



وزارة التعليم العالي والبحث العلمي
جامعة زيان عاشور بالجلفة
كلية الحقوق والعلوم السياسية



Ministry of Higher Education and Scientific Research
Xian Ashour University of Djelfa
Faculty of Law and Political Science



مخبر التنمية، الديمقراطية وحقوق الإنسان في الجزائر
تحت رقم C02280500

وبالتعاون مع:

Cecille Université de Lille
مخبر سيسيل و جامعة ليل - فرنسا
جامعة دو كوزايلول - تركيا



Laboratory of development, democracy and human rights in Algeria
under number C02280500

In cooperation with:

Cecille laboratory and Lille University -France-
Dokuz Eylul University -turkey-



Collective book:

SMART CITIES IN THE ARAB WORLD AND THE
MEDITERRANEAN RIM: THE CHALLENGES OF
EXPONENTIAL GROWTH

Security, surveillance, language, law, political discourse, media
and public diplomacy

General supervisor

Dr. HDR Boualem Fardjaoui,
University of Lille/France.

Chairman of the Scientific committee

Pr. Dr. Aissa Maiza
University of Djelfa -Algéria

Pr. Paola Todini
University of Ecampus -Italy

المدن الذكية في العالم العربي ومنطقة البحر الأبيض
المتوسط: تحديات الأمن المتسارع

الأمن، المراقبة، اللغة، القانون، الخطاب السياسي، الإعلام والدبلوماسية العامة

LES VILLES INTELLIGENTES DANS LE MONDE ARABE ET DANS
LE POURTOUR MÉDITERRANÉEN : LES ENJEUX D'UNE
CROISSANCE EXPONENTIELLE

Sécurité, surveillance, langue, droit, discours politique, médias et
diplomatie publique

المشرف العام
د. بوعلام فرجاوي
جامعة ليل - فرنسا

رئاسة اللجنة العلمية:

أ. بولوا توديني
جامعة إيكامبوس - إيطاليا
جامعة الجلفة - الجزائر



مطبوعات مخبر التنمية، الديمقراطية وحقوق الإنسان في الجزائر

المدن الذكية في العالم العربي ومنطقة البحر الأبيض المتوسط

مطبوعات مخبر التنمية الديمقراطية وحقوق الإنسان
الايذاع القانوني 2024
ر د م ك : 4-3-9846-9931-978

Edition of Laboratory Development Democracy
and Human Rights in Algeria
Legal deposit number 2024
ISBN: 978- 9931- 9846- 3- 4

SMART CITIES IN THE ARAB WORLD AND THE MEDITERRANEAN RIM: THE CHALLENGES OF EXPONENTIAL GROWTH

**Editions of Laboratory Development Democracy and
Human Rights in Algeria**

University of Djelfa, Algeria July 2024

ISBN: 978-9931-9846-3-4

**SMART CITIES IN THE ARAB WORLD
AND THE MEDITERRANEAN RIM: THE
CHALLENGES OF EXPONENTIAL
GROWTH**

FARDJAOUI Boualem (éd)

**SMART CITIES IN THE ARAB WORLD
AND THE MEDITERRANEAN RIM: THE
CHALLENGES OF EXPONENTIAL
GROWTH**

*Security, surveillance, language, law, political
discourse, media and public diplomacy*

**LES VILLES INTELLIGENTES DANS LE
MONDE ARABE ET DANS LE
POURTOUR MÉDITERRANÉEN : LES
ENJEUX D'UNE CROISSANCE
EXPONENTIELLE**

*Sécurité, surveillance, langue, droit, discours
politique, médias et diplomatie publique*

General supervisor **Dr. HDR Boualem Fardjaoui**, University of Lille /France.

Chairman of The Scientific committee

Pr. Paola Todini.

Ecampus University / Italy

Pr. Dr, Aissa Maiza

University of Djelfa / Algéria-

Science Board

- 1- **Pr.Dr. Ali khashan**..... Ecampus University / Italy
- 2- **Dr. Ghassemi Mehdi** ISTC/ Catholic University of Lille / France
- 3-**Pr.Dr. Refik Korkusuz**..... University Dokuz Eylul of Izmir / Turkey
- 4- **Pr.Dr. GUIRA Salim**..... University of Djelfa / Algeria
- 5-**Pr.Dr. María José Bravo Bosch**..... University of Vigo / Spain
- 6-**Dr. Aouari Issam**..... University of Bouira /Algeria
- 7-**Pr.Dr. Sibel Safi** University Dokuz Eylul of Izmir / Turkey
- 8-**Pr.Dr. Daoud Mansour** University of Djelfa /Algeria
- 9-**Benjamin Ibimi Ngambun** University of Lubumbashi / RD / Congo
- 10-**Dr. Malika Ouzir** University of M'sila / Algeria
- 11-**Pr.Dr. Serdar Nart** University Dokuz Eylul of Izmir / Turkey
- 12-**Dr. Younes Adjal** University of Algiers 3 /Algeria
- 13- **Dr. Bachir Dahmani**University of Lille /France
- 14- **Pr.Dr. Saad Lagoun** University of Djelfa / Algeria
- 15- **Dr. MCF. Yannick Lebtahi** University of Lille /France
- 16-**Dr. Soumia Chakri** University of Setif 2 /Algeria

CONTENTS

INTRODUCTION _____ 10

Boualem Fardjaoui

PRINCIPLES OF LABOR RIGHTS IN ARAB SMART CITIES _____ 12

Pr. Dr. M. Refik KORKUSUZ

Asst. Pr. Dr. Ömer UĞUR

تحديات المدن الذكية في الدول العربية، مدينة دبي أنموذجاً _____ 26

Pr. Chaouki Nadir

Dr. Mourad Benseghir

INTERNET OF THINGS (IOT) AND TYPES OF PEOPLE COMMUNICATION WITHIN SMART CITIES RIYADH CITY AS A MODEL _____ 44

Dr. Selami Saidani

Dr. Musa Al Shaher

REVOLUTIONIZING ESP PEDAGOGY IN AI-DRIVEN SMART CITIES: MEETING THE LANGUAGE NEEDS OF SPECIFIC PROFESSIONAL AND ACADEMIC FIELDS _____ 60

Dr. Ouafa Ouarniki

LA VILLE INTELLIGENTE DANS LES PAYS ARABES ; UNE REFLEXIONS SUR LA VULNERABILITE SOCIALE _____ 76

Dr. Ouzir Malika

Dr. HDR Boualem Fardjaoui

THE ALGERIAN STATE'S EXPERIENCE IN E-LEARNING _____ 90

Dr. Soumia Chakri,
Pr. Aissa Maiza,
Phd student Abdelhafid Kheit,

**POUR LA FORMATION UNIVERSITAIRE DES ÉTUDIANTS EN
LANGUES ÉTRANGÈRES : L'E-LEARNING COMME MODE
INTELLIGENT D'ENSEIGNEMENT-APPRENTISSAGE. _____ 120**

Pr. Ameer Lahoual
Dr. Baya Benderrah

**GREEN BUILDING: A CONSTRUCTION WITH A POSITIVE IMPACT
ON THE SMART CITIES _____ 136**

Dr. Issam Aouari
PHD student. Aicha Rouabeh

**DEVELOPMENT OF EGYPT'S NEW ADMINISTRATIVE CAPITAL: A
SMART CITY AND BUSINESS HUB _____ 150**

Dr. Sherif Adel Al-Bedewy

**THE INTERNET OF THINGS IN SMART CITIES (IOT):
REVOLUTIONIZING CONNECTIVITY AND AUTOMATION _____ 176**

Pr. Dr. Guira Salim
Pr. Dr. Daoud Mansour
Pr.Dr. Saad Lagoun

**THE ROLE OF ARTIFICIAL INTELLIGENCE IN COMMERCIAL
COMPANIES A COMPARATIVE STUDY _____ 192**

Dr. Gharbi Ali
Dr. Bensalem Ahmed Abderrahman

***PERSPECTIVES OF THE CONCEPT OF "SMART CITY" AND "SMART VILLAGE" IN AZERBAIJAN.*_____ 216**

Dr. Nuruzade Shahla.

***LA DURABILITÉ DE LA ROME ANTIQUE AUX VILLES INTELLIGENTES*_____ 226**

Pr. María Elisabet Barreiro Morales

***BILBAO TRANSFORMATION TOWARDS SMART CITY*_____ 254**

PHD Student. Roi Santamaría Mera

***L'IDEE DE LA « VILLE INTELLIGENTE » COMME ESQUISSE DE LA COMMUNICATION ENVIRONNEMENTALE. DEFIS ET ENJEUX POUR UN AMENAGEMENT DURABLE A LUBUMBASHI (RD CONGO)*_____ 284**

Benjamin Ibimi Ngambun

INTRODUCTION

Les villes intelligentes arabes sont à la pointe de l'innovation technologique, intégrant des systèmes de sécurité et de surveillance sophistiqués. Cependant, ces progrès suscitent des questions complexes qui traversent divers domaines tels que le droit, la linguistique, le discours politique, les médias et la diplomatie publique. Cet ouvrage se propose d'explorer ces interrelations multidisciplinaires pour mieux comprendre les défis et opportunités dans ces environnements urbains en constante évolution.

Objectifs de ce travail est :

- Examiner les implications sociales et sociolinguistiques des systèmes de surveillance sur les identités culturelles.
- Explorer le rôle du discours politique et médiatique dans la formation de l'opinion publique sur les systèmes de sécurité des villes intelligentes arabes, en analysant les dynamiques complexes entre le langage et la perception publique.
- Étudier les enjeux du droit liés à la sécurité et à la surveillance dans le contexte des villes intelligentes arabes, en mettant l'accent sur les aspects juridiques et réglementaires.
- Examiner les stratégies de diplomatie publique utilisées pour promouvoir les technologies de surveillance, en analysant les dimensions linguistiques et diplomatiques des initiatives gouvernementales.

Le côté technique n'est pas dénué d'intérêt dans l'analyse de ce sujet, innovations technologiques, cybersécurité, architecture moderne et traditionnelle ont un impact évident sur la modernisation de la ville. Nous avons choisi d'élargir l'aire géographique de notre analyse aux régions hors Moyen-Orient pour avoir une idée sur la différence de perception de la ville et de son développement.

Ce teamwork a réuni des chercheurs, des praticiens, des experts en droit, en linguistique, en communication, en urbanisme, ainsi que des professionnels de la sécurité qui ont soumis leurs contributions dans les domaines de la sociolinguistique, du droit, du discours politique, des médias et de la diplomatie publique. Leurs contributions incluent des études de cas, des analyses théoriques, des analyses de politiques publiques, et des perspectives interdisciplinaires. Il offre l'opportunité de transcender les frontières disciplinaires et de collaborer sur les enjeux cruciaux que présentent les villes intelligentes.

Dr. HDR Boualem Fardjaoui, université de Lille/France.

PRINCIPLES OF LABOR RIGHTS IN ARAB SMART CITIES

Pr. Dr. M. Refik KORKUSUZ

Dokuz, Eylul university/Turquie.

Asst. Pr. Dr. Ömer UĞUR

Dokuz, Eylul university/Turquie.

Abstract

A smart city is an urban area that utilizes advanced technology and data-driven solutions to enhance the efficiency of various services and infrastructure, improve the quality of life for its residents, and promote sustainable development. These technologies often include sensors, data analytics, artificial intelligence, Internet of Things (IoT) devices, and communication networks, which are integrated to optimize functions such as transportation, energy usage, waste management, public safety, healthcare, and more. Smart cities aim to address urban challenges by leveraging technology to make cities livable, resilient, and responsive to the needs of their inhabitants.

If we evaluate the principles of labor law, it must also be acknowledged that there have been some weakening of rules in exchange for workers' income dating back to centuries. It is also a result of the flexibilisation efforts in labour law. On the other hand, with the developments in digital surveillance system private lives and personal data of workers are more exposed. Moreover, in UAE, employment contracts are required to be definite term instead of indefinite term.

Since a high percentage of those who reside and work in such cities are foreign workers, it provides wage opportunities that cannot be compared to the economic opportunities in their own countries. In this context, there is very important economic portability, especially in terms of the characteristics of foreign jobs and even domestic jobs.

KEYWORDS:

Artificial intelligence, smart city, labor law rules, indefinite and permanent service contract, economic opportunity

SMART CITIES

The Internet of Things (IoT) refers to a network of interconnected devices, objects, or "things" embedded with sensors, software, and other technologies that enable them to collect and exchange data over the internet without human intervention. These devices can range from everyday objects such as household appliances, wearable devices, and industrial machinery to vehicles, infrastructure components, and environmental sensors¹. IoT systems facilitate the seamless integration of physical and digital environments, enabling real-time monitoring, control, and automation of processes, as well as the development of innovative applications and services across various industries and domains. In smart cities, the Internet of Things (IoT) is utilized in various ways to enhance efficiency, sustainability, and quality of life. IoT sensors are deployed throughout the city to monitor the condition and performance of infrastructure components such as bridges, roads, and utilities². This data is used to detect and predict maintenance needs, optimize resource.

A smart city is an urban area that utilizes advanced technology and data-driven solutions to enhance the efficiency of various services and infrastructure, improve the quality of life for its residents, and promote sustainable development³. These technologies often include sensors, data analytics, artificial intelligence, Internet

¹ Zanella, A.; Vangelista, L.: "Internet of Things for Smart Cities", IEEE Internet of Things Journal, Vol. 1, No. 1, February 2014.

² Schemmel, P. J.; Schemmel, J. J., Humphries, E. D.: "Technology-Enhanced Infrastructure", Smart Cities, Ed. McClellan, S.; Jimenez, J. A.; Koutitas, G., Springer, 2018.

³ Lehr, T.: "Smart Cities: Vision on-the-Ground", in: Smart Cities, Ed. McClellan, S.; Jimenez, J. A.; Koutitas, G., Springer, 2018.

of Things (IoT) devices, and communication networks, which are integrated to optimize functions such as transportation, energy usage, waste management, public safety, healthcare, and more⁴. Smart cities aim to address urban challenges by leveraging technology to make cities livable, resilient, and responsive to the needs of their inhabitants.

Artificial Intelligence (AI) plays a pivotal role in shaping the functions and services of smart cities. Especially after the wide use of artificial intelligence, it became much more efficient to manage the cities. Some of the key areas where AI can be commonly used are traffic control systems, public transportation⁵, public safety, energy management⁶, healthcare management⁷, waste management⁸. By harnessing the capabilities of AI, smart cities can unlock new opportunities for innovation, efficiency, and sustainability across various sectors, ultimately enhancing the quality of life for residents and contributing to the development of more resilient and inclusive urban environments.

THE EFFECTS OF SMART CITIES ON LABOR LAW

Smart cities have the potential to both positively and negatively affect labor rights. As it can be seen above, the concept of

⁴ Babar, A.: “Smart Cities: Socio-Technical Innovation for Empowering Citizens”, *Australian Quarterly*, Vol. 87, No. 3, Jul-Sep 2016, p. 21.

⁵ Jimenez, J.A.: “Smart Transportation Systems”, in: *Smart Cities*, Ed. McClellan, S.; Jimenez, J. A.; Koutitas, G., Springer, 2018.

⁶ Koutitas, G.: “The Smart Grid: Anchor of the Smart City”, in: *Smart Cities*, Ed. McClellan, S.; Jimenez, J. A.; Koutitas, G., Springer, 2018.

⁷ See also: Chen, T.C.T.; Lee, Y.J.: “Smart Technologies for Healthcare in Smart Cities”, in: *Smart and Healthy Walking*, Ed. Chen, T.C.T.; Lee, Y.J, Springer, 2024.

⁸ Lama, R.; Karmakar, S.: “Secure waste collection approach for smart cities”, *International Journal of Information Technology*, Vol. 16, 2024.

smart city is mostly related to the management of a city with the data driving from many different sensors and examining these data with the help of artificial intelligence. Since humans before performed the management of facility, there will be some changes in working life due to the fact that algorithms and artificial intelligence now mostly perform the management.

Undoubtedly, like every technological development, smart cities have very intense impact on the discipline of labor law and working life. For example, with advanced technology, the number of workers required to perform a task is reduces. This means that some of the existing workers will lose their jobs, or less people will be hired for these jobs.

There will be positive and negative effects on certain subjects such as automation and job displacement; surveillance and privacy; occupational health and safety; remote work; and flexible employment⁹.

A. Automation and Job Displacement

As smart cities implement advanced technologies like automation and AI, certain traditional jobs may become obsolete, leading to potential job displacement and concerns about unemployment. Labor rights issues may arise regarding the retraining and reemployment of affected workers, as well as ensuring fair treatment during the transition.

⁹ See also for ethical implications stemmed from the technologies used in smart cities: Plikas, J.H.; Trakadas, P.; Kenourgios, D.: "Assessing the Ethical Implications of Artificial Intelligence (AI) and Machine Learning (ML) on Job Displacement Through Automation: A Critical Analysis of Their Impact on Society", in: *Frontiers of Artificial Intelligence, Ethics, and Multidisciplinary Applications*, Ed.: Farmanbar, M.; Tzamtzi, M.; Verma, A.K.; Chakravorty, A., Springer, 2024.

Smart cities have the potential to significantly affect automation and job displacement in several ways. Smart cities often deploy advanced technologies such as robotics, artificial intelligence, and machine learning to automate various tasks and processes across different sectors. Automation leads to increased efficiency, productivity, and cost-effectiveness in areas such as manufacturing, transportation, and service industries. As automation technologies become more prevalent, certain traditional jobs may become obsolete or undergo significant changes. For example, automation in manufacturing may lead to a reduction in the demand for manual laborers, while self-driving vehicles could disrupt employment opportunities for drivers in transportation and logistics sectors. This displacement can result in job loss, economic uncertainty, and challenges for affected workers in transitioning to new roles or industries¹⁰.

While automation may displace certain jobs, it also creates new employment opportunities in emerging industries and occupations. For instance, the development and maintenance of smart city infrastructure, including IoT networks, data analytics platforms, and cybersecurity systems, require skilled professionals in areas such as engineering, data science, and software development. Additionally, new roles may emerge to support the deployment and operation of autonomous vehicles, smart grid systems, and other advanced technologies within smart cities.

¹⁰ While automation reduce the labour share and labour demand, new tasks increase the labour share (See: Acemoglu, D.; Restrepo, P: “Automation and New Tasks: How Technology Displaces and Reinstates Labor”, *The Journal of Economic Perspectives*, Vol. 33, No. 2, 2019, p. 27) .

B. Surveillance and Privacy

Smart city technologies often involve extensive data collection and monitoring of citizens' activities for various purposes such as traffic management, public safety, and resource allocation. This raises concerns about invasion of privacy and potential violations of workers' rights to privacy and autonomy, particularly in workplaces where surveillance technologies are deployed.

Smart cities introduce various surveillance technologies and data collection mechanisms to improve urban management and enhance public safety. While these innovations offer benefits such as crime prevention and efficient resource allocation, they also raise significant concerns regarding privacy and civil liberties¹¹. Smart cities utilize a wide range of surveillance technologies, including CCTV cameras, facial recognition systems, sensors, and drones, to monitor public spaces, traffic, and infrastructure. These surveillance tools enable authorities to collect vast amounts of data on individuals' movements, behaviors, and activities in real-time. The extensive surveillance infrastructure in smart cities poses significant privacy risks to residents. Constant monitoring of public spaces and the widespread deployment of facial recognition technology raise concerns about the erosion of anonymity and the right to privacy. Individuals may feel increasingly surveilled and inhibited in their daily activities, leading to a chilling effect on freedom of expression and assembly.

When considering the effects of smart cities on surveillance and privacy from a labor rights perspective, several key points emerge as discussed below.

¹¹ Guillaume, O.: "Digitalisation, Safety and Privacy", in: *Safety in the Digital Age*, Ed.: Le Coze, JC.; Antonsen, S., Springer, 2023.

1. Workplace Surveillance

Smart cities may introduce extensive workplace surveillance technologies, such as employee monitoring software, biometric authentication systems, and productivity tracking tools. While these technologies aim to enhance productivity and efficiency, they also raise concerns about employee privacy and autonomy in the workplace. Employees have the right to privacy and should not be subjected to intrusive surveillance measures that undermine their dignity and autonomy.

2. Data Privacy and Protection

The collection and analysis of employee data in smart city workplaces raise significant privacy concerns. Employers may gather sensitive personal information about their employees, such as biometric data, health records, and location tracking data, without adequate safeguards and consent mechanisms in place. This data could be vulnerable to security breaches, unauthorized access, or misuse, posing risks to employees' privacy rights and data protection.

3. Worker Monitoring and Control

Smart city technologies enable employers to closely monitor and control employees' activities, behaviors, and performance metrics in real-time. While it can be argued that this level of monitoring can improve accountability and compliance with workplace regulations, it is also possible to raise concerns about the potential for abuse and exploitation. Excessive surveillance and micromanagement can create a hostile work environment, erode trust between employers and employees, and infringe on workers' rights to autonomy and dignity in the workplace.

4. Worker Surveillance and Discrimination

The use of facial recognition technology and other biometric surveillance methods in smart city workplaces can exacerbate discrimination and bias against certain groups of workers. For example, facial recognition algorithms may exhibit racial or gender biases, leading to unfair treatment or discrimination against minority employees. The importance of addressing algorithmic bias and ensuring that surveillance technologies do not perpetuate or reinforce existing inequalities in the workplace must be emphasized.

5. Legal Protections and Accountability

Labor laws and regulations often lag the rapid advancements in surveillance technologies in smart cities. There is a need for stronger legal protections and accountability mechanisms to safeguard workers' privacy rights and prevent abuse of surveillance powers by employers. Labor unions, advocacy groups, and policymakers play a crucial role in advocating for robust privacy laws, transparency requirements, and oversight mechanisms to protect labor rights in smart city workplaces.

C. Workplace Safety and Health

Smart city solutions can improve workplace safety and health by monitoring environmental conditions, detecting hazards, and facilitating emergency response. However, there may be concerns about data security and employee consent regarding the collection and use of personal health and safety data¹².

Smart cities have a significant impact on occupational health and safety by leveraging technology to enhance workplace condi-

¹² See for occupational health and safety regulations in Turkey: Ekmekçi, Ö.; Korkusuz, M.R.; Uğur, Ö.: Turkish Individual Labour Law, On İki Levha Publishing, 2023, pp. 209-222.

tions, mitigate risks, and improve overall worker well-being. Smart city technologies, such as IoT sensors and wearables, enable real-time monitoring of environmental conditions, equipment performance, and worker health parameters in industrial and commercial settings. This allows for early detection of potential hazards, such as air pollutants, chemical leaks, or equipment malfunctions, and facilitates timely intervention to prevent accidents and injuries.

Moreover, data analytics and machine learning algorithms analyze historical data and patterns to predict potential safety risks and identify areas for improvement in occupational health and safety practices. By proactively identifying hazards and prioritizing preventive measures, smart cities help reduce the likelihood of workplace accidents and illnesses.

Smart city technologies also enable remote monitoring of workers' health and well-being, particularly in hazardous or remote environments. Telemedicine platforms and wearable devices allow for remote consultations, health assessments, and emergency response coordination, ensuring timely medical assistance and support for workers in need.

Advanced PPE equipped with IoT sensors and communication capabilities provide real-time feedback on environmental conditions, ergonomic factors, and worker health metrics. Smart helmets, vests, and gloves can detect potential dangers, monitor vital signs, and alert workers and supervisors to unsafe conditions or behaviors, enhancing safety on the job.

Lastly, smart city infrastructure, including surveillance cameras, communication networks, and emergency response systems, facilitates rapid response and coordination during workplace emergencies, such as fires, natural disasters, or security inci-

dents¹³. Automated alerts, geolocation tracking, and real-time communication tools enable swift evacuation, rescue operations, and emergency medical assistance, minimizing the impact of crises on worker safety and health.

D. Remote Work and Flexible Employment

Smart city technologies enable remote work and flexible employment arrangements, which can enhance work-life balance and accessibility for employees. However, there may be challenges related to ensuring fair compensation, benefits, and labor rights protections for remote and gig workers, as well as addressing potential disparities in access to technology and opportunities.

Smart cities have a profound effect on remote work and flexible employment by leveraging technology to enable new ways of working and supporting alternative work arrangements. Smart cities provide the infrastructure and digital connectivity necessary for remote work, allowing employees to work from anywhere with internet access. High-speed internet, reliable telecommunications networks, and cloud-based collaboration tools enable remote workers to stay connected, collaborate with colleagues, and access company resources from home or other remote locations.

Smart city technologies enable flexible work schedules, allowing employees to balance work and personal responsibilities more effectively. Remote work arrangements offer flexibility in terms of when and where work is performed, allowing employees

¹³ Saini, M.; Sengupta, E.; Thakur, S.: "Artificial Intelligence Assisted IoT-fog Based Framework for Emergency Fire Response in Smart Buildings", *Cluster Computing*, 3 April 2024; Talaat, F.M.; ZainEldin, H.: "An Improved Fire Detection Approach Based on YOLO-V8 for Smart Cities", *Neural Computing and Applications*, Vol. 35, 2023.

to customize their schedules to accommodate family obligations, personal preferences, and lifestyle choices.

Smart cities attract remote workers and digital nomads from around the world by offering a conducive environment for remote work and flexible employment. By tapping into a global talent pool, businesses can access specialized skills, diverse perspectives, and innovative ideas, driving economic growth and competitiveness in smart cities.

Smart cities also provide platforms and marketplaces for gig economy workers and freelancers to connect with clients, market their services, and manage their work portfolios. Digital platforms for freelancers, co-working spaces, and entrepreneurship hubs offer resources, networking opportunities, and support services to independent contractors and small businesses in smart cities¹⁴.

Overall, smart cities facilitate remote work and flexible employment by providing the infrastructure, technology, and support systems necessary for remote collaboration, flexible scheduling, and alternative work arrangements. By embracing these trends, smart cities can attract and retain talent, foster innovation, and promote inclusive economic growth in the digital age.

¹⁴ Tyson, L. D.; Zysman, J.: “Automation, AI & Work”, *Daedalus*, Vol. 151, No. 2, 2022.

CONCLUSION

Smart city is a new concept that emerged with the latest technological developments. Overall, while smart cities offer opportunities for innovation and efficiency in the workplace, it is crucial to address potential challenges and prioritize the protection of labor rights to ensure that technological advancements benefit all workers and communities equitably.

In Dubai, UAE, one of the prominent smart cities in the world, "employment contracts" have been changed from indefinite employment contracts to fixed term employment contract. The newly updated law strengthened discrimination law and outlined obligations for employers. Furthermore, the law changed the lengths of certain leaves.

In conclusion, it is a great opportunity for employers to benefit from developing technology. However, this opportunity must,

- protect employees' personal data,
- respect employees "indefinite right to work" in their labor relations,
- provide opportunity to workers to work at jobs in compliance with their skills.

It should be noted that personal rights of employees must be protected, including the personal data of employees. Likewise, applying remote work or flexible working arrangements should not lead employers to limit labor rights. Lastly, while benefiting from automation, the necessary precautions must be taken to prevent a rise in unemployment.

تحديات المدن الذكية في الدول العربية، مدينة دبي أنموذجاً

CHALLENGES OF SMART CITIES IN ARAB
COUNTRIES, DUBAI AS A MODEL

Pr. Chaouki Nadir

University of Tamanghasset / Algeria

Dr. Mourad Benseghir

University of sharjah / U.A.E.

Abstract

The development of a city is fundamentally linked to the principles of sustainable development in all its aspects. One of the best examples of this development is smart cities, which are an inevitable choice. They offer solutions to overcome many issues faced by society in general, mitigate the effects of climate change, and achieve development in all its fields, particularly the economic ones. This can be accomplished through elegant means, low costs, and a happy life.

Keywords: Smart Cities; Smart Dubai.

مقدمة

التحضر السريع يفرض الحاجة إلى حلول ذكية لإدارة تحديات مثل التحكم في حركة المرور، وتلوث الهواء، وارتفاع الجريمة، وإدارة النفايات، وزيادة استهلاك الطاقة، وانخفاض مستوى الحياة. الأنشطة البشرية غير المستدامة أثرت سلبًا على الجيولوجيا والنظم البيئية وتغير المناخ، مما زاد الاهتمام بالاستدامة عالميًا. نتيجة لذلك، تم تطوير مبادرات "المدينة الذكية" للتصدي لهذه التحديات وتحسين الحياة في المدن، وتشمل هذه المبادرات جوانب اقتصادية، تقنية، بيئية، وتخطيط حضري. مدينة دبي مثال بارز على التحول إلى مدينة ذكية، حيث أطلقت خطة دبي الذكية 2021 واحتلت مراتب متقدمة في تصنيفات المدن الذكية.

وإنّ الانتقال إلى المدن الذكية يتطلب مجموعة من الخطوات والمبادرات التي تدمج التكنولوجيا في البنية التحتية والخدمات الحضرية لتحسين جودة الحياة منها وضع استراتيجية شاملة، وتوفير البنية التحتية التكنولوجية، مثل الإنترنت عالي السرعة، وأجهزة الاستشعار الذكية، وأنظمة البيانات الضخمة، وجمع البيانات اللازمة، وإبرام شراكات وتعاون لتنفيذ المشاريع الذكية مع العديد من الشركات التكنولوجية الكبرى، وتوعية وتنقيف المواطنين وتعليمهم كيفية الاستفادة منها، وكذا تحسين الاستدامة البيئية وتقليل البصمة الكربونية للمدينة¹⁵.

إشكالية البحث: ومما سبق يمكننا طرق التساؤل الآتي: ما هي الأسس التي تم الاعتماد عليها في الانتقال إلى المدن الذكية؟

¹⁵ د. هدى بن محمد، الانتقال إلى المدن الذكية: تحليل لأطر التحول- دراسة حالة خطة دبي الذكية 2021-، الملتقى الدولي: صناعة المستقبل في السياسات العربية: نحو تفعيل للدراسات المستقبلية، جامعة قلمة، تم تحميل البحث من المستودع الرقمي لجامعة قلمة رابطة (<https://dspace.univ-guelma.dz/jspui/handle/123456789/7750>)، تم الاطلاع عليه يوم 2024/06/30، على الساعة 14:24 سا.

أهداف البحث

- دراسة وتحليل الأسس والمبادئ التي تقوم عليها عملية التحول إلى المدن الذكية، بما في ذلك الجوانب التكنولوجية، والاقتصادية، والبيئية، والاجتماعية.

- إبراز كيفية انتقال مدينة دبي إلى مدينة ذكية في إطار خطة دبي الذكية 2021¹⁶

- توثيق ودراسة الخطوات والمبادرات التي اتبعتها دبي لتحقيق التحول إلى مدينة ذكية.

- تقييم النتائج والفوائد التي حققتها دبي من خلال تبنيها لمفهوم المدينة الذكية، ومدى تأثير هذه التجربة على تحسين جودة الحياة والخدمات في المدينة.

أهمية البحث:

يكتسب موضوع المدن الذكية أهمية كبيرة على جميع الأصعدة، وذلك للأسباب التالية:

- مع تزايد التحضر، تواجه المناطق الحضرية تحديات كبيرة تتطلب حلولاً ذكية وفعالة لتحسين جودة الحياة.

- يشهد العالم تطوراً متسارعاً في تكنولوجيا المعلومات والاتصالات، مما يتيح فرصاً جديدة لتحسين الخدمات العامة والبنية التحتية.

- تزايد الوعي بأهمية الاستدامة في السنوات الأخيرة يدفع الحكومات والشركات والأفراد إلى البحث عن حلول تقلل من التأثير البيئي وتدعم التنمية المستدامة.

¹⁶ د. هدى بن محمد، الانتقال إلى المدن الذكية: تحليل لأطر التحول- دراسة حالة خطة دبي الذكية 2021-، مرجع سابق.

- دراسة تجارب ناجحة يمكن أن توفر دروساً قيمة وتوجيهات للمدن الأخرى الساعية لتحقيق نفس الأهداف.

وقد تم تقسيم العمل إلى نقطتين

أولاً: مفهوم المدينة الذكية

ثانياً: مدينة دبي الذكية نموذج ناجح للمدن الذكية العربية

أولاً: مفهوم المدينة الذكية

ازداد الاهتمام بالمدينة الذكية في السنوات الأخيرة كضرورة حتمية لمواجهة التحديات الكبيرة التي تواجهها مختلف مدن العالم، حيث يتطلب التحول إليها تضافر الجهود من مختلف التخصصات.

تاريخ المصطلح وتطوره¹⁷

-أصول المصطلح: مفهوم المدينة الذكية ليس جديداً، فقد صيغ هذا المصطلح لأول مرة في منتصف القرن التاسع عشر لوصف مدن جديدة في الغرب الأمريكي كانت فعالة وذاتية الحكم، حيث تعود إلى حركة "النمو الذكي" في التسعينيات، والتي تشير إلى التحضر المستدام، ومنذ تسعينات القرن الماضي، تطور مفهوم المدينة الذكية ليعني أي شكل من أشكال الابتكار التكنولوجي في تخطيط المدن وتطويرها وتشغيلها وإدارتها، على سبيل المثال، نشر حلول التنقل الذكية لمكافحة تحديات المرور في المناطق الحضرية، وخلال العقدين الأخيرين، ركزت عدة شركات متعددة الجنسيات على التكنولوجيا الحضرية الذكية، إلى جانب عدد من الشركات العامة والخاصة¹⁸.

¹⁷ د. هدى بن محمد، الانتقال إلى المدن الذكية: تحليل لأطر التحول- دراسة حالة خطة دبي الذكية 2021-، مرجع سابق.

¹⁸ د. هدى بن محمد، الانتقال إلى المدن الذكية: تحليل لأطر التحول- دراسة حالة خطة دبي الذكية 2021-، مرجع سابق.

و غالبًا ما تُستخدم مفاهيم مثل المدن الافتراضية، والمدن الإلكترونية، والمدن الرقمية، ومدن المعلومات، والمدن اللاسلكية، والمدن المستقبلية بشكل تبادلي مع مفهوم "المدينة الذكية".

وتعتبر المدينة "ذكية" عندما تؤدي الاستثمارات في رأس المال البشري والاجتماعي والبنية التحتية التقليدية (النقل) والبنية التحتية الحديثة (القائمة على تكنولوجيا المعلومات والاتصالات) إلى تعزيز النمو الاقتصادي المستدام ونوعية حياة عالية، مع إدارة حكيمة للموارد الطبيعية من خلال الحكومة التشاركية¹⁹.

-تعريف المدينة الذكية: هي مدينة متقدمة تستخدم تكنولوجيا المعلومات والاتصالات وغيرها من التقنيات لتحسين نوعية الحياة، والقدرة التنافسية، والكفاءة التشغيلية للخدمات الحضرية، مع ضمان توفر الموارد للأجيال الحالية والمستقبلية من حيث الجوانب الاجتماعية والاقتصادية والجوانب البيئية.

خلاص القول إنّ مفهوم المدن الذكية يقوم على مجموعة الخدمات التي يمكن تنفيذها لتحويل وتحسين الطريقة التي يتفاعل بها السكان والزائرون والشركات والحكومات مع بعضهم في سياق حياتهم²⁰.

-أهداف المدينة الذكية ومزاياها ودعائمها

من أهداف المدن الذكية عموماً هي²¹:

● **التقليل من انبعاث غازات الدفيئة.**

¹⁹ د. هدى بن محمد، الانتقال إلى المدن الذكية: تحليل لأطر التحول- دراسة حالة خطة دبي الذكية 2021-، مرجع سابق.

²⁰ د. مخلوف عمر، الحاجة إلى المدن الذكية لتحقيق التنمية المستدامة: الفرص والتحديات، مجلة التعمير والبناء، جامعة ابن خلدون تيارت، المجلد 04، العدد 01، ص 27 وما بعدها

²¹ د. هدى بن محمد، الانتقال إلى المدن الذكية: تحليل لأطر التحول- دراسة حالة خطة دبي الذكية 2021-، مرجع سابق.

- ترشيد استهلاك الطاقة.
- تطوير الصناعات المتخصصة.
- الاستفادة من تكنولوجيا المعلومات والاتصالات لتطوير الصناعات المتخصصة بالوسائط المتعددة والمعرفة.
- تحسين نوعية البيئة
- توسيع المناطق الخضراء
- تنمية البنى التحتية المعلوماتية
- تنمية المجتمعات المستدامة.
- تحقيق الانسجام الاجتماعي

ومن أهم مزايا المدن الذكية²²

- زيادة الكفاءة والفعالية الاقتصادية والإدارية
- تقليل التكاليف الاقتصادية
- تقليص إجراءات الهدر
- تقليل الضغط على شبكات النقل
- خفض استخدام الطاقة
- تقليل مستويات الجريمة
- تحسين مستوى الحياة

ومن أهم الدعائم الأساسية للمدينة الذكية²³

²² د. هدى بن محمد، الانتقال إلى المدن الذكية: تحليل لأطر التحول- دراسة حالة خطة دبي الذكية 2021-، مرجع سابق.

يجب أن تتوفر المدن الذكية على جملة من الشروط:

- تعزيز الابتكار وريادة الأعمال.
- دعم الاقتصاد الرقمي والصناعات الناشئة.
- توفير التعليم والتدريب المستمر.
- تعزيز المشاركة المجتمعية والتفاعل الاجتماعي.
- تعزيز الشفافية والمشاركة الفعالة في صنع القرار.
- استخدام التكنولوجيا لتحسين الخدمات الحكومية.
- تطوير نظم نقل ذكية ومستدامة.
- تحسين البنية التحتية للاتصالات.
- إدارة الموارد الطبيعية بشكل مستدام.
- الحفاظ على البيئة وتعزيز المساحات الخضراء.
- تحسين نوعية الحياة من خلال الخدمات الصحية والتعليمية والثقافية.
- توفير بيئة معيشية مستدامة وآمنة.

-عوامل نجاح إنشاء مدينة ذكية²⁴

إن إنشاء مدينة ذكية هو عملية معقدة ومتعددة الأبعاد، وتعتمد على التكامل الجماعي لمجموعة من العوامل. هناك العديد من العوامل التي تؤثر على

²³ د. هدى بن محمد، الانتقال إلى المدن الذكية: تحليل لأطر التحول- دراسة حالة خطة دبي الذكية 2021-، مرجع سابق.

²⁴ د. هدى بن محمد، الانتقال إلى المدن الذكية: تحليل لأطر التحول- دراسة حالة خطة دبي الذكية 2021-، مرجع سابق.

تصميم وتنفيذ مبادرات المدن الذكية والتي تساهم في نجاحها، وتتمثل هذه العوامل فيما يلي²⁵:

✓ إنَّ أهم ما تواجهه مبادرات المدن الذكية هو مجموعة من التحديات الإدارية والتنظيمية مثل حجم المشروع، مواقف وسلوك المديرين، التنوع التنظيمي، عدم التوافق بين الأهداف، مقاومة التغيير والصراعات.

ويمكن اتباع استراتيجيات مثل مهارات فريق المشروع، الأهداف الواضحة، تحديد أصحاب المصلحة، مشاركة المستخدم النهائي، التخطيط، معالم واضحة، التواصل الجيد، تحسين الأعمال السابقة، التدريب الكافي، التمويل الكافي والمبتكر، واستعراض الممارسات الحالية والأفضل.

✓ تعدّ تكنولوجيا المعلومات والاتصالات الدافع الرئيسي لمبادرات المدن الذكية، إذ تعتمد على تقنيات الحوسبة الذكية لتحسين عمليات الأعمال والنتائج.

وتشمل التحديات برامج التدريب، نقص الموظفين المهرة، عدم التعاون بين القطاعات، عدم التنسيق بين الإدارات، ورؤية غير واضحة لإدارة تكنولوجيا المعلومات.

✓ تهدف مبادرات المدن الذكية إلى تقديم خدمة أفضل للمواطنين وتحسين نوعية حياتهم من خلال مشاريع تشمل العديد من أصحاب المصلحة.

25 تقرير عن المدن الذكية، وزارة الاتصالات وتقنية المعلومات، المملكة العربية السعودية، تم تحميل التقرير من موقع وزارة الاتصالات وتقنية المعلومات، رابطته (mcit.gov.sa)، تم الاطلاع عليه يوم: 2024/06/30، على الساعة 13:01 سا.

وتعتمد على تقنيات، وأفراد، وسياسات، وممارسات، وموارد، وأعراف اجتماعية تدعم إدارة المدن.

✓ ينطوي التحول إلى مدينة ذكية على تفاعل بين المكونات التكنولوجية والسياسية والمؤسسية.

✓ يؤثر التحول إلى مدينة ذكية على نوعية حياة الأفراد ويشجع على تعليمهم ومشاركتهم، وتشمل التحديات الفجوة الرقمية، مراقبة بوابة المعلومات، المشاركة والشاركة، التواصل، التعليم، نوعية الحياة، وإمكانية الوصول.

✓ الاقتصاد هو المحرك الرئيسي لمبادرات المدن الذكية. تتمثل النتائج الاقتصادية في خلق الأعمال، خلق الوظائف، تطوير القوى العاملة، وتحسين الإنتاجية.

✓ تلعب البنية التحتية لتكنولوجيا المعلومات والاتصالات دورًا حاسمًا في تحقيق المدن الذكية. تشمل البنية التحتية اللاسلكية وأنظمة المعلومات.

✓ تسعى مبادرات المدن الذكية إلى استخدام التكنولوجيا لزيادة الاستدامة وتحسين إدارة الموارد الطبيعية، وتشمل حماية الموارد الطبيعية والممرات المائية والمساحات الخضراء.

-تأثير العوامل المختلفة

إنّ جميع العوامل السابقة لها تأثير ثنائي الاتجاه في مبادرات المدينة الذكية، أي كل منها يتأثر ويؤثر على عوامل أخرى في أوقات وسياقات مختلفة. يمكن تقسيم هذه العوامل إلى مستويين من التأثير:

- **العوامل الخارجية:** تشمل الحوكمة، الأفراد والمجتمعات، البيئة، البنية التحتية، والاقتصاد. هذه العوامل تتأثر أكثر من العوامل الداخلية.

- **العوامل الداخلية:** تشمل التكنولوجيا، الإدارة والتنظيم، والسياسة. هذه العوامل تمثل الجوانب الداخلية التي تؤثر على نجاح مبادرات المدينة الذكية.²⁶

- **عوائق المدينة الذكية²⁷**

رغم الفوائد العديدة التي تقدمها المدن الذكية، فإنها تواجه مجموعة من المشكلات والتحديات التي تعيق تنفيذها الكامل. فيما يلي أبرز هذه المشكلات:²⁸

✓ **التكلفة الباهظة**

حيث تتطلب المدن الذكية استثمارات كبيرة في البنية التحتية والتقنيات الحديثة، مما يزيد من التكلفة الإجمالية لبناء هذه المدن.

✓ **الحاجة إلى التعاون**

إن تعزيز مظاهر المدينة الذكية يتطلب تعاوناً من جميع الأطراف المعنية، بما في ذلك الجهات الحكومية، الشركات الخاصة، والمجتمع المدني، وليس فقط المبرمجون وخبراء التقنية.

✓ **الاقتصار على فئة محدودة**

هناك خوف من أن تقتصر فوائد المدينة الذكية على فئة محدودة من الناس، مما قد يؤدي إلى عدم استفادة الجميع بشكل متساوٍ.

✓ **نقص الثقافة الحاسوبية**

26 تيريزا باردو، لماذا تفشل المدن الذكية؟ كيف ننفذ مستقبل مدننا عبر الإلمام بالسياق، موقع كلية محمد بن راشد للإدارة الحكومية 2024، رابطته، (<https://dubaipolicyreview.ae/ar/>) تم الاطلاع عليه يوم 2024/06/30، على الساعة 15:24 سا.

27 لشلح محمد، بوزيدي أحمد تيجاني، المدن الذكية والواقع الجزائري، مجلة القانون العقاري والبيئة، جامعة ابن باديس مستغانم، المجلد 11، العدد 02، ص 20.

28 تيريزا باردو، لماذا تفشل المدن الذكية؟ كيف ننفذ مستقبل مدننا عبر الإلمام بالسياق، مرجع سابق.

عدم وجود مستوى كافٍ من الثقافة الحاسوبية بين أفراد المجتمع قد يعوق نجاح المدينة الذكية ويحد من استخدام التقنيات المتقدمة.

✓ الأمن السيبراني

تواجه المدن الذكية تهديدات من المتسللين والمتلاعبين بالبرامج والفيروسات، بالإضافة إلى مشاكل انتهاك الخصوصية.

✓ التخطيط والتصميم

يجب أن يتم بناء المدينة الذكية وفقاً للاحتياجات الفعلية والضرورات التقنية والبرمجية، وليس فقط بناءً على رؤية المبرمجين. يجب أن يتولى القائمون على إدارة المدينة العادية وضع المخطط الأساسي بالتعاون مع المبرمجين وخبراء التقنية.

✓ بناء مجتمع معلوماتي صحي

صعوبة بناء مجتمع معلوماتي صحي نظراً لاستخدام العديد من المواطنين لأسماء مستعارة، مما يشوه التبادل المعلوماتي ويفقده المصادقية.

✓ التداخلات المعلوماتية

تحتاج الخدمات المعلوماتية في المدينة إلى أن تكون متاحة لسكانها وكذلك لغير القاطنين مثل السياح وسكان القرى المجاورة، مما قد يؤدي إلى تداخلات معلوماتية وزيادة الضغط على الخدمات المخصصة للسكان.

-الحلول المقترحة

لتجاوز هذه التحديات والمشكلات، يمكن تبني عدة حلول واستراتيجيات، منها: التخطيط المالي الجيد، وتعزيز التعاون بين مختلف الأطراف المعنية، والتوعية والتدريب لتعزيز الثقافة الحاسوبية بين جميع فئات المجتمع، وتطوير سياسات أمنية قوية، ومشاركة المجتمع في

التخطيط، استخدام تقنيات التحقق الهوية، وضمان التوزيع العادل للخدمات²⁹.

ثانياً: مدينة دبي الذكية نموذج ناجح للمدن الذكية العربية

اعتمدت حكومة دبي مجموعة من المبادئ هي³⁰:

- تحقيق التفوق والريادة على الصعيدين الإقليمي والعالمي من خلال تبني معايير عالية وطموحات كبيرة.
- الاستفادة من التجارب الناجحة والخبرات العالمية في مجال التخطيط الاستراتيجي لضمان تنفيذ فعال ومستدام للخطة.
- ضمان إمكانية متابعة التقدم وتحقيق الأهداف المحددة من خلال مؤشرات أداء واضحة وقابلة للقياس.
- إشراك جميع الأطراف ذات العلاقة من أفراد المجتمع، الشركات، والمؤسسات الحكومية لضمان توافق وتكامل الجهود المبذولة لتحقيق أهداف الخطة.

وعموماً إنّ الإطار العام لخطة دبي الذكية 2021 يتضمن ستة محاور رئيسية تحدد السياق العام للعمل الحكومي في دبي، وهذه المحاور هي: تحسين كفاءة الخدمات الحكومية وتعزيز التفاعل الإلكتروني مع المواطنين والمقيمين، من أجل تقديم خدمات حكومية متقدمة تعزز من تجربة المستخدم وتسهم في تحسين الجودة الحياتية، وتعزيز المشاركة المجتمعية والتفاعل الاجتماعي بين جميع شرائح المجتمع، من أجل تعزيز الروابط الاجتماعية وتعزيز الشمولية في الفرص والخدمات المتاحة للمواطنين والمقيمين، وتعزيز التنافسية الاقتصادية لدبي وجذب الاستثمارات والمواهب، من أجل تعزيز بنية التكنولوجيا والابتكار لدعم

29 مراد بابعا، المدن الذكية...ضرورة ثورية تغير وجه الحضارة البشرية، موقع الجزيرة، رابطته، doc.aljazeera.net تم الاطلاع عليه يوم 2024/06/30، على الساعة 16:00 سا.

30 د. هدى بن محمد، الانتقال إلى المدن الذكية: تحليل لأطر التحول- دراسة حالة خطة دبي الذكية 2021-، مرجع سابق.

القطاعات الاقتصادية الرئيسية وتحفيز الابتكار وريادة الأعمال، والحفاظ على الموارد الطبيعية وتحسين جودة البيئة والاستدامة، من أجل تعزيز استخدام التكنولوجيا لإدارة الموارد بكفاءة وتعزيز مشاركة المجتمع في حماية البيئة، وتحسين جودة الحياة والرفاهية لسكان دبي، من أجل توفير بيئة معيشية متكاملة تعزز من راحة وسعادة السكان وتدعم الحياة النشطة والصحية، وتعزيز الابتكار والتعليم الرقمي وتحفيز المعرفة والتعلم المستمر، من أجل تعزيز البنية التحتية التكنولوجية في المجال التعليمي وتعزيز الابتكار والاستفادة من التكنولوجيا لتحقيق مجتمع معرفي متقدم³¹.

هذه المحاور الرئيسية تحدد السياق العام للعمل الحكومي، وهي³²:

- الاهتمام بإنشاء جهاز حكومي ذو كفاءة وموثوقية عالية.
- إيجاد نموذج فريد للنمو ينتقل من الاعتماد على تراكم عوامل الإنتاج إلى نموذج مستدام مدفوع بالابتكار والإنتاجية العالية لكل من رأس المال والعمالة، مدعوماً ببيئة تسهل ممارسة الأعمال.
- الاهتمام بالقدرة المستدامة على دعم النمو المستقبلي للإمارة، وضمان توفر مصادر طاقة مستمرة وتعزيز الاستدامة في البيئة الطبيعية، واتباع أفضل الممارسات العالمية من حيث معدلات الاستهلاك والكفاءة والإدارة الرشيدة في بيئة حضرية تتميز بأعلى درجات السلامة والموثوقية.
- الحفاظ على هذه القيمة الإيجابية وتعزيزها وتنميتها، بالتركيز على الخدمات التعليمية والصحية والإسكان، وتوفير تجربة ثقافية غنية

³¹ د. هدى بن محمد، الانتقال إلى المدن الذكية: تحليل لأطر التحول- دراسة حالة خطة دبي الذكية 2021-، مرجع سابق.

³² د. هدى بن محمد، الانتقال إلى المدن الذكية: تحليل لأطر التحول- دراسة حالة خطة دبي الذكية 2021-، مرجع سابق.

وخيارات ترفيهية ورياضية متنوعة، بما في ذلك المساحات الخضراء والشواطئ النظيفة والمرافق الرياضية.

- إيجاد مجتمع متعدد الثقافات يمتلك مقومات الاستمرارية والنجاح، مع إيلاء أولوية للأسرة باعتبارها النواة الأساسية والحاضنة الطبيعية للفرد.

- تعزيز الإحساس بالمسؤولية لدى الأفراد تجاه أنفسهم وأسرهم ومجتمعهم، وتشجيعهم على تحقيق أعلى مستويات التعليم والثقافة، والحفاظ على نمط حياة صحي وسليم، مما يمكنهم من لعب دور فاعل وريادي في نهضة دبي في كافة المجالات.

خاتمة

يعد التحول إلى مدينة ذكية عملية معقدة ومتعددة الأبعاد، حيث يعتمد النجاح على التكامل الجماعي لمجموعة من العوامل المؤثرة على تصميم وتنفيذ مبادرات المدن الذكية، وتشكل هذه العوامل الإطار العام لتحول هذه المدن³³.

وبشكل عام فإنّ بناء المدن الذكية يستند إلى ستة دعائم أساسية: هي اقتصاد الذكي، وأشخاص أذكىاء وحوكمة ذكية وتنقل الذكي وبيئة ذكية وحياة ذكية³⁴.

لهذا أطلقت دبي العديد من البرامج والمشاريع والمبادرات والتطبيقات، بالإضافة إلى تطوير السياسات والاستراتيجيات، ودمج تكنولوجيا المعلومات والاتصالات في مختلف المجالات، مما يساهم جميعاً في تحقيق أهداف وغايات الخطة المرسومة.

وبناء عليه نقدم جملة من التوصيات وهي³⁵:

- تكريس وتضافر الجهود من مختلف التخصصات لتصميم وهيكلة مشروع التحول.
- تخصيص الموارد التمويلية المناسبة لتحقيق مشروع التحول.
- نشر الوعي المجتمعي حول استخدام تكنولوجيا المعلومات والاتصالات وتطبيقاتها المختلفة.

33 د. مخلوف عمر، الحاجة إلى المدن الذكية لتحقيق التنمية المستدامة: الفرص والتحديات، مجلة التعمير والبناء، مرجع سابق ص 27 وما بعدها.

34 لشلح محمد، بوزيدي أحمد تيجاني، المدن الذكية والواقع الجزائري، مجلة القانون العقاري والبيئة، مرجع سابق، ص 18 وما بعدها.

35 د. هدى بن محمد، الانتقال إلى المدن الذكية: تحليل لأطر التحول- دراسة حالة خطة دبي الذكية 2021-، مرجع سابق.

- ضرورة مراعاة مختلف الأبعاد البشرية والاجتماعية والاقتصادية والحضرية والبيئية والثقافية والسياسية، ووضعها ضمن أولويات العمل.
- ربط تصميم المدينة الذكية بمفهوم الاستدامة لضمان الاستخدام الرشيد للموارد بين الأجيال، والاستفادة من الطاقات المتجددة.

INTERNET OF THINGS (IOT) AND TYPES OF PEOPLE COMMUNICATION WITHIN SMART CITIES RIYADH CITY AS A MODEL

Dr. Selami Saidani

Lecturer, Mohamed Boudiaf University of M'sila, Algeria.

Dr. Musa Al Shaher

King Khalid University, Saudi Arabia

Abstract

Sustainable smart cities rely on stable, secure, reliable, and interoperable communication infrastructure to support a vast array of ICT-based applications and services. Recent advancements in the Internet of Things (IoT), artificial intelligence (AI), digital twins, robotics, smart grids, and smart meters are all driving and supporting the development of sustainable smart cities worldwide, enriching and enhancing the decision-making process for governments.

Keywords: Internet; Things; people; communication, Smart cities, Riyadh City.

Introduction

Although cities where all urban systems and services are fully connected do not yet exist, many cities are on their way to becoming sustainable and smart cities. They rely on ICT, for example, to enhance energy consumption efficiency, waste management, housing, and healthcare improvements, traffic flow and safety enhancements, air quality detection, alerting police to street crimes, improving water and sanitation networks, and making rural communities smart and sustainable. These advancements improve the quality of life for rural residents and help achieve the United Nations Sustainable Development Goals (SDGs). ICT has the potential to accelerate the achievement of all seventeen UN SDGs, including Goal 11, which aims to create sustainable cities and communities.

The Saudi government has increasingly developed the smart city concept to meet sustainable development challenges and improve the quality of life for its citizens. This accelerated growth is embodied in the smart city project like Riyadh, reflecting the Kingdom's commitment to technological advancement and environmental sustainability. Riyadh is one of the most important cities in Saudi Arabia and one of the fastest-growing cities in the world.

1. Smart Cities in Saudi Arabia: Riyadh

The concept of smart cities encompasses several key elements, including smart infrastructure, sustainability, technology, and community engagement. These elements work together to improve the quality of life and enhance the citizen experience in the city. The smart city of Riyadh involves the development of infrastructure to provide advanced services to citizens. By utilizing communication technologies and smart networks, the management of public utilities such as transportation, sanitation, and electricity

is improved, helping to reduce congestion and save time and energy.³⁶

Sustainability is one of the most important components of the smart city in Riyadh. This sustainability includes reducing carbon emissions and improving the management of local resources such as water and energy. It relies on renewable energy and environmental practices to preserve the environment and maintain natural wealth.³⁷

Technology also plays a critical role in the smart city of Riyadh. This includes the use of artificial intelligence (AI), the Internet of Things (IoT), and big data to improve urban services and facilitate citizens' lives. For example, smart systems can be used to manage traffic and predict crises. The smart city of Riyadh encourages local community participation in the development of the city. Through open dialogue and future vision planning, citizens can contribute to decision-making and achieve sustainable development.³⁸

The Saudi government has implemented traffic congestion control measures, including adaptive traffic control measures and prioritization measures. The intelligent transportation system monitors and manages city traffic through various sensors and closed-circuit television (CCTV) systems. It uses advanced analytics to conduct real-time historical and predictive traffic analysis, includ-

³⁶ Bawadi, Fadwa. (2022). "Smart Cities Around the World," Dar Al-Maysarah, Cairo, p128

³⁷ Al-Dughli, Hatem. (2019). "The Disappearance of Traditional Cities: A Strategic Vision," 2nd ed., Dar Al-Raghib, Baghdad, p542

³⁸ *Ibid*, p543.

ing context-specific reporting of traffic incidents to inform traffic dashboards and key performance indicators.³⁹

Riyadh has advanced to 30th place among 141 smart cities globally, according to the 2023 Smart Cities Index issued by the International Institute for Management Development. Additionally, Mecca, Medina, and Jeddah have entered the index, making the total number of Saudi cities included in the index four.

2. Social Media and the Intelligence Index of Global Smart Cities

Social media is a source of big data, as are smartphones and mobile devices, where data related to public interactions on social media platforms is collected. This helps in understanding the needs and interests of the population, communicating with them, and knowing their opinions and feedback about smart cities and their services.

Of course, after collecting this data, it needs to be analyzed and transformed into valuable information for smart cities. This goal requires the use of machine learning and artificial intelligence technologies to extract value from this data to achieve the objectives of smart cities in improving urban life, enhancing the quality of life, and providing better services to the residents and visitors of these cities.⁴⁰

Therefore, developing the infrastructure of smart cities is essential to maximize the benefits of collecting and transmitting data from its sources.

³⁹ Al-Ghamdi, Al-Sharif. (2021). "The Integrated Strategic Vision of the Kingdom of Saudi Arabia," Dar Al-Motabeni Publishing and Distribution, Saudi Arabia, p421.

⁴⁰ *Ibid*, p422.

3. Successful Global Models in Smart Cities

We will mention some successful models in the development of smart cities both within the Kingdom and abroad, as the Kingdom, through Vision 2030, aims to achieve comprehensive development and build a society based on technology and innovation.

Firstly, within the Kingdom, there is the digital government, which relies on smart automation in collecting and analyzing data to provide government services easily to citizens and residents. Additionally, many smart cities in the Kingdom have benefited from data to improve their services and develop their infrastructure. For example, Riyadh has equipped many streets and parking lots with smart sensors to collect data on traffic and congestion. Riyadh uses this data to analyze and develop public transportation services, providing a more efficient system.⁴¹

Another example in the Kingdom is King Abdullah Economic City, which is one of the largest smart cities in the Kingdom. King Abdullah Economic City has modern technological infrastructure that allows for data collection and analysis from various sources, including transportation, environment, energy, and security. Data analysis is used to improve urban planning and achieve sustainability.

There are also successful models in Mecca and Medina, serving pilgrims and visitors to religious sites. Data analysis is used to improve transportation services, public safety, and healthcare, based on smart systems to monitor crowding, manage stampedes, and oversee public safety and emergency health situations during religious rituals. Collected data is also used to make strategic decisions to improve service quality each year.

⁴¹ *Ibid*, p5424.

There are other examples, such as the smart city of NEOM, which is currently under construction, and the implementation of smart city requirements in Dammam. Dammam is working towards transforming into a smart and sustainable city by using data from transportation, electricity, and water sources to improve consumption, better manage resources, and achieve efficiency and sustainability.

Internationally, many smart cities around the world have benefited from data to improve their services and develop their infrastructure. Some examples include:

- **Seoul, South Korea:** Seoul is one of the cities that has benefited the most from data in all aspects, especially traffic management, energy consumption, and air pollution crisis prediction to improve city management and enhance the quality of life for its citizens.
- **Sydney, Australia:** Sydney is another international example, using data collected from various sources such as the public transportation system, road networks, and the energy system to improve resource efficiency and provide better services to its citizens.
- **Turin, Italy:** Turin has equipped many streets and parking lots with sensors to collect data on traffic and congestion. This data is analyzed to improve traffic control patterns and reduce congestion.
- **Seattle, USA:** Seattle has equipped street lamps with sensors to measure light levels, air quality, and temperature. Seattle uses this data to improve need-based lighting and save energy.

These examples illustrate how smart cities leverage data to enhance their services and infrastructure, ultimately improving the quality of life for their residents.

4. Internet of Things (IoT) in Smart Cities

4.1. The Importance of IoT in Smart Cities

According to figures cited in a study on improving IoT security using Software-Defined Networking (SDN), there will be more than 75.44 billion devices connected to the Internet of Things by 2025. IoT is expected to grow into one of the smartest collective and collaborative systems in history.

With vast potential and opportunities across a wide range of sectors, including urban mobility, security, sustainability, maintenance, healthcare, and management, it is crucial for cities to understand the benefits and opportunities of IoT for smart cities.

Advanced connectivity is one of the fundamental building blocks for developing the next generation of cities. Communication between citizens and governments will occur in ways never seen before. IoT will provide tremendous opportunities and benefits for cities, but this level of connectivity will also bring its own set of challenges. The DUC Suite system plays a significant role in building smart cities by providing infrastructure to manage and analyze big data derived from IoT systems. DUC Suite is used for data integration and storage, facilitating intelligent analytics that contribute to a better understanding of city needs and improving the efficiency of services and operations.

4.2. What is the Internet of Things?

According to the International Telecommunication Union (ITU), the term "Internet of Things" (IoT) is a broad term that can be used to describe any object connected to the internet. However,

in recent years, the term IoT is increasingly used to specifically describe objects that can "talk" to each other.

It refers to the vast network of digital devices that communicate and interact with each other, impacting our daily lives. These devices include smart sensors, monitoring devices, artificial intelligence programs, and actuators that can assess, monitor, and control certain aspects of city life. For example, weather-related data can be collected by multiple sensors, which can then be used to manage thermostats in public buildings, reduce emissions, and save city funds.

There is no single, unified definition of what the Internet of Things is. Different organizations and individuals might propose varying definitions. However, they all agree that IoT is a set of technologies for accessing data collected by various devices via wireless and wired internet networks.

4.3. Examples of IoT Solutions and Smart Cities

According to IoT Analytics, smart cities prioritize IoT technology in several interesting ways. The study focused on decision-makers from some of the world's leading smart cities (including Barcelona, Paris, Amsterdam, and Palo Alto) and ranked how leaders use IoT to reduce urban inefficiencies and improve the quality of life for their citizens.

The study found that the following areas were top priorities for smart city governments:⁴²

- Connected public transport (74%)

⁴² Abu Habeib, Aribi. (2018). "An Introduction to Communication Technologies," National Publishing Establishment, Baghdad, p65.

- Traffic monitoring and management (72%)
- Water level/flood monitoring (72%)
- Video surveillance and analytics (72%)
- Connected street lights (68%)
- Weather monitoring (68%)
- Air quality/pollution monitoring (68%)
- Smart metering – water (66%)
- Fire/smoke detection (66%)
- Water quality monitoring (64%)

The percentages shown are the proportion of the included smart cities that have deployed use cases as part of their smart city initiatives.

Let us take a look at some examples of how smart cities are effectively using IoT technology to solve urban problems.

How IoT Solutions Can Help Future Smart Cities

The future of smart cities is closely tied to the future of the Internet of Things (IoT). As city governments begin to unlock the full potential of urban data platforms, artificial intelligence, smart devices, and interconnectivity, the need for IoT will grow significantly. This will lead to efficient problem-solving, smart mobility, sustainability, and more.⁴³

One of the most exciting ways IoT can benefit future smart cities is by reducing the need for private vehicles. With the advent

⁴³ Farouk, Laazali. (2022). "E-Governments: Applied Approaches," Taxiage Com Publishing and Distribution, Tower of Keifan, Algeria, p415.

of self-driving cars, it will not be long before autonomous public transport becomes accessible to everyone. Supported by IoT technology, future cars and buses will be able to operate using data transmitted via street furniture or street lighting, providing an efficient and smooth traffic flow.⁴⁴

Although the future of waste management is far less glamorous, it represents another way IoT can improve smart cities in the future. Currently, waste collection and disposal are among the biggest challenges cities face. Smart waste management solutions include real-time route planning tools and bin capacity levels, which can reduce collection volumes and inform citizens about the best ways to dispose of their waste.⁴⁵

These are just two of the many ways IoT will enhance the quality of life for citizens in future smart cities.

IoT has unlimited potential, and through large-scale implementation, thoughtful deployment, and precise management, IoT, urban data platforms, big data, and artificial intelligence can transform our urban centers into smart, sustainable, and efficient spaces. The key to success across all sectors, from healthcare to manufacturing, and from transportation to education, lies in the shared use of information. By collecting data and implementing practical solutions, the next generation of smart cities will be smarter than ever before.

⁴⁴ *Ibid*, p418.

⁴⁵ Ben Zakrin, Khuloud. (2019). "Applied Approaches to the Internet of Things," 2nd ed., Dar Al-Hilal for Publishing and Distribution, Egypt, p301

5. What Are the Key Characteristics of a Smart City?

Smart cities are distinguished by several key characteristics that set them apart from traditional urban areas. These features include:⁴⁶

1. **Connected Infrastructure:** Smart cities are built on the foundation of interconnected infrastructure, which in turn is based on a network of connected devices and systems that facilitate seamless communication and data exchange. This interconnected infrastructure allows for real-time monitoring and control of various city services, leading to more efficient urban management and responsiveness.
2. **Data-Driven Decision Making:** In a smart city, data is the lifeblood. It fuels the process of informed decision-making to enhance urban services and overall quality of life for residents. By collecting, analyzing, and utilizing vast amounts of data, city officials can make better decisions.
3. **Sustainability:** The primary goal of smart cities is to reduce their environmental impact. This is achieved through the use of innovative technologies and solutions that minimize energy consumption, reduce carbon emissions, and promote the efficient use of resources.
4. **Citizen-Centric Services:** Smart cities prioritize the needs and well-being of their inhabitants. By doing so, they leverage technology to make public services more accessible and improve the overall quality of life. Smart cities aim to create a more enjoyable, safe, and convenient living environment for their citizens.

⁴⁶ Al-Alawna, Oum Salma. (2022). "Smart Cities in the Gulf Cooperation Council," Muta Publishing House, Jordan, p236.

These characteristics collectively contribute to the advancement and development of smart cities, paving the way for more sustainable, efficient, and livable urban environments.⁴⁷

5.1. The Importance of Dock Suite System

The Dock Suite system can assist smart cities in the future in several ways:⁴⁸

1. **Efficient Data Management:** The Dock Suite system enables integrated management of IoT data, helping to avoid interference and ensuring smooth data flow between different devices and systems in the smart city.
2. **Advanced Data Analysis:** The system contributes to analyzing big data generated by IoT systems, opening up insights for a deeper understanding of urban lifestyles and identifying possible opportunities and improvements.
3. **System Coordination:** Dock Suite system coordinates the interaction of connected systems and devices, enhancing integration across various aspects of smart infrastructure, such as transportation, energy, and security.
4. **Enhanced Security and Privacy:** The system sorts and secures data, striking a balance between information gathering and ensuring the privacy protection of citizens in cities.
5. **Urban Service Management:** Dock Suite system contributes to improving urban service management, such as traffic management and energy provision, enhancing resource

⁴⁷ *Ibid*, p237.

⁴⁸ Katman, Salima. (2023). "Internet of Things: A Theoretical Introduction," Home Publishing and Distribution House, Algeria, p109

utilization efficiency. By utilizing the Dock Suite system, cities can maximize the potential of IoT capabilities, leading to improved quality of life, enhanced sustainability, and better resource utilization efficiency.

Conclusion

The role of technology in building smart cities is of utmost importance. By integrating advanced technologies such as the Internet of Things, artificial intelligence, and big data analytics into infrastructure and urban services, smart cities can revolutionize the way we live, work, and interact with our surroundings. As we delve deeper into the concept of IoT in smart cities, we gain a better understanding of how these technologies work together to create urban environments that are more efficient, sustainable, and conducive to living.

REVOLUTIONIZING ESP PEDAGOGY IN AI-DRIVEN SMART CITIES: MEETING THE LANGUAGE NEEDS OF SPECIFIC PROFESSIONAL AND ACADEMIC FIELDS

Dr. Ouafa Ouarniki

Ziane Achour University of Djelfa. Associate Professor

Abstract

Sustainable smart cities rely on stable, secure, reliable, and interoperable communication infrastructure to support a vast array of ICT-based applications and services. Recent advancements in the Internet of Things (IoT), artificial intelligence (AI), digital twins, robotics, smart grids, and smart meters are all driving and supporting the development of sustainable smart cities worldwide, enriching and enhancing the decision-making process for governments.

Keywords: Internet ;Things ;people ; communication, Smart cities, Riyadh City

Introduction

Although cities where all urban systems and services are fully connected do not yet exist, many cities are on their way to becoming sustainable and smart cities. They rely on ICT, for example, to enhance energy consumption efficiency, waste management, housing, and healthcare improvements, traffic flow and safety enhancements, air quality detection, alerting police to street crimes, improving water and sanitation networks, and making rural communities smart and sustainable. These advancements improve the quality of life for rural residents and help achieve the United Nations Sustainable Development Goals (SDGs). ICT has the potential to accelerate the achievement of all seventeen UN SDGs, including Goal 11, which aims to create sustainable cities and communities.

The Saudi government has increasingly developed the smart city concept to meet sustainable development challenges and improve the quality of life for its citizens. This accelerated growth is embodied in the smart city project like Riyadh, reflecting the Kingdom's commitment to technological advancement and environmental sustainability. Riyadh is one of the most important cities in Saudi Arabia and one of the fastest-growing cities in the world.

1. Smart Cities in Saudi Arabia: Riyadh

The concept of smart cities encompasses several key elements, including smart infrastructure, sustainability, technology, and community engagement. These elements work together to improve the quality of life and enhance the citizen experience in the city. The smart city of Riyadh involves the development of infrastructure to provide advanced services to citizens. By utilizing communication technologies and smart networks, the management of public utilities such as transportation, sanitation, and electricity is improved, helping to reduce congestion and save time and energy.⁴⁹

Sustainability is one of the most important components of the smart city in Riyadh. This sustainability includes reducing carbon emissions and improving the management of local resources such as water and energy. It relies on renewable energy and environmental practices to preserve the environment and maintain natural wealth.⁵⁰

Technology also plays a critical role in the smart city of Riyadh. This includes the use of artificial intelligence (AI), the Internet of Things (IoT), and big data to improve urban services and facilitate citizens' lives. For example, smart systems can be used to manage traffic and predict crises. The smart city of Riyadh encourages local community participation in the development of the city. Through open dialogue and future vision planning, citizens

⁴⁹ Bawadi, Fadwa. (2022). "Smart Cities Around the World," Dar Al-Maysarah, Cairo, p128

⁵⁰ Al-Dughli, Hatem. (2019). "The Disappearance of Traditional Cities: A Strategic Vision," 2nd ed., Dar Al-Raghib, Baghdad, p542

can contribute to decision-making and achieve sustainable development.⁵¹

The Saudi government has implemented traffic congestion control measures, including adaptive traffic control measures and prioritization measures. The intelligent transportation system monitors and manages city traffic through various sensors and closed-circuit television (CCTV) systems. It uses advanced analytics to conduct real-time historical and predictive traffic analysis, including context-specific reporting of traffic incidents to inform traffic dashboards and key performance indicators.⁵²

Riyadh has advanced to 30th place among 141 smart cities globally, according to the 2023 Smart Cities Index issued by the International Institute for Management Development. Additionally, Mecca, Medina, and Jeddah have entered the index, making the total number of Saudi cities included in the index four.

2. Social Media and the Intelligence Index of Global Smart Cities

Social media is a source of big data, as are smartphones and mobile devices, where data related to public interactions on social media platforms is collected. This helps in understanding the needs and interests of the population, communicating with them, and knowing their opinions and feedback about smart cities and their services.

Of course, after collecting this data, it needs to be analyzed and transformed into valuable information for smart cities. This

⁵¹ *Ibid*, p543.

⁵² Al-Ghamdi, Al-Sharif. (2021). "The Integrated Strategic Vision of the Kingdom of Saudi Arabia," Dar Al-Motabeni Publishing and Distribution, Saudi Arabia, p421.

goal requires the use of machine learning and artificial intelligence technologies to extract value from this data to achieve the objectives of smart cities in improving urban life, enhancing the quality of life, and providing better services to the residents and visitors of these cities.⁵³

Therefore, developing the infrastructure of smart cities is essential to maximize the benefits of collecting and transmitting data from its sources.

3. Successful Global Models in Smart Cities

We will mention some successful models in the development of smart cities both within the Kingdom and abroad, as the Kingdom, through Vision 2030, aims to achieve comprehensive development and build a society based on technology and innovation.

Firstly, within the Kingdom, there is the digital government, which relies on smart automation in collecting and analyzing data to provide government services easily to citizens and residents. Additionally, many smart cities in the Kingdom have benefited from data to improve their services and develop their infrastructure. For example, Riyadh has equipped many streets and parking lots with smart sensors to collect data on traffic and congestion. Riyadh uses this data to analyze and develop public transportation services, providing a more efficient system.⁵⁴

Another example in the Kingdom is King Abdullah Economic City, which is one of the largest smart cities in the Kingdom. King Abdullah Economic City has modern technological infrastructure that allows for data collection and analysis from various

⁵³ *Ibid*, p422.

⁵⁴ *Ibid*, p5424.

sources, including transportation, environment, energy, and security. Data analysis is used to improve urban planning and achieve sustainability.

There are also successful models in Mecca and Medina, serving pilgrims and visitors to religious sites. Data analysis is used to improve transportation services, public safety, and healthcare, based on smart systems to monitor crowding, manage stampedes, and oversee public safety and emergency health situations during religious rituals. Collected data is also used to make strategic decisions to improve service quality each year.

There are other examples, such as the smart city of NEOM, which is currently under construction, and the implementation of smart city requirements in Dammam. Dammam is working towards transforming into a smart and sustainable city by using data from transportation, electricity, and water sources to improve consumption, better manage resources, and achieve efficiency and sustainability.

Internationally, many smart cities around the world have benefited from data to improve their services and develop their infrastructure. Some examples include:

- **Seoul, South Korea:** Seoul is one of the cities that has benefited the most from data in all aspects, especially traffic management, energy consumption, and air pollution crisis prediction to improve city management and enhance the quality of life for its citizens.
- **Sydney, Australia:** Sydney is another international example, using data collected from various sources such as the public transportation system, road networks, and the energy system to improve resource efficiency and provide better services to its citizens.

- **Turin, Italy:** Turin has equipped many streets and parking lots with sensors to collect data on traffic and congestion. This data is analyzed to improve traffic control patterns and reduce congestion.
- **Seattle, USA:** Seattle has equipped street lamps with sensors to measure light levels, air quality, and temperature. Seattle uses this data to improve need-based lighting and save energy.

These examples illustrate how smart cities leverage data to enhance their services and infrastructure, ultimately improving the quality of life for their residents.

4. Internet of Things (IoT) in Smart Cities

4.1. The Importance of IoT in Smart Cities

According to figures cited in a study on improving IoT security using Software-Defined Networking (SDN), there will be more than 75.44 billion devices connected to the Internet of Things by 2025. IoT is expected to grow into one of the smartest collective and collaborative systems in history.

With vast potential and opportunities across a wide range of sectors, including urban mobility, security, sustainability, maintenance, healthcare, and management, it is crucial for cities to understand the benefits and opportunities of IoT for smart cities.

Advanced connectivity is one of the fundamental building blocks for developing the next generation of cities. Communication between citizens and governments will occur in ways never seen before. IoT will provide tremendous opportunities and benefits for cities, but this level of connectivity will also bring its own set of challenges. The DUC Suite system plays a significant role in

building smart cities by providing infrastructure to manage and analyze big data derived from IoT systems. DUC Suite is used for data integration and storage, facilitating intelligent analytics that contribute to a better understanding of city needs and improving the efficiency of services and operations.

4.2. What is the Internet of Things?

According to the International Telecommunication Union (ITU), the term "Internet of Things" (IoT) is a broad term that can be used to describe any object connected to the internet. However, in recent years, the term IoT is increasingly used to specifically describe objects that can "talk" to each other.

It refers to the vast network of digital devices that communicate and interact with each other, impacting our daily lives. These devices include smart sensors, monitoring devices, artificial intelligence programs, and actuators that can assess, monitor, and control certain aspects of city life. For example, weather-related data can be collected by multiple sensors, which can then be used to manage thermostats in public buildings, reduce emissions, and save city funds.

There is no single, unified definition of what the Internet of Things is. Different organizations and individuals might propose varying definitions. However, they all agree that IoT is a set of technologies for accessing data collected by various devices via wireless and wired internet networks.

4.3. Examples of IoT Solutions and Smart Cities

According to IoT Analytics, smart cities prioritize IoT technology in several interesting ways. The study focused on decision-makers from some of the world's leading smart cities (including Barcelona, Paris, Amsterdam, and Palo Alto) and ranked how

leaders use IoT to reduce urban inefficiencies and improve the quality of life for their citizens.

The study found that the following areas were top priorities for smart city governments:⁵⁵

- Connected public transport (74%)
- Traffic monitoring and management (72%)
- Water level/flood monitoring (72%)
- Video surveillance and analytics (72%)
- Connected street lights (68%)
- Weather monitoring (68%)
- Air quality/pollution monitoring (68%)
- Smart metering – water (66%)
- Fire/smoke detection (66%)
- Water quality monitoring (64%)

The percentages shown are the proportion of the included smart cities that have deployed use cases as part of their smart city initiatives.

Let us take a look at some examples of how smart cities are effectively using IoT technology to solve urban problems.

⁵⁵ Abu Habeib, Aribi. (2018). "An Introduction to Communication Technologies," National Publishing Establishment, Baghdad, p65.

How IoT Solutions Can Help Future Smart Cities

The future of smart cities is closely tied to the future of the Internet of Things (IoT). As city governments begin to unlock the full potential of urban data platforms, artificial intelligence, smart devices, and interconnectivity, the need for IoT will grow significantly. This will lead to efficient problem-solving, smart mobility, sustainability, and more.⁵⁶

One of the most exciting ways IoT can benefit future smart cities is by reducing the need for private vehicles. With the advent of self-driving cars, it will not be long before autonomous public transport becomes accessible to everyone. Supported by IoT technology, future cars and buses will be able to operate using data transmitted via street furniture or street lighting, providing an efficient and smooth traffic flow.⁵⁷

Although the future of waste management is far less glamorous, it represents another way IoT can improve smart cities in the future. Currently, waste collection and disposal are among the biggest challenges cities face. Smart waste management solutions include real-time route planning tools and bin capacity levels, which can reduce collection volumes and inform citizens about the best ways to dispose of their waste.⁵⁸

These are just two of the many ways IoT will enhance the quality of life for citizens in future smart cities.

⁵⁶ Farouk, Laazali. (2022). "E-Governments: Applied Approaches," Taxiage Com Publishing and Distribution, Tower of Keifan, Algeria, p415.

⁵⁷ *Ibid*, p418.

⁵⁸ Ben Zakrin, Khuloud. (2019). "Applied Approaches to the Internet of Things," 2nd ed., Dar Al-Hilal for Publishing and Distribution, Egypt, p301

IoT has unlimited potential, and through large-scale implementation, thoughtful deployment, and precise management, IoT, urban data platforms, big data, and artificial intelligence can transform our urban centers into smart, sustainable, and efficient spaces. The key to success across all sectors, from healthcare to manufacturing, and from transportation to education, lies in the shared use of information. By collecting data and implementing practical solutions, the next generation of smart cities will be smarter than ever before.

5. What Are the Key Characteristics of a Smart City?

Smart cities are distinguished by several key characteristics that set them apart from traditional urban areas. These features include:⁵⁹

5. **Connected Infrastructure:** Smart cities are built on the foundation of interconnected infrastructure, which in turn is based on a network of connected devices and systems that facilitate seamless communication and data exchange. This interconnected infrastructure allows for real-time monitoring and control of various city services, leading to more efficient urban management and responsiveness.
6. **Data-Driven Decision Making:** In a smart city, data is the lifeblood. It fuels the process of informed decision-making to enhance urban services and overall quality of life for residents. By collecting, analyzing, and utilizing vast amounts of data, city officials can make better decisions.

⁵⁹ Al-Alawna, Oum Salma. (2022). "Smart Cities in the Gulf Cooperation Council," Muta Publishing House, Jordan, p236.

7. **Sustainability:** The primary goal of smart cities is to reduce their environmental impact. This is achieved through the use of innovative technologies and solutions that minimize energy consumption, reduce carbon emissions, and promote the efficient use of resources.
8. **Citizen-Centric Services:** Smart cities prioritize the needs and well-being of their inhabitants. By doing so, they leverage technology to make public services more accessible and improve the overall quality of life. Smart cities aim to create a more enjoyable, safe, and convenient living environment for their citizens.

These characteristics collectively contribute to the advancement and development of smart cities, paving the way for more sustainable, efficient, and livable urban environments.⁶⁰

5.1. The Importance of Dock Suite System

The Dock Suite system can assist smart cities in the future in several ways:⁶¹

6. **Efficient Data Management:** The Dock Suite system enables integrated management of IoT data, helping to avoid interference and ensuring smooth data flow between different devices and systems in the smart city.
7. **Advanced Data Analysis:** The system contributes to analyzing big data generated by IoT systems, opening up insights for a deeper understanding of urban lifestyles and identifying possible opportunities and improvements.

⁶⁰ *Ibid*, p237.

⁶¹ Katman, Salima. (2023). "Internet of Things: A Theoretical Introduction," Home Publishing and Distribution House, Algeria, p109

8. **System Coordination:** Dock Suite system coordinates the interaction of connected systems and devices, enhancing integration across various aspects of smart infrastructure, such as transportation, energy, and security.
9. **Enhanced Security and Privacy:** The system sorts and secures data, striking a balance between information gathering and ensuring the privacy protection of citizens in cities.
10. **Urban Service Management:** Dock Suite system contributes to improving urban service management, such as traffic management and energy provision, enhancing resource utilization efficiency. By utilizing the Dock Suite system, cities can maximize the potential of IoT capabilities, leading to improved quality of life, enhanced sustainability, and better resource utilization efficiency.

Conclusion

The role of technology in building smart cities is of utmost importance. By integrating advanced technologies such as the Internet of Things, artificial intelligence, and big data analytics into infrastructure and urban services, smart cities can revolutionize the way we live, work, and interact with our surroundings. As we delve deeper into the concept of IoT in smart cities, we gain a better understanding of how these technologies work together to create urban environments that are more efficient, sustainable, and conducive to living.

LA VILLE INTELLIGENTE DANS LES PAYS ARABES ; UNE REFLEXIONS SUR LA VULNERABILITE SOCIALE

Dr. Ouzir Malika, université de Msila

Dr. HDR Boualem Fardjaoui, université de Lille

Résumé

Les villes intelligentes ont révolutionné l'environnement urbain en utilisant les technologies de l'information et de la communication pour améliorer la qualité de vie des citoyens. Ces villes visent à offrir des services performants dans divers secteurs comme les transports, la sécurité, la santé et l'environnement, tout en assurant une égalité d'accès aux technologies numériques. Cependant, un défi persistant est la fracture numérique, particulièrement visible dans les villes arabes, où l'accès à Internet et les compétences numériques sont souvent limités.

La transformation numérique requiert non seulement des investissements en infrastructures, mais aussi une large accessibilité aux technologies, posant des problèmes potentiels de vulnérabilité sociale si les politiques urbaines ne répondent pas aux besoins de toute la population. Cette étude se penche sur les faiblesses des approches actuelles des villes intelligentes, en proposant des réflexions spécifiques aux contextes des villes arabes. Elle questionne l'efficacité de ces villes et examine leurs impacts sociaux.

Pour construire une société véritablement intelligente et inclusive, il est crucial de réduire la fracture numérique en garantissant un accès universel à Internet et en offrant des formations aux compétences numériques. Il ne s'agit pas seulement de concevoir de nouvelles villes idéales, mais aussi de réaménager les villes existantes en élaborant des stratégies adaptées aux contextes locaux.

Mots clés : villes intelligentes, environnement urbain, technologies de l'information, communication, qualité de vie, accessibilité aux technologies, société inclusive, fracture numérique, accès universel à Internet.

Introduction

Dès son apparition, la ville intelligente a modifié l'environnement urbain tout en intégrant la gestion des données et utilisant les technologies de l'information et de communication (TIC). Les villes intelligentes ont un impact social significatif en améliorant la qualité de vie des citoyens et offrant à tous un accès équitable aux opportunités. Grâce à l'utilisation de technologies innovantes, ces villes peuvent offrir des services efficaces dans des domaines tels que les transports⁶², la sécurité, la santé et l'environnement. Dans une ville intelligente, il est essentiel de s'assurer que tous les citoyens ont accès aux technologies numériques et peuvent bénéficier des services intelligents. La société doit donc travailler à réduire la fracture numérique en garantissant un accès équitable à Internet et en fournissant une formation sur les compétences numériques aux populations mal desservies.

Cette transformation digitale ⁶³nécessite des investissements et des infrastructures urbaines bien développées, mais aussi une large capacité d'accès à la technologie diverse qui peuvent être des handicaps sociaux éventuels, spécialement dans les villes arabes dont se trouve l'absence d'accès à Internet⁶⁴, l'analphabétisme numérique ou de l'incapacité à utiliser les appareils numériques.

⁶² Savolle, Adrien et Mirza, Vincent, , *Anthropen*, 2023.

⁶³ Nicolas Douay et Christian Lamkar, *Ville intelligente* Nouvelles technologies, nouveaux outils, nouvelle organisation de la ville: vers une nouvelle planification numérique?, ville et métropole en France et en Allemagne, 2023.

⁶⁴ Jonckheere, Laurent. L'état d'avancement de l'Internet des Objets dans le secteur de la maison intelligente, de la distribution, de la ville intelligente et plus particulièrement des soins de santé : le consommateur belge est-il prêt à adopter l'usage de la surveillance à distance dans ce secteur ? Louvain School of Management, Université catholique de Louvain, 2019.

Notre perspective d'analyse systémique est d'identifier les différentes visions approchées dans les recherches sur la ville intelligente, en focalisant sur les faiblesses ou les lacunes observées dans les approches actuelles et en proposant quelques pistes de réflexion sur la ville intelligente arabe.

Donc, la problématique générale s'articule sur l'examen et l'analyse de la ville, pour mettre en place un processus socialement d'intelligence territoriale de la ville

Ce travail de recherche s'interroge plus précisément sur les vulnérabilités sociétales qui peuvent être générées par les politiques de villes intelligentes qui ne prennent pas en compte les besoins et les valeurs de tous les membres de la société. Cette question sous-entend deux axes principaux à explorer, celui qui questionne l'intérêt et l'efficacité de la notion de ville intelligente et celui qui s'intéresse aux effets sociaux de cette notion dans le milieu urbain. Les questions majeures sont :

-est-ce que les villes intelligentes, avec leurs dimensions techniques et économiques, conduisent nécessairement à l'établissement de sociétés intelligentes avec leurs dimensions sociologiques ?

Qu'est-ce que la Vulnérabilité sociale ?

Méthodologie :

Afin de contourner cette thématique, notre approche de l'effet de la ville intelligente sur l'aspect social, sera l'approche systémique, l'analyse systémique est une méthode qui convient pour décrire les phénomènes complexes avec de multiples éléments et interdépendances(en occurrence : la ville intelligente et l'aspect social), cette approche permet de comprendre le mécanisme de chaque système, d'identifier les sous-systèmes (la décomposition de chaque concept et les indicateurs ou phénomènes

observables), leurs interactions et comprendre les relations entre eux.

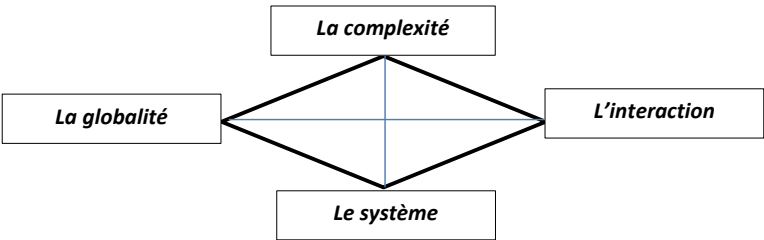


Figure 01: Les quatre concepts de base de la Systémique.

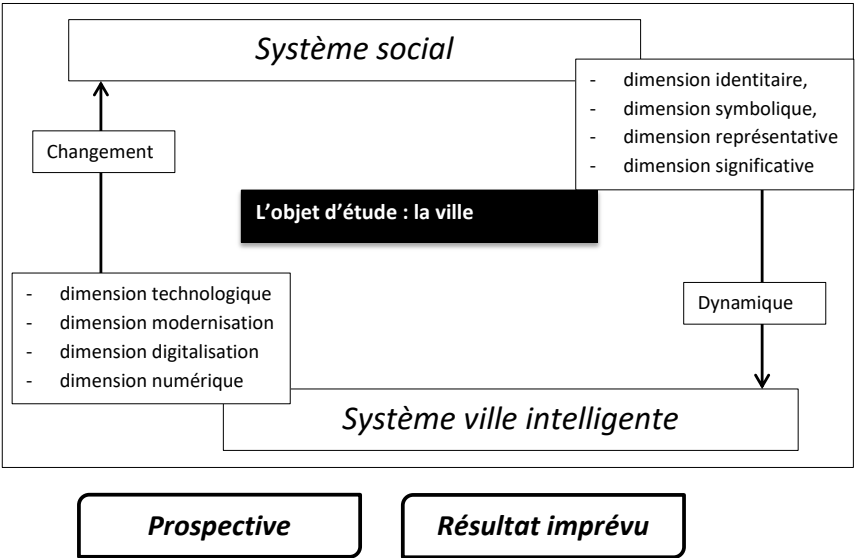


Figure 02: L'Analyse conceptuelle

Dans cette figure, différentes dimensions de chaque système ont été développées. Cette recherche invite à une réflexion sur les transformations, les transitions sociales/culturelles en rapport à la ville désignée comme objet d'étude, en ce sens, la société est dynamique et changeable, ce changement concerne d'abord les vécus, les comportements, les pratiques des habitants, le degré de cohésion et d'homogénéisation entre les groupes d'individu...

Ce qui est essentiel dans les études actuelles sur l'avenir, ce n'est pas l'effort pour prédire l'avenir, mais l'effort pour esquisser les avenir possibles » c'est fournir une base plus sûre aux options possibles et aux choix réalistes et des prévisions exactes.

1- Ville intelligente ou bien société intelligente :

Les deux termes ne sont pas du tout synonymes, ou comme l'a souligné le Forum mondial des communautés intelligentes, les capacités de la ville intelligente sont nécessaires pour fournir l'infrastructure et la technologie dont la société a besoin pour être « intelligente ». Mais ils ne suffisent pas pour lui donner cette description. Dans cette optique, l'intelligence des villes est une mise en réseau des moyens d'information publics⁶⁵ en vue d'en permettre l'accès aux entités publiques et privées, appartenant à des secteurs stratégiques : il s'agit en fait d'un instrument au service des citoyens de la ville.

2- L'aspect social de la ville intelligente :

La ville intelligente qui à son caractère partiellement non humain, doit être habilitée comme un lieu de plaisir pour l'homme

⁶⁵ Malika Grim-Yefsah¹, Mohamed Chachoua² et Lea Jeantet, *Vers une optimisation de la diffusion de l'information dans une ville intelligente*, INFORSID (INformatique des ORganisations et Systèmes d'Information et de Décision), 2023.

et la femme, un lieu de leur bien-être⁶⁶ et de leur épanouissement et plus apte à assurer le bonheur des citoyens qui l'habitent

La ville intelligente doit fournir les outils numériques qui permettent d'optimiser le fonctionnement et la durabilité (santé, cadre de vie...), mais aussi une qualité de vie de ses habitants et garantir le type des relations sociales les uns avec les autres (figure 03).



Figure N° 03 : les différentes traductions de l'aspect social dans la ville intelligente.

La ville espace de parole et dialogue :

Dans cet élément, il importe de bien comprendre les mécanismes et les interactions complexes qui jouent entre les individus et la ville intelligente. Le tout se déroulant dans le temps pour construire leur histoire, leur mémoire collective porteuse de sens

⁶⁶ Hassan Ait Haddou, Sibylle Turo, Anne-Sophie Cases et Claire Noy, « Bien-être et environnement connecté, études interdisciplinaires des environnements intelligents », N 37 , volume 1, 2023.

qui influe à son tour sur le vécu, et sur les comportements des individus, alors on peut dire que la relation espace/société est une relation réciproque.

Dans une approche complémentaire, on a essayé de rassembler les différents thèmes que pourrait couvrir une réflexion sur la ville intelligente et l'espace urbain au sens large et qui ne se limite pas au bâti, mais à l'environnement artificiel et naturel, au temps et aux présentations sociales.

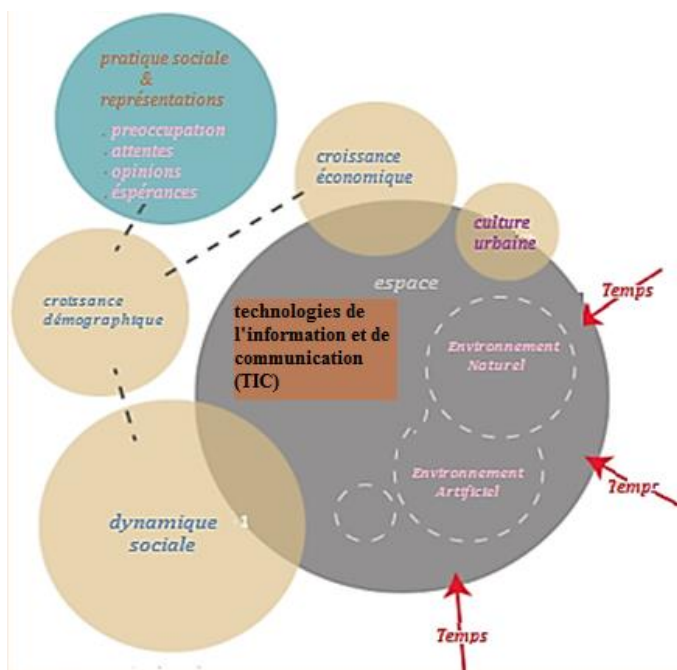


Figure N° 04 : les différentes composantes du système urbain.

La figure N° 04 est un organigramme d'information qui présente les différents composants de fonctionnement urbain (social, économique et culturel qui sont reliés entre eux). Ils sont représen-

tés par des bulles incrustées dans l'image représentant l'espace puisqu'ils interagissent directement avec lui. L'espace comporte un environnement naturel et autre artificiel qui doivent s'adapter en fonction des attentes et souhaits des habitants et visent à satisfaire leurs besoins.

Le géographe Jacques Levy définit la ville "comme une situation spatiale caractérisée par la concentration d'une société en un lieu en sorte d'y maximiser la densité et diversité des interactions sociales «. Selon Henri Laborit " la ville est une production de la vie, une sécrétion, une enveloppe... c'est à la fois un outil et en un vêtement, une cuirasse et une militante, un lieu d'échanges, une membrane ...la ville n'est pas un organisme, mais elle représente un des moyens utilisés par un organisme social pour contrôler et maintenir sa structure."

"La ville est un outil efficace qui n'a jusqu'ici servi à des groupes humains dominants, qu'a maintenir leur domination "

Les lignes discontinues représentent le lien entre la croissance économique et la dynamique sociale, la croissance économique peut, de diverses manières, stimuler l'accroissement démographique et ce dernier peut jouer sur la demande et sur l'offre des agents économiques.

Les lignes continues représentent la traduction de l'aspect social. En effet, l'environnement urbain se trouve assigné socialement par des significations, c'est à travers les pratiques des individus et l'usage commun et de la symbolique que se construisent les significations qu'on pourra lire par un ensemble de signes. Parmi celles-ci on peut citer :

La parole des habitants peut être un moyen d'intégration et d'affirmation de sa singularité, lorsque les habitants prennent la parole, ils existent et leur identité sociale se construit dans cette

dynamique" (Patrick NORYNBERG, 2001), cette parole doit faciliter l'expression et le respect de chacun.

Alors, qu'il devenu essentiel de valoriser les savoir-faire des habitants, de les réveiller et de les soutenir, et encourager leur enthousiasme, leur motivation à connaître qu'ils sont un véritable acteur du devenir de leur ville et à dire sur ce qui les concerne (il suffit de vouloir pour pouvoir), cette dernière ne peut être réalisée sans fournir de l'information urbaine ⁶⁷et sans réfléchir à la façon de traiter ce qui est dit et de restituer cette parole.

Mais, il faut toujours revenir sur les objectifs qui ont motivé les habitants parce qu'ils restent toujours le point central de la ville par leur participation ; Paul Claudel dit « même l'intelligence ne fonctionne pleinement que sous l'impulsion du désir ».

En dernier lieu, les flèches représentent les trois temps, la ville intelligente de demain peut-être bâtit en prenant en compte la superposition de trois temporalités urbaines :

- Le passé, qui constitue le patrimoine et la mémoire historique collective
- Le présent qui constitue le vécu
- Le futur qui constitue la prospective.

L'analphabetisme numérique : une forme de vulnérabilité sociale

Le passage au numérique de la ville est un exploit pour la modernisation des services intelligents au bénéfice de la qualité de vie des citoyens, en impliquant le privé et le public de faire émerger ensemble un contrat social de la donnée et de la digitalisation des services.

⁶⁷ André Cholley, *Développement durable (l'information géographique)*, Armand Colin, Paris, 2007.

Les technologies peuvent approfondir les inégalités territoriales et sociétales si elles sont implémentées sans souci d'égalité, rendant l'information immédiate (valide, pertinente, fiable, exacte, complète), disponible pour tous et quasiment gratuite (l'environnement, l'économie, les grands projets, la sécurité...).

Plusieurs facteurs peuvent influencer l'accès à Internet dans les villes arabes. Tout d'abord, l'infrastructure est un élément clé. Certaines régions peuvent manquer d'une infrastructure adéquate⁶⁸, telle que des câbles à fibres optiques, des tours de télécommunications et des antennes relais, ce qui limite la couverture et la vitesse de connexion. De plus, le coût de l'accès à Internet peut être prohibitif pour de nombreux utilisateurs potentiels. Les tarifs élevés des services Internet peuvent dissuader certaines personnes de souscrire à un abonnement. Les compétences numériques et la formation peuvent également influencer l'accès à Internet. Un manque de connaissances et de confiance dans l'utilisation des technologies de l'information peut rendre certaines populations moins enclines à se connecter à Internet. Enfin, les politiques gouvernementales et la réglementation peuvent jouer un rôle important dans l'accès à Internet. Des politiques favorables qui encouragent la concurrence entre les fournisseurs de services et qui garantissent l'accès égalitaire à Internet peuvent contribuer à améliorer l'accès dans les villes arabes.

⁶⁸ Hafía Salim Abdulkareem & Dheah Hameed Basee, *Towards Smart Sustainable Iraqi Cities: Problems and Potentials*, Journal of the International Society for the Study of Vernacular Settlements, N 04, 2023.

Aspect social	Les indicateurs mesurables	Les indicateurs mesurables	Ville intelligente
	les vécus	Infrastructure internet	
	les comportements,	Vitesse connexion	
	les pratiques des habitants, le degré de cohésion	le coût de l'accès à Internet	
	d'homogénéisation entre les groupes d'individu	Les compétences numériques	

Fracture numérique

Exclusion territoriale face aux technologies de la donnée

Vulnérabilité sociale

Analphabétisme numérique

Adaptation

Transformations

Transitions sociales/culturelles

Figure N° 05 : l’interaction entre les deux processus (l’aspect social et de la ville intelligente).

La fracture numérique⁶⁹ ne distingue désormais plus ceux qui ont ou non accès à du matériel et à une connexion internet, mais bien ceux qui maîtrisent ou non leur utilisation.

La vulnérabilité peut rendre compte de l’ensemble des facteurs qui constituent la fragilité d’une société, d’un territoire, d’une population. Elle peut également faire référence à des disparités sociales⁷⁰

⁶⁹ Clara Coulée et Marie Dieuzeide, *Smart cities : quelles sont les principales menaces ?* Louvain School of

Management, Université catholique de Louvain, 2018.

⁷⁰ Christophe Quéva, Anaïs Béji, Marie Duchêne, Félicie Mortier, Antoine Torre et Martin Valcke, « La vulnérabilité sociale et territoriale des

Conclusion

Dans une ville intelligente, il est essentiel de s'assurer que tous les citoyens ont accès aux technologies numériques et peuvent bénéficier des services intelligents. La société doit donc travailler à réduire la fracture numérique en garantissant un accès équitable à Internet et en fournissant une formation sur les compétences numériques aux populations mal desservies.

Le travail majeur n'est pas de concevoir une nouvelle forme idéale de la ville, mais aussi de "reconcevoir" les villes existantes et de prendre en considération que les villes sont uniques dans leurs structures et leurs formes et qu'il semble plus simple de développer des stratégies planificatrices adaptées au contexte local.

Recommandations

Pour une nouvelle société sans illettrisme informatique, plusieurs mesures doivent être prises en compte :

- Remettre consciencieusement aux expérimentations et réalisations actuelles à l'international, mais prendre le contexte local en considération
- L'installation d'une ville intelligente a besoin des transformations longues et respirées rythmées d'avancées en commençant par les citoyens
- Investir dans le développement des aptitudes informatiques et atténuer la fracture digitale en aidant les gens.

THE ALGERIAN STATE'S EXPERIENCE IN E-LEARNING

Dr. Soumia Chakri,

Setif 2 University Algeria

Pr. Aissa Maiza,

Zian,Achour University, Djelfa Algeria

Phd student Abdelhafid Kheit,

Catania University, Italy

Abstract

Since its independence, Algeria has prioritized investing in education as its most valuable asset, dedicating significant material and human resources to this end. Despite these efforts, Algerian universities still do not rank among the top international institutions. Algeria has made adjustments to its educational system, aligning it with globalization by introducing the LMD (License-Master-Doctorate) system and quality assurance measures. Subsequently, e-learning was implemented across various universities and educational centers.

Algeria's experience with e-learning, using descriptive and analytical approaches to address the issue of how extensively Algeria has adopted e-learning. The study concludes that Algeria has effectively implemented e-learning, especially in distance education during the COVID-19 pandemic, leveraging existing infrastructure, notably the Moodle platform. This initiative continues to evolve, utilizing tools like the Progress system for grading and student feedback, as well as digitalization through the establishment of digital cells within Algerian universities.

Introduction

The Algerian state guarantees the right to education for every Algerian citizen without discrimination based on gender, social, or geographical status.⁷¹ This right to education is realized through the provision of universal basic education and the assurance of equal opportunities in terms of schooling conditions and the continuation of studies after basic education.⁷² Education is compulsory for all girls and boys aged six (6) to sixteen (16) years old. However, the duration of compulsory schooling can be extended by two (2) years for students with disabilities, whenever their condition justifies it.

The Algerian state, in cooperation with parents, ensures the enforcement of these provisions. Parents or legal guardians who violate these rules are subject to a fine ranging from five thousand (5,000) DZD to fifty thousand (50,000) DZD. Moreover, the state supports the education of outstanding students by providing them with various forms of assistance, particularly scholarships, books, and school supplies. Those who meet the legal requirements are also granted accommodation, food, transportation, and school health services.

Despite these efforts, Algerian universities were not ranked among the top universities internationally. Therefore, significant efforts have been made to keep pace with technological and scientific advancements, particularly in the realm of e-learning. To understand the Algerian experience, we will examine the state of higher education in Algeria from independence to the present day.

⁷¹ Article 10 of Law No. 08-04 dated 15 Muharram 1429 corresponding to January 23, 2008, which includes the directive law for national education. Official Gazette No. 4, 2008.

⁷² Article 11 Law No. 08-04.

- **First Section:** The State of Higher Education in Universities Before the COVID-19 Pandemic

- **Second Section:** The State of E-Learning in Algeria During the COVID-19 Pandemic

- **Third Section:** Towards Activating E-Learning in Algeria After the COVID-19 Pandemic

First Section: The State of Higher Education in Public Institutions before the COVID-19 Pandemic

This section will cover the state of education in Algeria before 1962 (Part One), followed by the efforts of the Algerian state regarding higher education in public institutions from 1962 to the present day (Part Two).

Part One: The State of Education in Algeria Before 1962

On the eve of colonization, Algeria had a vast number of schools, teachers, and students. Educational endowments, high salaries, and waqf properties were notable features of education in both urban and rural areas. Education was an integral part of Algerian life, with teachers and students held in high regard and respect. The pursuit of knowledge was considered a form of worship, making education both free and compulsory. It was equally accessible to the rich and the poor, the ruler and the ruled, with all learning the same language, spirit, religion, and creed. Illiteracy was nearly non-existent as everyone knew how to read and write, with many memorizing and reading the Quran and learning Arabic as part of their religious duties. However, only a few continued their studies to higher education.⁷³

⁷³Abu al-Qasim Saadallah, *The Cultural History of Algeria*, Part Three, Dar al-Gharb al-Islami, Beirut, Lebanon, 1998, p. 20.

Higher education at the time included subjects such as jurisprudence, fundamentals of religion, theology, Islamic history, and medicine, with some also studying engineering, drawing, decoration, calligraphy, and documentation. Schools did not disappear all at once. For instance, in Algiers alone, there were about a hundred schools in 1830. By 1840, less than ten years after the occupation, only 24 schools remained. By 1846, the number of schools had dropped to 14, with only 300 to 400 students. Despite this decline, these schools were still preferred by Algerians over French schools. France actively suppressed religious and scientific gatherings and maintained schools that did not offer comprehensive education. Consequently, France struggled to find qualified personnel for Islamic judiciary roles.

After occupying Constantine, General Bugeaud wrote to the Minister of War, noting that education remained active there. The city had educational institutions at various levels, including higher education, with 700 students studying Quranic exegesis, Hadith sciences, philosophy, and rhetoric. When Algeria gained independence in 1962, it had three universities with 2,000 students and fewer than 250 professors.⁷⁴

Part Two: The Efforts of the Algerian State Regarding Higher Education in Public Institutions from 1962 to the Present Day

This section can be divided into several phases:

First Period (1962-1976): This phase extends from the enactment of the law on 31/12/1962, which involved extending the application of French legislation in Algeria due to the legislative

⁷⁴ Ibid., p. 35

vacuum that Algeria experienced after independence, to the Higher Education Reform Law of 1971.

Second Period (1976-2000)

	1972	1992	2000
Science and technology	9.67	40.62	26.57
Economic, commercial and planning sciences	10.42	9.22	18.67
Arts and social sciences	26.98	15.55	18.56
Law, journalism and political science	17.84	7.74	15.57
Biology and earth sciences	9.19	6.38	10.10
Medical Sciences	17.50	12.76	7.45
Exact sciences	8.40	7.739	3.08
The total	100.00	100.00	100.00

⁷⁵**Table 1: Percentage of Enrolled Students by Major Fields of Study**

⁷⁵ Ibid., p. 30

	1977	1990	2000
Science and technology	55	2670	5631
Literature and social sciences	875	2199	4433
Medical Sciences	110	3187	3838
Exact sciences	152	1178	2577
Law, journalism and political science	182	3347	1631
Biology and earth sciences	22	1191	1457
Economic, commercial and planning sciences	238	1081	1279
The total	2634	14853	20846

⁷⁶Table 2: Number of Students Enrolled in Postgraduate Studies

3. Third Period: Efforts of the Algerian State Regarding Higher Education in Public Institutions from 2000 to the COVID-19 Pandemic

The Algerian education system has continuously undergone adjustments to improve its educational outcomes and elevate its standards. One of the most significant changes was the introduction of a higher education system known as the Bachelor's, Master's, Doctorate system (LMD) in the 2004/2005 academic year. This system was a response to globalization and aimed to address the shortcomings of the classical system and achieve global accreditation for university institutions. By 2015, the number of

⁷⁶ *Ibidem*

higher education institutions had increased to a network of 107 institutions, including 48 universities, 20 national higher schools, 12 preparatory schools, 11 higher schools for teachers, 10 university centers, and 5 university branches, with a student population of one and a half million and more than 54,000 university professors.

To enhance performance, promote pedagogical effectiveness, and develop scientific research in line with quality indicators, mechanisms for public higher education institutions were activated and improved. Additionally, new mechanisms were established, particularly:

❖ Quality System

In June 2008, the Ministry of Higher Education organized a national conference titled "Mid-term Review After Four Years of Implementing the LMD System" and an international conference on quality in higher education titled "Quality Assurance in Higher Education: Reality and Requirements." These events, which included participation from the European Union and UNESCO, led to the establishment of the National Committee for Quality Assurance in Higher Education (CIAQES) on May 31, 2010, by ministerial decree No. 167. The goal was to support and encourage higher education institutions to implement best practices at both institutional and program levels.

The TEMPUS project for internal quality assurance in Mediterranean universities resulted in the final release of the internal quality assurance reference system for Mediterranean universities in October 2011. This reference system organized four major areas of quality: training (through seven fields), research (three fields), governance (five fields), and university life (four fields). However, the application of this reference faced many challenges, primarily

due to a lack of implementing structures and the absence of a legal framework for these structures.

Since the current Ministry of Higher Education took office, quality has moved from theory to practice through numerous legal texts and ministerial directives. The National Reference for ⁷⁷ Internal Quality Assurance in Higher Education Institutions ("Référentiel assurance qualité") was developed by CIAQES. Additionally, a Committee for Quality Assurance System Implementation was established by decree No. 2004 of 2014 (amended by decree No. 761 dated July 17, 2016). CIAQES is tasked with introducing and developing quality assurance procedures in higher education and research institutions through:

- Supervising internal and self-assessment processes of leading institutions in alignment with the national reference for quality assurance.
- Supporting and assisting the quality assurance units established in higher education and research institutions to become operational.
- Training supervisors and members of the quality assurance units.
- Coordinating and monitoring all activities related to quality assurance in higher education and research institutions to ensure coherence.

2. Supporting and Encouraging National, Regional, and International Cooperation

⁷⁷ Resolution No. 2004 dated December 29, 2014, includes the establishment of a committee to develop a quality assurance system in the higher education and scientific research sector (Official Bulletin of Higher Education and Scientific Research 2014, Fourth Triennial).

This is evident through various mechanisms, including short-term and long-term overseas training, scientific leave, scholarship programs for completing doctoral theses, the PROFAS program, The Erasmus+ program, among others. The Erasmus+ program of the European Union provides an integrated and simplified approach to seven existing programs through three main activities: mobility, cooperation, and policy reform aimed at youth. It covers sectors of education, training, youth, and sports from 2014 to 2020. The program aims to enhance skills, job opportunities, and modernize education, training, and youth employment⁷⁸. Additionally, the United Nations Institute for Sustainable Development was established in Algeria in 2016 following the activation of Presidential Decree 15/118.⁷⁹

❖ **Distance Learning:**⁸⁰

⁷⁸ <https://services.mesrs.dz/Erasmus>

⁷⁹ Presidential Decree 15/118 issued on May 13, 2015 (Official Gazette 2015, No. 25).

⁸⁰ E-learning is an educational system for providing educational or training programs to students. It is not limited to delivering information electronically to the student only, but it is based on interaction between the elements of the educational process in the professional e-learning environment. E-learning is one of the means that supports the educational process, which is based on the interaction between the elements of the educational process in the e-learning environment and its transformation from the phase of indoctrination to the phase of creativity, interaction, and skills development. It combines all electronic forms of teaching and learning, and uses modern communication technologies in the fields of education, publishing, and entertainment by relying on computers, their storage media, and networks. The learner continues his learning according to his ability, ability, and speed of learning according to his previous experiences and skills, at any time and in any place for the purpose of providing an interactive learning environment with multiple sources. It is based on four elements: the teacher, the learner, the administrative staff and the technical support staff

To address the shortcomings in supervision and improve the quality of training in line with quality assurance requirements, new training and teaching methods have been introduced, including new pedagogical procedures throughout the training process. Hence, the national distance learning project was launched. Distance learning currently relies on a network platform for visual lectures and e-learning, distributed across the majority of training institutions. Access to this network is possible through the National Research Network (ARN).⁸¹

❖ **Support Bodies:** These include the University Publications Office and the University Services Office.

- **University Publications Office:** Established by Executive Decree No. 95-84, the University Publications Office aims to ⁸² improve the quality of pedagogical work based on a pricing structure that benefits the university community. The Office is tasked with:

- Publishing and printing books, journals, documents, and all educational materials for university institutions at highly affordable prices accessible to all social classes within the university environment.

- Developing and expanding the distribution network by opening more libraries and sales points within university campuses.

⁸¹ https://services.mesrs.dz/e-learning/arabe/index_arab.php

⁸² Executive Decree No. 95-84 dated Shawwal 21, 1415, corresponding to March 22, 1995, including the establishment, organization, and work of a national office for university services (Official Gazette, 1995, No. 24), amended and supplemented by Executive Decree No. 03-312, dated Rajab 17, 1424, corresponding to September 14, 2003 (Official Gazette 2003, No. 57).

- Purchasing reprint rights for important works to ensure the development and improvement of faculty quality and the creation of knowledge.

- Publishing a collection of essential lectures that offer greater comprehension, especially in fields with high student enrollment.

- Promoting titles in rare or under-supplied specializations without affecting sales prices.

- Participating in the valorization of research results by promoting, publishing, and distributing the work of national research laboratories, units, and centers.

- Disseminating and distributing publications to generalize scientific knowledge.

University Services Office:

Established by Executive Decree No. 95-84 dated 21 Shawwal 1415 corresponding to 22 March 1995,⁸³the University Ser-

⁸³Executive Decree No. 95-84 dated Shawwal 21, 1415 corresponding to March 22, 1995, includes the establishment, organization, and work of a national office for university services (Official Gazette: No. 24, 1995).

Executive Decree No. 03-312 dated Rajab 17, 1424 corresponding to September 14, 2003 amends and supplements Executive Decree No. 95-84 dated Shawwal 21, 1415 corresponding to March 22, 1995, which includes the establishment, organization and work of the National Office for University Services (Official Gazette: Issue No. 57, year 2003)

A joint ministerial decision dated 18 Dhul-Qi'dah 1424, corresponding to January 11, 2004, defining the administrative organization of the National Office of University Services and the Directorates of University Services and University Residences (Official Gazette: Issue 08 of the year 2004).

A joint ministerial decision dated 20 Safar 1435, corresponding to December 23, 2013, amends and supplements the joint ministerial decision dated 10 Dhul-Qi'dah 1425, corresponding to December 22, 2004, which

vices Office has been regulated by several subsequent laws that have defined its operations. The university services sector has seen significant development, present in all national university districts. The national network of university services comprises 393 university residences and 65 directorates of university services, with each directorate encompassing a group of residences.

Advisory Bodies of the Ministry of Higher Education and Scientific Research:

Several advisory bodies have been established under the Ministry of Higher Education and Scientific Research, including ⁸⁴ the National University Conference, the National Committee for ⁸⁵

includes the establishment of university services directorates, determining their headquarters, and the list of affiliated university residencies and their contents (Official Gazette: No. 29 year 2014).

⁸⁴ Executive Decree No. 01-208 dated 2 Jumada al-Awwal 1422 corresponding to July 23, 2001, defining the powers, formation and functioning of regional bodies and the National Assembly of Universities (Official Gazette 2001, No. 41, pp. 18-21).

A decision dated June 17, 2006, establishing the national symposium for deans of medical schools (Official Bulletin of Higher Education and Scientific Research 2006, first semester)

Resolution No. 717 dated November 10, 2011, including the establishment of the Technical Committee for Schools Outside the University (Official Bulletin of Higher Education and Scientific Research 2011, Fourth Trimester).

Resolution No. 129 dated March 6, 2013, including the establishment of a deans' symposium for each field (Official Bulletin of Higher Education and Scientific Research 2013, first trimester)

Resolution No. 241 dated April 3, 2013, including the organization and conduct of the national symposium for deans of medical colleges (Official Bulletin of Higher Education and Scientific Research 2013, second trimester).

⁸⁵ Resolution No. 167 dated April 13, 2015, establishing the National Qualification Committee, its composition, authority and functioning (Official Bulletin of Higher Education and Scientific Research 2015, second trimester).

Accreditation, the National Council for Scientific Research and Technological Development,⁸⁶ the National Council for Evaluation of Scientific Research and Technological Development in Public Institutions of Scientific, Cultural, and Vocational Nature,⁸⁸ among others in higher education institutions.⁸⁹ There's also the University Research Programming and Evaluation Committee, the National University Committee, the National Committee for Researchers Evaluation, and the Qualification Committee for Third Phase Training.⁹⁰

In the context of quality indicators, efficiency, and alignment with economic, social, and environmental needs, several support mechanisms have been established to facilitate the professional

⁸⁶ Executive Decree No. 08-237 dated 24 Rajab 1429 corresponding to July 27, 2008, determining the composition and work of the National Council for Scientific and Technical Research (Official Gazette 2008, No. 43, page 17).

⁸⁷ Executive Decree No. 10-35 dated Safar 5, 1431 AH corresponding to January 21, 2010, defining the tasks of the National Council for the Evaluation of Scientific Research and Technological Development, its composition, and the methods of its operation (Official Gazette, 2010, No. 06, pages 15-17).

⁸⁸ Executive Decree No. 10-36 dated Safar 5, 1431 AH corresponding to January 21, 2010 determines the tasks and composition of the National Committee for the evaluation, organization and functioning of public institutions of a scientific, cultural, and professional nature and other institutions of higher education (Official Gazette 2010, No. 06, pages 17-19).

⁸⁹ A decision dated June 17, 1989, including the establishment of a committee for programs and evaluation of university scientific research (Official Bulletin of Higher Education and Scientific Research 1989, first semester, pages 93-94).

⁹⁰ A decision dated December 24, 2009, determining the organization and functioning of the National Committee for Researcher Evaluation (Official Bulletin of Higher Education and Scientific Research 2009, second semester).

⁹¹ Resolution No. 06 dated January 5, 2014, determining the composition of the qualification committee for training in the third stage and the modalities of its functioning (Official Bulletin of Higher Education and Scientific Research 2014, first trimester).

integration of graduates. These include the National Agency for Youth Support and Employment, which established the first Entrepreneurship House in Constantine in 2007, as well as contact offices at institution-university for training frameworks to quickly integrate into institutions, among others.

Despite all efforts, the ranking of public education institutions in international rankings has remained low. Therefore, the Algerian state has ventured into distance and e-learning to address these challenges.

In the context of quality, efficiency, and alignment with economic, social, and environmental needs, several support mechanisms have been established to facilitate the professional integration of graduates:

The National Agency for Youth Support and Employment was established, inaugurating the first Entrepreneurship House in Constantine in 2007. Additionally, university liaison offices were set up to expedite the integration of frameworks into institutions and other entities.

Despite all efforts, the classification of education in public institutions remained low in international rankings. Consequently, the Algerian state has ventured into distance and e-learning initiatives.

Secondly: The Algerian Experience in Using E-Learning Technology

The Algerian endeavor into virtual education began with the initiative of EEPAD and the National Center for Distance Education as the first experiment in virtual education, still overseen today by the University of Continuous Education.

Training Phase for Technical Components:

This phase was marked by several key milestones:

-The Francophone University Agency (AUF) established a master's program in Visualization and Design using Computer-Aided Design (CAD), preparing specialized educators for virtual education platforms.

-A master's program developed in collaboration between the Research Center for Scientific and Technical Information in Algeria and the Louis Pasteur University in Strasbourg, focusing on specialized graduate certificates in using information and communication technologies for education and training.

-An agreement between the Ministry of Higher Education and Scientific Research and the Swiss Agency for Development and Cooperation to train educational and technical specialists in the use of the www.qualilearning.org platform.

- An agreement to establish a specialized master's program in distance education involving the University of Continuous Education in Algeria, UNESCO, CNED, CNAM (France), and A6 Group. One hundred professors were trained on pedagogical approaches for distance learning curriculum.

Illustrative diagrams prepared by researchers outline the phases of the Algerian experience in using e-learning and its outcomes.

The Algerian experience went through a number of stages that can be summarized as follows:

The stage of forming the two technical components

The stage of installing distance education cells and laying the learning ground

Preparing courses for professors in distance education

Remote configuration embodiment

Each of the stages resulted in the following:

Preparing specialists in distance education, although the number was not sufficient to cover the distance education process comprehensively and completely

-Installing distance education cells in various Algerian universities

-It did not succeed due to the lack of interaction between professors and students and the chaos of distance education

-There are some lectures, but very few

Thirdly: The experience of higher education during the Corona pandemic

The COVID-19 pandemic compelled the Algerian Ministry of Higher Education, following the suspension of in-person classes, to resort to distance education. This shift raised questions about the feasibility of activating remote learning, which had been stagnant despite the availability of technological means throughout universities, and about the potential success of this experiment given the numerous obstacles it faced.

The measures taken by the Algerian state can be divided into two basic steps:

First step: Beginning of establishing strict procedures and measures to prevent and control the spread of Coronavirus (Covid-19)

Corona pandemic (Covid-19) imposed on the Algerian government to take several measures in order to save the lives of citizens, and to spare them the risk of infection with this serious

epidemic, including domestic quarantine and quarantine. Through numerous executive decisions and decrees:

A. The executive Decree No.20-69 of 21 March 2020 on measures to prevent and control the spread of Coronavirus (COVID-19)

The purpose of this Order was to establish social distancing measures to prevent and control the spread of Coronavirus (COVID-19) 1 and it took effect from Sunday, March 22, 2020 at 1:00 am .

These measures aimed exceptionally, to reduce physical contact between citizens in public spaces and at the workplace. The measures covered by this Order was applicable to the entire national territory for a period of fourteen (14) days; and it lifted and extended in the same form .

This decree also stipulated the closing of drinking places, establishments and spaces for leisure, entertainment, entertainment and restaurants, with the exception of those providing home delivery. this closure measure has extended to other activities and to other localities, by decree of the wali territorially competent .

B. The executive Decree No. 20-70 of 24 March 2020 laying down additional measures to prevent and combat the spread of Coronavirus (COVID-19) .

It should be noted that the application of quarantine in Algeria was gradual, where it started by a total containment, for a period of 10 days, was renewed, is applied to the wilaya of Blida. This measure has been extended to other Wilayas .

A partial lockdown, from 7 pm until 7 am, was applied to the wilaya of Algiers; for a period of 10 days, and it was renewed .

The article 15 of that Decree placed at least 50% of employees in the public and private economic sectors on exceptional paid leave.

Persons who violate the measures of confinement, the rules of distancing and prevention and the provisions of this decree, are liable to the penalties provided by the penal code.

C. The executive Decree No. 20-127 added another restriction, it has added a mandatory preventive measure that is the wearing of a protective mask, since the decree has obliged to wear the protective mask by all persons and in all circumstances, in all open or closed spaces receiving the public.

The Decree obliged any person engaged in trade or service activities, in whatever form, to observe and enforce the obligation to wear protective masks by all means, including the use of force, and he added in article 17 that the persons who violate the measures of confinement, wearing of protective mask, rules of distancing and prevention and the provisions of this decree, are punishable by penalties provided by the penal code.

Second step the gradual and adapted recovery of certain economic, commercial and service activities.

This step began on June 7, 2020, and included many measures and conditions in different Executives Decrees and we will study the most important

A. Executive Decree No. 20-145 of June 7, 2020, to redesign the prevention and control of the spread of Coronavirus (COVID-19)

The purpose of this Decree is to redesign the prevention and control of the spread of Coronavirus (COVID-19), provided for by the regulations in force, including Executive Decree No. 20-69

The specifics conditions are:

-1strict compliance, in workplaces and/or grouping, with health prevention measures and the rigorous application of health prevention protocols dedicated to each activity by all operators, traders, customers and users .

-2 the setting up of a special preventive support system for authorized activities

-the obligation to wear protective masks;

-posting of barrier and prevention measures on the premises;

—organizing access and queues outside and inside the premises to respect spacing and physical distancing, while limiting the number of people in one location;

—the installation of a single lane of traffic, ground-readable markings and barriers inside the premises to avoid customer crossings;

—installation of disinfection mats at entrances;

—making water-alcohol solution available to users and customers;

-daily cleaning and disinfection of premises and premises;

-disinfection of coins and bank notes;

—provide dedicated bins to collect used masks, gloves, tissues or medical equipment.

B. Executive Decree No. 20-159 of June 13, 2020 on the reorganization of home confinement and the measures taken as part of the mechanism for preventing and combating the spread of the Coronavirus (COVID-19)

This decree has reorganized home confinement and the measures taken as part of the mechanism for preventing and combating the spread of the Coronavirus (COVID-19), provided for by the regulations in force, in particular Executive Decree No. 20-69.

Given this perspective, the articles of the Executive Decree No. 20-159 state the following:

*The measure for the granting of paid exceptional leave to 50% of employees in the public and private economic sector, provided for by the provisions of Article 15 of Executive Decree No. 20-70, is lifted for employers who can transport their staff and meet the health prevention and protection conditions specific to their activity .

D. Executive Order 20-225 of 8 August 2020 easing the prevention and control of coronavirus (COVID-19)

The purpose of this decree is to phase in and monitor measures to reduce the prevention and control of Coronavirus (COVID-19) in accordance with provisions aimed at preserving the health of citizens and protecting them from any risk of the spread of Coronavirus .

The most important of these procedures are:

-1Empowerment Citizens of strict compliance with health measures and protocols for the prevention and protection against the spread of Coronavirus (COVID-19), from 15 August 2020, access, to authorized and controlled beaches, places of pleasure and relaxation and recreational and recreational spaces in accordance with the preventive accompanying mechanism, put in place by the local authorities Including:

—Mandatory wearing of the protective mask ;

—Respect for physical distance of at least one and a half metres (1.5m);

—Display of barrier and prevention measures at the various access points ;

—Organization of suitable parking spaces for vehicles ;

-Prior checking by the elements of civil protection, if necessary, of the temperature of summer visitors at the accesses to the beaches, by means of thermal devices;

- Provision of bins dedicated to collecting used masks, gloves or handkerchiefs.

-2Resumption of activity of hotels, cafes and restaurants is authorized from 15 August 2020. It remains subject to the implementation of health measures and protocols to prevent and protect against the spread of Coronavirus (COVID-19), including, but not limited to :

-Mandatory wearing of protective masks ;

-Organization of physical distancing within and outside the premises ;

-Priority use of terraces and the operation of one (1) of two (2) tables in interior spaces;

- Installation of disinfection benches at entrances;

- Regular disinfection of premises, tables and chairs and other equipment;

- Regular cleaning of laundry, towels and work clothes;

- Availability of hydro-alcoholic ;

-Prohibition of the use of air conditioners and fans ;

-Natural ventilation of the premises.

And the most important is to no celebration of parties and/or family events at hotels, cafes and restaurants shall be permitted.

It is worth noting that the Algerian government had been striving to implement distance education before the COVID-19 pandemic by imposing training courses for professors on how to create lectures, conduct discussions, develop questions, and use interactive and remote applications. This effort was particularly targeted at newly employed professors, where the training courses were mandatory for their position confirmation.

For professors employed before the adoption of these courses, there was encouragement to participate in these training sessions, evidenced by their choice of metrics. Algerian universities began experimenting with OPAL2, then OPAL3, eventually transitioning to the Moodle platform, which became rich in lectures. However, it was observed that many lectures remained inactive, as professors often closed them after the course ended due to lack of student interaction with the platform. This led to a decline in the effectiveness of training courses, turning them into theoretical exercises rather than practical applications, a situation that persisted until the COVID-19 pandemic.

The Moodle e-learning platform is a free educational software designed to deliver academic and educational activities. It was launched as part of the Moodle project, overseen by Moodle HQ, which comprises 80 global companies. Moodle is a dynamic platform operating on an open system, aimed at providing a secure and interconnected learning environment for learners, teachers, and administrators, safeguarding them from security threats inherent in software systems.

The COVID-19 pandemic swept across the world, prompting social distancing measures as detailed in the paragraphs above. This led to the suspension of traditional in-person education and the closure of educational institutions and universities for over five months. Subsequently, efforts were made to implement distance learning to continue education and mitigate the closure of educational institutions and universities. A hybrid education system was introduced, combining remote and in-person education through scheduling.

Distance learning utilized various methods, primarily disseminating lectures or educational materials via dedicated platforms, often followed by interactive or live discussions through tools such as Google Meet, Zoom, Moodle, and others. Throughout the pandemic, the Algerian government endeavored to harness numerous support measures to ensure the continuity of pedagogical activities and research, developing educational and training methods, including distance learning. It aimed to gradually provide capabilities, resources, and technologies to enhance access across societal segments within the lifelong learning framework. Distance learning also provided opportunities for employees to enhance their skills within the university context, particularly through specialized training for staff of economic institutions.

Activation of the Moodle platform aimed to develop interactive academic content and manage electronic courses, enabling students and other participants to engage directly to access required scientific information. These models emerged in Algerian universities since 2016. In this context, the Minister of Higher Education issued several directives regarding the implementation of distance learning during the COVID-19 pandemic, notably Circular No. 288/A.K.W/2020 dated February 29, 2020, Circular No.

416/A.K.W/2020 dated March 17, 2020, and Circular No. 440/A.K.W/2020 dated March 23, 2020.

The distance learning process adopted by Algeria during the pandemic was not based on a remote education strategy but rather a plan to salvage the academic year due to the exceptional circumstances imposed by COVID-19. Therefore, it was not subsequently adopted as a rule in higher education. However, it was essential to conduct numerous studies and statistics to understand why students were reluctant to study. It was also necessary to find solutions to enable students to have access to computers and high-speed internet, especially since the Algerian government adopted a scheduling system in university campuses. This included equipping lecture halls at the college and university campus levels to enable students to attend classes and lectures available on the platform.

Revealing the reality that some senior professors, despite their competence and experience in traditional education, struggled with information technology, which negatively affected their academic and pedagogical performance.

Due to the aforementioned challenges, the new academic year 2021-2022 was inaugurated with the adoption of hybrid education. This approach included in-person teaching for core subjects and remote learning for exploratory subjects. Assessment methods were adjusted accordingly, with remote evaluations for exploratory subjects and in-person assessments for core subjects. The Ministry took significant steps to address existing deficiencies.

Thirdly, the future prospects of distance education in Algerian universities faced significant challenges in developing the national higher education system, particularly due to infrastructure, resources, and modern technologies being insufficient, especially

for students. Legal and policy solutions were necessary to find resolutions.

To tackle these challenges, the Algerian universities leveraged their strengths, particularly those gained during the pandemic, by enhancing and developing them. Additionally, they established several mechanisms to activate e-learning, evident through:

- E-Platforms

In addition to activating the Moodle platform, several digital platforms have been launched to serve individuals in the university sector. These include:

1. Guidance Notebook Platform: Provides guidance and instructions for students and researchers.

2. Innovative Projects Monitoring Platform: Facilitates the monitoring and implementation of research projects.

3. University Cinema Platform: Enhances communication and exchange among members of the university community.

4. Permanent Researchers Evaluation Platform: Strengthens quality standards in scientific research.

5. The University Services Director Nomination Platform has been developed to facilitate transparent and efficient nomination and selection processes.

6. University Property Monitoring Platform was created to enhance the management of university resources and assets.

Special platforms were also established for:

- Foreign Students Platform: Enhances international relations with Algeria by providing support for international students.

- Alumni Networking Platform for Algerian Universities: Aims to create a supportive and stimulating environment for international students and graduates.

Furthermore:

- Platforms were programmed for detecting scientific plagiarism to protect intellectual property rights and ensure the integrity of scientific research.

- A digital platform for teaching French was launched to develop the skills of university professors.

Moreover:

- Electronic signatures were activated, replacing paper advertisements with electronic ones on internet pages, thereby enhancing efficiency and sustainability in administrative processes at Algerian universities.

Electronic Library:

With the rapid advancement in communications and information technology, and the enormous increase in the volume and flow of information, storing information in paper format in traditional books and libraries has become insufficient. Therefore, the Algerian university has transformed the format of books from paper-based to electronic, while retaining traditional libraries as an additional option. It has introduced an electronic library system as a special feature that facilitates scientific research for students and professors. This library is supported by an online infrastructure that connects it with users, making it a new and modern model that interacts with rapid developments in communications and infor-

mation technology. This library meets the researchers' needs for quick and immediate access to rich documentary information.

SNDL System:

The SNDL system, which stands for *Système National de Documentation en Ligne* (National System of Online Documentation), is considered one of the most important sources of electronic information supporting the functions of electronic libraries. It was adopted by Algerian universities.

Algeria initiated the Scientific Research Project in October 2008, issuing a directive decree on this matter. It was piloted in late 2010 in coordination with the Directorate General of Scientific Research and Technological Development and the Scientific and Technical Information Research Center (CERIST). It was officially launched in 2011 under the name "National Online Documentation System" known by its acronym SNDL. This system integrates various national and international electronic databases, encompassing all scientific and academic documentation sources, accessible via the link www.sndl.cerist.dz.

The Digital Transformation Roadmap:

The Digital Transformation Roadmap for the higher education sector aims to establish a strategy to embed digital technology across various activities in general education and scientific research. This roadmap encompasses seven core axes, which branch out into 16 strategies and 102 program projects.

The Ministry of Higher Education has launched several promising national plans and initiatives for digital transformation, the latest being the Strategic Digital Transformation Roadmap announced by the Minister of Higher Education and Scientific Research on October 24, 2022. The ministry aims to conceptualize and implement this roadmap by December 2024. It includes a fu-

ture vision for digitizing the higher education sector, based on identifying variables and requirements necessary to keep pace with global digital transformation, improve service delivery, meet stakeholder needs, and enhance the quality of learning more effectively and sustainably.

The establishment of the Directorate of Networks and Digital Development was legally enacted according to Executive Decree 21-134 (Executive Decree No. 21-134, 2021), which regulates the central administration of higher education and scientific research. Digitalization units have also been appointed at the level of all university institutions.

Despite the Ministry's efforts, it has encountered several challenges, most notably the lack of access to ICT devices for all students. Additionally, issues arise with internet connectivity and its inadequate coverage in many areas where students are located, especially in underserved regions that the Algerian state has allocated significant financial resources to develop. This has hindered interaction between professors and students, particularly affecting students in the first and second years compared to those in the third and master's programs.

Therefore, the ministry has decided to utilize the Moodle platform for distance learning but without relying on assessment through electronic interaction.

Conclusion

Today, Algerian universities face a significant challenge in developing the national system for electronic higher education, especially due to the lack of infrastructure, resources, and modern technologies, particularly for students. Finding legal and political solutions is essential.

**POUR LA FORMATION
UNIVERSITAIRE DES
ÉTUDIANTS EN LANGUES
ÉTRANGÈRES : L'E-LEARNING
COMME MODE INTELLIGENT
D'ENSEIGNEMENT-
APPRENTISSAGE.**

Cas d'étudiants de 1ère année de français de l'Université de Djelfa.

Pr. Ameer LAHOUAL

Université de Djelfa

Dr. Baya Benderrah

Université de Djelfa

.

Abstract

In this contribution, the accent is placed on the teaching and learning of foreign languages in a university context. The article explores how a language can be taught without or with the use of the internet in a non-face-to-face environment, which leads to the exploration of e-learning learning⁹².

The article begins by presenting e-learning, its objectives, its advantages and disadvantages, then discusses the modalities and functionalities of this type of teaching-learning. An experiment carried out with first year French undergraduate students at the University of Djelfa is then presented, using a statistical and analytical approach.

To maximize the benefits of e-learning in foreign language teaching, it is essential to effectively integrate e-learning technologies into academic programs. This requires adequate training for teachers and students in the use of digital tools and adapted teaching methods. It is also important to maintain a balance between online learning and face-to-face interactions to ensure a complete and enriching learning experience.

By adopting an integrated approach and leveraging the benefits offered by e-learning, universities can significantly improve the teaching and learning of foreign languages, preparing students to succeed in a globalized and interconnected world, especially with the advent of artificial intelligence.

⁹² Clark, R. C., & Mayer, R. E. (2016). *E-Learning and the Science of Instruction: Proven Guidelines for Consumers and Designers of Multimedia Learning*. Hoboken, NJ: Wiley.

Introduction

Dans notre contribution, nous nous intéressons à un sujet d'actualité, un sujet lié aux modalités d'enseignement-apprentissage des langues étrangères dans les villes intelligentes et ce en contexte universitaire. En effet, nous voulons savoir comment peut-on enseigner une langue sans faire recours au monde virtuel via l'internet en absence du public en présentiel ? Tel questionnaire nous conduit à un nouveau mode intelligent d'enseignement-apprentissage qui est bien celui de l'e-learning.

Dans notre article, nous allons en premier présenter ce mode d'enseignement-apprentissage, ses objectifs ainsi que ses avantages et inconvénients pour aborder après les modalités et les fonctionnalités de ce type d'enseignement-apprentissage.

Ensuite, nous allons présenter une expérimentation que nous avons faite avec les étudiants de 1ère année de licence de français de l'université de Djelfa, tout en nous inscrivant dans une démarche statistique et analytique.

1- Qu'est-ce que l'e-learning ?



L'e-learning est un domaine en pleine explosion aujourd'hui, apparu au début des années 2000, le mot Learning est un terme anglo-saxon qui fait son entrée dans le Petit Robert « apprentissage, formation par le moyen d'Internet ». C'est l'un des domaines de recherches les plus importants et prometteur.

Il est important de savoir que les définitions d'e-learning sont diverses et multiples. Celle que nous retenons est celle de l'Union européenne (U.E.) qui définit l'e-learning comme *l'« utilisation des nouvelles technologies multimédia et de l'Internet pour améliorer la qualité de l'apprentissage en facilitant l'accès à des ressources et des services, ainsi que les échanges et la collaboration à distance »*⁹³. En effet, l'e-learning est une modalité d'enseignement et d'apprentissage médiatisée par les technologies de

⁹³ Cité par Jacques Marc, 2014, *Le recours aux formations à distance (e.learning) dans la formation professionnelle des salariés*, P 4. Marc, J. *Le recours aux formations à distance (e.learning) dans la formation professionnelle des salariés. Présentation, influence sur les acteurs et éléments de vigilance.. [Rapport de recherche] Notes scientifiques et techniques de l'INRS NS 327*, Institut National de Recherche et de Sécurité (INRS). 2014, 69 p., ill., bibliogr. ffhal-01427308f

l'information et de la communication (TIC)⁹⁴, permettant un accès flexible et souvent à distance aux ressources pédagogiques et aux activités d'apprentissage. Cette approche inclut une variété de formats et de méthodes, tels que les cours en ligne, les webinaires, les modules d'apprentissage autogérés, les forums de discussion, et les systèmes de gestion de l'apprentissage (Learning Management Systems, LMS). Comprendre ces avantages et limites est essentiel pour maximiser l'efficacité de l'e-learning et garantir une expérience d'apprentissage enrichissante et productive.

2. Avantages et limites de l'e-learning

L'e-learning présente de nombreux avantages et inconvénients⁹⁵ qui influencent son adoption et son efficacité dans les contextes éducatifs.

2.1. Avantages de l'e-learning

1. Accessibilité et Flexibilité

✓ **Accessibilité** : Permet aux apprenants d'accéder aux ressources éducatives depuis n'importe quel endroit et à tout moment, ce qui est particulièrement bénéfique pour ceux qui ont des contraintes géographiques ou de temps.

✓ **Flexibilité** : Les apprenants peuvent avancer à leur propre rythme, ce qui favorise un apprentissage plus personnalisé et adapté aux besoins individuels.

⁹⁴ Moore, M. G., & Kearsley, G. (2011). *Distance Education: A Systems View of Online Learning*. Belmont, CA: Wadsworth.

⁹⁵ Anderson, T. (2008). *The Theory and Practice of Online Learning*. Athabasca University Press.

2. Réduction des Coûts

- ✓ L'e-learning peut réduire les coûts liés aux infrastructures physiques, aux déplacements, et aux matériels pédagogiques traditionnels.

3. Interaction et Collaboration

- ✓ Utilisation des forums de discussion, des chats en ligne et des outils de collaboration pour favoriser l'interaction entre les étudiants et les enseignants, ainsi qu'entre les étudiants eux-mêmes.

4. Accessibilité aux ressources variées

- ✓ Offre une variété de ressources multimédias, y compris des vidéos, des podcasts, des simulations, et des contenus interactifs, qui peuvent enrichir l'expérience d'apprentissage.

2.2. Limites de l'E-learning

1. Isolement social

- ✓ L'absence de contact physique et social peut entraîner un sentiment d'isolement parmi les apprenants, ce qui peut affecter leur motivation et leur engagement.

2. Dépendance technologique

- ✓ La nécessité d'avoir accès à des technologies appropriées (ordinateur, connexion Internet fiable) peut constituer une barrière pour certains apprenants.

3. **Autodiscipline et Gestion du Temps**

- ✓ Les apprenants doivent faire preuve de discipline et de bonnes compétences en gestion du temps pour réussir dans un environnement d'apprentissage en ligne.

4. **Qualité et Crédibilité**

- ✓ La qualité des cours en ligne peut varier considérablement, et certains programmes peuvent ne pas offrir la même crédibilité que les cours traditionnels.

5. **Interaction et Feedback limité**

- ✓ Les retours d'information peuvent être moins immédiats et moins fréquents que dans un cadre en présentiel, ce qui peut affecter l'apprentissage.

L'e-learning offre des avantages significatifs en termes d'accessibilité, de flexibilité et de réduction des coûts, tout en présentant des défis liés à l'isolement social, à la dépendance technologique et à la gestion du temps.

3. Modalités de l'e-learning

Les chercheurs distinguent généralement trois principales modalités d'enseignement-apprentissage dans le cadre de l'e-learning : l'e-learning asynchrone, l'e-learning synchrone, et l'apprentissage mixte (blended learning).

3.1 E-learning Asynchrone

Définition : L'e-learning asynchrone permet aux apprenants de suivre des cours, d'accéder aux ressources pédagogiques et de participer à des activités d'apprentissage à leur propre rythme, sans

contraintes de temps ou de lieu. Les apprenants interagissent avec le contenu et leurs pairs de manière décalée, souvent via des forums de discussion, des e-mails, et des plateformes d'apprentissage en ligne.

Caractéristiques

- **Flexibilité temporelle** : Les étudiants peuvent accéder aux matériaux de cours et réaliser les activités à tout moment.
- **Apprentissage auto-dirigé** : Encourage l'autonomie et la responsabilité des apprenants.
- **Ressources variées** : Vidéos préenregistrées, documents téléchargeables, quiz auto-évalués.

3.2. E-learning synchrone

Définition : L'e-learning synchrone se déroule en temps réel, avec des interactions directes entre les enseignants et les apprenants via des outils de communication en ligne tels que les vidéoconférences, les webinaires, et les salles de classe virtuelles.

Caractéristiques

- **Interaction en temps réel** : Facilite l'échange immédiat de questions, réponses et discussions.
- **Engagement accru** : Les apprenants peuvent se sentir plus connectés et engagés grâce à l'interaction directe.
- **Supports en temps réel** : Les enseignants peuvent offrir des explications et des clarifications immédiates.

3. 3. Apprentissage mixte (Blended Learning) ⁹⁶

Définition : L'apprentissage mixte combine des éléments d'e-learning synchrone et asynchrone avec des sessions d'apprentissage en présentiel. Cette modalité vise à tirer parti des avantages des deux approches tout en atténuant leurs inconvénients.

Caractéristiques

- **Flexibilité et structure** : Offre la flexibilité de l'apprentissage en ligne tout en fournissant la structure et l'interaction en face à face.
- **Richesse des interactions** : Les sessions en présentiel permettent des interactions plus riches et plus dynamiques.
- **Personnalisation** : Permet de personnaliser l'apprentissage selon les besoins et les préférences des étudiants.

Ces trois modalités d'e-learning - asynchrone, synchrone, et apprentissage mixte - offrent des approches diversifiées pour répondre aux besoins variés des apprenants et des contextes éducatifs. Chacune présente des avantages uniques et des défis spécifiques, et leur utilisation dépend souvent des objectifs pédagogiques, des ressources disponibles et des préférences des apprenants.

⁹⁶ Garrison, D. R., & Vaughan, N. D. (2008). *Blended Learning in Higher Education: Framework, Principles, and Guidelines*. Jossey-Bass.

4. Expérimentation

Il est important de savoir que ce travail expérimental touche à une partie que nous avons menée dans le cadre de notre projet PRFU intitulé « l'enseignement du/en français à l'université de Djelfa : Cas des départements de français et d'agronomie : analyse des besoins et intervention didactique.

En effet, parmi les outils d'investigation scientifique que nous avons utilisés dans notre tâche de recherche, il y a le questionnaire qui est destinées aux étudiants de 1^{ère} année de français inscrits au département de français de l'Université de Djelfa. En fait, sur les vingt questions abordant le vif sujet de notre projet de recherche, il y a seulement quatre questions qui pourraient intéresser l'objet de recherche de cet article.

Donc pour synthétiser, mes informateurs sont des 20 étudiants de 1^{ère} année licence de français ainsi que mon corpus consiste en questionnaire des étudiants en question.

Analyse et interprétation des résultats :

Question 01 : Avez-vous la possibilité d'accéder facilement au monde d'internet ?

Réponse



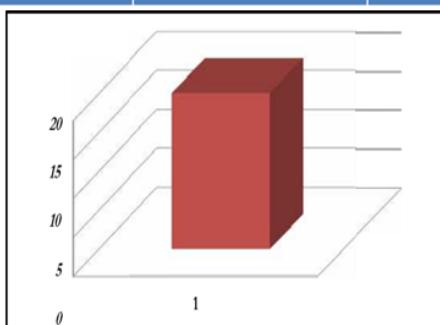
Commentaire

Les résultats montrent qu'il y a un bon pourcentage de la facilité d'accès au net. Par ailleurs, il est également important de se poser des questions par rapport aux étudiants où ce n'est possible d'être connecté sur internet : comment puissent-ils faire partie de la situation d'enseignement-apprentissage, en étant déconnecté virtuellement et aussi physiquement de l'atmosphère scientifique et pédagogique.

Question 02 pouvez-vous faire une recherche sans consulter le Web ?

Réponse

Reponses	Effectives	%
Oui	00	00%
Non	20	100%



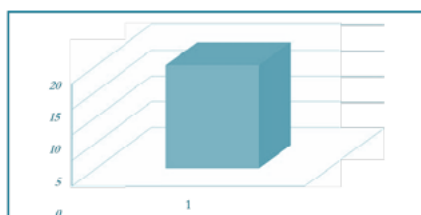
Commentaire

Les résultats montrent que les étudiants ne puissent pas faire leur recherche sans s'appuyer sur l'internet, ce qui reflète l'importance cruciale de ce monde dans la réflexion estudiantine. Ceci dit, l'enseignement apprentissage des langues étrangères doit s'inscrire dans ce monde afin de développer chez ces étudiants des compétences langagières.

Question 3 cherchez- vous des ressources utiles sur net pour votre apprentissage de la langue française en dors de la classe ?

Réponse

Reponses	Effectives	Pourcentage
Oui	20	100
Non	0	0



Commentaire

Les résultats montrent que même hors classe, en faisant allusion au mode habituel ordinaire d'enseignement –apprentissage des langues en contexte universitaire, l'internet se considère comme une ressource indispensable de la recherche d'information et aussi un outil très important d'apprentissage de la langue française à travers les différents sites, les forums, les logiciels, les méthodes, les livres électroniques...

Question 04 préférez-vous consulter vos supports (cours, documents d'appui) sur le compte Facebook du Département ou aller sur le site officiel de la faculté ?

Réponse

REPONSE	EFFECTIVES	POURCENTAGE
FACEBOOK	15	75
SITE OFFICIEL- BANQUE DES DONNEES-	05	25

Commentaire

Sur le plan statistique, les résultants montrent que les étudiants préfèrent être connectés sur le compte Facebook du département que le site officiel à travers les plateformes MOODLE qui se considèrent comme moyen de contact pédagogique où les enseignants ont la possibilité d'héberger leurs cours ainsi que leurs documents d'appui. Ceci pour dire que les étudiants ne sont pas encore assimilés à ces plateformes la chose qui puisse se faire avec le temps notamment quand il s'agit de la nécessité et l'obligation.

Conclusion

Pour maximiser les bénéfices de l'e-learning dans l'enseignement des langues étrangères, il est crucial d'intégrer efficacement les technologies e-learning dans les programmes académiques. Cela nécessite une formation adéquate pour les enseignants et les étudiants sur l'utilisation des outils numériques et des méthodes pédagogiques adaptées. De plus, il est important de maintenir un équilibre entre l'apprentissage en ligne et les interactions en présentiel pour assurer une expérience d'apprentissage complète et enrichissante. En adoptant une approche intégrée et en tirant parti des avantages offerts par l'e-learning, les universités peuvent améliorer considérablement l'enseignement et l'apprentissage des langues étrangères, préparant ainsi les étudiants à réussir dans un monde globalisé et interconnecté, notamment avec l'avènement de l'intelligence artificielle dans le monde actuel.

GREEN BUILDING: A CONSTRUCTION WITH A POSITIVE IMPACT ON THE SMART CITIES

Dr. Issam Aouari, Corresponding author,
University of Bouira, Algeria.
PHD student. Aicha Rouabeh
University of Bouira, Algeria

Abstract

The biggest environmental risk confronting the world now is climate change. Buildings are a major contributor to this problem, generating around one-third of global greenhouse gas emissions. The primary goal of future smart city construction will be to reduce the environmental impact of buildings. We present various methods in this study for green buildings with low energy consumption. Consequently, the goal of this research is to investigate the concept of green building from the perspective of a key factor in smart cities. Subsequently, we will investigate to identify the best techniques for the construction of green buildings. Additionally, the current study presents a few green buildings constructed in Algeria during the past ten years.

Key words: Green Building, Smart Cities, insulation materials, Algeria Smart projects.

Introduction

Leading scientists say that *«unless we change course drastically within the lifetime of people alive today, we are heading for a world that can support only 0.5 to 1 billion people. Such is the climate and ecological emergency»*⁹⁷.

The goals of smart cities and green buildings are similar in that the two aim to advance efficiency and sustainability in the built environment. Green buildings are made with eco-friendly materials, energy-saving technologies, and sustainable construction techniques to reduce their adverse impact on the environment⁹⁸. These structures are crucial parts of a more sustainable and efficient urban infrastructure, especially when they address smart cities.

Green buildings can be integrated into an intelligent network in a smart city, which can monitor and control energy usage, heating and cooling systems, and other environmental factors. This integration enables more efficient resource management and optimized city-wide energy performance. When many green buildings are integrated into a smart city, the cumulative benefits for urban sustainability are significant. Better energy efficiency reduces total energy consumption, which can help reduce greenhouse gas emissions and mitigate the effects of climate change. According to statistics provided by the Ministry of Ecological Transition in France,

⁹⁷ Tony Taylor. "Eight strategies to reduce energy use in buildings". Published 2023. Accessed March 20, 2023. <https://communionarchitects.com/article/eight-strategies-to-reduce-energy-use-in-buildings/>

⁹⁸ Najjar MK, Figueiredo K, Hammad AWA, Tam VWY, "Evangelista ACJ, Haddad A. A framework to estimate heat energy loss in building operation". J Clean Prod. 2019;235:789-800. doi:10.1016/j.jclepro.2019.07.026

the building sector accounts for 43% of France's annual energy consumption and generates 23% of greenhouse gas emissions⁹⁹.

The adoption of green buildings as part of a smart city strategy stimulates innovation in several areas, including sustainable building technologies, energy management systems, and communication infrastructures. This promotes economic development and strengthens the city's position as a leader in sustainability and technology.

According to Professor Rudolph Giffinger (2007)¹⁰⁰, an expert in analytical research on urban and regional development at Vienna University of Technology, the six dimensions of a smart city are: smart economy, smart mobility, smart governance, smart environment, smart people, and smart living, respectively. Introduce these parameters in smart buildings represent an essential element to promote the evolution of smart cities. They are widely recognized as a real support in order to meet the climate challenges that today's society is facing.

Cities and their buildings account for 65% of the world's energy demand. So, to support the goal of being more energy efficient and protecting the population, the convergence of AI and IoT technology is essential. In fact, smart building technology allows for more efficient use of energy. These include complex systems, involving the circulation of air, water and electricity. The use of

⁹⁹ Ministry of Ecological Transition in France. Accessed April 1, 2024. <https://www.ecologie.gouv.fr/construction-et-performance-environnementale-du-batiment#:~:text=Le secteur du bâtiment représente 43 %25 des, réglementation%2C incite et sensibilise les acteurs du secteur.>

¹⁰⁰ Giffinger R, Fertner C, Kramar H, Meijers E. "City-ranking of European medium-sized cities". *Cent Reg Sci*. Published online January 1, 2007:1-12.

advanced sensors and IoT-based technologies can ensure that these resources are routed in an efficient way.

However, it is not just about using new state-of-the-art systems. The intelligent design and optimization of existing buildings represent key factors to accelerate the sustainable development of smart cities around the world. In fact, the creation of more modern cities is supported by the conversion of older buildings into smarter constructions. This strategy promotes the development of creative communities contributing to a sustainable city. As a result, creating a smart city certainly involves the development of smart buildings.

Green buildings

The term Green Building refers to a construction designed and operated in a way that is environmentally sustainable and has a minimal impact on natural resources and uses natural resources as possible. Green building is an economical construction technique that results in healthier structures that have reduced environmental impact and maintenance costs. The entire life cycle of a structure is taken into consideration in this sustainable construction method: placement, creation, maintenance, operation, renovation, and destruction.

In addition, buildings use 30% of the world's energy. They contribute to 40% of global carbon emissions. Through the convergence of IoT technology, smart data, and cloud computing, buildings can communicate with each other. For example, in Hanoi, Viettel's building used ABB's technology to save up to 20% of its energy costs.

Chen, Vand, and Baldi (2024) in their study addressed the problem of optimizing energy efficiency strategies in construction areas and identified the gaps in existing theories related to passive

design strategies, active energy systems, and renewable energy integration¹⁰¹. The methods and means of analyzing heat losses in buildings to increase their energy efficiency are given in a research conducted by Yosifova Veneta (2021)¹⁰².

The press article presented by CNN staff on April 24, 2020¹⁰³ lists the top 18 examples of green buildings worldwide. Some of these constructions are: the Melbourne Pixel Building; One Central Park; Bahrain World Trade Center 1 and 2; the Museum of Tomorrow in Rio de Janeiro; the Vancouver Convention Centre West in Vancouver; the Shanghai Tower in Shanghai; CopenHill in Copenhagen; the Marco Polo Tower in Hamburg; the Bosco Verticale in Milan; and Suzlon One Earth in Pune.

Strategy adopted in greenhouse design

Natural, recyclable, or recycled materials are used in the construction, operation, and eventual disposal of green buildings, especially for thermal insulation. Therefore, natural thermal insulators such as glass **Wool**, rock wool, expanded polystyrene, extruded polystyrene, and polyethene are ideal choices (see figure 1). The materials ought to have a minimal carbon portion.

¹⁰¹ Chen X, Vand B, Baldi S. "Challenges and Strategies for Achieving High Energy Efficiency in Building Districts". *Buildings*. 2024;14(6):1839. doi:10.3390/buildings14061839

¹⁰² Yosifova V. "Methods and Means for Analyzing Heat-Loss in Buildings for Increasing Their Energy Efficiency BT - Intelligent Systems and Applications". In: Arai K, Kapoor S, Bhatia R, eds. *Springer International Publishing*; 2021:45-54.

¹⁰³ CNN Staff. "Green buildings: 18 examples of sustainable architecture around the world". *edition CNN*. Accessed April 3, 2024. <https://edition.cnn.com/style/article/green-buildings-world-sustainable-design/index.html>

The paper published by Badji et al. (2022)¹⁰⁴ provides an overview of current design trends in construction, current technological advancements for monitoring and controlling greenhouse microclimates, and the many methods available for managing greenhouse environments⁸. The main parameters to be taken into account in the construction of green buildings can be summarized as follows:

- The orientation of the building relative to the sun and the prevailing winds significantly influence the energy efficiency of the building.
- The installation of geothermal heating systems, solar panels, energy-efficient glazing, and the use of high-quality insulating materials.
- Use of sustainable and local materials to reduce CO2 emissions gas related to transport.
- Integrating rainwater harvesting devices and the use of low-water consumption devices can reduce and preserve water resources.
- Setting up an efficient ventilation system helps to maintain good indoor air quality.
- Implementing waste sorting systems can reduce the amount of waste sent to landfill.
- Obtaining a green certification can help ensure that the building meets specific standards.

A good orientation relative to the sun can maximize the use of natural light and solar heat. Ideally, the main rooms where occupants spend the most time, such as living rooms and offices,

¹⁰⁴ Badji A, Benseddik A, Bensaha H, Boukhelifa A, Hasrane I. *Design, technology, and management of greenhouse: A review*. J Clean Prod. 2022;373:133753. doi:<https://doi.org/10.1016/j.jclepro.2022.133753>

should face south in the northern hemisphere and north in the southern hemisphere. Taking into account the prevailing winds, the design of the building can be oriented to favor natural ventilation. This can be achieved by installing openings that promote the movement of air through the building. There are several materials with low thermal conductivity used in construction to improve energy efficiency and reduce heat loss. The following flowchart shows some materials used to improve thermal conductivity.

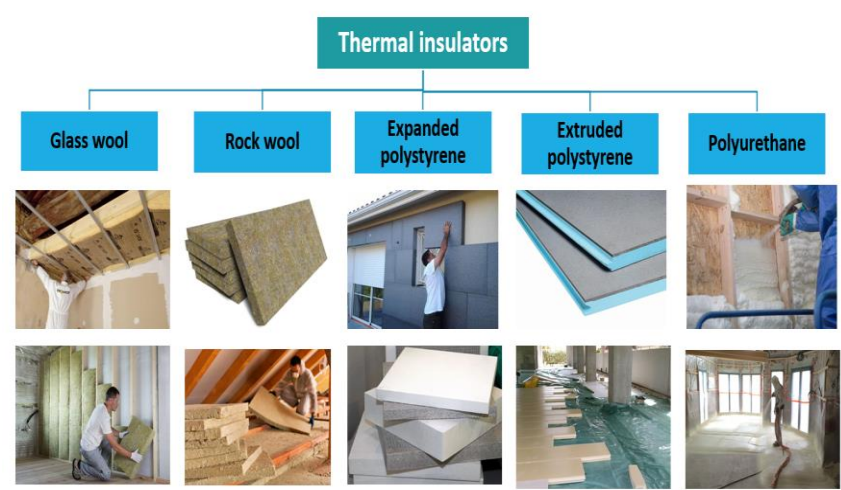


Figure 1 : The best thermal insulation materials used in the construction of green buildings.

Review of intelligent buildings in Algeria

The overview, definition, and implementation of nearly zero-energy buildings (NZEBs) in the world are given in the research proposed by D'Agostino and Mazzarella (2019)¹⁰⁵. Thus, the studies conducted by Omrany et al. (2022) and Ullahet al. (2021) aim

¹⁰⁵ D'Agostino D, Mazzarella L. "What is a Nearly zero energy building? Overview, implementation and comparison of definitions". *J Build Eng.* 2019;21:200-212. doi:<https://doi.org/10.1016/j.jobe.2018.10.019>

to provide an overview of research developments over the last three decades in the field of buildings with net zero energy consumption using bibliometric analysis techniques¹⁰⁶. In Algeria's case, a project was launched in spring 2017 named Algiers Smart City under the management of the wilaya of Algiers with the ambition to optimize urban management and improve the quality of life of its citizens by using and exploiting information technology to manage the city's databases. Consequently, and according to the 2023 Smart City Index (SCI) report of the International Institute for Management Development (IMD), Algiers has been ranked as the second smartest city in Africa¹⁰⁷.

Some of the most important green construction projects Algeria has implemented recently are shown below:

Ksar of Tafilalet (see figure 2a) is the first ecological city in the Algerian desert, built in 1998¹⁰⁸. Known for its ecological design and its socio-cultural base, the ksar of Tafilalet of Beni Isguen (Ghardaïa) combines ancestral and modern lifestyles. The objective was to build the least energy-intensive buildings to accompany

¹⁰⁶ Omrany H, Chang R, Soebarto V, Zhang Y, Ghaffarianhoseini A, Zuo J. "A bibliometric review of net zero energy building research 1995–2022". *Energy Build.* 2022;262:111996. doi:<https://doi.org/10.1016/j.enbuild.2022.111996>

Ullah KR, Prodanovic V, Pignatta G, Deletic A, Santamouris M. "Technological advancements towards the net-zero energy communities: A review on 23 case studies around the globe". *Sol Energy.* 2021;224:1107-1126. doi:<https://doi.org/10.1016/j.solener.2021.06.056>

¹⁰⁷ Salah B. « Classement des villes intelligentes : Alger dans le top 3 africain ». Published 2023. Accessed April 1, 2024. <https://www.algerie360.com/classement-des-villes-intelligentes-alger-dans-le-top-3-africain/>

¹⁰⁸ Bouarroudj N, Doussard C, Holden M, Cédissia D. Le Projet de Tafilalet, Ghardaïa, Algérie. In: *(Re) Penser la ville 20 Ans d'écoquartiers dans le monde*. Paris, Dunod, 2019.

the increase in demographics. The materials used during the construction of the Ksar are only local materials, such as stone, lime, earth, and plaster¹⁰⁹.

Anthill House at Ain Temouchent is considered to be the first Arabic village of its kind, "Anthill" is a unique model of similar villages found in the United States, France, and Switzerland¹¹⁰. This village is considered a unique tourist resort because it has a set of rooms designed in the form of "ant houses," the design of which blends Islamic and western architecture (Figure 2b). It covers an estimated 30 hectares of surface.

The new city of Sidi Abdallah is positioned as the city of the future (Figure 2c), capable of responding to the demographic challenges of Algeria¹¹¹. It should eventually house a population of 280,000 inhabitants and allow the creation of 85,000 jobs. It is planned to carry out a very large housing program there (55,000 housing units) with all their equipment.

The Great Mosque of Algiers, or Djamaa el Djazaïr, is a large Islamic structure that is situated in Algiers (Figure 2d). After the Great Mosque of Mecca and Al-Masjid an-Nabawi of Medina

¹⁰⁹ Sami Kaidi. Ksar écologique de Tafilelt (Ghardaïa) : «Exemple de la grandeur de l'architecture algérienne et de son aspect utilitaire». Published 2022. Accessed March 30, 2024. <https://www.elmoudjahid.dz/fr/dossier/ksar-ecologique-de-tafilelt-ghardaia-exemple-de-la-grandeur-de-l-architecture-algerienne-et-de-son-aspect-utilitaire-186363>

¹¹⁰ Younes Bouranene. "بيوت النمل" العمارة الإسلامية والعالمية في منتجع جزائري. Published 2020. Accessed March 30, 2024. <https://al-ain.com/article/algeria-bouzedjar-resort-anthill>

¹¹¹ Charlotte Bozonnet. « La ville nouvelle de Sidi Abdellah, concentré des maux algériens ». Published 2021. Accessed April 2, 2024. https://www.lemonde.fr/afrique/article/2017/12/26/la-ville-nouvelle-de-sidi-abdellah-concentre-des-maux-algeriens_5234397_3212.html

in Saudi Arabia, it is the third-largest mosque in the world and has the highest minaret in the world. Djamaâ El-Djazaïr has been chosen among the best architectural designs in the world in 2021, by winning the annual Prize of the "Chicago Athenaeum" Museum of Architecture¹¹². Djamaa el Djazaïr is equipped with a photovoltaic power plant to power the interior lighting of the auditorium, a collective solar water heater for the production of hot water, solar candelabra for outdoor lighting, a trigeneration system allowing a combined production of electricity, heat, and cold simultaneously and a stormwater and wastewater recovery system¹¹³.

¹¹² L'EXPRESS. « Djamaâ El-Djazaïr, une des meilleures conceptions architecturales au monde ». Published 2021. Accessed April 2, 2024. <https://www.lexpressquotidien.dz/2021/11/22/djamaa-el-djazair-meilleures-conceptions-architecturales-monde/>

¹¹³ APS. « Une convention cadre pour promouvoir Djamaa El Djazair en tant qu'édifice durable ». Published 2021. Accessed April 4, 2024. <https://www.aps.dz/economie/131220-convention-cadre-pour-la-promotion-de-djamaa-el-djazair-en-tant-qu-edifice-durable>

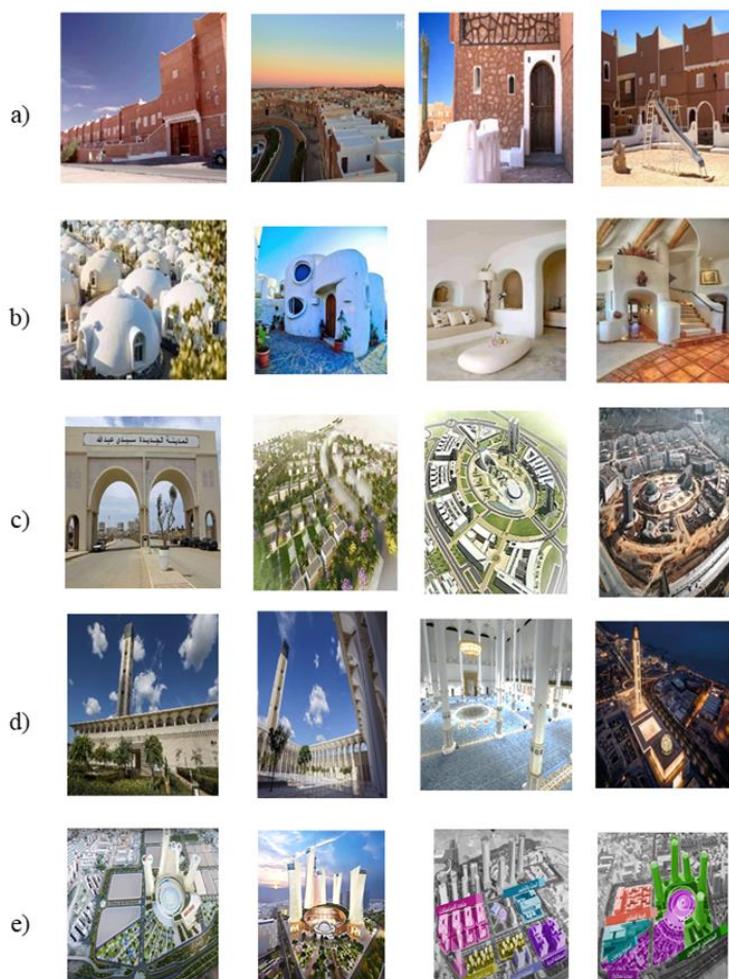


Figure 2: Smart buildings in Algeria; (a) Ecological Ksar of Tafilelt -Ghardaïa, (b) Anthill house Ain Temouchent, (c) New city of Sidi Abdellah -Algiers, (d) Djamâa el Djazair-Algiers, (e) Dzair Media City-Algiers

Another project is Dzair Media City-Algiers. This project aims to advance the audiovisual industry by building a global in-

frastructure that unites the key players and media operations, such as studios, TV channels, and public and private radios (Figure 2e). Additionally, a teleport will ensure broadcasting via the newest platforms and a sizable artificial intelligence-powered data center¹¹⁴.

Conclusion

In conclusion, the integration of green buildings into smart cities is a significant step toward a more sustainable future in which environmental preservation, economic efficiency, and innovation all work together to produce stronger, more affluent societies.

Smart cities and green buildings aim to enhance efficiency and sustainability in the built environment by using eco-friendly materials, energy-saving technologies, and sustainable construction techniques. In addition, green buildings can reduce greenhouse gas emissions and improve energy efficiency by being incorporated into smart city networks.

Building orientation is crucial for maximizing natural light and solar heat use. Ideally, main rooms should face south and north in the northern and southern hemispheres. Building design should also consider prevailing winds for natural ventilation. Low-thermal conductivity materials can improve energy efficiency and reduce heat loss.

¹¹⁴ Lamia F. Dzair « Média City : du nouveau pour le projet de ville médiatique implanté à Alger ». *Algerie 360°*. Accessed April 3, 2024. <https://www.algerie360.com/dzair-media-city-du-nouveau-pour-le-projet-de-ville-mediatique-implante-a-alger/>

By increasing demand for green ecological technologies and construction methods, green buildings serve as a catalyst for the expansion of the green industry. This economic expansion can support ongoing innovation and accelerate the shift to a more sustainable economic model.

DEVELOPMENT OF EGYPT'S NEW ADMINISTRATIVE CAPITAL: A SMART CITY AND BUSINESS HUB

Dr. Sherif Adel Al-Bedewy,

Arab Academy for Science Technology and Maritime
Transport, Egypt

Abstract

The New Administrative Capital project represents an ambitious and significant undertaking aimed at transforming it into a major hub for finance and business. This transformation is facilitated by the development of a smart city that integrates cutting-edge technologies and adheres to the principles of sustainability. The project aims to improve the quality of life of citizens and provide an environment conducive to business and investment.

The success of this project marks a major step towards a brighter future for Egypt, achieved through continued investments in smart infrastructure and strengthening international partnerships. The New Administrative Capital has the potential to serve as a model for smart cities worldwide, especially after the successful completion of its initial phase and the start of subsequent phases.

Introduction

In the current era of technological advancement and the country's desire to expand its development and urbanization efforts, smart cities have emerged as beacons reflecting the innovation and progress achieved by nations. Many countries have successfully established alternative capital cities, positioning smart cities as advanced centers of civilization within technologically advanced, safe, and environmentally friendly environments. These cities foster innovation, technological advancement, provide opportunities, host multinational corporations, offer investment opportunities, and contribute to economic revitalization. For the Arab Republic of Egypt, it was a significant challenge to catch up with countries that had already embarked on creating smart cities.

The significance of smart cities for Egypt has been underscored by the increasing population density, with 97% of the population residing in less than 7% of Egypt's total area. This has strained infrastructure, affected the quality of facilities and services, and exacerbated congestion resulting from the concentration of governmental interests in Cairo's city center. Cairo, one of the world's most densely populated capitals with approximately 18 million residents, is projected to nearly double its population to around 40 million within the next two decades¹¹⁵.

Therefore, Egypt's political leadership decided to intervene decisively by establishing the New Administrative Capital to expand development and urbanization, alleviate population density from existing cities, enhance population welfare, secure new opportunities for progress and development, and transition into a

¹¹⁵ State Information Service, "New Administrative Capital", posted online on July, 19 2024, <https://bit.ly/4cKPOEs>, accessed on July, 3 2024.

smart digital economy¹¹⁶. Egypt Vision 2030 primarily aims to transform the country into a knowledge-based smart economy capable of thriving in the Fourth Industrial Revolution, offering distinct services to citizens and investors alike¹¹⁷e.

Thus, the New Administrative Capital represents Egypt's commitment to shaping a new urban future through thoughtful strategic planning, economic investment, and technological integration. It is not merely a governmental headquarters for the presidency, ministries, and authorities, but a technologically advanced smart city founded on sustainability principles, delivering services electronically using cutting-edge technology. It is an integrated system aimed at sustainable development, attracting both local and international investments, and building a business hub that appeals to multinational corporations with its advanced urban and technological infrastructure, including an international airport, solar energy stations, and up to 40,000 hotel rooms.

Moreover, it serves as a testament to Egypt's commitment to urban future planning through strategic planning, investment, and technological integration, addressing the urgent need to alleviate pressures faced by its capital, Cairo, and unlocking the country's economic potential.

¹¹⁶ Esmat Al-Shami, Al- Ahram Newspaper, "Everything you want to know about the New Administrative Capital", posed online on January, 19 2018, <https://gate.ahram.org.eg/News/1803575.aspx>, accessed on July, 3 2024.

¹¹⁷ Derayah Forum, Strategic Forum for Public Policies and Development Studies, "The Administrative Capital...economic importance and expected returns", posted online on April, 6, 2023, bit.ly/45Oj7n8, accessed on July, 3 2024.

Since its inception, the New Administrative Capital has been envisioned not just as a governmental center but as a comprehensive ecological system designed to promote sustainable growth, empower citizens, and attract both local and foreign investments.

In this paper, we aim to explore the New Administrative Capital as a smart city and emerging business hub, despite various challenges such as the COVID-19 pandemic, the Russian-Ukrainian war, accompanying economic issues, funds¹¹⁸, and the shortage of technological knowledge on building a Fourth Generation smart city in Egypt. However, the political leadership and the project's stakeholders have managed to overcome these challenges, currently nearing completion of Phase One, which includes:

- Establishment of eight residential districts.
- Development of the governmental district.
- Construction of several universities and schools.
- Building of the parliament and senate buildings.
- Establishment of the Knowledge City.
- Development of the third residential district.
- Creation of the sports city.
- Construction of the arts and culture city.
- Establishment of Egypt's Islamic Cultural Center.
- Construction of the Nativity Cathedral.
- Creation of the green river.

¹¹⁸ Aidan Lewis and Mohamed Abdellah, "Egypt's new desert capital faces delays as it battles for funds", reuters, posted on May, 13 2019, <https://www.reuters.com/article/us-egypt-new-capital-idUSKCN1SJ10I/>, accessed on July, 3 2024.

Indeed, the New Administrative Capital is not the beginning of Egypt's new cities; over the past two decades, Egypt's map has witnessed the creation of numerous new cities to expand development and urbanization, easing population density from traditional areas.

First: What is the New Administrative Capital Project

- Background and inception: The Egyptian state announced the New Administrative Capital project during the "Egypt the Future" economic development conference on March 13, 2015.

The New Administrative Capital project is considered one of Egypt's most important projects in the past decade in achieving Egypt Vision 2030, and it stands as one of the largest and most recent mega investment projects. It has been built at a remarkable speed, which has been astonishing.

The New Administrative Capital project has successfully transformed desert land into highly valuable real estate, contributing significantly to Egypt's economy by adding approximately two trillion Egyptian pounds in value. One of the primary objectives of this project is to expand the urban area of the Arab Republic of Egypt. The New Administrative Capital project aims to accommodate a population of at least seven million people in its initial phase, with plans to increase this number to 40 million by 2050.

- Location and Area:

The total area of the New Administrative Capital is approximately 700 square kilometers¹¹⁹, equivalent to 170,000 acres, di-

¹¹⁹ Emanuele Midolo, Property Week, "Inside Egypt's New Capital", posed on March, 9 2019,

vided into several phases. The first phase covers 168 square kilometers (40,000 acres) of the total area, with 70% of it completed and preparations underway for the second phase¹²⁰.

The project is designed to attract around 7 million residents¹²¹. Located east of Cairo, the New Administrative Capital is surrounded by major highways including the Cairo-Suez Road and Cairo-Ain Sokhna Road, as well as the Regional Ring Road and the Middle Ring Road. It is situated approximately 60 kilometers from the cities of Suez and Ain Sokhna, 60 kilometers from the heart of Cairo, and 45 kilometers from New Cairo City. The New Administrative Capital will host government institutions, ministries, parliament, governmental offices, foreign embassies, international organizations, a global trade center, an international medical city, international schools and universities, and an international airport. The second phase covers an area of 47,000 acres, while the third phase spans 97,000 acres.

The New Administrative Capital is considered the largest smart city in the Middle East, covering an area equivalent to that of Singapore and nearly four times the size of Washington, D.C.¹²².

<https://www.propertyweek.com/insight/inside-egypts-new-capital>, accessed on July, 3 2024.

¹²⁰ Khaled Abbas, Al- Ahram Newspaper, "We compete with major global capitals and artificial intelligence facilitates the lives of residents", posted online on June, 14 2024, <https://gate.ahram.org.eg/News/4844927.aspx>, accessed on July, 3 2024.

¹²¹ State Information Service, "New Administrative Capital", posted online on July 19 2024, <https://bit.ly/4cKPOEs>, accessed on July, 3 2024.

¹²² Arkan House, "Important Information about New Administrative Capital", posted online on 2024, <https://arkanhouse.com/new-capital-info/>, accessed on July 3 2024.

Secondly, the objectives of establishing a new administrative capital for the Arab Republic of Egypt include:

1- Establishing a sophisticated economic capital:

One of the primary objectives of the New Administrative Capital project is to establish a sophisticated economic capital that meets international standards in finance and business. This includes advanced infrastructure, sophisticated logistical networks, tourist zones, commercial areas, investment zones, diplomatic zones, industrial zones, and free zones, all contributing to increasing international trade exchange and encouraging investment in the Arab Republic of Egypt, thereby providing an ideal economic environment. This has been the goal of the Egyptian state since the inception of the New Administrative Capital project, aiming to make it a major hub for finance and business in the region.

- Contributing to economic growth: The New Administrative Capital has contributed to enhancing economic growth by creating new urban areas and relocating population density to the New Administrative Capital. This has been achieved through the establishment of large companies, private universities and institutes, and branches and headquarters, thereby attracting additional investments and providing employment opportunities.

- Legislative system: Egypt has introduced a new legislative system, including the enactment of several laws, most notably Investment Law No. 72 of 2017 and its executive regulations, which include investment incentives for foreign companies, in addition to amendments to Law No. 159 of 1981, which added several benefits and facilitations for establishing companies. The Industrial Licensing Law and its executive regulations have also been enacted.

- Renewable energy: Renewable and green energy sources are utilized in the New Administrative Capital, with plans to cover approximately 50% of rooftop surfaces with solar energy. Additionally, 52 solar stations are planned for the governmental district, with a plan to generalize solar energy by 2035. The New Administrative Capital Development Company has announced the opening of investment opportunities for purchasing solar energy produced from solar cells above the roofs of residential neighborhoods in the New Administrative Capital.

2- Reducing population density and expanding urban footprint:

The primary goal of the New Administrative Capital is to reduce population density by relieving Cairo, which suffers from high population density and severe traffic congestion, despite its limited area¹²³.

Therefore, reducing population density was among the primary objectives in establishing the New Administrative Capital through the creation of residential neighborhoods. The plan includes the development of 20 residential districts within the capital. The first phase encompasses 8 residential neighborhoods, with 6 of them located between the Middle Ring Road and the Regional Ring Road. Additionally, there are two residential districts east of the Regional Ring Road, alongside the Capital Residence district, spanning approximately 1,000 acres. This area is divided into 8 neighborhoods comprising villas (328 units), residential buildings (699 buildings - 19,992 units), townhouses (157 buildings - 642

¹²³ Eric Reguly, The Globe and Mail, "Egypt's new capital city rises in the desert", posed online on October, 25, 2021, <https://www.theglobeandmail.com/world/article-egypts-new-capital-city-rises-in-the-desert/>, accessed on July, 3 2024.

units), and mixed-use residential-commercial zones (64 buildings - 1,536 residential units - 584 commercial units), totaling 22,480 residential units along with various service buildings.

As for the new Garden City district, it occupies around 1,000 acres and includes 23,000 residential units consisting of apartments, connected and semi-detached villas, and luxury units. The architectural style adopted for this district follows the old French style, resembling the architecture found in Downtown Cairo. The district also features a residential towers area with about 2,000 units and a 5-star hotel. These neighborhoods aim to alleviate the increasing pressures on infrastructure in the crowded and densely populated Cairo, diverting a significant population density to the New Administrative Capital.

Besides accommodating multi-level residential areas suitable for all societal segments, the New Administrative Capital also features a world-class medical city utilizing the latest advancements in medical technology globally. Additionally, it includes an advanced sports city, international conference halls, and exhibition centers, alongside business and financial districts. This concept has reinforced the idea of transferring a significant portion of population density to the New Administrative Capital.

3- Improving Quality of Life for Egyptians

This goal is directly linked to alleviating population density. It's not merely about transferring population density from the crowded Cairo to the New Administrative Capital, but rather about enhancing the quality of life for citizens. This is achieved by providing integrated residential environments with all necessary amenities such as advanced and diverse schools, medically equipped hospitals, public parks for recreation, and other entertainment areas.

Furthermore, from the outset of constructing the New Administrative Capital, there was a commitment to allocate a minimum of 15 square meters of green spaces per capita, in contrast to less than one square meter in other cities. Hence, several regulations were established to incentivize developers to implement sustainable environmental designs in various projects, adhering to internationally recognized standards such as LEED certification for green and sustainable building, including the LEED Certificate for excellence in energy and environmental design throughout design, construction, and operation phases.

4- Economic Development and Attraction of Investments

The New Administrative Capital project aims to attract both local and foreign investments by providing a conducive business and financial environment with investment incentives, administrative facilitations, tax exemptions, advanced infrastructure, an integrated transportation network, and sophisticated communication systems.

Coupled with its strategic location, this presents a golden opportunity for investors seeking to enter or expand within the Egyptian market, thereby revitalizing the economy through foreign currency inflows, increasing national income, and enhancing the quality of life for Egyptians.

5- Relocating Government Headquarters and Ministries

This objective encompasses several goals, including reducing population density. Given that the number of visitors to governmental institutions and ministries, whether employees, workers, or the public, reaches millions, relocating these headquarters from the congested Cairo to the New Administrative Capital alleviates pressure on Cairo.

Another goal is to create an advanced governmental system utilizing modern technology and artificial intelligence through the establishment of governmental complexes for ministries and agencies. These complexes operate using cutting-edge technologies that facilitate communication and coordination, alongside providing ample spaces capable of accommodating large numbers of citizens, thereby achieving speed and efficiency in delivering governmental services and enhancing governmental management efficiency.

Thus, the New Administrative Capital includes a governmental district housing 18 ministerial buildings, a parliament building, a presidential institution building, and a council of ministers building. Therefore, relocating governmental institutions and ministries to the New Administrative Capital serves as a means of providing a modern and integrated governmental workplace, employing modern technology in communication and archiving while providing a conducive working environment for employees. Moreover, it alleviates Cairo from ministries, affiliated agencies, and the accompanying congestion resulting from citizens from various provinces visiting to complete required transactions.

6- Development of Modern Infrastructure Based on Advanced Technology

The project aims to develop a modern and integrated infrastructure including advanced road networks, transportation systems, and sophisticated electricity, water, and communication networks. Overall, it creates a smart city leveraging modern technology through the use of cutting-edge communications and information technologies, such as smart lighting systems, advanced traffic monitoring systems, and advanced waste management, thereby creating a sustainable environment utilizing renewable energy and achieving resource efficiency. This makes the New

Administrative Capital a model for technological advancement in the region.

Regarding the introduction of modern technology, the New Administrative Capital benefits from technology and possesses an information network. All administrative buildings in the New Administrative Capital operate on solar energy, contributing to electricity savings, alongside encouraging investment and work in the solar energy field.

7- Enhancing Egypt's Regional and International Position

This objective is one of the most significant goals for establishing the New Administrative Capital. The New Administrative Capital enhances Egypt's position as a financial, business, innovation, and development center, attracting multinational companies to establish offices, branches, and representation offices in the New Administrative Capital. This contributes to enhancing international cooperation, technology transfer, and Egypt's economic strength, thereby bolstering Egypt's regional and international stature.

Thirdly: The Distinctive Features of the New Administrative Capital as a Smart City Compared to Other Cities in Egypt:

The New Administrative Capital cannot be compared to any other city within Egypt, as it is a smart city classified among fourth-generation cities. It is Egypt's first smart city, distinguished by the following features:

- Each zone or district within the New Administrative Capital has its own services and facilities according to a system developed by the Administrative Capital City Authority.

- The capital is currently supplied with clean water stations from New Cairo and Badr, and a power station has been established within the capital city with a capacity of 4800 megawatts and was completed in 2018.

- The New Administrative Capital Company has contracted with numerous companies to enhance infrastructure, relying on electronic surveillance networks. This approach utilizes dedicated software for each network, avoiding traditional methods such as digging into existing transport pipelines. Each network operates independently through control rooms spaced at equal intervals, enabling rapid maintenance and renovation without service interruptions in other districts of the New Administrative Capital.

- Embracing solar energy, the New Administrative Capital Development Company has partnered with the Industrial Modernization Center and the United Nations Development Programme to install solar panels. Contracts were awarded to the Egyptian Factory for Military Production and Suntech for the construction of solar power stations on over 65 roofs of ministerial buildings in the Government District of the New Administrative Capital. The project was completed at a cost of 140 million Egyptian pounds.

- Wide streets characterize the New Administrative Capital, with a minimum width starting from 30 meters and extending up to 124-130 meters, depending on the street. Street widths vary to accommodate different areas within the capital.

- Advanced security systems are a hallmark of the New Administrative Capital, featuring a highly efficient

security apparatus with at least 6,000 cameras monitoring the city.

- Establishment of other subsidiary cities includes specialized areas within the New Administrative Capital such as the Cultural and Arts City, Knowledge City, Medical City, and Sports and Olympic City, each catering to various fields and functions

Fourth: Achievements of the New Administrative Capital on the Ground:

1- Government District (Administrative District):

- Located on an area of 550 acres, equivalent to 4.8 million square meters.

- Comprises 36 buildings, including 34 ministerial buildings, a building for parliament, another for the Prime Minister's office, and the central axis of the district. Also includes the Egypt Cultural Islamic Center and other facilities reflecting stages of Egyptian civilizations throughout history.

- Completion rate of 98% for the Government District, accommodating up to 51,000 employees from various ministries. The state has implemented a plan to relocate ministries and governmental agencies, with the first phase already completed, easing the burden on Egyptian citizens and contributing to increased productivity and economic growth.

2- New Administrative Capital Airport:

- The Ministry of Civil Aviation began trial operation of "Capital International Airport" in the New Administrative Capital on July 9, 2019, with the first test flight by EgyptAir from Cairo Airport.

- Designed to handle large aircraft with an operational capacity of 300 passengers per hour, the airport features 48 different buildings. It contributes to comprehensive developmental progress in the region, particularly due to its connection with the Suez Canal Development Axis and the Ain Sokhna Industrial Zone, home to important maritime ports, serving as a hub for global trade and an industrial fortress, as well as an important tourist destination in the future.

- Located on an area of 16 square kilometers, the New Administrative Capital Airport includes the first control tower with a height of 50 meters, and parking facilities that can accommodate up to 500 cars and 20 buses.

3- Egypt Stadium:

Located in the Olympic City of the New Administrative Capital, Egypt Stadium has a capacity of 90,000 spectators.

4- Museum of Antiquities:

- The Museum of Antiquities in the New Administrative Capital is located adjacent to the Government District. It is a museum dedicated to religious tolerance, demonstrating how the great Islamic religion and Egyptian civilization, with its accepting attitude towards others, encompass and respect diverse religions and civilizations.

- The museum houses archaeological artifacts from Pharaonic, Islamic, and Coptic eras, along with a collection of Jewish artifacts, in proportion to the number of existing artifacts.

- The museum aims to show the world how Egyptian civilization has respected all religions and civilizations that have passed through Egypt, and to send a message to the world that Islam is a

nurturing ground for all religions, countering the false image propagated by extremist forces and terrorist groups.

5- International Universities:

- The European University Complex (EUE) is being constructed on an area of 80 acres, encompassing faculties such as Information Technology, Electronic Biology, Engineering, Pharmacy, Biotechnology, Architectural Design and Urban Planning, Arts and Humanities, Business Administration, Economics, Political Science, and Media. The first phase includes 3 faculties.

- According to the agreement signed at the Spanish University headquarters in Barcelona, the European University in Egypt has the right to grant degrees accredited by the parent university (UPC) in specializations including "Architecture Studies - Bachelor's Degree," "Landscape Engineering - Master's Degree," "Architecture Engineering - Master's Degree," "Advanced Studies in Architecture - Master's Degree," and "Advanced Studies in Design - Master's Degree."

- The plan includes the establishment of several international universities in the New Administrative Capital, including Canadian, Swedish, Hungarian, English, and Italian universities. Additionally, the Egyptian City for Science, Research, and Innovation is being established in partnership with international entities, with admission systems based on the procedures of the respective parent universities.

6- Diplomatic District

The Diplomatic Quarter spans an area ranging from 1500 to 1600 acres. The size of each embassy varies based on its specific requirements, with embassy plots ranging from one to 24 acres. Land parcels have been allocated within the New Administrative Capital for several international organizations to establish their

headquarters. Among these organizations are the Food and Agriculture Organization (FAO) and the African Bank.

7- Central Business District (CBD)

- This area comprises 20 towers with diverse uses including residential, administrative, commercial, and service facilities. The iconic tower, the tallest in Africa at approximately 385 meters high, was developed through collaboration between the Ministry of Housing represented by the New Urban Communities Authority, and the Chinese company CSCEC.

- The CBD covers an area of 195 acres, with a total built-up area of 1.24 million square meters above ground and 465,000 square meters below ground. The commercial and service area totals 230,000 square meters.

8- Culture and Arts City

- Built on 127 acres, this city includes theaters, exhibition halls, libraries, museums, and art galleries showcasing traditional and contemporary arts such as music, painting, sculpture, and handicrafts. It also houses the new Opera House, capable of accommodating 2000 attendees, along with theaters for music and drama performances, an Artistic Innovation Center, and a wax museum.

- The Culture and Arts City features a grand celebration hall for 2500 people equipped with state-of-the-art technologies, a small theater for special shows accommodating 750 people, and a chamber theater for intimate performances. It includes a musical library with access to the global opera archive and a central library serving 6000 people.

- Additionally, it houses an Artistic Innovation Center for young creators, a cinema hall linked to satellites, three training halls, and a recording studio equipped with the latest technologies.

9- Knowledge City

- Spanning 211 acres, Knowledge City aims to promote knowledge-based activities including an applied research center, branches of the Information Technology Institute, and the National Telecommunications Institute. It utilizes advanced IT technologies across all sectors.

- The development plan of Knowledge City includes software production and various applications, especially in IoT (Internet of Things) applications, smart city management, and intelligent transportation systems.

- The project aims to create a digital community and an integrated environment supporting the growth of the telecommunications and IT sectors in Egypt through three main pillars:

1. Human Development: Training programs in advanced fields like artificial intelligence and data sciences will be offered through the IT Academy for Persons with Disabilities in the initial phase.

2. Innovation Support and Entrepreneurship: The Innovation Building in the first phase will serve as a hub for technological creativity, encouraging youth and startups to develop innovative solutions in areas such as augmented reality, smart cities, and AI.

3. Attracting Investments and Creating Job Opportunities: The city aims to attract leading

global companies in the telecommunications and IT sectors, creating job opportunities for youth and attracting investment in Egypt through centers of excellence and data centers.

10- Sports City

- Spanning an area of 10 acres, Sports City includes indoor halls, a swimming complex, standard and futsal football fields, multi-purpose courts, a hockey field, changing rooms, children's play areas, cultural and entertainment areas, a theater, a social building, and an administrative building.

11- Transportation and Mobility within the New Administrative Capital¹²⁴:

- **Bus Lines:** The New Administrative Capital will feature eco-friendly bus lines powered by electricity or natural gas. These buses will connect all parts and neighborhoods of the capital.

- **Monorail Train:** A monorail system is nearing completion, designed as a fast single-track train running on a suspended concrete beam. It is expected to link vital areas of Greater Cairo to the New Administrative Capital via the following routes:

- **Line 1:** Connects Greater Cairo to the New Administrative Capital, spanning 21 stations from Nasr City, one of Cairo's busiest areas, to New Cairo and onward to the New Administrative Capital.
- **Line 2:** Currently encompasses 12 stations, starting from the Arab League Street to major areas within 6th of October City.

¹²⁴ The Peak Properties, "Everything you need to know about the New Administrative Capital", posted online on 2022, <https://thepeakeg.com/new-capital-blog/>, accessed on July, 3 2024.

- **LRT Electric Train:** The LRT train marks a significant advancement in Egypt's transportation network, connecting Ain Sokhna to New Alamein City and integrating the New Administrative Capital and new cities into a passenger and freight rail network. The project costs EGP 360 billion, covering a distance of 460 km with a design speed of 250 km/h. It includes 12 stations, beginning from Adly Mansour Station with only one interchange station extending to Badr Station.

- **Heavy Electric Rapid Train:** Known for its capacity to transport both passengers and cargo over long distances, the New Suez Canal Heavy Train includes 5 lines, with contracts officially awarded for 3 lines:

- **Line 1:** Links the Red Sea cities to the Mediterranean cities with 21 stations.
- **Line 2:** Links 6th of October City to Aswan City.
- **Line 3:** Links Luxor City to Hurghada City.

Fifth: Major Landmarks of the New Administrative Capital:

- **The Green River:** A large watercourse feeding central parks and surrounding residential neighborhoods. Initially spanning 10 km from the Middle Ring Road to the borders of New Cairo, it will eventually stretch to 35 km in future phases. The river is fed by treated sewage water.

- **Al-Fattah Al-Alim Mosque:** Spanning 106 acres, accommodating up to 18,000 worshippers, with exterior space for 8,500. It features 4 minarets at 90 meters each, a main dome, and secondary domes, along with educational facilities and a Quran memorization center.

- **The Cathedral of Christ's Nativity:** Spread over 15 acres (63,000 sq. m), it is the largest in the Middle East, capable of seating 8,200. It includes smaller churches, main event halls, baptism rooms, and administrative offices.

- **The Masa Capital Resort and Hotel:** One of the largest and most luxurious hotels globally, covering over 10 acres, featuring conference halls, a mosque, a shopping mall, and lake areas, all designed in a distinctive architectural style.

- **Central Park (Capital Park):** Among the world's largest parks, covering 5,000 acres along a 35 km stretch, serving residents of the New Administrative Capital, New Cairo, and Cairo. It includes various themed sections such as historical, health and population, financial and business, international, sports, scientific, and botanical gardens.

This vast parkland will be irrigated using treated wastewater to preserve drinking water supplies.

- **Opening of the Canadian University:** considered the international branch of the University of Prince Edward Island, one of the world's oldest universities, established on a 30-acre campus.

Sixthly: The New Administrative Capital is a Smart City

The New Administrative Capital embraces efforts towards digital transformation, skill development, digital capabilities, and fostering digital innovation in a smart, integrated environment. Egypt has advanced its digital services notably through the implementation of the national flagship project "Digital Egypt", enabling individuals and companies to fulfill their requirements electronically. This initiative continues to evolve, with recent developments allowing for online filing of lawsuits and attendance of sessions, among other services. Egypt has made significant progress in the global rankings for "Government Readiness for Artifi-

cial Intelligence," advancing from 111th place to 56th place worldwide¹²⁵.

Engineer Tamer Mohamed, a prominent IT expert, highlighted in a news report the presence of a giant data center powered by artificial intelligence in the New Administrative Capital, resulting in high performance and minimal error rates, even surpassing human capability¹²⁶.

The Chairman of the Administrative Capital Company's Board of Directors also confirmed in a news report the existence of two control centers securing facilities and individuals, managing traffic across the capital's streets. One center focuses on security aspects and traffic control, while the other manages various facilities smartly, including supply control, fault management, and billing for electricity, gas, water, and internet services. Users interact with and are billed for all facilities.

Smart columns are deployed throughout the New Administrative Capital, each equipped with specialized cameras based on usage location: thermal, night vision, and high-zoom capabilities, alongside public internet access points and interactive digital billboards. Smart lighting systems send data to control and command centers for processing and handling, along with intelligent fault handling procedures¹²⁷.

¹²⁵ Arab Information & Communication Technologies Organization, "New Administration Capital Arab Digital Capita 2021", posted online on 2022, <https://bit.ly/4cJge9z>, accessed on July,3 2024.

¹²⁶ Eng. Tamer Mohamed, Sada ElBalad Newspaper, "A giant center for state administration in the Administration Capital which relies on artificial intelligence", posted online on December, 15 2021, <https://www.elbalad.news/5085875>, accessed on July, 3 2024.

¹²⁷ Khaled Abbas, Al- Ahram Newspaper, "We compete with major global capitals and artificial intelligence facilitates the lives of residents",

Additionally, a zone for precision and clean industries has been planned and developed in a prime location along the Sokhna Road, benefiting from port and state facilities integrated into all projects. This has contributed to increased foreign investments, particularly from embassies and international organizations purchasing land in the Diplomatic Quarter. These investment opportunities led the state to remove all potential obstacles and intervene legislatively, issuing a cabinet decision under Article 10 of Investment Law No. 72 of 2017 to include the New Administrative Capital in areas offering investment incentives.

Moreover, a smart city within the New Administrative Capital is dedicated to the Ministry of Interior and Civil Defense, enabling comprehensive monitoring of activities such as traffic violations, accidents, and fires through city-wide surveillance cameras connected to this smart city.

This city also manages infrastructure networks; for example, in case of a water problem in a specific area, it is identified and resolved immediately using a technological system implemented by the Armed Forces Systems and Information Management and the Ministry of Communications.

Furthermore, the New Administrative Capital competes with and surpasses many fourth-generation cities worldwide, having embarked since the project's inception on a unique and distinguished master plan, defining building ratios not exceeding 25% for residential projects and 40% for commercial and administrative projects. It has signed contracts with global companies specialized in managing facilities and green spaces, using cutting-edge tech-

nologies such as French companies like Atos for technology and German companies like Dorsh for water facility management, along with partnerships with American Honeywell and Chinese Huawei for the latest in global advancements, aiming to deliver an urban smart, sustainable, green community that enhances quality of life for all Egyptians¹²⁸.

It is noteworthy that the New Administrative Capital was selected as the Arab Digital Capital for the year 2021 during the 24th session of the Arab Ministers of Communications and Information Council held on December 17, 2020. This underscores its role in digital transformation efforts, developing digital skills and capabilities, and fostering digital innovation in an integrated and cohesive smart environment¹²⁹.

Despite all this, Egypt continues to take serious and rapid steps in this field, with the latest being the Egyptian Ministry of Justice organizing the Artificial Intelligence Conference in the New Administrative Capital in collaboration with the World Intellectual Property Organization (WIPO), titled "Generative Artificial Intelligence Conference and Its Impact on Intellectual Property Rights," which took place in April 2024 and saw international participation from experts in this field¹³⁰.

¹²⁸ Khaled Abbas, Al-Ahram Newspaper, "We compete with major global capitals and artificial intelligence facilitates the lives of residents", posted online on June, 14 2024, <https://gate.ahram.org.eg/News/4844927.aspx>, accessed on July, 3 2024.

¹²⁹ Arab Information & Communication Technologies Organization, "New Administration Capital Arab Digital Capital 2021", posted online on 2022, <https://bit.ly/4cJge9z>, accessed on July, 3 2024.

¹³⁰ Mohamed Eissa, "The start of the Artificial Intelligence Conference in the New Administrative Capital, ElWatan Newspaper, posted online on April, 23 2024,

As previously mentioned, the New Administrative Capital project represents an ambitious and significant endeavor aimed at transforming it into a leading hub for finance and business. This transformation is facilitated through the development of a smart city that integrates cutting-edge technologies and adheres to sustainability principles. The project aims to enhance the quality of life for citizens and provide a conducive environment for business and investment.

The success of this project marks a major step towards a brighter future for Egypt, achieved through continued investment in smart infrastructure and strengthening international partnerships. The New Administrative Capital has the potential to serve as a model for smart cities worldwide, particularly following the successful completion of its initial phase and the commencement of subsequent phases.

THE INTERNET OF THINGS IN SMART CITIES (IOT): REVOLUTIONIZING CONNECTIVITY AND AUTOMATION

Pr. Dr. Guira Salim

Pr. Dr. Daoud Mansour

Pr.Dr. Saad Lagoun

University of Djelfa, Algeria

ملخص باللغة العربية

انترنت الأشياء (IoT) هو مفهوم تقني ثوري يربط الأجهزة اليومية بالإنترنت، مما يتيح لها تبادل البيانات والتفاعل مع بعضها البعض بما يخدم الإنسان. بدأ هذا المفهوم في الثمانينيات ولكنه تطور بشكل كبير منذ ذلك الحين. تلعب انترنت الأشياء دورًا حيويًا في تطوير المدن الذكية، حيث تساهم في تحسين الكفاءة الإدارية والخدمية، وتعزز من جودة الحياة، وتدعم الاستدامة البيئية. حيث تتضمن تطبيقاتها المنازل الذكية التي تضم أجهزة مثل حساسات الحرارة الذكية، والكاميرات الأمنية، وأنظمة الإضاءة الذكية... الخ، التي تعزز مبادئ الراحة والأمان وتحسن كفاءة الطاقة. كما تمكن من إقامة نظم المراقبة عن بعد، وتساهم في تحسين النقل من خلال أنظمة إدارة المرور الذكية وتقنيات القيادة الذاتية، في الصناعة مثلًا تمكن من تعزيز العمليات التصنيعية عبر مصانع ذكية مجهزة بأجهزة استشعار لمراقبة أداء المعدات والتنبؤ بالصيانة.

غير أنه، وعلى الرغم من الفوائد العديدة التي تقدمها انترنت الأشياء، إلا أن هناك تحديات كبيرة تواجه تنفيذها في المدن الذكية. تشمل هذه التحديات القضايا الأمنية والخصوصية، حيث يؤثر جمع البيانات الضخمة مخاوف حول كيفية استخدام هذه البيانات وحمايتها. كما أن التحديات تشمل التوافق بين الأجهزة المختلفة، والتكلفة العالية للبنية التحتية، وتعقيدات إدارة البيانات الكبيرة.

تساهم هذه التطورات في تقنيات الجيل الخامس 5G، والذكاء الاصطناعي (AI)، والحوسبة الطرفية (Edge Computing) في تعزيز قدرات انترنت الأشياء، مما يؤدي إلى تحسين الاتصال، وتقليل زمن الاستجابة، وزيادة الكفاءة والاستجابة الفورية للأنظمة. ويعد انترنت الأشياء تقنية محورية قد تحدث ثورة في العديد من جوانب حياتنا، مع ضرورة مواجهة التحديات المتعلقة بالأمن والخصوصية لتحقيق إمكاناتها الكاملة.

Introduction

The Internet of Things (IoT) is a groundbreaking technological paradigm that connects everyday objects to the internet, enabling them to send, receive, and process data. This interconnectivity allows devices to interact with each other and their environment, significantly enhancing functionality and efficiency across various domains. From smart homes and cities to industrial automation and healthcare, IoT is revolutionizing the way we live and work.

The Internet of Things (IoT) has emerged as a transformative technology with the potential to revolutionize urban living. By interconnecting devices, sensors, and systems, IoT enables cities to operate more efficiently, improve the quality of life for residents, and enhance sustainability. This essay explores the role of IoT in smart cities, its benefits, challenges, and future prospects.

History and Evolution

The concept of IoT dates back to the early 1980s when a Coca-Cola vending machine at Carnegie Mellon University was modified to report its inventory and whether newly loaded drinks were cold. However, the term "Internet of Things" was coined by « Kevin Ashton » in 1999 during his work at « Procter and Gamble ».¹³¹

The advent of affordable sensors, ubiquitous internet access, and advancements in data analytics and artificial intelligence has propelled IoT from a futuristic idea to a present-day reality.

The history of the Internet of Things (IoT) traces the evolution of interconnected devices that collect and exchange data¹³².

• **1960s-1980s: Foundations:** Early concepts of connected devices emerged in the 1960s with the development of ARPANET*, the precursor to the internet. In the 1980s, advancements in wireless communication and microprocessors laid the groundwork for IOT¹³³.

¹³¹ - Miller, M. The Internet of Things: How Smart TVs, Smart Cars, Smart Homes, and Smart Cities Are Changing the World. Que Publishing, 2015,

https://books.google.dz/books/about/The_Internet_of_Things.html?id=9GQ0BwAAQBAJ&redir_esc=y.

¹³² - The History of ARPANET. « Computer History Museum »,

https://computerhistory.org/?gad_source=1&gclid=EAIaIQobChMIzdiIxO7-hgMVM6loCR2QzwSoEAAYASAAEgLkIPD_BwE.
27,06,2024. 17.00.

* - شبكة وكالة مشاريع الأبحاث المتطورة: هي شبكة حاسوب نقل البيانات ربطت بين عدد من الجامعات في و م أ.

¹³³ - صادوق خضرة، نيل خيرة، "تطبيقات انترنت الأشياء في المكتبات "دراسة نظرية"، مجلة الرواق للدراسات، المجلد 8 العدد 2، 2022، ص 98.

• **1990s: Early Innovations:** The term "Internet of Things" was coined by « Kevin Ashton » in 1999 while working at « Procter & Gamble ». The idea was to connect devices using RFID (Radio-Frequency Identification) technology.¹³⁴

• **2000s: Concept to Reality:** The adoption of IPv6, which provided a vast number of IP addresses, facilitated the growth of IoT. Advances in sensor technology and wireless communication contributed to the practical implementation of IoT¹³⁵.

• **2010s: Rapid Growth:** IoT saw exponential growth with the proliferation of smartphones and the development of cloud computing. Smart home devices, wearable technology, and industrial IoT applications became widespread. Major tech companies, including Google, Amazon, and Apple, invested heavily in IoT ecosystems.

• **2020s: Integration and Expansion:** IoT is becoming integral in various sectors, including healthcare, agriculture, transportation, and smart cities. The development of 5G networks is expected to further accelerate IoT capabilities with faster and more reliable connectivity.

What is Internet of Things (IoT)?

IoT refers to a network of physical objects "things" embedded with sensors, software, and other technologies that enable them to connect and exchange data with other devices and systems over the internet. These "things" can range from simple household

¹³⁴ - نفس المرجع الأنف الذكر، ص 99.

¹³⁵ - نفس المرجع الأنف الذكر ونفس الصفحة

items like refrigerators and thermostats to complex industrial machines.¹³⁶

a- Key Characteristics of IoT

- **Interconnectivity:** IoT devices can connect and communicate with each other and the internet.
- **Data Collection:** These devices collect data through sensors and other embedded technologies.
- **Automation and Control:** IoT allows for automation and remote control of devices, improving efficiency and reducing the need for human intervention.
- **Intelligence:** IoT systems can analyze the collected data and make intelligent decisions based on predefined criteria.

b- Applications of IoT:

- **Smart Homes:** Devices like thermostats, security cameras, and smart locks that enhance home automation and security.
- **Healthcare:** Wearable devices that monitor health metrics, enabling remote patient monitoring and personalized medicine.
- **Industrial IoT (IIoT):** Machines in factories equipped with sensors to monitor performance and predict maintenance needs.

¹³⁶ - Uckelmann, D, Harrison, M, & Michahelles, F, « Architecting the Internet of Things », Springer, <https://link.springer.com/book/10.1007/978-3-642-19157-2>. 28,06,2024, at 18.00

- Agriculture: Sensors that monitor soil moisture, weather conditions, and crop health to optimize farming practices.
- Smart Cities: Infrastructure like smart streetlights and traffic management systems to improve urban living conditions.

c. Benefits of IoT¹³⁷

- Increased Efficiency: Automation and optimization of processes lead to significant time and cost savings.
- Improved Quality of Life: Smart devices offer convenience and enhanced lifestyle options for consumers.
- Data-Driven Decisions: Access to real-time data allows businesses and individuals to make informed decisions.
- Predictive Maintenance: IoT enables proactive maintenance of machinery, reducing downtime and extending equipment life.

d. Challenges of IoT¹³⁸

- Security: The vast number of connected devices increases the potential for cyberattacks.

¹³⁷ - Gubbi, J, Buyya, R, Marusic, S, & Palaniswami, M, « Internet of Things (IoT): A vision, architectural elements, and future directions ». Future Generation Computer Systems, V29, N°7, 2013, pp 1645-1660.

¹³⁸ - Sundmaeker, H, Guillemin, P, Friess, P, & Woelfflé, S, « Vision and challenges for realizing the Internet of Things », Cluster of European Research Projects on the Internet of Things (CERP-IoT), 2010,

https://www.researchgate.net/publication/228664767_Vision_and_Challenges_for_Realizing_the_Internet_of_Things , 28,06,2024, 19,30.

- Privacy: Collecting and sharing data raise concerns about user privacy and data protection.
- Interoperability: Different devices and platforms need to work seamlessly together, which can be a challenge.
- Complexity: Managing and analyzing large amounts of data from various sources can be complex.

The Role of IoT in Smart Cities¹³⁹

IoT facilitates the creation of smart cities by enabling real-time data collection and analysis. This technology integrates various urban systems such as transportation, energy, waste management, and public safety, leading to improved resource management and service delivery.

For instance, IoT sensors can monitor traffic patterns and adjust signal timings to reduce congestion. Additionally, smart grids utilizing IoT can optimize energy distribution, reducing wastage and lowering costs.

Ways IoT Contributes to Smart Cities

1. Improved Efficiency: IoT helps in automating city operations, reducing manual interventions, and increasing operational efficiency. Smart lighting systems, for example, can adjust

¹³⁹ - Xia, F, Yang, L T, Wang, L, & Vinel, A, « Internet of Things ». International Journal of Communication Systems, V 25, N°9, 2012, pp 1101-1102, <https://onlinelibrary.wiley.com/doi/10.1002/dac.2417> 28,06,2024 , 18,30.

brightness based on the presence of pedestrians, thereby conserving energy.

2. Enhanced Quality of Life: IoT applications in healthcare, such as remote monitoring and telemedicine, provide residents with better access to medical services.

3. Sustainability: By optimizing resource usage, IoT contributes to environmental sustainability. Smart waste management systems use IoT sensors to monitor waste levels and optimize collection routes, reducing fuel consumption and emissions.

Key Components of IoT

1. Sensors and Actuators: Sensors collect data from the environment, such as temperature, humidity, light, and motion. Actuators can perform actions based on the data received, like turning on a light or adjusting a thermostat.

2. Connectivity: Devices communicate with each other and central systems through various communication protocols such as Wi-Fi, Bluetooth, Zigbee, and cellular networks.

3. Data Processing: Collected data is processed either locally (edge computing) or centrally (cloud computing) to derive meaningful insights and trigger appropriate actions.

4. User Interface: Users interact with IoT systems through interfaces like mobile apps, web applications, or voice assistants.

Applications of IoT

1. Smart Homes: IoT is transforming homes into smart environments where devices can communicate and be controlled remotely. Smart thermostats, lighting systems, and security cameras enhance convenience, safety, and energy efficiency.¹⁴⁰
2. Healthcare: In healthcare, IoT devices like wearable fitness trackers, smartwatches, and remote patient monitoring systems collect real-time health data. This data helps in early diagnosis, personalized treatment plans, and improved patient outcomes.¹⁴¹
3. Transportation: IoT enhances transportation systems through smart traffic management, vehicle-to-vehicle communication, and autonomous driving technologies, resulting in safer and more efficient travel.
4. Industrial IoT (IIoT): IoT drives significant improvements in manufacturing and industrial processes. Smart factories equipped with IoT sensors monitor equipment health, predict maintenance,

¹⁴⁰ - Kranz, M. Building the Internet of Things: Implement New Business Models, Disrupt Competitors, Transform Your Industry. Wiley, 20216.

<https://www.wiley.com/en-gb/Building+the+Internet+of+Things%3A+Implement+New+Business+Models%2C+Disrupt+Competitors%2C+Transform+Your+Industry-p-9781119285663> 28,06,2024. 14.00.

¹⁴¹ - McKinsey & Company, The Internet of Things Mapping the Value Beyond the Hype. Mckinsey global institute, june 2015, P 8.

nance needs, optimize supply chains, and enhance overall productivity.¹⁴²

5. Smart Cities: IoT technology is pivotal in developing smart cities, where interconnected systems manage traffic flow, reduce energy consumption, improve waste management, and enhance public safety.

Benefits of IoT

1. Enhanced Efficiency: Automated systems and real-time data analysis optimize operations and resource management, leading to cost savings and increased productivity.¹⁴³

2. Improved Quality of Life: IoT devices provide convenience, security, and health benefits, significantly improving the quality of life for individuals.

¹⁴² - IBM Internet of Things, 2023,

https://www.google.es/search?q=IBM.+%282023%29.+IBM+Internet+of+Things.&sca_esv=af7166023be3609c&ei=Kf9-Zo_sKbaYkdUPj8mpkA0&ved=0ahUKEwjPpOeH9f6GAxU2TKQEHY9kCtIQ4dUDCA8&uact=5&oq=IBM.+%282023%29.+IBM+Internet+of+Things.&gs_lp=Egxnd3Mtd2l6LXNlcnAiJElCTs4gKDIwMjMpLiBJQk0gSW50ZXJuZXQgb2YgVGhpbmdzLjJlFECEY0AEyBRAhGKABSIUPUMQJWMQJcAF4AJABAJgB7wGgAe8BqgEDMi0xuAEDyAEA-AEB-AECmAICoAKjAqgCCsICEBAAGAMY-tAIY6gIYjwHYAQHCAhAQLhgDGLQCGOoCGI8B2AEBmAMiugYECAYECpIHBTEuMC4xoAeeAg&sclient=gws-wiz-serp , 27,06,2024, 14,00.

¹⁴³ - Atzori, L, Iera, A, & Morabito, G, « The Internet of Things: A survey. Computer Networks », 2010, V 54, N°15, pp 2787-2805. https://www.researchgate.net/publication/222571757_The_Internet_of_Things_A_Survey, 28,06,2024, 19,30.

3. Data-Driven Decision Making: The vast amount of data collected by IoT devices allows businesses and governments to make informed decisions and implement strategic initiatives.

4. Innovation: IoT spurs innovation across various sectors, leading to the development of new products, services, and business models.

Challenges and Concerns

1. Security: The vast number of interconnected devices presents significant security risks. Weak security protocols can lead to data breaches, hacking, and other cyber threats.

2. Privacy: IoT devices collect a plethora of personal data, raising concerns about how this data is used and protected.

3. Interoperability: The lack of standardization across IoT devices and platforms can hinder seamless integration and communication. Ensuring that different devices and systems can work together without issues is a major challenge.

4. Scalability: As the number of IoT devices grows, managing and processing the vast amount of data becomes increasingly challenging. Systems must be designed to handle this growth efficiently.

5. Cost: The initial investment required for IoT infrastructure can be substantial, posing a barrier for many cities and organizations.

6. Complexity: Implementing and maintaining IoT systems can be complex, requiring specialized skills and knowledge.

Challenges of IoT Implementation in Smart Cities

Despite its benefits, the deployment of IoT in smart cities faces several challenges:¹⁴⁴

1. **Privacy and Security:** The extensive data collection inherent in IoT raises significant privacy concerns. Ensuring the security of IoT devices and the data they collect is paramount to prevent cyber attacks and data breaches.
2. **Interoperability:** The lack of standardized protocols across different IoT devices and systems can hinder seamless integration and communication.
3. **Scalability:** As the number of connected devices grows, managing and scaling IoT networks becomes increasingly complex.
4. **Cost:** The initial investment required for IoT infrastructure can be substantial, posing a barrier for many cities.
5. **Data Management:** IoT generates vast amounts of data, necessitating robust data management and analytics capabilities to derive meaningful insights.

¹⁴⁴ - Al-Fuqaha, A, Guizani, M, Mohammadi, M, Aledhari, M, & Ayyash, M, « Internet of Things (IoT): A vision, architectural elements, and future directions », *Future Generation Computer Systems*, 2015.

https://www.researchgate.net/publication/279177017_Internet_of_Things_A_Survey_on_Enabling_Technologies_Protocols_and_Applications, 27,06,2024, at 19,55.

The Future of IoT:¹⁴⁵

The future of IoT in smart cities looks promising, with advancements in technologies such as 5G, artificial intelligence (AI), and edge computing set to enhance IoT capabilities.

Key Trends Shaping the Future of IoT:

- **AI Integration:** The combination of AI and IoT (AIoT) will lead to smarter devices capable of learning from data and improving over time. This will enhance automation and predictive capabilities.
- **Enhanced Connectivity:** The rollout of 5G networks will significantly increase the speed and reliability of IoT connections, supporting more devices and higher data volumes.
- **Edge Computing:** By processing data closer to the source, edge computing reduces latency and bandwidth use, making IoT systems more efficient and responsive.
- **Sustainable IoT:** IoT can contribute to sustainability by optimizing resource use, reducing waste, and enabling renewable energy solutions.
- **Blockchain Technology:** Developments in blockchain technology could address security and privacy concerns by providing decentralized and secure data management solutions.

As IoT continues to evolve, it will undoubtedly bring about unprecedented changes, driving efficiency, innovation, and improved quality of life.

¹⁴⁵ - McKinsey, OP.CIT, p 9.

However, addressing the associated challenges, particularly in security and privacy, will be crucial to realizing the full potential of IoT in the future¹⁴⁶.

¹⁴⁶ - Atzori, L, Iera, A, & Morabito, G, « The Internet of Things: A survey », *Computer Networks*, V54, N°15, 2012, pp 2787-2805.

Conclusion

The Internet of Things is a transformative technology with the potential to revolutionize numerous aspects of our lives. As IoT continues to evolve, it will undoubtedly bring about unprecedented changes, driving efficiency, innovation, and improved quality of life.

However, addressing the associated challenges, particularly in security and privacy, will be crucial to realizing the full potential of IoT in the future.

IoT holds significant promise for the development of smart cities, offering numerous benefits such as improved efficiency, enhanced quality of life, and sustainability. However, addressing the challenges of privacy, security, interoperability, and cost is essential for the successful implementation of IoT in urban environments. As technology continues to evolve, the integration of IoT in smart cities is expected to become more seamless and impactful.

THE ROLE OF ARTIFICIAL INTELLIGENCE IN COMMERCIAL COMPANIES A COMPARATIVE STUDY

Dr. Gharbi Ali,

University of Djelfa, Algeria.

Dr. Bensalem Ahmed Abderrahman,

University of Djelfa, Algeria.

Abstract

Artificial intelligence is one of the most significant topics that have gained widespread global interest and attention, especially in recent years. This is due to it being one of the essential technologies resulting from the components of the fourth digital revolution, thus permeating various sectors and creating a real breakthrough, particularly in the world of the digital economy. Artificial intelligence primarily aims to surpass the way humans comprehend and interact with the external world and the changes that occur within it. Subsequently, it has quickly evolved to become and form the cornerstone for achieving creativity and innovation in all fields and domains.

Undoubtedly, it has shown great potential for application in various areas of the business sector. This research paper aims to shed light on the contributions of artificial intelligence in companies and commercial entities.

Keywords: **Commercial Companies, Digital Revolution, Blockchain Technology, Governance**

Introduction

The world today is rightly living with a rapid and accelerated revolution in the field of communication and information technology, which was termed the so-called Digital Revolution, which came as a result of the steady and tremendous progress in the means of communication and digital technology, so that it gave birth to important and radical transformations in the economy and global trade, It can be described as the pivot point from which the significant development observed today in various fields has emerged.

As some jurists describe that technology in the end has no value if not exploited commercially, and commercial exploitation is the ultimate goal that gives material and commercial value in addition to the scientific value, which entails opening doors for humanity to benefit from this exploitation, it is necessary that this commercial exploitation of digital technology is surrounded by a general external framework that determines the legal positions of the parties to the relations that arise between the dealers in it.

Understanding the technological aspects associated with commercial issues – as a basic and indispensable experience in the world of communication – has become of great importance, if it is not possible to work in this field without a clear understanding and full knowledge of its aspects.

Blockchain technology and smart contracts are one of the most important topics that have received wide global attention and resonance, and increasingly and significantly in recent years, given that it is one of the important technologies resulting from the components of the fourth digital revolution, which has contributed and will contribute to changing the features of the global economy.

Artificial intelligence is a broad research field with economic dimensions whose effects are evident in various fields, as it was not limited to pure technological fields, but included aspects of research, industry, teaching, medicine and media, and there is still hope among those concerned with the future of the machine to reach artificial intelligence to advanced levels, where many human energies can be provided, through the development of the capabilities of the machine to simulate humans.

This term appeared in existence in 1956, at a conference held at Dartmouth University in the United States of America, under the supervision of John McCarthy, in the presence of a group of experts and specialized scientists, most of whom are from IBM, to study "smart software and software capable of thinking." This field was called the term "artificial intelligence", and John McCarthy defined it as the science of engineering and creating smart machines, especially computer programs. Artificial intelligence is a science that is interested in creating machines and computer programs that can think exactly as a person thinks, learns as he learns, speaks like him, and also acts like him.

The first to use this term was the scientist "Marvin Minsky" when he wrote an article in 1961 under the title "Step towards Artificial Intelligence", and the definitions and interpretations of artificial intelligence by scientists and specialists were numerous. The basis of this difference between them is due to the ambiguity and ambiguity of the concept of "intelligence" itself. The term intelligence involves a lot of confusion, and thus it is impossible to adjust its terminological concept, and this was reflected in the concept of artificial intelligence, and in the eyes of Eileen Rich, artificial intelligence is that science that studies how to make a

computer do the same work performed by humans, but in a lesser way than at present¹⁴⁷.

One of the most important applications and contributions of artificial intelligence in the field of commercial companies is the technology of the blockchain, which appeared at the hands of its founder Satoshi Nakamoto, when he mined the first block known as the Genesis block in 2009, as a result of the exchange of Bitcoin between him and the American programmer Hal Finney on January 12, 2009. Then, researchers and technologists confirmed and realized that the network and the technology on which this process was founded is a safe environment for conducting transactions or saving, exchanging and transferring assets. The most important feature is that it is decentralized, open and distributed. It is also a network based on compatibility and peer-to-peer technology, in addition to being fixed and unchangeable as well as time series. As a result of the technical and programmatic development, the Russian programmer Vitalik Buterin founded the first application of the second generation of the blockchain known as the Ethereum platform in 2013, which is the basis of the current smart contracts¹⁴⁸.

There is no doubt that the economy has a great role in the development and prosperity of countries, so that developing and developed countries alike have been keen to diversify economic projects, using for this purpose many tools and methods, perhaps the most important of which are commercial companies, which are

¹⁴⁷ Ahmed Ali Saleh Dabash. No date. "Smart contracts technology and its impact on the stability of financial transactions, a jurisprudential study", *Conference on the Role of Sharia and Law in the Stability of Societies*, (page 6). Egypt: Al-Azhar University.

¹⁴⁸ Ahmed Issa Haitham Elsayed. (2021). *The emergence of smart contracts in the era of blockchain*, Egypt, Dar Al-Nahda Al-Arabiya.

only the backbone of the local and international economy, as the company as an idea arose automatically given the urgent need for it in the field of commercial activity.

The economic environment also imposed on companies in general and commercial companies in particular to keep pace with the development, as the increasing degree of complexity in the climate in which companies interact is inevitable, and the speed to adopt technology that answers the challenges and obstacles posed may be the only refuge that ensures their survival.

From the above, we can raise the question of the contributions of artificial intelligence in companies and commercial entities?

Or in other words: What are the advantages that commercial companies gain by applying artificial intelligence?

To answer this problem, the study will embrace the descriptive analytical approach and this is for enrichment, and in line with the scope of the research, we decided to address the topic by first addressing the conceptual framework of artificial intelligence, and then moving on to discuss the role of artificial intelligence in commercial companies, and this was according to the following pattern:

First axis: An exploratory look at artificial intelligence technology.

Second axis: Blockchain as an infrastructure for commercial companies.

First: Definition of artificial intelligence

Due to the interest of many researchers and thinkers from different disciplines, whether from the natural, applied, or humanities and social sciences, in artificial intelligence, and due to the

complexity of artificial intelligence in itself, many conceptual approaches have emerged that have tried to dissect the concept of artificial intelligence and give it several definitions.

Artificial intelligence, sometimes called machine intelligence, is a branch of computer science and one of the main pillars on which the technology industry is based in the current era. The term artificial intelligence refers to systems or devices that simulate human intelligence to perform tasks and that can improve themselves based on the information they collect.

It was the American scientist Johan McCarthy who coined the term artificial intelligence in 1956 and defined it as "the science and engineering of the manufacture of intelligent machines and especially intelligent computer programs, or it is the branch of computer science that aims to create intelligent machines, or branches of computer science that aim to create intelligent machines."

The General Assembly of the United Nations, through the United Nations Commission on International Trade Law, has defined artificial intelligence as: "a science based on devising systems capable of studying and solving problems, and performing functions by simulating mental processes on their own without human intervention, and these systems can reach self-operating levels, and they can act completely independently, and it is not possible to predict their work or results, because they act as black boxes."

Artificial intelligence has also been defined in the Oxford English Living Dictionary as "the theory and development of computer systems capable of performing tasks that usually require human intelligence, such as: speech recognition, visual perception, language translation, and decision-making," while the Encyclope-

dia Britannica defined it as "the ability of a digital computer or computer-controlled robot to perform tasks usually associated with intelligent objects," while the Cambridge Dictionary defined it as "the study of how to produce machines that have some of the qualities of the human mind, such as: the ability to understand language, recognize images, and learn." Through the definitions contained in the reference dictionaries we note that they focused on two pivotal ideas, namely simulation and cognitive characteristics, that make artificial intelligence, especially the computer, work and think like humans, but without neglecting other types of intelligence.

The World Intellectual Property Organization (WIPO) defines it as "a discipline in computer science that aims to develop machines and systems that can perform tasks that are perceived to require human intelligence, whether with limited human intervention or without human intervention."

Among the Arab jurists, we find the stadium Abdul Razzaq Mukhtar , who defined it " as a science that seeks to develop computer systems that work with high efficiency similar to the efficiency of the expert human, that is, it is the ability of the machine to imitate and simulate the motor and mental processes of the human being, and the way his mind works in thinking, deducing and responding, and taking advantage of previous experiences and intelligent reaction, it is to emulate the human mind and play its role."

Professor Mustafa Obaid also defined artificial intelligence as: A name that has been agreed upon to be launched on the quality of intelligence that a deaf machine can gain, by inoculating it with programs and algorithms that make it look like it has a mind that simulates human mental abilities in its various patterns, "and

thus it makes that machine behave like a rational or distinctive human using artificial intelligence research.

Second: Types of artificial intelligence

There are many forms and divisions of artificial intelligence according to angle, but most jurists and researchers agree on three basic divisions:

1-Artificial Narrow Intelligence

In this type of artificial intelligence, it is designed to do specific work and functions without going beyond this. It is also called weak artificial intelligence because of its inability to do work independently, such as image recognition, self-driving cars

2.General Artificial Intelligence (AI)

This type is higher than the previous one because it thinks in a similar way to humans and solves problems that need thinking and intelligence, while researchers are still working on developing it to understand the way of human thinking more accurately to link it to computer systems

3- Super Artificial Intelligence (Super AI)

It is also called super artificial intelligence. This type is still a research concept under study, and seeks to simulate man. Here, two basic patterns can be distinguished. The first is trying to understand human thoughts and emotions that affect human behavior, and it has a limited ability to social interaction. The second is a model of the theory of mind, where these models can express their internal state, predict the feelings and attitudes of others and are able to interact with them, and are expected to be the next generation of super-intelligent machines.

The second axis: Contributions of artificial intelligence in commercial companies: Blockchain as a model

It is also known in the world of information technology that over the years a technology appears that holds answers and solutions to several problems and challenges, which marks the beginning of a new era characterized by modernity. Since 2016, that technology is the blockchain, the cornerstone of which was in

1999 by both Haber and Stornetta as a simple initial idea¹⁴⁹, to be adopted with the motivation imposed by the economic environment and the inevitable development to emerge from the narrow space that was represented in digital currencies, specifically Bitcoin, to become usable for all sectors of the supply chains of the health sector and the tax sector and others¹⁵⁰

This research paper focuses on the uses of artificial intelligence through blockchain technology in the economic institution. What are the motives for adopting it by economic institutions and what is its use?

First: Supply Chain Management

A supply chain is defined as a group of entities that are involved in designing new products and services, purchasing raw

¹⁴⁹ Kaspars, z., & Renàte, S. (2018), "Blockchain Use Cases and Their Feasibility", *Applied Computer Systems*, 23(1), 12. Récupéré sur https://www.researchgate.net/publication/325534791_Blockchain_Use_Cases_and_Their_Feasibility

¹⁵⁰ Taskinsoy, J. (2019). "Blockchain: A Misunderstood Digital Revolution. Things You Need to Know about Blockchain", *Electronic Journal*, 2. Récupéré sur https://www.researchgate.net/publication/336349583_Blockchain_A_Misunderstood_Digital_Revolution_Things_You_Need_to_Know_about_Blockchain

materials, converting them into semifinished and finished products, and delivering them to end customers. Therefore, it is an effective end-to-end management process from the first stage of product or service design to the time when it was sold, consumed, and finally disposed of by the consumer. This process includes product design, procurement, planning and forecasting, production, distribution, fulfillment, and after-sales support¹⁵¹.

According to the aforementioned, the supply chain is the link between the producer and the consumer, and to ensure the efficiency of the company and the satisfaction of the consumer's desires to the fullest, effective management is a must and blockchain technology answers to the latter as it ensures the identification of the source of the product and facilitates the traceability process, and the property verification feature through blocks (Shared Ledger) prevents counterfeiting, in addition to the fact that blockchain technology, when integrated with the supply chain, provides security for the chain by identifying any defect in the chain that may result in the destruction of products, and it also enhances confidence among partners in the supply chain, and an example of the above is Ever ledger platform that uses blockchain technology, which has become a global public ledger and one of its most prominent uses is the identification of ownership of luxury products such as diamonds and proof of the originality of the pieces¹⁵².

¹⁵¹ Lauren , X. L., & Jayashankar , M. (2015), "Supply Chain Management. International Encyclopedia of social and Behavioral Science", 23, 3. Récupéré sur https://www.researchgate.net/publication/304194361_Supply_Chain_Management

¹⁵² Ioannis , K., & Georgios , S. (2018), "Blockchain for Business Applications", *A Systematic Literature Review*, Springer International Publishing AG, part of Springer, 389., P389

Second: Marketing

Many researchers focus on the idea that the marketing department is very important in the performance of companies, which affects them directly and positively, so that marketing has a role that allows companies to create channels that connect customers with their products¹⁵³, which facilitates sales and profits. With the expansion of the Internet, marketers have been fortunate to reach consumers quickly through social media platforms, and here was the transition from traditional marketing to digital marketing. This transition has made digital institutions capable of overcoming the challenges posed by the market in the case of full competition, which opened the door for blockchain to be proactive in offering revolutionary solutions and more effective tools for digital marketing. Facebook, the largest social media platform, is developing its own blockchain for the galaxies of evolution.

Blockchain works on the principle of transparency as it is a publicly accessible ledger, which makes the decision-making process based on data-driven marketing more effective. This is because blockchain provides the feature of verifying and confirming the viewing of ads, which results in the viewing of ads by real people. It also gives marketers the ability to control how their assets are displayed and closely monitor where they are displayed so as to reduce advertising fraud resulting from robots and ensure real interactors interact with ads. Blockchain technology also creates Chain is the appropriate and interoperable environment that cannot be achieved with a central database.

¹⁵³ Jochen , W., & Sven , T. (2013). "The Role of Marketing in Today's Enterprises". *Journal of Service Management*, 25(2), 171-194, https://www.researchgate.net/publication/239261685_The_Role_of_Marketing_in_Todays_Enterprises

This technology becomes more suitable for all Loyalty Programs for business-to-business and business-to-consumer exchanges, as it needs to scrutinize data and some important transfers to curb fraud and support customers through the ability to access the blockchain platform in a real-time manner¹⁵⁴

Blockchain technology allows marketers to easily access and obtain information such as file, points, payment dates, purchase pattern, and their responses to promotions and discounts. All of the above allows For the in-house marketer to design offers and programs that suit loyal customers, for example, American Express has hired Hyperledger Blockchain, which grants reward points to customers based on their acquisition of products in an individual way anywhere, instead of evaluating their spending behavior at a specific merchant, and the decentralized nature of blockchain technology allows customers to track their files and know the amount of Reward Points earned and the ability to dispose of them, which gives comfort and freedom to both the customer and marketers from the physical holdings of discount vouchers. Raju, 2011) (Discount coupons).

Third: Internal corporate governance

Corporate governance is the microscope that reveals all the problems that affect the decision-making process (Decision-Making) at the level of the Board of Directors and senior management in order to ensure that all decisions taken are in the course of the objectives that serve the company and its shareholders, that is,

¹⁵⁴ Adigüzel, S. (2021). "The Impact Of Blockchain In Marketing", Socrates Journal of Interdisciplinary Social Studies, 10, 84. Récupéré sur https://www.researchgate.net/publication/353891880_The_Impact_Of_B

corporate governance covers all the rules and restrictions of decision-making in companies¹⁵⁵.

Corporate governance exists to answer the problem posed by the inherent problem of agency between both managers and partners, which arose after the separation of ownership from management, as it is represented in the conflict of interests between the two parties, where the party of managers works to exploit the second party represented in the owners for their personal interests because they are more aware of the work environment¹⁵⁶ and therefore corporate governance defines the relationship between both managers and partners, good corporate governance assumes that managers have sufficient incentives to work on behalf of shareholders, and that shareholders are clearly and correctly aware of decisions from managers, and therefore corporate governance allows to achieve a balance between the wishes of managers and shareholders¹⁵⁷.

Blockchain technology has been shown to be a powerful tool that serves owners Shareholders and helps them intervene, and this

¹⁵⁵ Mulbert, P. (2009, August 23), "Corporate governance of banks after the financial crisis: Theory, evidence, reforms", *ECGI Law Working Paper*(130), 12. Récupéré sur https://www.researchgate.net/publication/228156660_Corporate_Governance

¹⁵⁶ boshkoska, M. (2015), "The agency problem: Measures for its overcoming", *International Journal of Business and Management*, 204. Récupéré sur https://www.academia.edu/26401953/The_Agency_Problem_Measures_for_Its_Overcoming

¹⁵⁷ Wells, H. (2010), "The birth of corporate governance", *Seattle University Law Review*, 33(4), pp. 1247- 1292. Temple University Legal Studies Research Paper(12), 1247-1292.

is the most desirable aspect of corporate governance as it serves its main purpose, allowing blockchain technology¹⁵⁸ :

–Greater transparency in terms of ownership and transfer of ownership on the one hand, and all users can see the trades and transfers by managers, activists and others, with regard to the processes of legal internal trading and the violations that occur in it, such as backdating, disguised derivatives hedging, and similar illegal and desirable actions that are impossible to occur in the blockchain network.

–Effective and fair meetings for owners, due to the availability of an easy and effective digital voting system, which results in the referral of vote manipulation as it takes place on the blockchain network.

–Real-time accounting: The technology that characterizes blockchain technology, known as distributed ledger technology (DLT), is a big and revolutionary step. After the introduction of double-entry ledgers, blockchain technology greatly reduces traditional auditing and leaves the role to smart contracts, which results in a reduction in costs.

Poor governance may be the biggest factor in the failure of companies and the occurrence of crises and arise because of the divergence between the parties to the task in the company, such as owners and managers, as well as the complexity of the network of intermediaries between them, and since the most important goal of

¹⁵⁸ Akgiray, V. (2019), “The Potential for Blockchain Technology in Corporate Governance”, *Oecd Corporate Governance Working Papers*, 21. Récupéré sur https://www.academia.edu/es/63445025/The_Potential_for_Blockchain_Technology_in_Corporate_Governance

blockchain technology is to eliminate intermediaries, it works to provide a great opportunity to improve corporate governance¹⁵⁹.

Characteristics of Block-chain	Objective of Govern-ance Corporate
Shared distributed Ledger	Transparency
Irreversibility of Rec-ords	Accountability
Peer-to-peer commu-nication	Responsibility
Smart Contracts	Fairness

Source: Vedat Akgiray, The Potential for Blockchain Technology in Corporate Governance, OECD Corporate Governance Working Papers, 2019. P21 **Fourth.**

Business model

The business model has recently gained the attention of many researchers because it is an important factor in creating value so that it represents the description and engineering that creates,

¹⁵⁹ Akgiray, V. (2019), “The Potential for Blockchain Technology in Corporate Governance, Oecd Corporate Governance Working Papers, 21.

receives and captures value¹⁶⁰, The business model is a new concept in management studies. The term "business model" first appeared in 1957, but until the twentieth century, it began to gain sufficient fame among researchers. The business model can be considered as the story that explains how the institution works, or how the institution does its work. In addition to the multiplicity of definitions of the business model and its close link to value creation, it was found that there is a strong link between the business model and technology, and the way in which systems have established technology (IT) allows it to support the business model, which makes the business model a middle layer between the organization's strategy, management processes and its information technology system. Whatever the development of the information technology system cannot stand alone and ensure the success of the organization, and this relationship between the information technology system (IT) and the business model (BM) is essential and necessary to understand, the business model (BM) guarantees the company a competitive advantage and mediates between modern technologies Creating economic value, as well as the performance of companies, it is necessary to capture value from innovations and ensure its commercial success¹⁶¹.

The organization must understand and know how modern technology affects its business model, led by blockchain being the leader in recent times. According to Osterwalder and Pigneur, the business model consists of 9 blocks, which represent the four most

¹⁶⁰ Weking, J. (2019). "The impact of blockchain technology on business models –a taxonomy and archetypal patterns", *The International Journal on Networked Business*, 30

¹⁶¹ Holotiuk, F. (2017), "The Impact of Blockchain Technology on Business Models in the Payments Industry", *Proceedings of 13th International Conference on Wirtschaftsinformatik (WI 2017)*. Frankfurt: Frankfurt School of Finance & Management, ProcessLab

important axes of work in the organization, namely consumer, supply, infrastructure, and financial liquidity. As for 9 elements, they are the customer sector, value proposition, channels, customer relations, revenue sources, key resources, key activities, and key partnerships. The cost structure, when these elements are combined and properly aligned, creates value for the institution¹⁶².

Blockchain affects each element to be more effective than before, so that the customer segment is the customers that the institution is trying to reach. Blockchain technology allows the accurate identification of customers in the market, and individuals interested in buying and consuming the institution's services, in addition to addressing new customers in markets that have not been addressed before. The value proposition element also includes all the activities of the institution that create value for the customer. The customer buys a product with the intention of meeting His needs, and the value derived (Retained value) from the customer increases in this case as his degree of saturation increases.

Blockchain technology can affect the value derived from the customer by providing products or services that did not exist previously or require a long time and high costs. For example, in South Africa, Cent bee provides the ability to send Bitcoin to the List Contact across borders using the phone application in a simple, faster and inexpensive way and without the need for the Currency Exchange Service. For channels, it is the ability of the institution to communicate and reach the customer sector. Custom-

¹⁶² Alexander Osterwalder, Y. P. (2010), "Business model generation", John Wiley & Sons, Hoboken, New Jersey. doi:<https://www.semanticscholar.org/paper/Business-ModelGeneration%3A-A-handbook-for-game-and-Osterwalder-Pigneur/f9af326fc7bb8b25b62ad5e7e6dfc92079f333edc>

er Segment) to provide value propositions. These channels may be represented in the sales force, its website, shops, etc. Blockchain technology affects the channels by canceling the third party and facilitating and simplifying operations within the channels, such as the ability of smart contracts to make the process of selling and transferring real estate property faster and canceling the personal approval of the authentication bodies because they work automatically¹⁶³ As for customer relationships, they describe the types of relationships that the company establishes with a specific sector of customers. These relationships may be motivated by acquisition the integration of blockchain technology aims to enhance trust and transparency through (Distributed Ledger Technology), followed by revenue sources (Revenue Streams), the fifth element of the organization's business model, which represents the cash generated by the company from the customer sector. There are two types of revenue sources, revenue from one-time payments and recurring revenue resulting from continuous payments in order to provide a value proposition to the customer or provide after-sales services. \$10.6 billion was estimated as revenue generated through blockchain projects from the sale of programs and the provision of services only, and blockchain technology allows to achieve revenues by reducing the costs of transfers (Transaction Costs) and activities that occur in the network ¹⁶⁴The sixth and seventh component of the business model, which is represented in resources and basic activities (Key Resources and Activities) Resources are on the one hand the most important element required to ensure the success of

¹⁶³ Vida J, M. (2019), "How Blockchain Technologies Impact your Business Model", *Business Horizons*, 5. Récupéré sur <https://www.sciencedirect.com/science/article/abs/pii/S000768131930009>

¹⁶⁴ *Ibid.*

the business model, they create value propositions for customers, maintain relationships and collect revenues, and may be either in-kind, financial, intellectual or human. As for the main activities, they contain all the activities required to provide value, that is, how the institution converts resources into ways to create value¹⁶⁵, and the characteristics of blockchain technology that allow increasing the flexibility of resources to allow the institution to move from traditional ownership of resources to the ability to access resources only when they are required. They also allow the automation of many services to allow the human factor to focus its focus and energies on other parties, such as documentation, examination, and auditing and key partnerships (Key Partnerships). The network that brings together suppliers and partners makes the business model work, and these partnerships may take many forms, including strategic alliances, joint ventures, and reliable supplies. Blockchain technology may have the merit of canceling traditional intermediaries and transforming financial institutions. The use of blockchain attracts new partners such as technology institutions that help develop applications and programs for windows (APIs). The latter block is the cost structure, which describes all the costs that appear when operating the business model, and the integration of blockchain technology with the latter reduces the number of Remittance costs, negotiation and research costs and the elimination of intermediary costs, as it is expected that blockchain technology may save from 10 to 20 billion dollars in the financial sector by the end of 2022, these savings are the result of reducing the costs resulting from maintenance operations of the information technology (IT) infrastructure, as well as eliminating manual operations that did not bring value to the institution .

¹⁶⁵ Alexander Osterwalder, *Op. cit*,

Fifth: The accounting audit process

There is no doubt that any company is obliged to appoint a governor and a representative of the accounts in order to audit and audit the financial information and statements presented to the Board of Directors and the use of artificial intelligence in this field allows to carry out the audit process in a short time and lower costs by creating accounts through websites that allow companies to evaluate their financial information electronically in addition to allowing the state represented in its bodies such as the Tax Authority to periodically review the company's files whenever the need arises. The systems supported by artificial intelligence also allowed the portfolios to establish an electronic portal that helps them in auditing and auditing quickly and fairly with a commitment to international standards, all of which supports and helps to implement the rules of transparency.

Sixth: Increasing the operational effectiveness of companies

Since the 1970s, companies have been investing large amounts of money in information technology, automating manual and repetitive tasks. AI advances now lead to the automation of professional tasks, from auditing to legal work to medical diagnosis Technology also reduces transaction costs between and within companies Companies often deal with each other without any human intervention, and increased transparency of course makes it easier to resolve disputes and problems.

Seventh: Companies are becoming less vertically integrated and more horizontally specialized

This is a long-term trend. Think of the postindustrial war period, when many companies controlled the entire value chain (Ford Motor Company had its own rubber plants for its tires, and IBM

developed its own processors). Gradually, it became clear that this level of vertical integration was inefficient and lacking in flexibility, and companies increasingly focused on a narrower set of activities for which “core competencies” were the norm. As the 1990s and 2000s entered, this trend toward horizontal specialization continued to grow and the norm among enterprises in the digital age became the pursuit of narrow expertise in a single, but global, area of work. Google and Facebook represent this trend, as do organizations like Uber, WeWork, and Palantir.

Conclusion

Through this modest study, we have found that blockchain technology answers many questions and hypotheses that have asked the ink of many thinkers, perhaps the most important of which is the problem of agency, which stems from the problem of asymmetry of information between managers and owners, which governance has always strived to devote the principle of transparency to alleviating this conflict, and finding a balance that achieves satisfaction for both parties. The transparency advantage given by blockchain technology through Distributed Ledger Technology may be sufficient for this.

Blockchain technology also extends to other aspects that the institution is interested in, such as minimizing costs by canceling many costly and unprofitable traditional operations, creating value, enhancing the relationship between the company and customers, effective management of the supply chain and others, but despite the effectiveness of this new technology, it has a number of challenges that may hinder its activity, so excessive transparency may result in many problems that are related to customers and the nature of the work, as is the case in banks and financial institutions.

Among the most important recommendations proposed are:

- The need to accelerate the development of a legal framework for smart contracts, which balances the economic and programmatic thought of smart contracts with the ethical dimension of contract law.

- Holding scientific conferences and seminars by specialists for the benefit of students, researchers and university professors interested in this field to clarify the technical, legal and economic aspects of blockchain technology.

- The Algerian legislator should encourage the work of the blockchain network, especially for financial and economic institutions and entities.

- The government should support projects based on blockchain technology and smart contracts, to benefit from them during the digital transformation process.

- Unlike some Arab countries, the position of the Algerian legislator is unsuccessful with regard to the adoption of this technology, so that through Law 17-11, which includes the Finance Law of 2018, it did not deal in virtual currencies, which are among the uses of artificial intelligence.

PERSPECTIVES OF THE CONCEPT OF "SMART CITY" AND "SMART VILLAGE" IN AZERBAIJAN.

Dr. Nuruzade Shahla.

Baku Slavic University, Azerbaijan.

Abstract

The article examines the perspectives of the concept of "Smart City" and "Smart Village" in Azerbaijan. First of all, it is shown that this concept is the result of the globalization process. Globalization affects the development of almost all areas of social life. "Smart City" and "Smart Village" projects are new for Azerbaijan. The article shows the necessity and main directions of applying the concept to overcome the consequences of urbanization and other processes taking place in Azerbaijan.

Key words: *Azerbaijan, globalization, "Smart City", "Smart Village", security.*

Globalization affects almost all spheres of social life in modern society. Although the phenomenon of globalization and its consequences are one of the most discussed problems of the modern era, its main factors and its impact on social processes are still not clearly understood. In modern times, the process of globalization is not welcomed equally by people. In the world, science and technology are developing rapidly, parallel to this, people's outlook on life is also changing. The concepts of "smart city" and "smart village" arose as a result of globalization. The idea of creating a "smart city" is becoming increasingly popular on the global stage. At the same time, there is no clear and unambiguous idea of what this concept means, what are the main features of "smart city" and "smart village", what conditions, opportunities and potential are necessary for its implementation. Therefore, this concept is currently one of the most discussed problems. At the same time, it is impossible to lag behind the technological development taking place in the world.

United Nations Economic Commission for Europe (UNECE) and International Telecommunication Union (ITU) developed jointly a definition of smart sustainable cities, through a multi-stakeholder approach which involved over 300 international experts: "A smart sustainable city is an innovative city that uses Information and Communications Technology (ICT) and other means to improve quality of life, efficiency of urban operation and services, and competitiveness, while ensuring that it meets the needs of present and future generations with respect to economic, social, environmental as well as cultural aspects" [Smart Sustaina-

ble Cities]. Under this proposed definition, a city is considered a "complex" system¹⁶⁶.

During the last ten years, many cities of the world have managed to take a "smart city" concept has been successfully applied in cities such as Barcelona, Singapore, Santander, Chicago, San Diego, and San Francisco. In 2017, Sweden's Stockholm City Council approved a road map aiming to make the capital the world's "smartest city" by 2040.

The "Smart City" concept is already being applied in the construction of Baku, the capital of Azerbaijan, and the Karabakh region. This concept is new for Azerbaijan and is currently one of the problems widely discussed in the Azerbaijani community. Innovations are not always welcomed by society. People often fear that innovation will take them away from their traditional way of life. However, the rapid development of science and technology requires the improvement of people's living conditions, the economy, the facilitation of human labor and the provision of safety.

Located at the crossroads of Europe and Asia, the Azerbaijani society, which has a unique culture, has always accepted innovations. Therefore, the establishment of "smart cities" and "smart villages" in Azerbaijan is mostly welcomed by the population.

According to UN more than half of the world's people live in cities. By 2050, it will be nearly seven in ten. Cities account for more than 70% of global carbon emissions and 60-80% of energy consumption. Rapid urbanization has created additional

¹⁶⁶ Smart Sustainable Cities. <https://unece.org/housing/smart-sustainable-cities#:~:text=Definition%20of%20smart%20sustainable%20cities,involved%20over%20300%20international%20experts>

challenges, such as social inequality, traffic congestion, and water contamination and associated health issues. Governments and municipalities can use ICT, in combination with renewable energy and other technologies, to build smarter and more sustainable cities for their citizens. A smart sustainable city is innovative. It uses ICTs to improve people's quality of life, make urban operations and services more efficient, and boost its competitiveness, while ensuring that it meets the economic, social, environmental, and cultural needs of present and future generations” [Smart sustainable cities].

What is the situation in Azerbaijan? The process of urbanization that took place in the country since the beginning of the 20th century is still ongoing. Industry, economy, education and etc. among the republics within the USSR and general infrastructure was created in the fields. The fall of the USSR and the independence of Azerbaijan required the reconstruction of its infrastructure in all areas. The population flow from the regions to the cities, which started in the middle of the 20th century, accelerated even more in the 90s of the 20th century. Although there are higher education institutions in the regions, young people mainly came to Baku to study. This led to a rapid increase in the city's population. At the same time, the occupation of 20% of Azerbaijani lands for 30 years resulted in the settlement of the population engaged in agriculture and animal husbandry in the country's large cities, mainly in the capital Baku. It is known that the development of agriculture in the country affects the social security of the population.

The reconstruction of the destroyed regions during the foreign occupation requires a substantial development of the urban and rural development project. Along with the Green energy zone, the most modern technologies are applied in agriculture in the

Karabakh region of Azerbaijan. Taking into consideration that those areas have fertile lands and there are great opportunities for both crop and animal husbandry, there are very large grazing areas (land for grazing animals), the development of agriculture based on the most modern technologies must be ensured there. In order to develop productivity in Azerbaijan, it is important to use "smart technology" in these lands and create "smart villages" in general, and the country's population is interested in the success of this concept.

During the participation in the Davos World Economic Forum, the President of Azerbaijan stated that he had meetings with dozens of companies and most of them are technological companies. Therefore, the concept of "smart city", "smart village" should be developed and applied" [Prezident İlham Əliyev: Ölkəmizdə "ağıllı şəhər", "ağıllı kənd" konsepsiyası işlənməli və tətbiq edilməlidir]¹⁶⁷.

The creation of "Smart Villages" can prevent people from flocking to the city in pursuit of an easier lifestyle, as well as to acquire a profession, acquire skills, and find employment. However, at the same time, the land plots of the peasants and the uniqueness of the rural way of life should be preserved. In particular, it is important to ease the labor activity of the rural population living in mountainous regions, to ensure communication and their safety.

For this purpose, the President of the Republic of Azerbaijan, İlham Aliyev, issued an order to use the "smart city" and "smart village" experience of many countries in this field. On

¹⁶⁷ Prezident İlham Əliyev: Ölkəmizdə "ağıllı şəhər", "ağıllı kənd" konsepsiyası işlənməli və tətbiq edilməlidir.
<https://azerbaijan.az/news/6397>

April 19, 2021, the Decree of the President of the Republic of Azerbaijan on the development of the concept of "Smart City" (Smart City) and "Smart Village" (Smart Village)¹⁶⁸ states: "Modern telecommunications, sensors, "Big Data" and other digital data and the use of artificial intelligence technologies, as well as innovation and knowledge, make socio-economic relations more productive and efficient, and create new income opportunities in the overall value chain of the economy. With the use of the mentioned technologies in an integrated form, the formation, collection, storage, processing of digital data and the improvement of the quality of decision-making and management based on analytical analysis open wide opportunities for providing efficient and quality services. These opportunities create the basis for the transition to functional, large-scale "Smart City" and "Smart Village" services at the next stage of development of services provided in cities and villages" [Ilham Aliyev, President of the Republic of Azerbaijan. Baku city, April 19, 2021]¹⁶⁹.

Based on Article 109, Clause 32 of the Constitution of the Republic of Azerbaijan, a working group was established in connection with the development of the concept of "Smart City" and "Smart Village" of the Republic of Azerbaijan. The working group is headed by the Minister of Transport, Communications and High Technologies of the Republic of Azerbaijan. Ministry of Economy of the Republic of Azerbaijan, Ministry of Agriculture, Ministry of Ecology and Natural Resources, Ministry of Energy,

¹⁶⁸ Decree of the President of the Republic of Azerbaijan on the development of the concept of "Smart City" and "Smart Village". <https://president.az/az/articles/view/51179>

¹⁶⁹ Ilham Aliyev, President of the Republic of Azerbaijan. Baku city, April 19, 2021. <https://president.az/az/articles/view/51179>

State Agency for Service to Citizens and Social Innovations under the President of the Republic of Azerbaijan, State Urban Planning and Architecture Committee, "Azerishiq" Open Joint Stock Company. "Azersu" Open Joint Stock Company participation in this project is also planned [Decree of the President of the Republic of Azerbaijan on the development of the concept of "Smart City" and "Smart Village"].

President İlham Aliyev has repeatedly touched on this issue in his statements: "Smart Village" - "State Rural Development Project" provides rural population and infrastructure with new technological solutions. The "Smart Village" project in Azerbaijan combines many important elements. Among them are e-learning and training centers in schools, online learning platform, e-medical services, use of alternative and renewable energy, smart irrigation systems, electronic and SMS notification. In addition, in order to build a smart business and economy, the project provides convenient market access platforms, digital access to domestic and foreign markets for suppliers, manufacturers, online banking services and other services. The project envisages electronic agriculture, electronic services, "one window" system, GIS-based real-time control and intelligent local management in the direction of "Smart State Administration" [Prezident İlham Əliyev Kənd təsərrüfatı Nazirliyinin yenidən qurulan Qax damazlıq İpəkçilik stansiyasının açılışında iştirak edib]¹⁷⁰.

¹⁷⁰ Prezident İlham Əliyev Kənd təsərrüfatı Nazirliyinin yenidən qurulan Qax damazlıq İpəkçilik stansiyasının açılışında iştirak edib/
<https://www.agro.gov.az/az/news/prezident-ilham-lyev-knd-tsrrfati-nazrlynn-yendn-qurulan-qax-damazliq-pklk-stansiyasinin-ailiinda-trak-edb>

Thus, the "Smart Village" pilot project in Azerbaijan will be implemented mainly on 5 components. They are residential, manufacturing, social services, "smart agriculture" and alternative energy sectors. In the area, it is planned to build 200 individual houses, using fully insulated and innovative construction materials. Indoor engineering communication and heating systems will also be built on the basis of smart technologies. Modern schools, kindergartens, hospitals and electronic management centers will be built in these villages, tourism infrastructure will be formed as well. All residences, social facilities, administrative and public catering buildings, processing and production of agricultural products will be provided with alternative energy sources. Experts from Turkish, Chinese, Italian and Israeli companies will also take part in the implementation of the project.

The implementation of "Smart Village" projects and the "Smart Agriculture" concept can stimulate the development of tourism in these regions in the near future. The tourism sector has been identified as one of the priority areas of economic policy in terms of accelerating economic growth in the post-pandemic period.

One of the main goals of creating such villages in the world is to prevent urbanization. These living conditions are created for people in rural areas so that all the necessary services provided in cities are also provided in villages. The second important point is that the "Smart Village" concept allows people to earn more than in the city.

The Smart City project was launched in Baku by Huawei company and the Ministry of Transport, Communications and High Technologies of Azerbaijan. Thus, the "Public Wi-Fi" project, already launched in the Baku, served as the beginning for the implementation of the "Smart City". The role pursued by

Huawei is to help the Ministry of Communications of the republic in the development of the project.

“In subsequent stages, components such as “Smart Transport”, “Smart Port”, “Smart Trade”, etc. will be implemented, for each, there are specific solutions that will be implemented step by step” [Huawei поможет Азербайджану превратить столицу в «умный город»]¹⁷¹.

Therefore, in order to increase the quality, safety, and efficiency of the services provided in the cities and villages, it is important to ensure the effective use and management of the applied information technologies and available resources. For this, it is important to have scientific personnel who will implement this concept in the country. At the same time, it is purposeful to use the experiences of other countries in the field of "smart city" and "smart village" projects. Based on the experiences of other countries, we can identify success and shortcomings in this area and develop mechanisms for implementing more effective policies.

In order to create "smart cities" and "smart villages", first of all, a stable, secure, reliable and interoperable telecommunication infrastructure should be needed. At the same time, measures should be taken to protect these systems from cyber attacks.

¹⁷¹ Huawei поможет Азербайджану превратить столицу в «умный город». [https://digital.report/huawei-pomozhet-azerba ydzhanu-prevratit-stolitsu-v-umnyiy-gorod/](https://digital.report/huawei-pomozhet-azerba- ydzhanu-prevratit-stolitsu-v-umnyiy-gorod/)

LA DURABILITÉ DE LA ROME ANTIQUE AUX VILLES INTELLIGENTES

María Elisabet Barreiro Morales

Pr. University of Vigo, Spain

Résumé : La protection de l'environnement a toujours été très présente, depuis la Rome antique, mais pas avec l'importance qu'elle a aujourd'hui. Dans l'Antiquité, la réglementation visant à protéger la nature était indirecte et subsidiaire, mais aujourd'hui, des lois ont déjà été promulguées dont le but direct est de protéger l'environnement naturel, ainsi que de parvenir à une activité humaine de plus en plus durable dans tous les sens du terme.

Mots-clés : durabilité, environnement, protection, régulation.

Introduction

Ce travail commence par l'analyse du concept et des caractéristiques de la protection de l'environnement depuis le système juridique romain jusqu'à l'apparition et le développement, actuellement, de la nouvelle conception de la ville avec les Smart Cities. Actuellement, un nouveau modèle de ville est en train d'être conçu, dans lequel la durabilité constitue la base et pour lequel les nouvelles technologies constituent un élément fondamental. Au début, l'environnement importait peu, car on pensait que ses ressources étaient inépuisables et même qu'il était sous la protection des divinités. Au fil du temps, les conséquences de cette activité humaine illimitée ont commencé à contribuer à l'émergence d'une nouvelle conscience et d'un nouveau souci de la nature. Cela a donné naissance à un nouveau concept, celui de durabilité, c'est-à-dire que l'objectif était d'utiliser ces ressources sans nuire à l'environnement. Au fil du temps, il est non seulement prévu que cette utilisation reste durable mais, avec le développement des nouvelles technologies, il est prévu que les établissements humains soient durables, où les citoyens participent à la gestion des ressources et où ils peuvent prendre des décisions dont la priorité principale est le bien commun.

La protection de l'environnement dans le système juridique romain

Depuis l'Antiquité, on se préoccupe de la santé et de l'habitat des villes, et de tout ce qui touche à l'eau : le drainage, la circulation, l'assistance et les services publics, c'est-à-dire tout ce qui est lié au fonctionnement d'une communauté organisée.

C'est un sujet qui a un grand impact sur la société actuelle et qui était déjà présent dans la Rome antique, mais pas de la même manière. Il existait déjà une sensibilité à l'égard de l'environnement, que l'on ne retrouvait que dans les milieux les plus scientifiques et cultivés de l'époque¹⁷².

En droit romain, il n'existait pas de protection directe de l'environnement, mais une protection indirecte, au travers d'une réglementation spécifique. Cette réglementation a été appliquée dans différents domaines, tels que la gestion des déchets, la déforestation, l'eau ou encore les mines.

La plupart des Romains n'étaient pas conscients de l'importance de préserver la nature, même si celle-ci était utilisée comme instrument de guerre. Cependant, le manque de soin et l'abus des ressources naturelles dont il disposait ont fait tomber l'Empire romain dans une situation de chaos et de manque de contrôle, en ne produisant pas certains produits, avec la même quantité et la même rapidité, avec lesquels il était produit l'a fait dans ses étapes les plus glorieuses.

Les Romains n'avaient pas non plus la protection de l'environnement comme priorité dans leur système juridique, on peut donc dire que la réglementation, sur cette question, a toujours

¹⁷² Solidoro Maruottili, Laura, *La tutela dell'ambiente nella sua evoluzione storica, L'esperienza del mondo antico*, Torino, 2009, p. 41 y ss.

été indirecte¹⁷³. Bien qu'ils n'aient pas eu de préoccupation directe, les habitants de la ville de Rome ont montré une préoccupation ou une attention particulière à la gestion et à la garantie de l'hygiène citoyenne, axée notamment sur la pollution des eaux et des forêts.

Le droit romain réglementait, de manière indirecte, la nécessité de préserver la *naturitas*. On peut donc parler d'une réglementation très large qui aborde différentes questions telles que la flore et les forêts ; l'eau et sa pollution, ainsi que les mines et carrières¹⁷⁴.

À l'époque la plus archaïque, on croyait que les dieux étaient ceux qui préservaient et prenaient soin de la nature, c'est-à-dire ceux qui garantissaient sa conservation et son bien-être, donc on ne s'inquiétait pas de l'épuisement de la flore ou de certaines espèces animales. Par la suite, face à la poursuite de l'exploitation incontrôlée de la nature, il a fallu fixer certaines limites à cette activité. Le système juridique romain s'en est occupé. Cette limitation n'a pas été faite dans une perspective durable ou environnementale telle que nous la connaissons aujourd'hui, puisqu'à cette époque il n'y avait pas de préoccupation pour l'environnement comme nous le pouvons aujourd'hui. Ce que le système juridique romain a fait,

¹⁷³ FARGNOLI, Iole, «Ruina Naturae e Diritto Romano», *Teoria e storia del diritto privato*, N 8, 2015, p. 4: «Per diversi aspetti, esistesse nel mondo romano una protezione dell'ambiente, attenta specialmente dell'inquinamento delle acque e dei boschi, e parla al riguardo addirittura di un nucleo sistematico di risposte che era già stato elaborato dai giuristi romani. A smentita di ciò è stato ritenuto che i Romani, da una parte, conoscevano l'inquinamento, ma sicuramente, dall'altra, non avevano raggiunto la consapevolezza odierna della scarsità delle risorse ambientali, né avevano una coscienza ecologica sensibile alla salute ambientale e alla natura come valore in sé considerato».

¹⁷⁴ Bravo Bosch, María José, «La protección del medio ambiente en la antigua Roma», *Index : quaderni camerti di studi romanistici, international survey of roman law*, N 42, 2014, p. 490-514.

c'est réglementer un usage raisonnable de la *naturitas* et, indirectement, a favorisé la naissance de l'exploitation, avec certaines limites, de la nature par les êtres humains.

Depuis la Grèce antique, elle a joué un rôle important en matière de protection de l'environnement. Cela s'est reflété dans diverses sources provenant de divers domaines scientifiques consacrés à l'étude de l'écologie. En fait, ce même terme désigne l'étude de l'habitat dans son interaction avec les êtres vivants qui s'y installent¹⁷⁵. On peut également citer les premières études réalisées sur l'environnement, parmi lesquelles on peut citer le *Corpus Hippocratum*, entre les années 450 et 350 avant JC, ainsi que le *Critias* de Platon¹⁷⁶. On peut également retrouver quelques impératifs destinés à la protection des ressources naturelles dans la réglementation des XII Tables, spécifiquement, destinée à la protection de la pureté de l'air ou du sol dans les villes, en interdisant l'inhumation ou la crémation d'un cadavre en milieu urbain¹⁷⁷.

¹⁷⁵ Solidoro Maruotiti, Laura. , *La tutela dell'ambiente nella sua evoluzione storica, L'esperienza del mondo antico*, Torino, 2009, p. 22: «L'attenzione per la salubrità dell'ambiente e per la tutela del decoro urbano risulta già ben presente nella antica Grecia, innanzitutto nell'ambito della sfera religiosa; poi, nel VI sec. a.C., in alcune legge di Solone sull'uso delle risorse idriche, sulle distanze tra gli edifici e sull'igiene urbana; e quindi, più diffusamente, nel pensiero dei filosofi (Ippocrate, Platone, Aristotele, ma specialmente Teofrasto)».

¹⁷⁶ Harris, Barbara L. «*Corpus Hippocraticum*: One of Western Civilization's Earliest Technical Documents», *Technical Communication* 38, no. 4 (1991): 598–99; PIZARRO HERRMANN, Álvaro, «*Corpus Hippocraticum*», *La Melancolía En La Antigüedad: El Problema XXX En Aristóteles*, 1st ed., 35–60. Ediciones UC, 2017; GILL, Christopher, «Plato and Politics: The Critias and the Politicus», *Phronesis* 24, no. 2 (1979): 148–67; LAPLACE, Marcelle, «Le 'Critias' de Platon, Ou l'ellipse d'une Épopée», *Hermes* 112, no. 3 (1984): 377–82.

¹⁷⁷ Tab. 10.1: *Hominem mortuum in urbe ne sepelito neve urito*. Vid. Cic. *De leg*, 2.23.58; 2.24.61, quien alega que es debido a un peligro de in-

Comme nous l'avons dit précédemment, le système juridique romain réglementait, de manière indirecte, certains aspects liés à la préservation de l'environnement. Ainsi, on peut trouver quelques dispositions sur la déforestation, l'eau, les mines ou la gestion des déchets, par exemple.

Dans le domaine de la déforestation, même s'il y a eu peu de réglementation, on peut trouver quelques exemples d'une grande importance. On peut situer ses précédents à l'époque grecque, puisqu'ils avaient déclaré seulement l'olivier comme arbre protégé, ce qui laissait le reste des espèces d'arbres en dehors de cette protection. L'importance de cet arbre était telle qu'il n'était pas seulement considéré comme un arbre protégé, espèce sacrée, mais était également utilisée pour la production de carburant, élément fondamental de l'économie de l'époque. On peut citer, à titre d'exemple, un discours de Démosthène, dans lequel il évoque l'interdiction d'abattre plus de dix oliviers par an, à moins qu'il ne s'agisse d'arbres destinés à des sanctuaires. Les peines étaient très lourdes et c'était une autre source de revenus pour les caisses publiques¹⁷⁸. Dans le même sens, Gaius nous indique la distance nécessaire à laquelle un olivier peut être planté, qui devait être plus

cendio; Cass. Dio 48.43 ; Serv. Aen. 5.64, 6. 162, 11. 206, afirma que el senado prohibió los enterramientos en el recinto de la ciudad, es decir, el *pomerium*, en el año 260 a.C. El emperador Adriano también se manifestó al respecto y condena a aquellas personas que realicen un entierro dentro de los límites de la ciudad, vid. D. 47. 12. 3. 5: «**Divus Hadrianus rescripto poenam statuit quadraginta aureorum in eos qui in civitate sepeliunt, quam fisco inferri iussit, et in magistratus eadem qui passi sunt, et locum publicari iussit et corpus transferri. Quid tamen, si lex municipalis permittat in civitate sepeliri? Post rescripta principalia an ab hoc discessum sit, videbimus, quia generalia sunt rescripta et oportet imperialia statuta suam vim optinere et in omni loco valere**».

¹⁷⁸ Dem. or. Contr. Mac. 43.71.

grande que pour le reste des espèces. Cela indique l'importance que l'olivier avait par rapport au reste des espèces d'arbres.¹⁷⁹

Il faut mentionner un des écrivains, considéré par certains comme l'un des premiers écologistes à avoir exprimé dans son œuvre un grand souci de la nature, est Pline l'Ancien et, plus précisément, son œuvre *Naturalis Historia*¹⁸⁰. Il y affirme qu'il y avait une relation étroite entre les inondations et la déforestation, puisque l'existence d'arbres et de végétation était nécessaire pour retenir l'eau et ainsi éviter des catastrophes naturelles majeures provoquées par des inondations et des glissements de terrain. Un équilibre entre la flore et la faune était nécessaire et, si cet équilibre n'était pas respecté, cela entraînerait l'apparition de catastrophes naturelles majeures. L'importance de la flore et l'équilibre

¹⁷⁹ D. 10.1.13: «*Sciendum est in actione finium regundorum illud observandum esse, quod ad exemplum quodammodo eius legis scriptum est, quam athenis solonem dicitur tulisse: nam illic ita est: ean tis ahimasian par' allotriw xwriw orugy, ^ orutty^ ton horon my parabainein: ean teixion, poda apoleipein: ean de oikyma, duo podas. ean de tafon y bovron orutty, hoson to bavos y, tosouton apoleipein: ean de frear, orguian. elaian de kai sukyn ennea podas apo tou allotriou futeuein ta de alla dendra pente podas [id est: Si quis maceriem iuxta praedium alienum aedidicet, finem ne excedito: si murum, pedes intervallum esto: si aedes, pedum duorum. Si sepulchrum [immo fossam] vel scrobem fodiat, quanta altitudo est, tantum intervallum esto: si puteum, ulnae. Oleam autem et ficum novem pedes ab alieno serito, reliquas arbores quinque pedes.]*».

¹⁸⁰ Pline, *Naturalis Historia*, 31.19: «*Nascuntur fontes decisis plerumque silvis, quos arborum alimenta consumebant, sicut in haemo obsidente gallos cassandro, cum valli gratia silvas cecidissent. plerumque vero damnosi torrentes contrivantur detracta collibus silva continere nimbos ac digerere consueta. et coli moverique terram callumque summae cutis solvi aquarum interest. proditur certe in creta expugnato oppido, quod vocabatur arcadia, cessasse fontes amnesque, qui in eo situ multi erant, rursus condito post sex annos emersisse, ut quaeque coepissent partes coli*».

entre celle-ci et la faune, dans l'écosystème, a également été reflétée par Cicéron¹⁸¹, en déclarant qu'Anco Marcio avait désigné comme *res publicae* les forêts proches de la côte qu'il avait conquises, afin que l'écosystème ne soit pas autant affecté par l'activité humaine.

À l'époque romaine, l'utilisation du bois pour construire des navires, réaliser des travaux publics ou chauffer des bains publics était à l'origine d'une grande déforestation sur tout le territoire, il a donc fallu commencer à prendre des mesures pour contrôler cette activité. A tout cela, l'utilisation d'engrais dans les cultures a contribué à obtenir une plus grande production agricole et avec de meilleurs résultats, mais ce qui, au contraire, a gravement endommagé les terres cultivées.¹⁸².

¹⁸¹ Cic. *de rep.* 2.33: «(Laelius?) '*<neque> enim serpit sed volat in optimum statum instituto tuo sermone res publica.*' (Scipio) '*post eum Numae Pompili nepos ex filia rex a populo est Ancus Marcius constitutus, itemque de imperio suo legem curiatam tulit. qui cum Latinos bello devicisset, adscivit eos in civitatem, atque idem Aventinum et Caelium montem adiunxit urbi, quosque agros ceperat divisit, et silvas maritimas omnis publicavit quas ceperat, et ad ostium Tiberis urbem condidit colonisque firmavit. atque ita cum tres et viginti regnavisset annos, est mortuus.*' tum Laelius: '*laudandus etiam iste rex; sed obscura est historia Romana, siquidem istius regis matrem habemus, ignoramus patrem.*' (Scipio) '*ita est*' inquit; '*sed temporum illorum tantum fere regum inlustrata sunt nomina*».

¹⁸² Frank, Tenney, *An economic History of Rome*, New York, 2005, p.57 y ss: «The labor of fertilizing the field could of course not be neglected. So important was this item that the keeping of cattle was largely justified on the score of the manure; one head provided for half an acre of ground. [...] But there, were natural limits to such intensive cultivation: the canals, for instance, needed constant cleaning and repairs—which they did not always get—and the water which stood in th'e canals for some time before being lifted retained but little of its fertilizing silt. Hence, eventually, the lands which were exploited for double crops were precisely the lands that were receiving least fertilization and were constantly deteriorating».

Une grande activité de déforestation a également été enregistrée, à l'initiative de l'État, pour la construction d'une base navale par exemple. C'est ce qui s'est passé en l'an 37 avant JC. lorsque Marcus Vespasien Agrippa, sous le commandement d'Octave Auguste, ordonna la construction d'une base navale sur le lac Lucrin, le reliant au lac Avernus et à la mer. Une base navale et un *portus Iulius* furent ainsi construits pour abriter les navires¹⁸³. Tout cela a non seulement conduit à la conversion du lac en *res publicae*, mais aussi à la destruction des forêts environnantes¹⁸⁴.

Plus tard, les Romains ont utilisé la destruction de la nature comme instrument de guerre optimal et ont ainsi gagné des positions contre leurs adversaires. De cette manière, ils réussirent à réduire leurs adversaires, provoquant la dévastation de vastes étendues de territoire, non seulement à l'intérieur des limites de l'Empire, mais aussi à l'extérieur de celui-ci. À cause de cela et de la destruction incontrôlée de l'écosystème, pour des raisons de guerre, un grand déséquilibre s'est produit dans la flore de tout

¹⁸³ Urbanus, Jason ; «Rome's Imperial Port», *Archaeology* 68, no. 2 (2015): 26–33.

¹⁸⁴ Blackman, David; «Roman Shipsheds», *Memoirs of the American Academy in Rome. Supplementary Volumes* 6 (2008): 23–36; STRABON, *Geografía*, 5.4.5., Trad. et notes de José Vela Tejada y Jesus Gracia Artal, Editorial Gredos, 2001, p. 102: « Tales leyendas contaban nuestros predecesores, pero, en la actualidad, una vez que el bosque del Averno fue talado por Agripa, que estos lugares han sido edificados [por los de Bayas] y que el túnel subterráneo que iba desde el Averno hasta Cumas ha sido cortado, todas aquellas historias aparecen como meras leyendas»; LEONARD, Amy, «From Otium to Imperium: Propertius and Augustus at Baiae», *Illinois Classical Studies*, vol. 40, no. 1, 2015, pp. 139–54.

l'Empire, de sorte que l'apparition d'inondations a été constante pendant cette période¹⁸⁵.

L'eau était et est toujours un élément fondamental dans la vie de tout être humain et, à l'époque romaine, elle ne le serait pas moins. La civilisation romaine a toujours été consciente de son importance et a donc toujours eu le souci évident de préserver cette ressource naturelle¹⁸⁶. Déjà dans la Rome antique, divers dangers pour la santé publique étaient détectés lors de la consommation d'eau potable. À de nombreuses reprises, sa qualité n'était pas optimale pour la consommation humaine et la raison en était pas toujours due à l'activité humaine, mais également à des causes indirectes. Les nombreux conflits de guerre dans lesquels l'Empire romain a été impliqué ont également affecté les rivières et les fontaines car elles étaient contaminées par le sang, la saleté des soldats et même les cadavres des victimes des conflits de guerre. Les restes d'animaux sacrifiés à différents dieux et ensuite jetés dans les cours d'eau, apportant avec eux des maladies de divers types, ont également contribué à cette contamination des lits des rivières et des fontaines.

L'eau était présente dans la vie de la civilisation romaine à travers les thermes. Ces endroits, où l'eau coulait à des températures très élevées et on pensait qu'ils étaient pour cette raison plus hygiéniques, pouvaient présenter un risque pour la santé car avec

¹⁸⁵ Aldrete, G.S., *Floods of the Tiber in Ancient Rome* Gregory, Baltimore, 2007, p. 241 y ss., où il nous montre une liste des inondations les plus importantes survenues entre 414 et 2000 avant JC.

¹⁸⁶ Blázquez Martínez, José María, «La administración del agua en la Hispania romana», *Segovia. Symposium de arqueología romana*, Barcelona, 1977, p. 153.

des températures aussi élevées, les bactéries pouvaient causer davantage de dommages à la santé des citoyens¹⁸⁷.

Concernant les conduites d'eau, celles-ci étaient, pour la plupart, en plomb. À cette époque, la toxicité de ce matériau était déjà connue, c'est pourquoi l'architecte Vitruvio proposa de remplacer ces tuyaux par des tuyaux en terre cuite. Parmi les arguments qu'il a présentés pour cette proposition, il y avait que l'eau était fondamentale pour la civilisation romaine et que sa pureté déterminait la santé d'un peuple, de sorte qu'avec ces tuyaux en plomb non seulement ils ne pouvaient plus garantir la pureté de l'eau, mais qu'ils changeaient également le goût¹⁸⁸.

¹⁸⁷ Bravo Bosch, María José, «Termalismo y *ius romanorum*», *Revista General de Derecho Romano*, N°. 39, 2022; *Ibid.*, «La salud de las aguas termales en el Derecho Romano y su reflejo en la actualidad», *Mediación medioambiental*, coord. por Ana Isabel González Fernández; Inés Celia Iglesias Canle (dir.), 2023, pp. 17-46; SCOBIE, Alexander, «Slums, sanitation, and mortality in the Roman world», *Klio* 68, 1986, 399-433; Fagan, Garret G., «Bathing for health with Celsus and Pliny the Elder», *CQ* 56, 2006, p. 190-207; SCHEIDEL, Walter, *Disease and Death in the Ancient City of Rome*, Princeton/Stanford Working Papers in Classics, 2009: «The Roman culture of public bathing is another example of unexpected consequences. Immersion in unchlorinated water posed its own health hazards, especially when it was heated and thus triggered bacterial growth. Authorities such as Celsus and Pliny the Elder leave no doubt that 'medicinal bathing' was supposed to take place in public baths: as a matter of fact, the former advises patients with bowel troubles to bathe their anuses in the hot pools located at these venues but (not unreasonably) warns those with infected wounds not to expose them to the filthy contents to these facilities»

¹⁸⁸ Vitruvius. *De arch.* 8.6.10-11: «[10] Habent autem tubulorum ductiones ea commoda. Primum in opere quod si quod vitium factum fuerit, quilibet id potest reficere. Etiamque multo salubrior est ex tubulis aqua quam per fistulas, quod per plumbum videtur esse ideo vitiosum, quod ex eo cerussa nascitur; haec autem dicitur esse nocens corporibus humanis. Ita quod ex eo procreatur, <si> id est vitiosum, non est dubium, quin ipsum quoque non sit salubre. [11] Exemplar autem ab artificibus plumbariis possumus accipere, quod palloribus occupatos habent corporis colores.

Le secteur qui a le plus endommagé l'eau et sa pureté a été le secteur industriel, car les fortes de déversement qui y ont été déversés ont causé de grands dégâts. Les industries métallurgiques et céramiques, avec leur forte consommation de combustible, provoquaient une grande pollution des eaux. Au sein de ce secteur industriel, on ne peut manquer de mentionner le rôle joué par les blanchisseries et les pressings, également appelés fullones. Cette activité industrielle s'exerçait sur tout le territoire impérial, en raison de l'importance de la teinture pourpre comme symbole de distinction sociale au sein de la société romaine.

Ainsi, au sein de cette activité industrielle, on peut souligner la fonction des fullonicae, qui étaient des établissements spécialisés dans deux activités. D'une part, ils étaient chargés de nettoyer et de laver les tuniques confectionnées par les citoyens et, d'autre part, ils traitaient, teignaient et dégraissaient la laine tondue et autres matières premières. Parmi les techniques qu'ils utilisèrent, on peut citer l'utilisation de la terre à foulon pour teindre les vêtements, des lessives, du nitrate de potassium, et même de l'urine humaine ou animale pour la lessive. Ce dernier était utilisé en raison de son pouvoir dégraissant et purifiant, c'est pourquoi il était assez fréquemment utilisé pour éliminer la saleté et la graisse des vêtements. En raison de l'utilisation de grandes quantités d'urine, pour obtenir les résultats escomptés sur les vêtements, cela a également conduit à utiliser une grande quantité d'eau pour les rincer. En outre, les blanchisseries et les pressings étaient généralement situés à proximité des cours d'eau, de sorte que les dommages en-

Namque cum fundendo plumbum flatur, vapor ex eo insidens corporis artus et inde exurens eripit ex membris eorum sanguinis virtutes. Itaque minime fistulis plumbeis aqua duci videtur, si volumus eam habere salubrem. Saporemque meliorem ex tubulis esse cotidianus potest indicare victus, quod omnes, et structas cum habeant vasorum argenteorum mensas, tamen propter saporis integritatem fictilibus utuntur».

vironnementaux qu'ils pouvaient causer étaient très élevés. Ces dégâts ont été, pour la plupart, causés par des détournements d'eau entre fermes voisines et par l'absence d'un système de drainage approprié, permettant à l'eau de s'écouler efficacement sans causer de dommages à l'eau. L'eau qui sortait des pressings était contaminée et, comme il n'y avait pas de système de drainage et de dérivation adéquat, cette eau finissait par atteindre les cultures, les lits des rivières et même les pâturages des agriculteurs, exposant ainsi la population à ce danger¹⁸⁹.

Pour cette raison, une disposition visant à protéger la santé publique a été adoptée, par laquelle les pressings et les blanchisseries ont été déplacés vers une périphérie industrielle, où se trouvaient également d'autres industries polluantes.

Il s'agissait d'un problème grave, car l'eau qui sortait des pressings était de l'eau contaminée, de telle sorte qu'elle affectait également les terres adjacentes qui étaient généralement consacrées aux pâturages et aux cultures à cette époque. On peut égale-

¹⁸⁹ Ulpiano, en D. 39. 3.3 hace referencia a esta agua contaminada y la denomina *aqua spurca*: « *Ulpianus libro 53 ad edictum: pr. Apud Trebatium relatum est eum, in cuius fundo aqua oritur, fullonicas circa fontem instituisse et ex his aquam in fundum vicini immittere coepisse: ait ergo non teneri eum aquae pluviae arcendae actione. Si tamen aquam conrivat vel si spurcam quis immittat, posse eum impediri plerisque placuit. 1. Idem Trebatius putat eum, cui aquae fluentes calidae noceant, aquae pluviae arcendae cum vicino agere posse: quod verum non est: neque enim aquae calidae aquae pluviae sunt. 2. Si vicinus, qui arvom solebat certo tempore anni rigare, pratum illic fecerit coeperitque assidua irrigatione vicino nocere, ait Ofilius neque damni infecti neque aquae pluviae arcendae actione eum teneri, nisi locum complanavit eoque facto citatior aqua ad vicinum pervenire coepit. 3. Aquae pluviae arcendae non nisi eum teneri, qui in suo opus faciat, receptum est eoque iure utimur. Quare si quis in publico opus faciat, haec actio cessat, si-bique imputare debet is, qui damni infecti cautione sibi non prospexit. Si tamen in privato opus factum sit et publicum interveniat, de toto agi posse aquae pluviae arcendae Labeo ait*».

ment citer une loi destinée à réglementer les *fullons*, notamment la *Lex Metilia fullonibus dicta*, selon laquelle les blanchisseries et les pressings ne pouvaient pas déverser de l'eau, provenant de leurs commerces, dans les lieux publics ou dans les champs¹⁹⁰. En raison de l'inefficacité de cette mesure législative, une mesure de Pretoria a par la suite apporté une solution à cette contamination. Il s'agit de l'*actio aquae pluviae arcendae*, selon laquelle le propriétaire d'une propriété pourrait demander au propriétaire de la propriété adjacente de démolir les travaux effectués sur sa propriété et qui ont modifié le cours normal des eaux, nuisant ainsi à la propriété adjacente propriété¹⁹¹.

Concernant la pollution de l'air, c'était également important dans la Rome antique en raison des mauvaises odeurs incessantes provenant des égouts, la qualité de l'air était très mauvaise. Le problème des eaux usées était très important et un système d'égouts fut construit qui se déversait dans un plus grand, appelé égout maximum. Avec l'augmentation de la population, le réseau

¹⁹⁰ Bravo Bosch, María José, «La Regulación Romana de La Actividad Industrial de Lavanderías y Tintorerías», en *Hacia Un Derecho Administrativo, Fiscal y Medioambiental Romano IV. Volumen I. Derecho Administrativo y Derecho Medioambiental.*, edited by Antonio Fernández de Buján y Fernández, Raquel Escutia Romero, and Gabriel M. Gerez Kraemer, 1st ed., 579–602. Dykinson, S.L., 2021, pp. 579–602; Casinos Mora, Francisco Javier, «Lex Metilia de Fullonibus», en *La Restricción Del Lujo En La Roma Republicana. El Lujo Indumentario*, 1st ed., Dykinson, S.L., 2015, pp. 215–24; Vallejo Pérez, G., «Regulación Medioambiental: Salus per Aquam», en *Hacia Un Derecho Administrativo, Fiscal y Medioambiental Romano IV. Volumen I. Derecho Administrativo y Derecho Medioambiental.*, edited by Antonio Fernández de Buján y Fernández et al., 1st ed., Dykinson, S.L., 2021, pp. 717–32.

¹⁹¹ Ligi, Pompeo, «Sul Diritto Di Libera Pesca Nelle Acque Demaniali Ed Il Consenso Dei Proprietari Dei Fondi per Il Suo Esercizio», en *Il Foro Italiano*, vol. 78, no. 9, 1955; Bannon, Cynthia, «Fresh Water in Roman Law: Rights and Policy», en *The Journal of Roman Studies*, vol. 107, 2017, pp. 60–89.

d'égouts construit n'était plus suffisant, ce qui a entraîné une augmentation du nombre de puisards, tous dans des conditions inappropriées¹⁹².

En outre, en ce qui concerne l'environnement et sa préservation, l'activité minière était également importante puisqu'elle était l'un des secteurs dont l'activité affectait grandement la *naturalitas*¹⁹³. On croyait que les gisements minéraux constituaient une

¹⁹² Di Porto, Andrea, «La tutela della salubritas fra editto e giurisprudenza. Il ruolo di LabeoneII - Cloache e salubrità dell'aria », en Bullettino dell'Istituto di Diritto Romano "Vittorio Scialoja", N° 31-32, 1989-1990, pp. 271-309: «Le cloache, più precisamente lo scarico delle lordure e la loro canalizzazione tramite cloache, appaiono, nella considerazione del pretore e dei giuristi, con certo l'unico, ma forse il più pericoloso «fattore inquinante» dell'aria (e non solo di essa) a Roma —come verosimilmente in altri importanti centri urbani —nel periodo tra tarda-repubblica e primo-impero. Nel periodo, cioè, durante il quale, a seguito di una complessa serie di fattori ed eventi, quali —per indicare solo alcuni fra i principali — il crescente incremento della popolazione — dovuto in parte all'urbanesimo —, la sempre minore disponibilità di aree fabbricabili e l'aumentato valore di quelle più interne alla città, le profonde innovazioni relative ai materiali di costruzione e la miseria degli strati inferiori della popolazione, compresa la sempre più numerosa «popolazione» servile, si va definendo il nuovo profilo urbanistico di Roma, contrassegnato, fra l'altro, da uno sviluppo in senso verticale di alcuni quartieri, specie di quelli più affollati, come l'Aventino ed il Celio, e (poi) dalle caratteristiche costruzioni ad *insula*. Sovraffollamento. Costruzioni «ammassate» le une alle altre. Strade strette. Edifici a più piani, con alta densità abitativa. Ecco, in questo scenario si pone il problema del rapporto fra cloache e salubrità. Per rendersi conto del quale e pure al fine di comprendere appieno il significato degli interventi del pretore e delle discussioni dei giuristi che ad esso si riferiscono, è necessario fare un cenno al più generale problema della evacuazione delle lordure, di cui le cloache rappresentano una soluzione».

¹⁹³ Lazzarini, Sergio, « Studi di diritto minerario romano negli ultimi decenni. Evidenze archeologiche, considerazioni, discussioni », en *Rivista di diritto romano*, N° 20, 2020 ; Negri, Giovanni, *Diritto minerario romano*, Giuffrè, 1985, p. 13 ; Ibáñez, Elena Zubiaurre, and Beltrán Ortega, Alejandro; «el trabajo en las minas antiguas. Visiones historiográficas

source inépuisable de minéraux, leur extraction se faisait donc de manière illimitée, sans tenir compte des conséquences possibles découlant de cette activité. L'obtention de minéraux comme l'argent ou l'or, de grande valeur commerciale, s'effectuait selon des méthodes très agressives qui endommageaient la nature. Déjà dans le s. I J.-C., Pline l'Ancien, à travers son œuvre, critique sévèrement la méthode d'extraction des minéraux précieux. Tout au long de son œuvre *Naturalis Historia*, il s'est concentré sur l'étude approfondie de la nature ainsi que des sciences naturelles¹⁹⁴. Les in-

cas», en *Historiografía de La Esclavitud.*, edited by Mirella Romero Recio, Dykinson, S.L., 2019, pp. 477–502.

¹⁹⁴ Plin. *Nat. Hist.* 33.1.1-3: « 1. *Metalla nunc ipsaeque opes et rerum pretia dicuntur, tellurem intus exquirente cura multiplici modo, quippe alibi divitiis foditur quaerente vita aurum, argentum, electrum, aes, alibi deliciis gemmas et parietum lignorumque pigmenta, alibi temeritati ferum, auro etiam gratius inter bella caedesque. persequimur omnes eius fibras vivimusque super excavatam, mirantes dehiscere aliquando aut intremescere illam, ceu vero non hoc indignatione sacrae parentis exprimi possit.* 2. *imus in viscera et in sede manium opes quaerimus, tamquam parum benigna fertilique qua calcatur. et inter haec minimum remediorum gratia scrutamur, quoto enim cuique fodiendi causa medicina est? quamquam et hoc summa sui parte tribuit ut fruges, larga facilisque in omnibus, quaecumque prosunt.* 3. *illa nos peremunt, illa nos ad inferos agunt, quae occultavit atque demersit, illa, quae non nascuntur repente, ut mens ad inane evolans reputet, quae deinde futura sit finis omnibus saeculis exhauriendi eam, quo usque penetratura avaritia. quam innocens, quam beata, immo vero etiam delicata esset vita, si nihil aliunde quam supra terras concupisceret, breviterque, nisi quod secum est!:* 33.2.4. *Eruitur aurum et chrysocolla iuxta, ut pretiosior videatur, nomen ex auro custodiens. parum enim erat unam vitae invenisse pestem, nisi in pretio esset auri etiam sanies. quaerebat argentum avaritia; boni consuluit interim invenisse minium rubentisque terrae excogitavit usum. heu prodigia ingenia, quot modis auximus pretia rerum! accessit ars picturae, et aurum argentumque caelando carius fecimus. didicit homo naturam provocare. auxere et artem vitiorum inritamenta; in poculis libidines caelare iuvat ac per obscenitates bibere;* 33.2.5: *Abiecta deinde sunt haec ac sordere coepere, ut auri argentique nimium fuit. murrina ex eadem tellure et crystallina effodimus, quibus pretium faceret ipsa fragi-*

tellectuels rejettent les actions massives et néfastes des humains dans la nature et sont conscients des dégâts que tout cela provoque. L'un des exemples les plus remarquables de cette action massive est le système de *ruina montium*, utilisé dans les mines, grâce auquel, grâce à la force de l'eau, de grandes montagnes pouvaient s'effondrer en une seule impulsion, et ainsi pouvoir extraire les minéraux¹⁹⁵.

Pour cette raison, les intellectuels et les sphères les plus cultivées de la société romaine commencent à développer une nouvelle conscience, que le reste des citoyens romains ne suit pas, de préserver la nature.

Cependant, il faut beaucoup de temps pour que le reste des citoyens prenne conscience de la nécessité de préserver et de prendre soin des ressources naturelles. Cette nouvelle conscience n'a pas non plus reçu le soutien initial des législateurs, puisque sa priorité était de réglementer la propriété privée et l'enrichissement

litas. hoc argumentum opum, haec vera luxuriae gloria existimata est, habere quod posset statim perire totum. nec hoc fuit satis. turba gemmarum potamus et zmaragdis teximus calices, ac temulentiae causa tenere Indiam iuvat. aurum iam accessio est».

¹⁹⁵ Reher, Guillermo S., et al., «Configuring the Landscape: Roman Mining in the Conventus Asturum (Nw Hispania)», en *Landscape Archaeology between Art and Science: From a Multi- to an Interdisciplinary Approach*, edited by S.J. Kluiving and E.B. Guttman-Bond, Amsterdam University Press, 2012, pp. 127–36; Orejas, Almudena, et al. « L'eau et la terre : Exploitation et Gestion Des Ressources Dans Les Zones Minières Au Nord-Ouest de l'Hispanie », *Du Mont Liban Aux Sierras d'Espagne : Sols, Eau et Sociétés En Montagne : Autour Du Projet Franco-Libanais CEDRE "Nahr Ibrahim"*, Archaeopress, 2015, pp. 235–50 ; Domergue, Claude et Hérail, Gérard ; *Mines d'or romaines d'Espagne : le district de la Valduerna (León) : étude géomorphologique et archéologique* , Toulouse-Le Mirail : Université de Toulouse-Le Mirail, 1978.

du trésor. Il y avait toujours d'autres priorités. C'est pourquoi nous pouvons affirmer qu'en droit romain, il n'existait pas de protection ni de législation spécifique pour préserver l'environnement, mais qu'il s'agissait plutôt d'une réglementation indirecte, sur différentes matières, dispersée et qu'en réglementant d'autres matières, il était possible de préserver de petites et de manière insuffisante, l'environnement.

On ne peut nier qu'il existait à Rome un mécanisme administratif, constitué de l'existence d'institutions, ainsi que de différentes réglementations administratives dans différents domaines, mais il faudra attendre la Révolution française pour que l'on puisse parler de l'existence d'un système administratif. la loi en tant que telle. Au sein de ce droit administratif, on retrouve l'existence d'une branche, spécialisée dans l'étude de l'environnement, connue sous le nom de droit de l'environnement et dont le but n'est autre que la préservation des ressources naturelles. Auparavant, comme nous l'avons vu, les ressources naturelles étaient protégées pour des raisons de santé ou d'utilisation humaine et cela, indirectement, a jeté les bases de ce que l'on appelle aujourd'hui le droit de l'environnement¹⁹⁶.

Environnement et développement durable

Dans le système juridique romain, il existait une série de réglementations destinées à jeter les bases de l'organisation, de la création et de la transformation des agglomérations urbaines, c'est-à-dire qu'elles cherchaient à créer un habitat idéal de coexistence pour les êtres humains, dans lequel la sécurité et l'hygiène étaient

¹⁹⁶ Ruiz Pino, Salvador; «Algunas consideraciones en torno a la defensa popular de los recursos naturales y el medio ambiente en derecho romano y el derecho español», en *Revista Digital de Derecho Administrativo*, N°. 30, 2023, pp. 273-311.

garantis. Chaque agglomération urbaine exigeait l'utilisation de ressources naturelles et, bien qu'il existait une réglementation spécifique pour parvenir à une coexistence pacifique au sein de ces agglomérations urbaines, il n'existait aucune réglementation ni réglementation visant à établir des bases ou des lignes directrices sur la manière dont l'exploitation des ressources naturelles pouvait être réalisée de manière durable.

Le concept de durabilité que nous connaissons et utilisons aujourd'hui n'était pas valable dans les temps anciens. Cependant, nous pouvons remonter à 1713, lorsque l'administrateur minier allemand Hans Carl von Carlowitz (1645-1714) publie *Sylvicultura oeconomica*, un ouvrage dans lequel il exprimait son inquiétude face à l'exploitation abusive de l'environnement par l'industrie minière et surtout du bois. Pour exprimer ses recommandations, Von Carlowitz a inventé le terme *nachhaltigkeit*, durabilité, en allemand¹⁹⁷.

Un autre auteur pionnier d'un développement économique et social compatible avec l'environnement est Alfredo Oriani, qui, à travers son livre « La rivalité idéale », publié en 1908, a établi que la base des principes d'égalité et de solidarité entre les générations qui sont à la base d'un développement durable développement ou Thomas Malthus, qui expose sa théorie de la population, selon laquelle la population croît plus vite que les ressources et la planète n'a pas le temps de se régénérer¹⁹⁸.

¹⁹⁷ Mallén Rivera, Carlos. "Tres siglos de la invención de la sostenibilidad." *Revista mexicana de ciencias forestales* 4.20, 2013, pp. 4-6; Meyer Cohen, Felipe, «Sustentabilidad y ergonomía», en *Ergonomía, Investigación y Desarrollo* 2.2, 2020, pp. 7-10.

¹⁹⁸ Malthus, Thomas Robert, *Ensayo sobre el principio de la población*, Madrid, 1846.

Au fil du temps, la notion de développement durable évolue. Dans la première moitié du s. XX, avec l'avènement des deux guerres mondiales, les priorités politiques et économiques étaient différentes, de sorte que les préoccupations environnementales sont passées au second plan. C'est au milieu des années soixante que le concept de développement durable commence à prendre une plus grande importance à l'échelle mondiale. Parmi les principales causes de ce nouvel essor du développement durable figure le début du processus de décolonisation qui a eu lieu après la Seconde Guerre mondiale. Pendant la période de colonisation, les gouvernements coloniaux ont exploité toutes les ressources naturelles possibles dans leurs colonies européennes respectives en Asie et en Afrique, et ont également utilisé les droits de chasse pour le tourisme international comme source de revenus. Toute cette exploitation excessive, ainsi que la nécessité pour les nouveaux gouvernements nationaux de garantir une source de revenus en devises de grande valeur, ont conduit à la formation de ce que nous appelons aujourd'hui le développement durable, compris comme le seul moyen de lancer le développement économique. les anciennes colonies d'Afrique et d'Asie.

À la fin des années 60, le premier document officiel a été rédigé, la Loi sur la politique nationale de l'environnement (NEPA), dont les objectifs étaient de déclarer une politique nationale promouvant l'harmonie productive entre l'homme et son environnement ainsi que de promouvoir les efforts de prévention, éliminer les dommages causés à l'environnement et à la biosphère, stimulant ainsi la santé et le bien-être de l'homme¹⁹⁹.

Au fil du temps, l'importance de la préservation de l'environnement a acquis une plus grande visibilité internationale et, en

199 *National Environmental Policy Act / NEPA, 1969.*

1972, la première conférence mondiale sur l'environnement s'est tenue à Stockholm²⁰⁰.

La théorie de la durabilité sera développée plus en profondeur à la fin des années 1980 au sein de l'ONU et de la FAO, lorsque seront établis les principes d'action que doivent suivre toutes les activités productives humaines²⁰¹.

En 1987, le terme durabilité a été utilisé pour la première fois. Ce terme apparaît, pour la première fois, dans le rapport Brundtland) préparé par plusieurs pays pour l'ONU. La commission qui a préparé le rapport était dirigée par le Dr Gro Harlem Brundtland, c'est pourquoi il a été appelé le rapport Brundtland alors que le titre était en réalité « Notre avenir commun ». Le rapport a été rédigé en raison de la nécessité d'étudier et de définir l'impact des activités humaines sur l'environnement et, à son tour, a mis en garde contre les conséquences environnementales négatives du développement économique et de la mondialisation et a tenté de trouver des solutions possibles aux problèmes résultant de l'industrialisation et de la mondialisation démographique croissance²⁰².

²⁰⁰ *Informe de la Conferencia de las Naciones Unidas sobre el Medio Humano, Estocolmo, 5 a 16 de junio de 1972, Naciones Unidas, Nueva York, 1973.*

²⁰¹ García de Quevedo Ruiz, José Carlos; «Finanzas e inversiones sostenibles. La sostenibilidad en ICO», en *Boletín económico de ICE* 3120 (2020); BONIL, Joseph, JUNYENT, Mercé and PUJOL, Rosa María. "Educación para la sostenibilidad desde la perspectiva de la complejidad." *Revista Eureka sobre enseñanza y divulgación de las ciencias* 7 (2010): 198-215; JIMÉNEZ HERRERO, Luis M.. "La sostenibilidad como proceso de equilibrio dinámico y adaptación al cambio." *ICE, Revista de Economía* 800 (2002).

²⁰² Aguado Puig, Alfonso, *Desarrollo sostenible: 30 años de evolución desde el informe Brundtland*. Diss. Universidad de Sevilla, 2018; Ramírez Treviño, Alfredo, Sánchez Núñez, Juan Manuel et García Camacho, Alejandro; «El desarrollo sustentable: interpretación y análisis»,

Plus tard, en 1992, la Conférence des Nations Unies sur le développement et la durabilité a eu lieu à Rio de Janeiro. À partir de ce moment, le principe fondamental de la durabilité a été abordé au niveau international, tant au niveau scientifique que politique.

La « Déclaration de Rio » pose les bases de la protection de l'environnement en tant qu'élément fondamental du développement. C'est pourquoi les gouvernements sont invités à élaborer la législation nécessaire pour protéger et réparer l'environnement. Il a été établi ce que l'on appelle l'Agenda 21, qui comprenait les questions qui doivent être abordées aux niveaux mondial, national et local pour parvenir au développement durable²⁰³.

Tous ces rapports, réunions et accords internationaux changeaient l'idée de produire et de consommer, en introduisant les aspects sociaux et de développement humain aux aspects économiques. En bref, comprenez que le monde et ses ressources ne sont pas illimités et que des solutions globales sont nécessaires à l'échelle internationale. Si la société utilise plus de ressources qu'elle n'en génère, les générations suivantes n'auront pas les mêmes possibilités d'accéder à ces ressources.

Ces objectifs ont été révisés en 2015, donnant naissance à un nouvel agenda mondial avec les Objectifs de Développement Durable (ODD). Le 25 septembre 2015, les dirigeants du monde ont adopté une série d'objectifs mondiaux visant à éradiquer la pauvreté, à protéger la planète et à assurer la prospérité pour tous dans le cadre d'un nouveau programme de développement durable.

en *Revista del centro de investigación. Universidad La Salle* 6.2, 2004, pp. 55-59.

²⁰³ Avendaño, William, «Responsabilidad Social Corporativa (RSC) y Desarrollo Sostenible: una mirada desde la Declaración de Rio de 1992», en *Respuestas* 16.2, 2011, pp. 45-59;

Chaque objectif comporte des objectifs spécifiques qui doivent être atteints au cours des 15 prochaines années²⁰⁴.

En tant que nouvelle feuille de route pour parvenir au développement durable, les Nations Unies ont approuvé l'Agenda 2030, qui contient les objectifs de développement durable, une série d'objectifs communs visant à protéger la planète et à garantir le bien-être de tous. Ces objectifs communs nécessitent la participation active des personnes, des entreprises, des administrations et des pays du monde entier²⁰⁵.

Durabilité Et Villes Intelligentes

Ce nouveau concept de développement durable et de durabilité a contribué à l'émergence d'un nouveau modèle de ville, un modèle dans lequel les villes où la composante technologique est

²⁰⁴ Gómez Gil, Carlos, «Objetivos de Desarrollo Sostenible (ODS): una revisión crítica», EN *Papeles de relaciones ecosociales y cambio global* 140, 2018, pp. 107-118; Vilches, A., et al. "Objetivos de desarrollo sostenible (ODS), 2014.

²⁰⁵ Sanahuja, José Antonio, «La Agenda 2030 de desarrollo sostenible: de la cooperación Norte-Sur al imperativo universalista del desarrollo global», en *Gaceta Sindical. Reflexión y Debate* 26, 2016, pp. 205-221; García Matíes, Rafael, «Las entidades locales y los objetivos de desarrollo sostenible. Algunas notas sobre la naturaleza jurídica de la Agenda 2030», en *Revista de estudios de la Administración local y Autonómica*, 2016, pp. 96-105; Martínez Dalmau, Rubén, « *El giro ecocéntrico en Naciones Unidas y en la Unión Europea: la Agenda 2030 y el pacto verde europeo* », en *La lucha contra el cambio climático y el reconocimiento de los derechos de la naturaleza: sinergias de la cooperación mediterránea* : Actas del congreso celebrado en la Universitat de València los días 29 y 30 de junio de 2022 / Rubén Martínez Dalmau (dir.), 2022, pp. 171-190.

l'élément clé pour relever les grands défis que représentent les villes, donnant ainsi naissance au concept de Smart City.²⁰⁶

Le concept de croissance intelligente a été largement utilisé dans les années 1990 dans le cadre du nouvel urbanisme, en réaction à l'aggravation des tendances en matière de congestion routière, de surpopulation scolaire, de pollution de l'air, de perte d'espaces ouverts, de disparition de sites historiques précieux et la flambée des coûts des équipements publics²⁰⁷. Ces objectifs font toujours partie des raisons pour lesquelles les villes intelligentes sont attractives.

Le Parlement européen, à travers son étude « European Smart Cities », a tenté, selon FERNÁNDEZ²⁰⁸, systématiser l'objet d'intérêt des *Smart Cities* dans les six indicateurs que l'on appelle le « smart sextet »: (Smart Economy, Smart People, Smart Mobility, Smart Environment, Smart Governance et Smart Living). Pour suivant cette institution, le Parlement européen lui-même considère, selon ONTIVEROS BAEZA *et al.*²⁰⁹, qu'une ville est intelligente si elle a au moins une initiative qui aborde un ou plusieurs des indicateurs susmentionnés.

²⁰⁶ Fernández Güell, José Miguel, Ciudades inteligentes: la mitificación de las nuevas tecnologías como respuesta a los retos de las ciudades contemporáneas. *Economía Industrial*, 395, 2015, 17-28.

²⁰⁷ Eger, John M. ; «Smart Growth, Smart Cities, and the Crisis at the Pump A Worldwide Phenomenon», *I-WAYS - The Journal of E-Government Policy and Regulation*, Volume 32 (1), 2009, pp 47-53.

²⁰⁸ Fernández, Manuel; *Descifrar las smart cities. ¿ Qué queremos decir cuando hablamos de smart cities?*, Caligrama Editorial, Barcelona, 2016.

²⁰⁹ Ontiveros Baeza, E., Vizcaíno, D., & López Sabater, V. (2016). *Las ciudades del futuro: inteligentes, digitales y sostenibles*. Barcelona: Ariel y Fundación Telefónica, 2016.

CHOUDHARY, explique que la clé fondamentale des Smart Cities est que tout est connecté les uns aux autres, donc pour y parvenir, nous dépendons de la technologie²¹⁰.

Selon KOMNINOS & SEFERTZI²¹¹, les initiatives de villes intelligentes s'efforcent délibérément d'utiliser les technologies de l'information pour transformer de manière significative et fondamentale la vie et le travail au sein de leur région plutôt que progressivement. C'est pourquoi la ville intelligente implique le transfert de technologie, les fonctions de recherche, le développement de produits et l'innovation technologique.

Le concept de *Smart city* est parfois confondu avec celui de ville durable. Tandis que ces dernières cherchent à réduire l'empreinte écologique de leurs activités et à promouvoir des modes de consommation et de production durables, les Smart Cities utilisent des outils qui s'articulent autour de la technologie pour avancer vers un avenir plus équitable, plus sûr, plus efficace et plus durable. Ils présentent des solutions efficaces à tous les défis que présentent les grandes villes en matière de mobilité, d'économie, d'employabilité ou de participation citoyenne. Si le système juridique proposait déjà des solutions aux défis posés par l'augmentation de la population, aujourd'hui, elles ne cherchent pas seulement à être proposées dans des villes de plus en plus peuplées, mais elles tiennent également compte du fait que ces solutions sont durables, équitables et, surtout, ne nuisent pas à l'environnement. Le but d'une ville intelligente est d'améliorer l'efficacité des activités qui y sont réalisées et, pour ce faire, on

²¹⁰ Choudhary, M. 6 *Essential Smart City Technologies | Smart & Resilient Cities*, 2018.

²¹¹ Komninos, N., «Intelligent cities: Variable geometries of spatial intelligence», en *Intelligent Buildings International*, 3(3), 2011, pp. 172-188.

utilise « l'intelligence », c'est-à-dire de nouvelles technologies et systèmes de communication qui permettent d'obtenir à tout moment des informations sur l'environnement. . Toute cette technologie servira également à ce que la population puisse accéder à toutes ces informations et ainsi prendre des décisions et effectuer des procédures en temps réel et de manière efficace.

Réflexions finales

L'objectif principal du système juridique romain était d'obtenir une réglementation contrôlant l'activité humaine autour de l'exploitation des ressources naturelles. L'objectif n'était pas de protéger la nature mais plutôt de contrôler le travail humain pour garantir la santé des citoyens et ainsi garantir des niveaux minimums de qualité de l'eau et de l'air. L'objectif ultime est la protection des ressources naturelles, car on prend conscience qu'elles sont inépuisables et qu'elles peuvent continuer à être exploitées selon des méthodes agressives pour l'environnement. Lorsque ces actions commencèrent à affecter la population, c'est à ce moment-là que l'activité économique et industrielle des citoyens romains commença à être réglementée, avec quelques dispositions légales.

Par la suite, les résultats obtenus par l'exploitation continuent, avec des méthodes rudimentaires et agressives, des ressources naturelles de la planète ont commencé à se faire sentir. En outre, pour des raisons politiques découlant des différents processus de décolonisation auxquels certaines colonies d'Afrique et d'Asie ont été exposées, le concept de développement durable a commencé à prendre forme. Sans la naissance de cette nouvelle conscience environnementale, au début du XXe siècle. XX, la naissance de ces nouvelles villes ne serait pas possible, car l'un des objectifs est qu'elles soient des villes autosuffisantes et causent le moins de dommages possible à l'environnement. Au fil du temps, cette préoccupation pour les ressources naturelles s'est accrue car

notre activité, sans limites, depuis des milliers d'années, a causé différents ravages sur la planète, il est donc nécessaire de commencer à prendre des mesures. Certaines ont été prises, mais cela n'a pas suffi. Nous devons continuer à y travailler, nous avons les moyens, les ressources et suffisamment d'informations pour faire plus pour notre planète, ce qui nous manque, c'est une plus grande implication et une plus grande action de la part de chacun.

BILBAO TRANSFORMATION TOWARDS SMART CITY

Roi Santamaría Mera

Architect and Building Engineer. PhD student, University of
Coruña, Spain.

Abstract

Bilbao has been a world reference at an industrial level for years. Its decline has led to a transformation towards a medium-scale smart city taking advantage of these industrial voids. The changes and its rapid transformation make it the urban laboratory of reference for many other cities.

Keywords: La Ria, iconic city, identity, sustainability, smart city.

Introduction

The city is an incomprehensible space-time. Architecture and urban planning change, theories follow one another since human beings decided to build a place to shelter and even today the debate continues.

The city is the place where the vast majority of human beings on the planet live. It is the space through which our daily steps pass. It is the center of the economy; where rulers and large corporations make decisions. The city is the projection of the future that will come. It is also the place where we feel like citizens, where we belong and where we feel proud.

Whenever one acts in the urban space, an endless number of conditions appear: morphology, the limits raised by man, economic interests, ideologies, time. Treating that space requires being reflective, responsible and imaginative.

Bilbao has transformed especially in the last 40 years and continues to change. The city is a living being, which is always experimenting. The important thing is that any transformation improves the lives of those who inhabit it and allows them to preserve their essence.

Contextualization of the city of Bilbao.

Situation

Bilbao (43° 15MIN 44SEG N, 2° 57MIN 12SEG W), with an approximate area of 41.5 km², is a city located in the north of the Iberian Peninsula, in the autonomous community of the Basque Country. The territory of the Basque Country is shaped like an inverted triangle, whose base, in the northern part, is the Cantabrian Sea, where the Bay of Bizkaia is located. In the northwest it borders with France and in the west with the regional community of Navarra; in the west, with the community of Cantabria and the province of Burgos, in the community of Castilla-León; and in the south, with the latter territory and also with the community of La Rioja.

The town of Bilbao, known as Botxo, owes its name to the depression 2 kilometers in diameter surrounded by different mountain ranges that separate it from the outside, as described by Arizaga and Martínez²¹².

The element that defines Bilbao geomorphologically speaking is the Bilbao estuary. The estuary owes its origin to the melting of continental ice during the last ice age. It has a length from its mouth to Bilbao of 14 km. Bilbao is located in the upper area of the estuary, where the waters of the Nervión and Ibaizabal rivers converge, 19 meters above sea level. This positioning is strategic: it helped connect both sides of the estuary at low tide and during high tide the 3 m draft allowed navigation. The Abando marsh, the

²¹² Arízaga, Beatriz, & Martínez, Sergio, *Atlas de villas medievales de Vasconia: Bizkaia. Donostia*. Spain: Eusko Ikaskuntza ; Bilbao Bizkaia Kutxa, 2006, p. 4.

largest in the estuary despite its size, is where the Bilbao expansion of the mid-19th century is currently located²¹³.

The great wealth of Bilbao and its surroundings was found underground with its iron deposits that emerged parallel to the estuary at very shallow depths. Currently the mines are exhausted but for centuries the exploitation of iron caused the great development of the city.

Administrative organization.

Bilbao is the capital of Bizkaia, one of the 3 provinces that make up the autonomous community of the Basque Country or Euskadi.

The Basque Country is one of the 3 communities of Spain considered «historical nationalities» for presenting its own collective, cultural and linguistic identity (the language is Basque) and for having approved its statutes during the Second Republic, that is, before the Civil war. The Spanish Constitution recognizes the historical regional rights of the Basque Country, making it the territory with the highest level of powers transferred from the State, including its own Treasury.

Bilbao is one of the 112 municipalities of Bizkaia and the head of the metropolitan area

called Greater Bilbao.

Demography.

The population of the metropolitan area of Bilbao amounts to one million inhabitants, which represents 80% of the population

²¹³ *Ibid*, p. 7.

of Bizkaia and 44% of the entire inhabitants of the Basque Country. Bilbao has, according to official figures from 2018, 345,110 inhabitants.

From the founding of the town, in the year 1300, until the 16th century, Bilbao went from being a fishing town to becoming a commercial and industrial reference. The first population data do not refer to the number of inhabitants and are based on the record of the number of bonfires that exist, as documented by Arizaga and Martínez²¹⁴.

The population is increasing as reflected by bonfire data: 1,140 registered in 1514; 1,242, in the year 1685; reaching 1,300 bonfires in the year 1700.

The first population data is from the year 1787 and puts the population of the town at 9,500 people. During the 19th century, the population began to increase and, although there was a break due to the War of Independence (1808-1814), in the second half of the century the number of residents doubled: it went from 35,227 inhabitants in 1880 to 78,598. in 1901. The economic and industrial boom led precisely to the creation, in 1876, of Ensanche, the area of the city where the bourgeois class would reside and where they would establish their businesses and businesses.

In 1924, the annexation of Deusto and Begoña by the Bilbao City Council took place, which caused the population to increase to 138,056 inhabitants in 1925 compared to the 105,886 that were registered in 1920. The population gradually grew as they were annexed. other municipalities in the region.

²¹⁴ *Ibid*, p. 24.

In parallel to these administrative restructurings, the phenomenon of immigration occurs, linked to the industrial development of Bilbao and its region in the 50s and 60s, which triggers demographic growth. The arrival of citizens from other less developed parts of Spain to work in the industry, mainly in the iron and steel and naval sectors, translates into the creation of neighborhoods on the periphery of the city and the development of municipalities on the left bank of the city, the Estuary.

Bilbao recorded a historical maximum population in 1971, with 412,554 inhabitants, with a significant weight of the working class. Another industrial municipality, Barakaldo, will go from having 36,000 inhabitants in 1940 to 117,000 in 1970.

The arrival of democracy is accompanied by industrial decline and a slowdown in the arrival of immigrants. In 1987, the city had 385,773 inhabitants. In 1990 Bilbao registered a population of 369,839 inhabitants, which increased to 356,635 in the year 2000.

The trend is parallel in the metropolitan area, which lost 60,000 inhabitants between 1980 and 2000, with a slight recovery in the new century.

Economy.

The Basque Country is one of the four autonomous communities of Spain whose GDP per inhabitant exceeds the European average, being 121% above the community average, according to the latest data from the Community Statistics Office, Eurostat, corresponding to 2016. The Basque economy closed 2018 with growth of 2.8%, 3 tenths above the Spanish average. and employment increased by 2.1%, which confirms its dynamism at this time.

Bilbao, with a per capita income similar to Barcelona, has an active population of 165,600 people, of which 23,472 are unem-

ployed, which meant a year-on-year decrease of 6.7%. Although the unemployment rate is around 15%, the trend is positive.

The economic development of Bilbao was linked from its beginning to trade and the iron industry. However, it is known that livestock farming was abundant in the initial settlement due to the extensive pastures in the area, where orchards with apple trees and vineyards also stood out, which allowed wine to be obtained since the 14th century. Arizaga and Martínez mention the existence of orchards and vineyards on the road to Begoña and in the Ascao area close to the medieval urban center²¹⁵.

In the 15th century, coinciding with the reign of the Catholic Monarchs, a policy of conservation of the mountains was developed and wood became a fundamental element used for the construction of homes, as fuel for forges and as material for creation. of ships, the basis of the future naval industry.

The protectionism and care of the forests can be seen in different municipal ordinances during the 15th century, as stated by Arizaga&Martínez, «a thousand trees were planted each year in the mountains of the town» and «mountains, when they are sold, a third of their value is distributed in planting»²¹⁶.

The location of the town next to the estuary also favored the fishing industry. Although inshore fishing was a common activity in all the coastal towns of Bizkaia, large deep-sea ships left from Bilbao to Newfoundland or Ireland during the 15th and 16th centuries. Those crews captured, among other species, the whale, which supplied blubber and oils.

²¹⁵ *Ibid*, p. 60.

²¹⁶ *Ibid*, p. 124.

The ordinances reflect different trades that were carried out in the town in the 16th century: stonemason, locksmith, swordsmith, baker and tailor. However, Bilbao's economy already had a strong mercantilist component. The location of the port of Bilbao between the two great commercial areas of the time, Castile and the North Atlantic, meant that it acted as a link in the transport of goods. This activity spread throughout Western Europe to the shores of the Mediterranean. Interior trade routes were established with the crown of Castile, reaching the city of Seville.

It was during the end of the Middle Ages when Bilbao achieved the great commercial monopoly after abandoning the tutelage exercised by Burgos. Commercial control was such that the administration prohibited commercial activity in the suburbs; any commercial exchange took place within the walls.

In parallel with commercial development, there is the rise of shipbuilding and the industry linked to iron mines.

In the 19th century, the society and economy of Bilbao were deeply affected by the succession of wars, Napoleonic, royalist and Carlist. The end of these war conflicts, coinciding with the last third of the century, will mark the great transformation towards the future industrial city²¹⁷. In 1857, Banco Bilbao was created, of vital importance for the economy, by financing the railway works. The arrival of the Industrial Revolution in Bilbao allowed the city to take a great leap starting in 1876, with the construction of different facilities and infrastructure and economic growth based on mining and heavy industry. On the left bank of the estuary, large steel industries are settling, such as Altos Hornos de Bilbao and La Viz-

²¹⁷ Aguirreazkuenaga, Joseba, *Vizcaya en el siglo XIX. Las finanzas públicas de un Estado emergente*. Bilbao, UPV-EHU, 1987, p. 35

caya, founded in 1901. These two companies will end up merging into Altos Hornos de Vizcaya, a national and international benchmark in the sector and a symbol of industrial potential of Bilbao in the 20th century. The Santa Ana de Bolueta factory also stands out.

The Industrial Revolution introduced changes and strengthened maritime trade. The large tonnage that steamships now allowed compared to sailing ships meant an increase in imports and exports. The port of Bilbao at the end of the 19th century was fundamental in the commercial activity of Spain; Many imports from the Peninsula arrived through this port and were distributed by railroad. The import of coal stands out for its importance, given its role in industrialization until later electricity was used.

The arrival of the 20th century consolidated the steel, metallurgical, mining and naval sectors. In the latter, the Euskalduna shipyard stood out. Thanks to the acceleration of the economy, new productive sectors were added, such as hydroelectric. The productive fabric of Bilbao was not destroyed during the Civil War and, after the war, the companies located next to the Ría del Nervión, an authentic avenue of industry²¹⁸, They become the driving force of the Spanish economy. Bilbao absorbed, along with Madrid and Barcelona, the large internal migratory movements during the decades of the 50s, 60s and first half of the 70s.

At that time, Bilbao concentrated 39% of the province's industrial employment but, at the same time, it brought together the

²¹⁸ Borja, Jordi, Muxí, Zaida., & Cenicacelaya, Javier. (Eds.). (2004). *Urbanismo en el siglo XXI: una visión crítica: Bilbao, Madrid, Valencia, Barcelona* (1. a ed). Barcelona: Escola Tècnica Superior d'Arquitectura de Barcelona : Edicions UPC.

tertiary sector. The economic boost led to significant commercial development in the city. To the more traditional establishments installed in the Old Town, the first department stores were added: Galerías Preciados, in 1959; Simago, in 1964; and El Corte Inglés, in 1969.

The situation of economic prosperity translated into a deep crisis, in the mid-70s, in the Basque Country as a whole but more substantially in the Greater Bilbao region. «These are specialized areas in mature industrial sectors, such as steel and shipbuilding, which since the mid-seventies have presented problems of competitiveness, high production costs, low productivity and excess productive capacity»²¹⁹. 50,000 jobs are lost in the industry and the employed population falls by 3.5% between 1981 and 1986.

The process of industrial reconversion took over the main industries in the iron and steel and naval sectors starting in 1980, with the consequent loss of jobs and permanent closures.

The crisis is receding as Bilbao advances in its transformation, the result of the strategy and coordination of the different administrations. There are signs of economic revitalization in the 1990s, with an increase in the number of companies dedicated to construction, transportation and communications as well as business services. However, it will be from the turn of the millennium when the city's economic takeoff occurs again. Activity linked to commerce, construction and financial intermediation services increases. The situation translates into a drop in the unemployment rate to levels similar to those of the 70s; In 2000 it was 5%.

²¹⁹ Iglesias, Mariela, *Políticas urbanas en España: grandes ciudades, actores y gobiernos locales* (1. ed). Barcelona: Icaria Editorial, 2011, p. 83.

Currently, a change is observed in the productive fabric of Bilbao. The increasing weight of the tertiary sector, specifically tourism, is confirmed, with double-digit increases in the number of visitors and new hotel establishments. However, «business activities with high added value and cutting-edge innovative activities linked to the generation of knowledge, such as computing, engineering, biomedicine and communications, still have little weight»²²⁰. In any case, Bilbao is one of the Spanish cities best positioned to attract talent, along with Madrid, Barcelona and Zaragoza.

Transformation of the city of Bilbao.

The creation of the town and its evolution.

On June 15, 1300, the natives of Bilbao obtained the founding charter. The Puebla Charter was granted by the lord of Bizkaia, Don Diego López de Haro. Until then, these settlers, according to Cenicacelaya, belonged to the Bizkaia lordship and their commercial activities were related to the port.²²¹

With the Carta Puebla, the people of Bilbao enjoy an excellent position to achieve a monopoly on commercial transit through the estuary, an aspect from which they were able to take great advantage. In addition, other advantages are added over the years, as Arizaga and Martínez indicate²²².

²²⁰ *Ibid*, p. 96.

²²¹ Cenicacelaya, Javier., Román, Antonio., & Solaña, Iñigo, *Bilbao, 1300-2000: hiri ikuspegia*

= *una visión urbana* = *an urban vision*. Bilbao: Colegio Oficial de Arquitectos Vasco- Navarro, Delegación de Bizkaia, 2001, p. 43

²²² Arizaga, Beatriz., & Martínez, Sergio. (2006). *Atlas de villas medievales de Vasconia: Bizkaia*.

In 1301, new privileges granted by King Ferdinand IV complemented the maritime loading and unloading franchise granted to the people of Bilbao. This makes Bilbao a commercial benchmark at the European level. On June 25, 1310, Doña María López de Haro proceeded to refound the town of Bilbao.

In 1372 and 1375 the rights of Bilbao residents to fish and trade without impediments were expanded. Furthermore, buying and selling is limited in different sections of the estuary, consolidating the Bilbao monopoly.

On the basis of these privileges, the importance of commercial Bilbao increased, by uniting the ports of Flanders and Great Britain, also those of France, Portugal and Italy, with the main ports of Castile and Aragon.

The urban core would be made up of 7 streets. The town has urban characteristics typical of a «founding city». Its scheme is close to what Pierre Lavedan called «fishbone», due to the transversal crossing of streets and blocks. Cenicacelaya indicates that the town of Bilbao «follows a late Gothic layout made up of lots, with seven parallel streets, orthogonal to the bank of the estuary and connected to each other by the cantons that cross them»²²³. The ends of the route are marked by the square next to the estuary and the Church of Santiago. In this first configuration, the bridge, the castle, the walls, the main square, with its docks, and the suburbs located outside the walls also stand out.

Donostia, op. cit., p.78

²²³ Cenicacelaya, Javier, Román, Antonio, & Solaña, Iñigo, *Bilbao, 1300-2000: hiri ikuspegia*

= una visión urbana = an urban vision, *op. cit.*, p. 53.

One of the great concerns of the town's administration was the evacuation of water. «The water poured into the light rights-of-way ran to the cantons and from these to the main streets to immediately pour into the estuary, quickly eliminating wastewater and also allowing natural runoff in case of rain»²²⁴. This great concern does not prevent the people of Bilbao from suffering floods throughout the Middle Ages, with evidence of floods in the years 1380, 1402, 1408, 1447 and 1450.

During the Middle Ages, the port of Bilbao was one of the safest on the Cantabrian coast. The large indentation that the estuary had allowed ships to shelter in storms and from attacks. The security of the port was added to the skill and expertise of the sailors to access it.

During the first two centuries of the town there was a notable internal growth of the population. Furthermore, the privileges granted to the town generated a call effect from people who until then were foreign to Bilbao. The growth of the suburbs does not prevent the urban core from demanding another type of expansion since the mid-15th century. This growth, «the expansion», will occur from the original nucleus towards the suburbs of San Nicolás and Arenal, on the edge of the estuary.

The increase in population and the boost in commercial activity, directly linked to the creation of the Consulate of Bilbao, marked the urban development of the city in the 16th century.

²²⁴Arízaga, Beatriz., & Martínez, Sergio. (2006). *Atlas de villas medievales de Vasconia: Bizkaia*.

Donostia, op. cit., p. 83.

The city continued to strengthen its commercial role in the 17th century and this circumstance led to the multiplication of docks in the estuary and the consolidation of the «expansion» around the original core of the city. The new streets house public buildings and the new houses of the first bourgeoisie.

The distinctive elements of Bilbao in the 18th century demonstrate the marked mercantile nature of its activity and the strength of the bourgeois social class. An example of this will be the promenade and the first theater built next to the Arenal pier. As I will explain below, the increase in population will force measures to be taken and with that objective the first municipal urban planning plan will be designed to expand the town by building 258 homes in open spaces, as Salazar states²²⁵. This project promoted by the city council aimed to solve the shortage of land, expanding the Old Town.

Another phenomenon is added to the increase in population: the desire of the clergy to locate in new areas. The late settlement of the clergy had placed it on the outskirts of the city. However, in the middle of the 18th century there was a transfer by the clergy to the bourgeois and more valued areas of expansion.

The end of the century comes accompanied by an agrarian crisis and great demographic pressure in the town. This provokes the interest of the passive classes in the real estate business. The bourgeoisie also tries to position itself in this business to gain access to the power controlled by the aristocracy and the clergy. All of this leads the city towards a liberal and bourgeois future.

²²⁵ Salazar Arechalde, José Ignacio, «Normas edificatorias en el Bilbao anterior al ensanche», *Revista Bidebarrieta* 15, 2004, pp. 67-82.

Industrialization is the catalytic phenomenon of the transformation of Bilbao in the 19th century. In parallel to the installation of iron and steel factories and the arrival of the railway and tram, a great leap occurred in the city's urban planning.

Bilbao extends its limits and the Ensanche is designed on the Abando plain, the space that is the subject of the current study since it will be the area that also experiences the latest transformation of the city. The 19th century Ensanche project defined the expansion of Bilbao, with new streets, avenues such as Gran Vía, squares such as Elíptica and spaces for banks, companies and warehouses.

The Ensanche always had the right side of the estuary in mind. In search of new communications with the historic center, the Merced Bridge was built in 1886, 350 meters from the Arenal Bridge. Its destruction in 1937, during the Civil War, and its subsequent reconstruction without being faithful to the original project have devalued it²²⁶.

Transportation undergoes significant changes in the second half of the 19th century. Bilbao is infected by the innovative spirit of the time. The Ensanche began to provide the city with solutions to the new needs of the population and economic sectors.

The first half of the 20th century is a turbulent period on a political and social level, in which population growth and industrial development in Bilbao continue. While new suburbs appear

²²⁶ Basurto, Nieves., Rodríguez, Paloma, & Velilla, Jaione, *El Bilbao que pudo ser: proyectos para una ciudad, 1800-1940*. Bilbao: Bizkaiko Foru Aldundia, Hirigintza Saila = Diputación Foral de Bizkaia, Departamento de Urbanismo, 1999.

around the city, the expansion of the Ensanche takes place, with new avenues and squares, residential buildings and facilities.

The consolidation of Ensanche, which includes a space of industrial activity around the estuary, will be explained below. Furthermore, for the first time, the idea of a metropolitan area is proposed.

The beginning of the 20th century marks the rise of social movements. Along with industrialization, labor movements emerged, but monarchical liberalism, republicanism and, above all, Basque nationalism also stood out on the political level.

At an economic level, the beginning of the 20th century brings with it an increase in mining, steel, naval, commercial and financial activity. The bourgeoisie of Bilbao and its surroundings extend their investments to other sectors, such as the energy or chemical industry, and hold positions on the boards of directors of the main Spanish companies.

In 1904, Federico Ugalde's proposal prevailed in the Ensanche expansion competition, to which Ricardo Bastida and Pedro Guimón had also participated. The space will grow towards the west, respecting the existing buildings and the projects that are being carried out, such as the Basurto hospital. This extension is completed by Sabino Arana Avenue, which leads to the new Plaza del Sagrado Corazón²²⁷.

Buildings related to the economic sectors that are boosted by the industrial revolution are being added to the existing port and railway infrastructures. Joaquín Cárcamo highlights that new mod-

²²⁷Cenicacelaya, Javier, Román, Antonio, & Solaña, Iñigo, *Bilbao, 1300-2000: hiri ikuspegia*

= *una visión urbana* = *an urban vision*, *op. cit.*, p. 64.

ern and functional facilities are being built in the center of Ensanche²²⁸. Architectural solemnity and traditional materials are mixed with new elements, such as iron, steel and reinforced concrete.

The expansion of Bilbao places the best residential buildings and the main economic activities in the Ensanche. The wealthiest social class leaves the historic center, where the humbler classes remain.

The Civil War broke out in 1936 and that year Bilbao suffered several bombings by Franco's aviation. In 1937, after a siege of several weeks, the rebellious military took the city and blew up all its bridges.

In the second half of the 20th century, new legislation on land and urban planning was approved, which favored the construction of housing without control. This fact and the massive arrival of immigrants from other parts of Spain to work in the industry cause the multiplication of suburbs with high building density in Bilbao and other towns in the metropolitan area.

The economic situation, in any case, improved noticeably since the 1950s. Shortly after the end of the Civil War, the factories of Bilbao resumed their activity. The steel and metallurgical industries became a strategic sector in the reconstruction of Spain. Bilbao recorded its greatest population growth between 1950 and 1975. There was accelerated industrialization, a spectacular economic takeoff but also uncontrolled urban growth.

²²⁸ Homobono Martínez, José Ignacio, «El patrimonio industrial y sus actividades: turismo, museos, ecomuseos y reutilización», *kobie. Antropología cultural* 12, 2006, pp. 5-34.

After «developmentalism», in the 1970s came the industrial crisis and the democratic period, which would mean the transfer of powers in urban planning to the autonomous community.

In the mid-70s, the crisis hit the industrial sectors that had been a symbol of the city. Many iron and steel industries and shipyards located near the Bilbao estuary were closed or employment was reduced.

In the 70s and 80s, the banks of the estuary were a clear reflection of the process of deindustrialization and urban decline of the city and its region. The closure of industries left behind numerous degraded and abandoned spaces next to the estuary, spaces that, as will be seen later, will be reused for other uses, such as public or residential during the transformation process of Bilbao.

The metamorphosis of Bilbao.

It will be in the mid-80s when the central government and the Basque executive assume the weight of the deindustrialization of Bilbao and the urban dimension of the crisis. Both administrations are then aware of the need to undertake plans to relaunch the economy and revitalize the city. At first these are specific initiatives and then move on to more global and coordinated strategies.

The first measures will be adopted following the impact on Bilbao, especially in the Old Town, of the serious flooding and overflowing of the estuary that occurred in August 1983.

The metamorphosis of the city will have as its flagship the urban regeneration process of Abandoibarra, as stated in the Advance of the Urban Planning Plan of Bilbao, presented in 1989. The document highlighted the potential of the old industrial and port enclave located along the left bank of the Ría, in the northern area of the Ensanche. The space, of 35 hectares and a slope of 10 meters, had until then been occupied by the Euskalduna shipyard,

by other industries and warehouses, as well as by the railway tracks on that left bank. For the Bilbao City Council, the closure of this naval industry and the central positioning of the land in the city were an opportunity to convert that area into a strategic space, in which to install a tertiary center offices, businesses and services²²⁹.

The 90s brought with it a change in the way urban planning was approached. Administrations are committed to strategic planning that has large urban projects as key instruments²³⁰. Abandoibarra, on the northern limit and next to the Estuary, which already appeared as a space of great potential in the Advance of the General Urban Planning Plan, and Ametzola, on the southern limit. The work in Ametzola, with a marked residential character, began in 1996.

The Abandoibarra project underwent a complicated and long development process, with various changes since an ideas competition was launched in 1992 to develop this area. The American Cesar Pelli was the architect selected to shape the new urban proposal.

The most emblematic action in Abandoibarra was the installation of the European headquarters of the Guggenheim Museum. The Basque Government and the Provincial Council of Bizkaia established negotiations with the Guggenheim Foundation of New York in 1991 in absolute secrecy. The interests of both parties facilitated the agreement. The cultural entity was seeking interna-

²²⁹ Rodríguez, Arantxa, «Reinventar la ciudad: milagros y espejismos de la revitalización urbana en Bilbao», *Lan Harremak*. Revista de Relaciones Laborales. Nº 6, 2002, pp. 69-108.

²³⁰ *Ibid*, pp. 69-108.

tional expansion and the Basque Government was eager to find an icon that symbolized the new image of the city. The Guggenheim Museum, the work of architect Frank Gehry, opened its doors in 1997 in a space that only a few years before was linked to industry and the railroad.

The arrival of the Guggenheim goes far beyond the volume built for this cultural space. The museum becomes a world reference for art, a pole of attraction for avant-garde architects and the emblem of the new «Bilbao» brand. Likewise, its installation has a multiplying effect on cultural and tertiary facilities, in general, and represents a boost to actions in the Abandoibarra area. In 1997, 2 new bridges were opened, the Zubizuri pedestrian walkway, by architect Santiago Calatrava, and the Euskalduna bridge, located next to a new cultural space, the Euskalduna Palace of Congresses and Music, which will be inaugurated in 1999.

The urban regeneration promoted by the Bilbao Ría 2000 strategy would not have been possible without the synergy created with the large infrastructure and transportation projects undertaken in the 1990s²³¹.

Associated with the railway remodeling in the metropolitan area, work on the Bilbao metro begins, the first line of which will be inaugurated in 1995. This mobility system, the work of architect Norman Foster, represents a decisive change in the way of moving around the city. and reflects Bilbao's new orientation towards a more sustainable city model.

²³¹ Borja, Jordi, Muxí, Zaida., & Cenicacelaya, Javier. (Eds.). (2004). *Urbanismo en el siglo XXI: una visión crítica: Bilbao, Madrid, Valencia, Barcelona*, op. cit., p. 66 y ss.

At the level of large infrastructures, the expansion of the outer port stands out, a project included in the Infrastructure Pact signed in 1989 by the Government of Madrid and the Basque Government. Work began in 1993 and the first phase, with the creation of 40,000 m² of additional surface area, was completed in 1999. That same year, the southern railway variant opened, which restructures local rail traffic to connect it with the metro.

With the entrance of the 21st century, a new airport terminal is put into operation, necessary to respond to the socio-economic changes in Bilbao and its region, to promote the tertiary sector, especially tourism.

The Abandoibarra space, where the Guggenheim Museum and the Euskalduna Palace already operated, was consolidated with the installation of new equipment and green areas.

In 2003, Ribera Park opened, a green and leisure space that connects the two existing cultural buildings. A common walking area for many residents of Ensanche, the park becomes an integrating element of the estuary in the city. Also in 2003, the new Pedro Arrupe pedestrian walkway over the estuary was inaugurated. This infrastructure links the right bank in the area of the University of Deusto with Abandoibarra, thus creating a new communication axis towards the future Plaza Euskadi, which will be completed in 2011. The new axis will be consolidated with the location on both sides of two unique buildings to add to the Guggenheim: the Auditorium of the University of the Basque Country, the work of the Portuguese architect Álvaro Siza, and the Library of the University of Deusto, designed by the architect Spanish Rafael Moneo.

Built by the architect who designed the Abandoibarra area, the Pelli tower was inaugurated in 2011. This construction, known

as the Iberdrola tower, is intended for office use. Guarding this tower, 2 buildings for residential use will be built.

In the same Abando district and a short distance from the Guggenheim Museum, one more piece of the puzzle will rise: the Isozaki complex. This action, carried out on land of the old free warehouse of the port, is made up of 7 buildings, including two towers, which the Japanese architect intended to convert into a new gateway to the Eixample. The project included a staircase that bridges the 14 meters of unevenness between the estuary and that area of the Ensanche.

Outside the Abandoibarra area but also in Ensanche, the authorities developed different urban planning actions to respond to citizens' demand for culture and leisure in the new millennium. The most notable is the Azkuna Zentroa, the result of the rehabilitation of the Alhóndiga, an old wine warehouse until 1977. Under the guidance of Phillipe Stark, the building reaches a new dimension and becomes a cultural and leisure complex, to which the surrounding urban space is added.

In 2013, the new San Mamés soccer stadium was inaugurated. This sports infrastructure, built on the western edge of the Ensanche, on the same land as the old stadium, reconfigures the associated urban space. In that same area, close to the bus station and the Basurto hospital, the Garellano Master Plan project, designed by Richard Rogers, is being built. It is a residential complex that will also house Bilbao's new intermodal bus station.

In the area of infrastructure, the most outstanding thing is the completion of the works on the superport, which as of 2014 houses a new dock for docking large ocean liners.

Among the future projects in Ensanche, the intermodal bus station, mentioned above, and the remodeling of the Abando rail-

way station, next to the Plaza Circular, to convert it into a modern intermodal terminal play a relevant role. In the vicinity of the square and the new station, the Bizkaia Tower is planned, a rehabilitation project for what until a few years ago was the headquarters of Banco Bilbao Vizcaya. The new facility will be an international entrepreneurship center.

Currently, as the axis of the smart city, the Zorrotzaurre project is being developed, known as «The Island» and designed at the time by the Pritzker architecture prize winner Zaha Hadid.

The Zorrotzaurre urban regeneration project is outside the limits of the Ensanche but is considered an extension of the Abandoibarra project. The small peninsula existing in the Ria, with remains of disused industrial fabric, has recently become an island thanks to the opening of the old Deusto canal. Working and living in the middle of the estuary will be possible after the approval of the Zorrotzaurre Special Plan in 2012. This island is characterized by a mixed use of land, with technological centers, services, a university and new residential buildings.

The construction of almost 5,500 homes is planned for the new island; half of them will be protected. Thus, a balanced development of the residential area is sought, which will be completed with 150,000 m² of surface for public use and around 90,000 m² of plots intended for facilities. The completely new planning will allow controlling building density, giving rise to small-scale buildings, which generally will not exceed ten floors, thus following the example of Abandoibarra. In order not to lose the memory of what this peninsula once was, 19 industrial buildings will be rehabilitated for different purposes. It is estimated that the mix of land uses in Zorrotzaurre will mean the generation of 6,000 new jobs, largely linked to the Technology Park that will be installed at the ends of the island. Zorrotzaurre can be accessed via up to four new

bridges, some of which will include the tram route. The island is an area with a high probability of flooding according to the flood zone map. For this reason, the project includes a series of tanks that will collect rainwater both to reuse it and to retain it at high tide and drain it at low tide. Finally, the edges of the island will be reinforced with protection against possible rising waters.

This island will act as a laboratory for the new smart city, to be able to implement these strategies to the rest of the city.

Keeping in mind the 2030 agenda, a triple social and ecological digital transformation has been carried out since 2020. All of this promoted by public institutions with private participation.

A digital transformation that seeks readaptation to new times. Responding to new economic and social challenges. Small businesses are promoted with new intelligent services. Global digitalization focuses on people, promoting quality of life, social cohesion, inclusion and diversity.

Conclusions of an unfinished city

The transformation of urban space always has as a background time, the needs and aspirations of the beings that inhabit that space.

The set of actions undertaken in the last 40 years has led to a significant morphological transformation of the Ensanche, which begins with the elimination of barriers and the alteration of limits and gives way to the creation of new axes, new urban fabric and new centralities.

The reorganization of the connections and the structure of the new urban area has caused a restructuring of the axes in the Ensanche. Yes, until 1983, Gran Vía was the backbone of the urban fabric with several diagonals that started from the epicenter of

Plaza Moyúa. After the transformation process and as a consequence of the installation of the new Euskalduna bridge, the axis of the Gran Vía is reinforced in the final section, next to the Sagrado Corazón roundabout.

Two of the main diagonals of the Ensanche, Ercilla and Elcano streets, mainly the latter, are consolidated as axes, creating an element of torsion in the urban fabric.

-Appearance of a new urban landscape - La Ría.

The paradigm shift of the estuary, from an industrial «depot» to an urban space, implies that the sheet of water loses its barrier status and is symbolically configured as an extension of the Ensanche itself towards the right bank. New bridges and walkways strengthen the connection of the new urban fabric with the pre-existing fabric and of the Ensanche with the districts of Deusto and Uribarri, on the right bank of the estuary.

The set of actions has led to the creation of a new urban landscape following the sinuous course of the estuary and has returned to this geomorphological accident the structuring role in the city that it had long ago.

-New centralities. Polynuclear phenomenon of differentiated uses.

Frank Gehry's construction of the Guggenheim Museum was the spearhead of the area's regeneration. It was the architect himself who chose the location of the art center, next to the estuary and the Salve bridge. The construction of this spectacular building is followed by the installation of other educational and cultural facilities, stakeholders, residential and large recreational areas, where art is mixed with green areas and walking areas. The different elements are integrated into the landscape as if it were a puzzle.

The transformation can respond to the «waterfront» scheme, that is, the regeneration of a water façade, such as the projects that have been carried out in cities such as Boston or London. However, the case of Bilbao involves more ambitious implications related to mobility and residential, introducing new typologies, not only in the Abandoibarra area.

Multifunctionality and organic morphology mark the new area of centrality that emerged in Abandoibarra. It is a permeable centrality, with centripetal and centrifugal movement. The Guggenheim Museum and the rest of the pieces that make up that space act as an attracting element. Tourists who visit the Guggenheim pass through the new centrality, university students who go to the new academic facilities, professionals who work in the Pelli Tower and families who attend concerts at the Euskalduna Palace, go shopping at the Zubiarte shopping center or enjoy the recreation areas. At the same time, the centrality of Abandoibarra generates a centrifugal force on the rest of Ensanche due to its role as a regenerator of the environment and engine of the economy.

Along with the centrality of Abandoibarra, it is worth mentioning three others that emerged from smaller-scale transformative processes but that have also significantly changed the urban morphology and the quality of life of the residents of those areas. Ametzola, Garellano and the Azkuna Zentroa area can be considered new centers of centrality

In Ametzola, the burying of the railway tracks has allowed the creation of a residential complex, with a typology similar to the pre-existing one, surrounded by a large green area. The new station and the connection between railway services determine its centrality function.

It is still worth mentioning the reinforcement of the centrality of the Circular Plaza, which is planned in the future. The space will be reinforced by plans to remodel the Abando train station and renovate the Bizkaia Tower, where the International Entrepreneurship Center will be installed. The creation of a large green area in the area is also scheduled, just a few meters from the Estuary and the Arenal bridge, which connects with the Old Town.

-Increase in sustainable mobility and connectivity.

The implementation of new public transport systems and new connections, both internally and between Ensanche and abroad, constitute a defining characteristic of the transformation carried out in the last 40 years.

The city of the future must necessarily be a sustainable city, which gives priority to the pedestrian over the car, which provides fast and effective transport alternatives and which facilitates both internal and external travel. Thanks to a set of actions framed in the global strategy to reduce environmental pollution, Bilbao has

become one of the first Spanish cities in mobility indices.

The installation of the metro, a transportation solution long awaited by citizens, has meant a quantitative and qualitative change in mobility within the Ensanche, with the rest of the city and the Metropolitan Area. The same has happened with the installation of the tram line that runs from the southern limit, next to the original core of the city, to the Basurto area, in the west, much of its route coinciding with the axis of the estuary.

The reorganization of the railway system has been an ambitious set of actions that, in addition to involving the burying of the old tracks, has made it possible for the train integrates naturally into the city space. Internal vehicle travel has been reduced. According to the latest Bilbao Urban Observatory, 87% of people

who work in Bilbao walk or take public transport to their workplace, a rate significantly higher than other Spanish and even European cities.

-Positioning of the city in global space. Appropriation of urban identity.

When the administrations agreed on a global strategy to modify the city of Bilbao, they considered, among other objectives, achieving an economy different from the one that had been buried in the destroyed or abandoned industrial warehouses. From the beginning, they decided to carry out actions based on quality projects and attract prestigious architects. The bet exceeded all expectations and today the Bilbao brand resonates throughout the world.

The design of the subway by Norman Foster was the first step. The installation of the Guggenheim Museum, with the spectacular design of Frank Gehry, was the definitive leap to place the city at the architectural avant-garde and make everyone want to visit this new temple of art. Gehry's signature on this new facility on the edge of the estuary had a multiplying effect, encouraging other prestigious architects to participate in new projects to transform Bilbao. The city is today an icon of contemporary architecture, culture and urban planning, which has already been defined as the «Bilbao effect».

This new model of city carries its name throughout the world, an advertisement that has been noted in the growing number of tourists who arrive each year.

Tourism and brand image are leaving their mark on the activity of two renovated infrastructures, the cruise ship dock and the new airport terminal, but also in the city's tertiary sector. Along

with the push from the hotel sector, a boost from the economy linked to culture and the celebration of congress stands out; also a moderate boost until now of the economy linked to the technology sector and entrepreneurship.

The fact that the transformation has reinforced the identity of the city and the pride of belonging to it among the people who live there is, without a doubt, another mark of what happened in Bilbao.

Citizens identifying with their city and interrelating with space is one of the premises that should mark the urban development of the 21st century. The trend of Urban Morphologism, in which the works of Aldo Rosi, among others, are framed, points to the need to «find other ways of approaching design that allow us to respond to the diverse social demands for significant spaces, susceptible to understanding and appropriation»²³².

For citizens, the transformation has meant an improvement in mobility, new cultural and educational facilities, the creation of green spaces and recreation areas in an area next to the estuary that until a few years ago remained hidden and gray for the residents of Ensanche. and the city. Citizens have reconquered the city center in the urban space.

Residents of Bilbao value the international projection that the city has but also the fact that, however, it has not lost its own local character. The transformation has meant reinforcing the pride they feel in their city, which they consider attractive, sustainable, creative, multicultural, open and dynamic.

²³² Sánchez De Madariaga, Inés, *Esquinas inteligentes: la ciudad y el urbanismo moderno*. Madrid: Alianza, 2008, p. 36.

**L'IDEE DE LA « VILLE
INTELLIGENTE » COMME
ESQUISSE DE LA
COMMUNICATION
ENVIRONNEMENTALE. DEFIS ET
ENJEUX POUR UN
AMENAGEMENT DURABLE A
LUBUMBASHI (RD CONGO)**

Benjamin Ibimi Ngambun

Université de Lubumbashi/RD. Congo

Abstract

The idea of the smart or sustainable city has become a social norm guiding society to environmental communication. This communication, verbal or not, aims to mobilize and obtain support for the sustainable project. Principal frameworks use intentional and persuasive communication focused on the environmental crisis to encourage green actions.

Local communication strategies inform, convince and encourage people to believe in the possibility of lasting change. Sometimes you need to involve opinion leaders as participants and give them a key role in raising awareness. Artists play an important role in using surprise and persuasion to raise awareness. Event professionals are seen as the future creators of communication techniques for the third millennium.

Communication on “sustainable change” aims to prepare minds for ecological change. Territorial communication actors must avoid blaming speeches and favor communication that encourages urban change. Without consensus and effective local communication, individual citizen engagement in ecological practices remain difficult and subject to frequent failures.

Introduction

En juillet 2015, le président Joseph Kabila a inauguré l'immeuble le plus intelligent de la République démocratique du Congo à la place Royal à Kinshasa, qui abrite l'Hôtel du gouvernement avec en son sein une dizaine de ministères et de différents services publics ([http : //www.radiookapi.net](http://www.radiookapi.net)). Ce projet évalué à 37 millions de dollars a suscité des vives critiques de la part de ceux qui estimaient que le pays avait d'autres urgences. Plusieurs autres projets urbains s'inscrivant dans la droite ligne de l'adaptation à l'idée de ville intelligence ont connu les mêmes critiques acerbes et désobligeantes. Au Sénégal, le lancement du Train Express Régional en 2021 et 2022 n'a pas été majoritairement salué par les Sénégalais²³³. Pas plus qu'il y a quelques jours, le président malgache a exprimé simultanément son indignation et sa détermination à « changer le visage » de son pays malgré les critiques de sa population qui revendique de l'eau à boire au lieu de la station téléphérique inaugurée à Antananarivo. Pour Rajoelina, même la construction de la tour Eiffel, qui est actuellement l'un des sites touristiques le plus visités de la France a été sévèrement critiquée par les Français.

Que ce soit pour réduire la taille du loyer gouvernemental, soit pour innover dans le secteur de transport interurbain, soit pour améliorer l'accès au soin de santé primaire, certain gouvernement africain heurte les critiques et la grogne de la population. Ce comportement met en exergue une certaine impréparation et inadaptation de la majorité du peuple africain à accueillir véritablement l'avènement d'une « ville intelligente ». Or la préparation et l'adaptation impliquent impérativement un flux informationnel. Ce dernier, à son tour implique des formations ou de sensibilisations

²³³ Cf. [http : // www. Lemonde.fr](http://www.Lemonde.fr)

afin d'inculquer au peuple les prérequis du nouvel attribut de la ville. D'autre part, c'est la pomme de discorde entre gouvernants et gouvernés : la satisfaction des besoins primaires (santé, éducation, alimentation, etc.). Cela indique par ailleurs le cloisonnement par lequel les gouvernants africains devraient penser l'architecture de la « ville intelligente ». Le véritable cloisonnement dans ce sens, passerait par la communication tous azimuts.

Par ailleurs, la mobilisation des ressources humaines pour lutter contre l'insalubrité, le réchauffement climatique et plusieurs autres facteurs de la dégradation environnementale a pour finalité de forger l'imagination d'une ville intelligente ou durable, (VD). Celle-ci est considérée comme un imaginaire urbain innovant d'autant plus qu'une ville durable fédère plusieurs représentations sociales autour d'une cause commune. La ville durable dans le contexte africain mérite une cogitation à la base (avenue, cellule, bloc) et donne lieu à des dispositifs spécifiques, qui répondent à une question de société contemporaine²³⁴. La ville intelligente (durable) devrait être le fruit d'une production, d'une construction et d'une formulation, qui accompagne des actions des collectivités ou entités de base à l'instar de la rue, la cellule et du bloc dans le domaine de l'aménagement urbain.

À ce titre se pose la question de la pertinence de la communication face à ce double projet de territoire et de société. Ce projet intelligent sans enfreindre l'idée qu'il sert d'« exutoire » à l'angoisse contemporaine, ne se positionne-t-il pas tel un dessein

²³⁴ Gagnebien A., et Bailleul H., « la ville durable imaginée : formes et modalités de la communication d'un projet de société », *Etudes de communication* (en ligne), 37, 2011, consulté le 29 juin 2024, URL : <http://journals.openedition.org>

d'horizon suscitant l'espoir, la controverse (mais aussi un nouveau modèle de société, induisant de nombreux changements, tant dans la structure de la ville que dans les comportements des citadins »²³⁵. En outre, quelles sont les formes dans lesquelles s'incrument ses enjeux et ses modalités pratiques ? Si l'idéal du projet cherche à recréer à la fois une « communauté de destin » et provoquer un irrésistible attachement au territoire urbain, il se structure indéniablement autour de sa forte capacité à être séduisant et à fonctionner comme un réseau de valeurs-signes participatives à l'élaboration du mythe²³⁶. Bref il se structure tel un système symbolique.

Ainsi la complexité des rapports humains et les interactions sociales provoquées par les thématiques environnementales dans plusieurs entités municipales de Lubumbashi nécessitent la mise en œuvre des stratégies efficaces et efficientes : la conception des messages écoconçus, le choix et l'utilisation des outils adéquats. Cette stratégie est basée sur l'incitation des individus au changement, et à un autre niveau, comme une preuve de l'exemplarité de l'action territoriale²³⁷. Au-delà de la formulation d'objectifs d'aménagement à l'échelle locale et mondiale (Agenda 21), mise en œuvre dans une sphère technocratique, il semble que le projet d'une ville intelligente (durable) soit l'émanation d'une certaine communication tenue face au grand public, cela à l'occasion de mises en relief de récits menées par les acteurs de la communica-

²³⁵ *Idem*

²³⁶ Sauvageot A., 1987, *Figures de la publicité, figures de la mode*, Paris, Presses Universitaires de France. Cité par Anne Gagnebien et Hélène. Bailleul. *Op. Cit.* <http://journals.openedition.org>

²³⁷ *Idem.*

tion de ces entités de base (presse régionale et nationale, presse territoriale, etc.).

Cette réflexion part de l'observation et de l'analyse du paysage urbain, des comportements des citoyens pour s'atteler sur les approches qualitatives et quantitatives. Cette démarche vise l'appropriation du projet de ville durable partant de la ville de Lubumbashi en Rd Congo. Ce projet est pensé tel un acte de communication environnementale faisant partie de la stratégie de développement durable des entités de base. Il s'agit de voir dans un premier temps que le processus d'aménagement durable est un acte de communication parce que d'une part, il met en relation des interlocuteurs qui interagissent soit par le verbal, le non verbal et le numérique. D'autre part, il unit des acteurs qui utilisent de canaux ascendants, descendants et horizontaux pour se communiquer. Cela a permis de définir et d'analyser les stratégies et les outils de communication, susceptibles de mieux atteindre un large public, et de provoquer en eux une rétroaction. S'inscrivant dans le champ des Sciences de l'Information et de la Communication (SIC), l'on part du principe que les discours éducatifs, prédictifs, d'accompagnement ou d'injonction jouent un rôle indéniable dans la diffusion de la notion de ville intelligente ou d'aménagement durable.

1. Ville formelle et ville informelle : le vrai dilemme africain

L'arrivée dans une ville africaine est souvent intriquant par le visiteur. Ce dernier découvre le contraste surprenant d'une ville à double facette. Elle est formelle : organisée, souvent planifiée et équipée, et informelle : caractérisée par son étalement, son inorganisation, son sous-équipement, à côté d'une croissance vertigi-

neuse. Ce désordre est souvent imputé sans trop de peine, à une déficience remarquable dans la planification administrative de ces villes. Cela peut à la fois s'avérer vrai comme aussi bien-être faux. En réalité, le taux élevé de croissance des villes rend inopérante la pratique de planification urbaine mise en place jusqu'ici. La difficulté provient de l'accroissement rapide des villes africaines à des rythmes qui imposent le doublement de leur population et de leur superficie tout les quinze à vingt ans. Un vrai dilemme à la mutation vers la ville durable. D'autant plus que ce phénomène se retrouve dans toutes les villes, qu'elles soient petites (moins de 100 000 habitants), de taille intermédiaire (de 100 000 à 1 million d'habitants), grandes (de 1 million à 5 millions d'habitants) ou très grandes (plus de 5 millions d'habitants)²³⁸. À titre d'illustration, l'agglomération de Lagos au Nigeria, peuplée de plus de 14 millions d'habitants, accueille 500 000 nouveaux habitants par an. La ville de Kinshasa (11 millions d'habitants) accueille plus de 300.000 nouveaux habitants et Lubumbashi dont la densité est évaluée à 7 millions accueille quant à elle plus de 100. 000 nouveaux locataires de la ville. Tous ces chiffres rendent difficile l'adaptation aux méthodes classique de planification urbaine pour anticiper et traiter des croissances de cette ampleur. Dans de telles circonstances, il est très difficile d'organiser à l'avance l'appropriation ou l'occupation du sol. Il n'est pas étonnant que la croissance urbaine dans la plupart des villes africaines se fasse par addition de quartiers auto-construits (Elong Mbasi., 2019)²³⁹, par les habitants eux-mêmes, sans lotissement préalable, mais avec

²³⁸ Elong Mbasi JP., (2019). La révolution urbaine africaine et les collectivités locales, In *Afrique Contemporaine*, (En ligne) consulté le 28 juin 2024. URL : <http://www.cairn.info>.

²³⁹ *Idem*

l'intervention des « chefs de terre », qu'ils relèvent des autorités de l'État moderne ou des autorités traditionnelles.

2. Communication de masse dans la projection durable

Dans les quartiers sous étude, les résultats montrent que les quartiers planifiés utilisent soit l'interaction indirecte (60%) comme canal de communication. Il s'agit de relais communautaires (10%), de téléphone 30%), des invitations écrites (10%), des communiqués officiels (10%). Soit l'interaction directe (30%), où l'on peut constater que le bouche-à-oreille (10%) le porte-à-porte (10%) et les réunions circonstanciels ou périodiques (10%) constituent les principaux canaux de communication. Pour cette catégorie, le téléphone est le média le plus utilisé d'autant plus qu'il permet la localisation, l'accessibilité et la transmission rapide du message à un récepteur. Dans ces quartiers planifiés (Kitumaïni, Lualaba, Shindaïka etc.), la « complexité de l'urbanisation » et les « exigences de la modernité », lesquelles définissent les « protocoles de visites » chez autrui contribuent énormément dans le processus d'interaction entre cadres de base et les populations membres de l'entité administrative.

Par contre dans les quartiers non planifiés, où le taux d'alphabétisme est faible (30%), les cadres de base ont principalement recours à l'interaction directe (70%). Le porte-à-porte (30%) et l'invitation orale (30%), rarement les communiqués officiels (5%) ou les réunions périodiques ou circonstanciels (5%) constituent les canaux privilégiés pour interagir. L'abandon ou l'usage peu fréquent des canaux à interaction indirecte (téléphone, télévision, réseaux sociaux) est justifié par le fait que ces médias rencontrent des difficultés similaires à celles reconnues à la presse

papier et à l'avènement d'internet. Internet, ainsi que l'affirment Makal Samanyong et Makal Kanteng, a particulièrement connu un rendez-vous manqué à Lubumbashi²⁴⁰. Il est réservé à un public instruit, vivant au seuil de l'embourgeoisement, un public qui considère que le scénario de la conceptualisation du futur d'une ville « véritablement durable » se profile à travers l'imprégnation sociale de ces voies de contact qui rythment les accentuations que subit l'évolution d'une société²⁴¹. Or la plupart des quartiers non planifiés de la ville de Lubumbashi, estime le sociologue Pierre petit que nous paraphrasons, se caractérisent par un niveau de précarité, gage d'une « ruralité » légendaire qui interpelle la volonté politique tant au niveau provincial que national²⁴². Le niveau de paupérisation qui stratifie la population en classe des riches ou des nantis et d'exécrablement pauvres ou les marginalisés, se remarque même dans l'insertion de chacun dans la société dite numérique ou digitalisée. La plupart des populations qui vivent à Lubumbashi et dans ces environs, ne semblent pas assez maîtriser ces « autoroutes de l'information » et, donc sont-en hors de jeu de la « société de l'information » dont les imaginations et les idées les plus débridées sur l'avenir démocratique de la société s'affrontent²⁴³. Le constat de Mazinga va jusqu'à montrer que dans la sphère de Lubumbashi,

²⁴⁰ Makal S., et Makal K, « Regards sur la presse écrite de Lubumbashi. De l'indépendance à l'ère de l'internet », In Mbegu, *Les sciences de l'information et de la communication en RDC*, 2019, Lubumbashi, p.70.

²⁴¹ Sorokin Pa, » Comment la civilisation se transforme » Librairie marcel Rivières et Cie, Paris, 1964, p. 68-69.

²⁴² Petit P. (Dir) *Ménages de Lubumbashi entre précarité et recomposition*, Paris, L'Harmattan, p. 12.

²⁴³ Mazinga M. (1996), *Télévision et responsabilité des parents*, In *Famille et Télévision, Actes de la 28e Journées Mondiales des Communications Sociales*, Kinshasa, FCK, p.106.

certaines médias traditionnels comme tout aussi bien ces nouveaux médias, sont encore des nouveautés pour la quasi-totalité de ces populations, et que leur vie quotidienne, même dans le centre urbain de Lubumbashi se déroule à la lisière de ces « médiateurs techniques »²⁴⁴ qui font la puissance et le prestige de l'Occident.

2.1. Canaux d'information : luxe et corruption sociale

S'insérer dans la logique d'une sensibilisation durable au travers la coalition des médias classiques et nouveaux médias s'avère une aventure à la fois délicate et déconcertante. D'autant plus qu'elle brandit d'une part un « luxe » de lors que son public ne se recrute que dans le cercle des nantis et des initiés de la nouvelle société de l'information. D'autre part, il y a une « corruption » sociale observée auprès des dépourvus du savoir numérique. Ceux-là, étant donné que l'adhésion à la télévision ou à la radio est exclusivement liée à la fonction distractive au détriment de la fonction informative ou encore éducative. On sait que la radio et la télévision, comme d'ailleurs depuis peu l'internet exerce une action sur les rapports entre les individus et la culture. Il ne s'agit pas d'émerger un modèle spécifique de culture comme on l'a cru vainement, ou de créer un nouvel imaginaire social susceptible de créer la réunification des parties. Cet imaginaire social existe bel et bien dans les substrats culturels des sociétés comme ce « processus d'élaboration perceptive et mentale de la réalité qui transforme les objets sociaux (personnes, contexte, situation, évènement ...) en catégories symboliques (valeurs, croyances, idéologie...) et leur confère un statut cognitif en permettant d'appréhender les aspects

²⁴⁴ *Idem*

de la vie ordinaire par un recadrage de nos propres conduites à l'intérieur des actions sociales »²⁴⁵. Mais en créant des nouveaux espaces d'assimilation et de mimétisme rivalisant cruellement avec les acquis de l'institution scolaire.

Ne convient-il pas de qualifier cela d'un « nouvel esprit du temps » orphelin d'une paternité et dépourvu d'un scénariste pouvons-nous nous interroger à la suite de Mpungu Mulenda²⁴⁶, ou bien devons-nous admettre ce nouvel esprit du temps, comme l'émanation de ces médias considérés par E. Morin, comme des « dispositifs d'échange quotidien entre le réel et l'imaginaire, appelés à fournir des soutiens imaginaires à la vie pratique et des points d'appui pratiques à la vie imaginaire »²⁴⁷. L'autorité parentale semble à cet effet mise en cause de manière collective²⁴⁸ elle qui devrait pérenniser ces acquis scolaires dans le chef des enfants. Ainsi, la question relative à la détermination de multiples interactions entre la famille et les images télévisuelles dans une démarche durable réglerait préalablement le fondement de l'indice culture formulé en ces termes : là où le niveau culturel des parents est moins élevé, les rapports avec la télévision, bref, avec les médias

²⁴⁵ Pungi L., (2013). Eduquer aux médias à l'ère de l'internet. Repères théorique et pistes d'action en RD. Congo. Kinshasa, Médiaspaul, p. 65.

²⁴⁶ Mpungu Mulenda J., (2019) Médias et imaginaires, In *Mbegu, Les sciences de l'information et de la communication en RDC*, 2019, Lubumbashi, p. 76.

²⁴⁷ Morin E, (1962) *L'esprit du temps*, Paris, Grasset, p. 34.

²⁴⁸ Okomba W., « Télévision et famille : Essai d'analyse structurale », In *Famille et télévision, Actes de la 28e Journées Mondiale des Communications Sociales*, Kinshasa, FCK, pp. 45.

traditionnels ou les nouveaux médias (Sic) sont de l'ordre de la fascination et de l'émerveillement²⁴⁹.

Tout compte fait, l'usage des canaux de communication vu sous le prisme d'une ville intelligente est complexe. Une complexité qui débouche tout d'abord de l'univers assez sophistiqué de ces médias qui créent de l'évasion pure et simple auprès de ces nouveaux utilisateurs à Lubumbashi. Ensuite, la complexité émane du clivage social qu'elle crée dans une société où les garants du secret de la technologie matent les ignorants. Il y a donc, à cet effet, une certaine absence d'inclusivité et d'harmonie dans l'utilisation des canaux de communication dans la perspective durable. Si l'interaction indirecte expose les difficultés liées à l'adaptation et à l'insertion culturelle des individus dans l'ère de NTIC, l'interaction directe ramène quant à elle la difficulté liée à l'oralité comme principale forme de prise de contact avec l'altérité. Cela est souvent visible à travers les mécanismes psychologiques d'oubli et de distorsions. Les messages transmis par biais de relais communautaires sont souvent confrontés à ces difficultés. Cela est dû au fait que chaque message est appréhendé en fonction des codes éducatifs qui constituent le cadre de référence culturel du récepteur. Et c'est en ce moment que la fonction de mémorisation, qui sert de support au stockage et à l'utilisation de l'information reçue entre en jeu à travers deux phases : l'acquisition et l'actualisation. On ne peut conserver l'information reçue et la réutiliser ultérieurement que si elle a retenu notre attention. C'est-à-dire qu'au départ, notre mémoire est « sélective » et les informations reçues et réactualisées répondent à un intérêt humain majeur. D'où le déploiement d'une stratégie de communication efficace et

²⁴⁹ Mazinga M., *Op. Cit.*, p.22.

efficace afin d'attirer l'attention de populations et de solliciter leur adhésion aux messages de sensibilisation vers le durable.

3. La communication de proximité : une stratégie dans la perspective durable

Les villes africaines à l'instar de la ville de Lubumbashi sont plus jeunes et plus flexibles que les villes des pays développés. Ce sont des métropoles de moins en moins freinées par le poids des infrastructures existantes. Par conséquent, elles offrent de nombreuses opportunités pour l'émergence d'une panoplie des projets à fort potentiel technologique comme le passage direct au mobile et à la fibre optique.

Les deux types d'interactions²⁵⁰ analysés précédemment concourent à une seule finalité : celle de rechercher la proximité entre les parties prenantes au projet de la ville durable. À travers le porte-à-porte ou le bouche-à-oreille, les invitations écrites et l'organisation de réunions ou des activités liées à l'assainissement du milieu, tous ces efforts visent à réduire l'écart entre un émetteur et un récepteur et favoriser une certaine familiarité. La communication de proximité est une communication décentralisée qui cible objectivement un groupe ou un individu spécifique au niveau de communautés locales. Thierry Libaert affirme qu'elle « est centrée sur le local, à la recherche des relations des face à face, des valeurs du terroir et des racines. Liée intrinsèquement à la communication environnementale en raison d'impacts écologiques, son opérationnalisation s'effectue selon un axe dynamique, évolutif, une parfaite connaissance du jeu des acteurs et l'ouverture d'un dialogue »²⁵¹.

²⁵⁰ Teri K., Gamble M. (2016). *Communiquer et interagir*, Quebec, Chenelière Education, p.5.

²⁵¹ Libaert L, *La communication de proximité*, (en ligne), consulté le 29 juin 2024. URL : [http : //tlibaert.info](http://tlibaert.info).

Tous ces éléments ne peuvent s'opérer qu'à l'échelon local et dans une approche participative. Cette dernière postule que « l'adhésion aux changements proposés implique un dialogue, une négociation, prenant en compte non seulement les besoins prioritaires de la population, mais aussi ses pratiques, son savoir et ses techniques, qui contiennent bien souvent les solutions les plus appropriées et les mieux adaptées aux conditions du milieu »²⁵². Le voyage vers une ville intelligente dans le contexte africain et spécifiquement à Lubumbashi a besoin de l'« inclusivité endogène ». C'est-à-dire que le projet durable doit réunir toutes les communautés humaines sans exclusions possibles, et prendre en compte la somme du savoir interne qu'elle possède. Ceci offre les assurances réelles pour une appropriation et une adaptation à une mentalité durable qui ouvre la voie au changement de comportement durable.

Ce changement est pourtant possible grâce à l'apport de modèle transthéorique de James Prochaska et de Carlo DiClemente qui étudie la motivation par laquelle une personne change soit seule soit à l'aide d'un thérapeute. Ce modèle présente une série d'étapes à travers lesquelles passe une personne en voie d'abandonner une habitude (dépendance à l'alcool, drogue, tabagisme...). Que ce soit hors ou dans le cadre d'une thérapie, le devenir des personnes semble passer par des phases similaires²⁵³, et

²⁵² Ibimi Ngambun., (2022). La communication pour un aménagement durable à Lubumbashi. Entre imagination formes et modalités sociales, *In Revue Della/Afrique*, Tome 2, Vol.4, n°11-Nov 2022, (En ligne) Consulté le 29 juin 2024, URL : <http://www.revues.acaref.net>

²⁵³ Ces étapes sont : la précontemplation, la contemplation, la préparation, l'action, le maintien, la terminaison cf. Prochaska, J.O. et DiClemente, C.C. *Op. Cit.*, p. 276-287.

utilisent tout aussi bien des processus similaires, dans une perspective de changement culturel profond et durable²⁵⁴. Mais pour des raisons de méthodologie, nous estimons que deux étapes seulement semblent s'appliquer véritablement à la cartographie environnementale que présente la ville de Lubumbashi.

3.1. La précontemplation et la contemplation

3.1.1. La précontemplation

Appelé aussi stade de « l'inaction » ou de la « non-implication », à ce premier niveau, la personne ne reconnaît pas ou ne réalise pas qu'elle a un problème lorsqu'on lui en parle. Souvent la personne ne se sent absolument pas concernée par le problème écologique et encore moins du danger que cela représente dans la vie ou dans l'entourage direct. Il est donc très difficile de tenter un changement de comportements, car la personne est d'emblée réticente à tout changement, ayant tendance à nier le problème ou à rejeter la faute sur les autres. La non-implication ou la préintention peut individuellement et collectivement se faire ressentir dans une sorte de déni populaire allant des critiques aux sabotages et révoltes. On se rappelle qu'en 2014, les Congolais n'ont pas bien accueilli l'avènement de la fibre optique, car soupçonné d'être un projet inutilement coûteux. Il est inachevé jusqu'à ce jour pendant que le pays connaît l'un service internet défectueux, mais paradoxalement l'un des plus chers au monde. Comment les cadres de bases devraient-ils communiquer avec les populations non impliquées et réticentes à un quelconque change-

²⁵⁴ Chabaud J., (2007). « Développement durable et écocitoyenneté : des gestes aux actes, le chaînon manquant, intervention au colloque international Instituer le développement durable, Atelier n°3 » « Comportements », Lille, 8-10 novembre.

ment ? Quelles stratégies et quels médias d'accompagnement faut-il mettre en place à ce stade ?

● **Informier et convaincre**

Excepté dans certains coins de Kalubwe, Kasungami, Tshamalale qui connaissent des nouveaux lotissements et sont de fois inaccessibles, dans le reste des quartiers planifiés ou non planifiés, les cadres de base informent à 90% leurs populations. Le 10% concerne une information transformée par les distorsions et les incomplétudes caractérisées souvent par la pollution sonore ou la saturation de réseaux téléphoniques et autres éléments qui gênent la clarté du message. Au moins sur le terrain, on peut constater que l'information reçue de la hiérarchie s'applique à travers des actes concrets tels l'organisation de travaux d'assainissement (80%), la sensibilisation sur le terrain (70%), la convocation des réunions (30%) pour le $\frac{3}{4}$ des quartiers non planifiés. La tendance varie ostensiblement dans les quartiers planifiés Luluaba, Shindaïka, industrielle ou encore à Mampala où l'on constate que les cadres de base ne fournissent pas d'efforts supplémentaires pour informer. La rétroaction est l'effet d'un degré élevé de conscientisation aux problèmes environnementaux. S'il faut considérer que l'information n'est pas restée exclusivement l'apanage de technique marketing et publicitaire, elle s'applique aussi bien aux techniques écologiques qui recherchent par ce biais, le changement de comportements. Il est à noter qu'informer peut dans une demi-mesure, employer des techniques de persuasion, mais en général sa spécificité repose davantage sur les faits.

Tandis que convaincre cherche à appeler l'émotion de l'individu, afin qu'il adhère à la mentalité durable. On peut le percevoir à travers les activités d'assainissement (80%), les participa-

tions aux réunions (60%), les échanges téléphoniques récurrents (50%), qui montrent que d'une manière ou d'une autre, les cadres de base touchent aux « affects » ou aux « sentis » d'une bonne partie des populations respectives. Ainsi, la participation ou l'adhésion massive souhaitée devient un « idéal social » à atteindre, et elle peut prendre encre dans ces nouvelles modalités : la connaissance de bruitage de l'information, l'assouplissement de points de vue divergents sur la perception sociale de la mutation urbaine vers le durable et, la recherche collective de leur congruence vers la nécessité du changement durable.

Une telle démarche exigerait l'augmentation de niveau de conscience écologique. Celle-ci passe par la production d'une information proactive, citoyenne et responsable, c'est-à-dire, celle qui prédispose des individus à l'anticipation et à la participation dans la lutte contre les facteurs de bouleversement de l'ordre social. La transversalité de cette information transmet des messages de sensibilisation clairs et précis, tenant compte du niveau d'instruction de la population et du caractère scientifique de la terminologie écologique. C'est à ce niveau que le critère d'intellectualisme avéré devient un impératif pour les cadres de base.

3.1.2. La contemplation

C'est le stade de la prise de conscience où l'intérêt pour la question écologique est un peu plus fort. Le problème est reconnu, et la nécessité d'un changement commence à être admise. Mais le niveau de connaissance étant partiel, l'individu vit la peur du changement. Il oscille entre les avantages et les désavantages de l'abandon des vieilles habitudes et l'adoption des nouvelles habitudes pour sa vie future. Cela fait encore renaître le besoin d'être convaincu avant de passer à l'acte. C'est de cette manière, et faute à une information suffisante, que plusieurs fonctionnaires congo-

lais boudent encore la bancarisation. Car habitués à faire la queue pour percevoir leurs émoluments. De même, plusieurs structures scolaire et sanitaire peinent à faire fonction le système d'abonnement et de paiement de service par virement. Les mentalités réfractaires mettent en exergue l'impréparation et la réticence à l'intégration et à l'adaptation des mentalités durables.

● **Convaincre et donner envie**

Face aux exemples susmentionnés, il y a ici un réel besoin de l'évaluation des enjeux que présente l'idée d'une mutation durable. À ce stade, la personne doit commencer à évaluer les enjeux, sa responsabilité, et les solutions possibles. Cela peut se faire de deux manières : par la favorisation de l'éveil de l'émotionnel et par l'incitation à la réévaluation personnelle.

Par éveil émotionnel l'on sous-entend le besoin d'identification et d'expérimentation qu'il faut susciter en la personne. Face à cette nécessité, les cadres de base feront un effort d'amener chaque individu à se découvrir face aux exigences de l'aménagement durable. Les collatéraux d'un environnement insalubre, l'intérêt pour un changement, et les avantages que cela peut présenter, deviennent les points focaux de la communication du sensibilisateur. L'individu devra, à cet effet, sentir la différence entre le mode de vie ancien et le nouveau. Le sensibilisateur est convié à bannir la dramatisation factuelle à ce stade, car elle peut rigidifier les barrières culturelles et empêcher la dégustation aux nouvelles habitudes sociales et individuelles.

L'incitation à la réévaluation personnelle préconise qu'un auto examen vise à évaluer la perte ou le gain si un individu décide d'opérer le changement dans sa vie ou en faveur de son milieu de vie. Compte tenu des aléas socioculturels, susceptibles de remettre

en cause la motivation et l'engagement à tout moment, la stratégie de l'engagement de leaders du milieu dont parle Gérard Baril²⁵⁵ est vivement sollicitée ici. Elle consiste à intégrer, dans le cadre d'une intervention de promotion durable, la participation active de leaders communautaires (chefs traditionnels, responsables religieux et politiques, leaders de la société civile...), des personnes non professionnelles, des rémunérées ou non. En raison de leur lien privilégié avec la population ciblée, en tant que pairs, ces leaders communautaires doivent s'ouvrir préalablement à un dialogue et à l'échange d'information sur le concept de la ville intelligente, son déploiement, avant d'apporter une contribution particulière à la sensibilisation de masse.

3.2. La radio, la communication à double étage et l'évènementiel

Nous n'avons pas mené une étude spécifique pour déterminer le taux d'alphabétisation des populations dans la ville de Lubumbashi. Nous constatons que la majorité des cadres de base ont par ailleurs un niveau d'étude bas. Ce qui peut poser de problème d'assimilation de messages de la hiérarchie et leur retransmission aux populations. Ces intermédiaires tentent inlassablement la retransmission des messages reçus de la hiérarchie, mais de fois échouent, certainement à cause de leur incapacité à identifier de freins et contraintes psycho-anthropologiques, de bruitage et de saturation de réseau, de distorsion et dissonance cognitives qui entravent le changement constructif et durable.

Cela ne peut pas produire de bons résultats à cause de l'absence de la reconstruction de l'imaginaire individuel et collec-

²⁵⁵ Baril G., (2016). L'efficacité de l'engagement de leaders du milieu en promotion des saines habitudes de vie : synthèse de connaissances, Québec : Institut National de Santé Publique, p.8.

tif, censée miroiter « l'avenir » et le « devenir » de la vie de populations si la ville doit muter vers le « durable ». Il est de bon aloi, à cet effet, d'employer les artistes comédiens et humoristes. Ceux-là, par leur capacité d'imaginer de nouvelles formes d'expressions et de supports, voire se faire admettre comme une partie intégrante et légitime du spectacle, ces artistes, en dehors de critères proposés par Simoni et ses collaborateurs²⁵⁶ possèdent constamment de « nouvelles façons d'intéresser, de surprendre, d'étonner ». Ils constituent les supports indiscutables de la communication « évènementielle » dont parle Lionel Chouchan²⁵⁷, et qui en est une communication de face à face ou de la rencontre immédiate avec l'autre. Devenu un média de la surprise et de l'étonnement, l'évènementiel permet une sensibilisation segmentée et personnal-

²⁵⁶ Il s'agit de : 1. La parité : Les leaders du milieu sont reconnus comme des pairs, dans la population, le groupe ou le segment ciblé par l'intervention. Ils partagent avec les autres membres de la collectivité des caractéristiques personnelles, des situations ou des expériences communes.

2. La valeur ajoutée : Les leaders du milieu sont engagés dans une intervention pour le surplus d'efficacité et de bénéfices qu'ils peuvent apporter, en raison de leurs liens privilégiés avec une collectivité.

3. Le statut non professionnel : Bien qu'ils doivent être adéquatement préparés pour agir dans le cadre de l'intervention, les leaders du milieu ne sont pas des professionnels de la santé et ne détiennent pas de formation spécialisée en intervention socioculturelle.

4. L'encadrement : La stratégie de l'engagement de leaders du milieu implique que ceux-ci sont formés pour bien s'intégrer dans l'intervention, agissent selon des protocoles standardisés et sont soumis à l'évaluation. Simoni, J. M., J. C. Franks, K. Lehavot et S. S. Yard (2011). « *Peer Interventions to Promote Health: Conceptual Considerations* », *The American journal of orthopsychiatry*, vol. 81, n° 3, p. 351-359. Cité par Baril G., (2016). *Op.Cit.* p.12.

²⁵⁷ Chouchan. L., (2000). *L'événement, la communication du XXe siècle*, Paris : Ipm, p. 43

sée. Car de plus en plus, souligne le sociologue Gérard Mermet « les personnes se choisissent en fonction de leurs centres d'intérêt et forment des tribus modernes.

Ainsi, insérer le collègue Nzembela, le duo Serge Manseba et Karibiona, Delamba, etc. à la construction de l'imaginaire d'une ville durable au sein de la population segmentée peut rendre l'appel écologique attrayant, désirable, et positiver son optimalisation. Ces artistes peuvent également permettre le déclenchement des messages ciblés, qui s'adressent à des microcibles. Grâce à cette personnalisation, il est facile de constater l'émergence du cercle vertueux de la gestion événementielle : plus la cible est identifiée, plus le message est adapté, plus la qualité de la relation se construit, plus le taux de succès est important²⁵⁸.

En plus de renforcer le changement de comportements, la stratégie peut viser le renforcement de la capacité des mêmes personnes à agir collectivement pour susciter des changements environnementaux dans leur milieu. Une autre option fondamentale est celle de procéder par mimétisme : les victimes des collatéraux de la dégradation environnementale peuvent être impliquées dans les équipes de campagnes de sensibilisation. Ils montrent par l'expérience que le changement est possible, qu'il est positif, que ça marche... (Nature humaine, 2009,) avec des témoignages et des retours d'expériences qui donnent envie.

²⁵⁸ Lefébure R- Venturi G. (2005). Gestion de la relation client, Paris : Eyrolles, p.197.

Conclusion

L'idée de la ville intelligente ou ville durable s'impose dans des champs extrêmement multiples et variés pour devenir, à l'aide de la communication environnementale, non seulement un moyen de penser, mais aussi une norme sociale qui conduit et oriente la société. Elle peut emprunter plusieurs canaux verbaux comme non verbaux et développer des d'interactions directes ou indirectes ayant un seul et unique objectif : celui de mobiliser les bases et acquérir leur adhésion au projet durable. Cette nécessité sur laquelle sont cramponnés les cadres de base a produit une forme de communication à la fois intentionnelle, dissuasive et persuasive, centrée sur la crise environnementale. Cette crise est mise en évidence par le truchement de la notion de ville intelligente ou durable et l'urgence qu'elle crée afin de muter vers des comportements écophiles.

Les stratégies de communication réunies autour de la communication de proximité permettent d'informer, de convaincre et de donner envie de croire que le changement durable est possible. Il faut à cela, parfois, faire admettre certains leaders d'opinion comme des parties prenantes du projet et leur accorder le monopole de la sensibilisation. C'est ainsi que le rôle des artistes se dessine ici, comme celui des nouveaux partenaires sociaux, eux qui ont le secret culturel de la surprise et de l'étonnement et de la persuasion massive. C'est pourquoi l'on développe la conviction que les techniques de communication du troisième millénaire seront inventées par les professionnels de l'évènementiel, véritables défricheurs de la communication de demain.

L'objectif de la communication dans la perspective de la « mutation durable » serait alors de préparer les esprits au chan-

gement écophile. Ainsi, les acteurs de la communication territoriale (presse, institutions, collectivités) n'élaboreront plus des discours iniques ou n'initieront plus des formes de communication qui semblent instaurer une « idéologie » de la culpabilisation et de la légitimation de l'imposition d'une solution pour prôner le changement urbain²⁵⁹. En absence de tout consensus, d'attitudes et de conscience écologique qui passent par la communication de proximité, l'engagement dans les pratiques des citoyens, au niveau individuel restera complexe avec beaucoup de risque de rebondissement, d'échec à chaque tentative de matérialisation d'un projet durable.

²⁵⁹ CARRE D., (2005). « Apport de la problématique communicationnelle à la compréhension des processus de la diffusion des techniques ». In : Actes des travaux du groupe de recherche « sociologie de la communication », Congrès international des sociologues de langue française, Tours 5-9 juillet 2004, pp. 65-73.

