
- Mandi, L., & Ouzzani, N. (2013). *Water and Wastewater Management in Morocco: Bio-technologies Application*.
- Mayors Summit (2004). *ISoCaRP 40th World Congress: Management of Urban Regions—Casablanca*. <https://isocarp.org/app/uploads/2015/02/Geneva-2004-Mayors-Summit-and-City-Profiles.pdf>
- Morocco Now (2021). <https://www.moroconow.com/wp-content/uploads/2021/10/OBG-The-Report-Morocco-2020.pdf>
- Morocco Poverty Rate 1984-2022. <https://www.macrotrends.net/countries/MAR/morocco/poverty-rate>
- Morocco Synthesis Report for Decision Makers (2013). *State and Future of the Environment in the Grand Casablanca Region*.
- Morocco-Energy-Policy-MRV (2018).
- Mouline, M. T. (2012). *Conférence la sécurité énergétique du Maroc: Etat des lieux et perspectives*.
- Moustakbal, J. (2021). *The Moroccan Energy Sector: A Permanent Dependence*. <https://www.cadtm.org/The-Moroccan-energy-sector-A-permanent-dependence>  
<https://www.printfriendly.com/p/g/4B4ju8>
- Oxford Business Group (2020). *Morocco 2020*. <https://www.moroconow.com/wp-content/uploads/2021/10/OBG-The-Report-Morocco-2020.pdf>
- Perry, J., Clark, C., & Carey, A. G. (1962). The Two Developing Worlds of Morocco: A Case Study in Economic Development and Planning. *Middle East Journal*, 16, 457-475. <http://www.jstor.org/stable/4323524>
- Pistilli, M. (2022, September 22). *10 Top Phosphate Countries by Production*. Phosphate Investing News. <https://investingnews.com/daily/resource-investing/agriculture-investing/phosphate-investing/top-phosphate-countries-by-production>
- Poverty & Equity Brief (2020, April). The World Bank from Global\_POVEQ\_MAR.pdf (worldbank.org).
- Rahhou, J. (2022, October 5). *Phosphate Exports in Morocco Rose by a Record 68% in 2022*. <https://www.morocoworldnews.com>  
<https://www.morocoworldnews.com/2022/10/351699/phosphate-exports-in-morocco-rose-by-a-record-68-in-2022>
- Saul, S. (2002). L'électrification du Maroc à l'époque du protectorat. *Outre-Mers*, 89, 491-512. <https://doi.org/10.3406/outre.2002.3952>
- Schinke, B., Klawitter, J., Zejli, D., Barradi, T., Garcia, I., & Leidreiter, A. (2016). *Background Paper: Country Fact Sheet Morocco. Energy and Development at a Glance, 2016* (p. 58).
- Smahi, D., El Hammoumi, O., & Fekri, A. (2013). Assessment of the Impact of the Land-

---

fill on Groundwater Quality: A Case Study of the Mediouna Site, Casablanca, Morocco. *Journal of Water Resource and Protection*, 5, 440-445.  
<https://doi.org/10.4236/jwarp.2013.54043>

The Climate Chance Observatory Team (2020). *Morocco Moroccan Society's Uneven Response to the Proliferation of Waste*. Climate Chance.

<https://www.climate-chance.org/en/card/morrocco-waste-moroccan-societys-uneven-response-to-the-proliferation-of-waste>

The Hidden Hunger in Morocco (2021, September 30). Madaar.

<https://peoplesdispatch.org/2021/09/30/the-hidden-hunger-in-morocco>

The Nature Conservancy (2022). *Urban Water Blueprint—Casablanca, Morocco*.

<http://water.nature.org/waterblueprint/city/casablanca>

The World Bank (2022, October 20). *The World Bank in Morocco*.

<https://www.worldbank.org/en/country/morocco/overview#1>

Trading Economics (n.d.). *Morocco—Credit Rating*.

<https://tradingeconomics.com/morocco/rating>

World Bank (1987). *Morocco—Greater Casablanca Sewerage Project*.

<https://documents.worldbank.org/en/publication/documents-reports/documentdetail/577801468274488904/morocco-greater-casablanca-sewerage-project>