# AI Ecosystem in Support For Morocco's Digital Transformation: A Focus on Smart Cities

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IEEE Smart Cities – Morocco | March 18, 2022

# Outline

- Introduction
- Strategy, Policy and Regulations
- Data and Infrastructure
- Skills & Talents
- Innovation Ecosystem
- Key Smart Cities AI Use Cases
- Concluding Remarks

# Introduction

1 NO POVERTY

2 ZERO HUNGER

3 GOOD HEALTH AND WELL-BEING

4 QUALITY EDUCATION

5 GENDER EQUALITY

6 CLEAN WATER AND SANITATION

7 AFFORDABLE AND CLEAN ENERGY

8 DECENT WORK AND ECONOMIC GROWTH

9 INDUSTRY, INNOVATION AND INFRASTRUCTURE

10 REDUCED INEQUALITIES

11 SUSTAINABLE CITIES AND COMMUNITIES

12 RESPONSIBLE CONSUMPTION AND PRODUCTION

13 CLIMATE ACTION

14 LIFE BELOW WATER

15 LIFE ON LAND

16 PEACE, JUSTICE AND STRONG INSTITUTIONS

17 PARTNERSHIPS FOR THE GOALS

SUSTAINABLE DEVELOPMENT GOALS

# AI For SDGs Acceleration

# Smart City Ecosystem Framework

- Parking
- Lighting
- Traffic
- Waste Mgmt
- Energy Mgmt

- Ridesharing
- Commute planning
- Bike sharing

- Airports
- Districts
- Office parks
- Universities
- Apartments

- For profit microservices
- Not for profit microservices

Quality of Life
Government Efficiency
Health and Wellness
Economic Development
Sustainability
Public Safety
Mobility

City Created Services
Corporate Created Services
Community Created Services
Private Citizen Created Services

Innovation Enablement and Acceleration
Governance, Management and Operations
Policies, Processes, Public-Private Partnerships and Programs
Data "Marketplace" and Analytics – internal, external, open data
Connectivity, Accessibility and Security (internal, external)
Smart City Technology Infrastructure

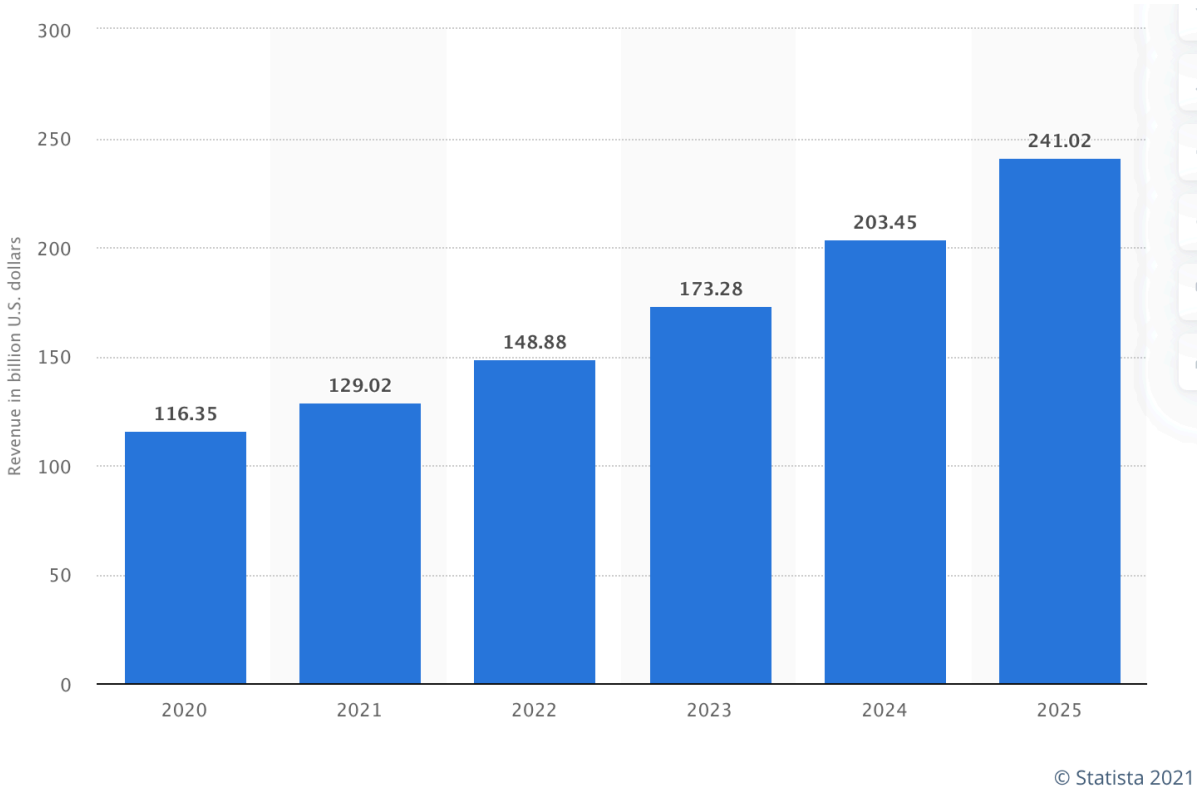
Source: StrategyofThings.io

# Main Smart Cities Challenges

- Technology challenges with coverage and capacity.
- Digital security.
- Legislation and policies.
- Lack of confidence or reluctance shown by citizens (lack of clarity around benefits).
- Funding and business models.
- Interoperability.
- Existing infrastructure for energy, water and transportation systems.

ComputerWeekly.com

# Projected revenue generated by companies in the global smart city



# Country profile

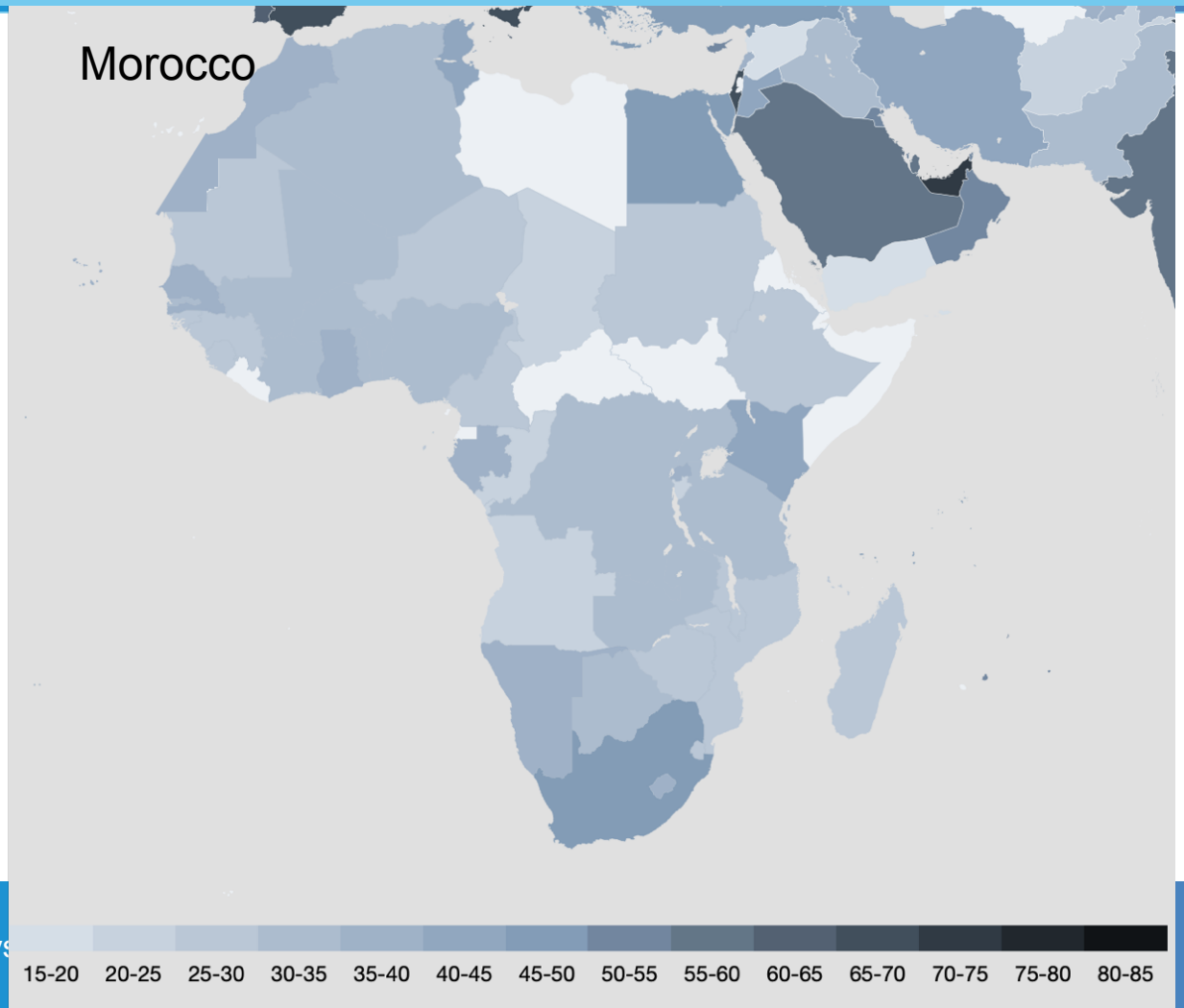
*The Kingdom of Morocco Map*

- Population: 36,289,698 *
- Urban population: 63,8 % *
- Internet users: 27,62 M *
- Social media users: 22 M *
- Mobile subscribers: 117,1% *
- GDP: 119,7 B $ **

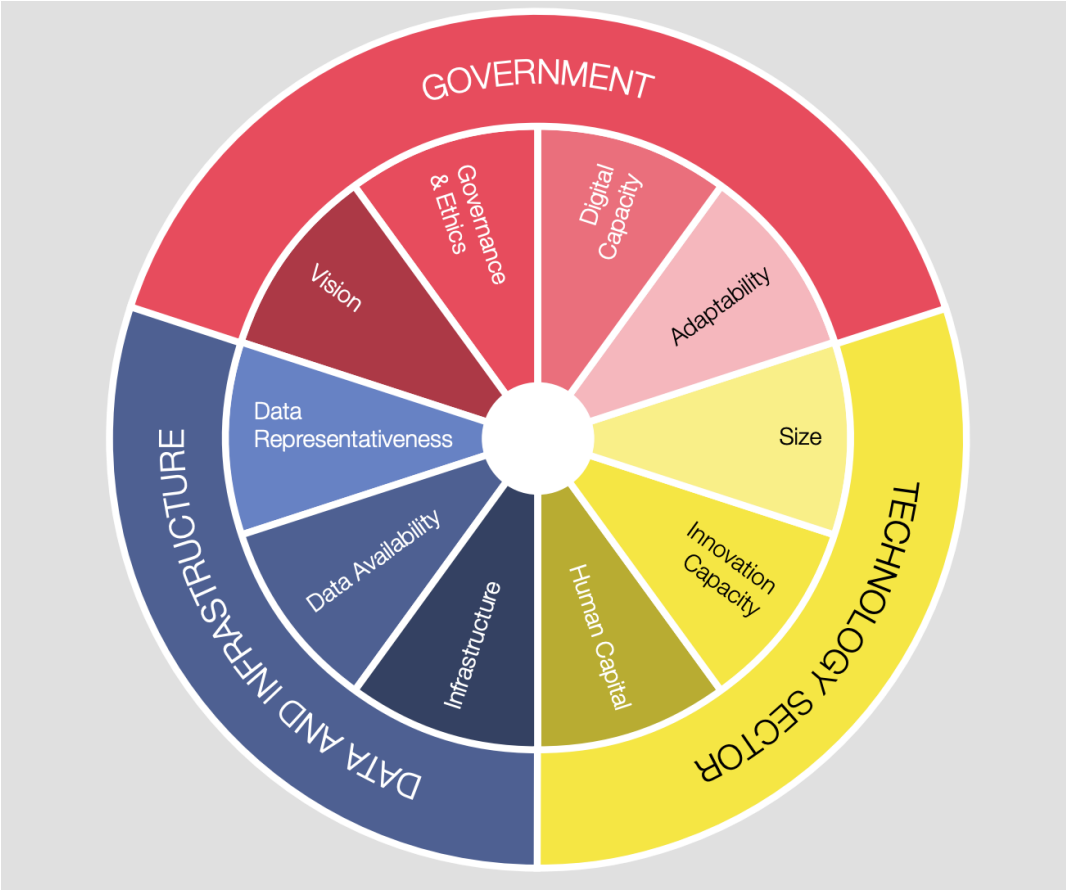
* *HCP - High Commission for Planning of Morocco, 2020.*

** World Bank Group, 2020.

# 2020 Government AI Readiness Index in MEA



# Pillars & Dimensions of the Government AI Readiness Index




*Source: Government Readiness AI Index, 2020.*

# The Building Blocks of Government AI Readiness

1. The Government needs to be willing to adopt AI, and able to adapt and innovate to do so ;
2. It also needs a good supply of AI tools from the technology sector ;
3. These tools need to be built and trained on high quality and representative data, and need the appropriate infrastructure to be delivered to and used by citizens.

*Source: Government Readiness AI Index, 2020.*

# AI Readiness Index Indicators

| Cluster | Indicator |
|---|---|
| Governance | Data protection/privacy laws - yes/no |
| | National AI strategy - yes/no/pending |
| Infrastructure and data | Data availability |
| | Government procurement of advanced technology |
| | Data/AI capability (in government) |
| Skills and education | Technology skills |
| | Private sector innovation capability |
| | Number of AI startups |
| Government and public services | Digital public services |
| | Effectiveness of government |
| | Importance of IT to government's vision of the future |

*Source: Government AI Readiness Index, 2020.*

# Strategy, Policy & Regulations

# Strategy, Policy & Governance

- During the last few years, Morocco has adopted several policies and Strategies that support AI & digital Transformation in the country through out all sectors and enablers ;
- The “Morocco’s New Development Model”: 2035 vision for Morocco, announced two week ago,  puts AI and DT as the main and key enablers for the countries’ sutainable and inclusive development ;
- Covid-19 has been an amazing accelerator of DT and AI adoption in all sectors and activities ;

# Strategy, Policy & Governance (Cont'd)

- Digital Development Agency (Governmental Agency, 2018)
- ADD Road Map (Digital & AI Strategy 2025, 2019).
- Data protection regulation: (Law 1-09-15 of February 2009)
- Data protection agency: National Commission Controling Personal Data Protection (CNDP)
- National Telecom Regulation Agency
- National Sectoral Strategies (Agriculture, Industry, Healthcare, Administration, Education, Innovation, …)

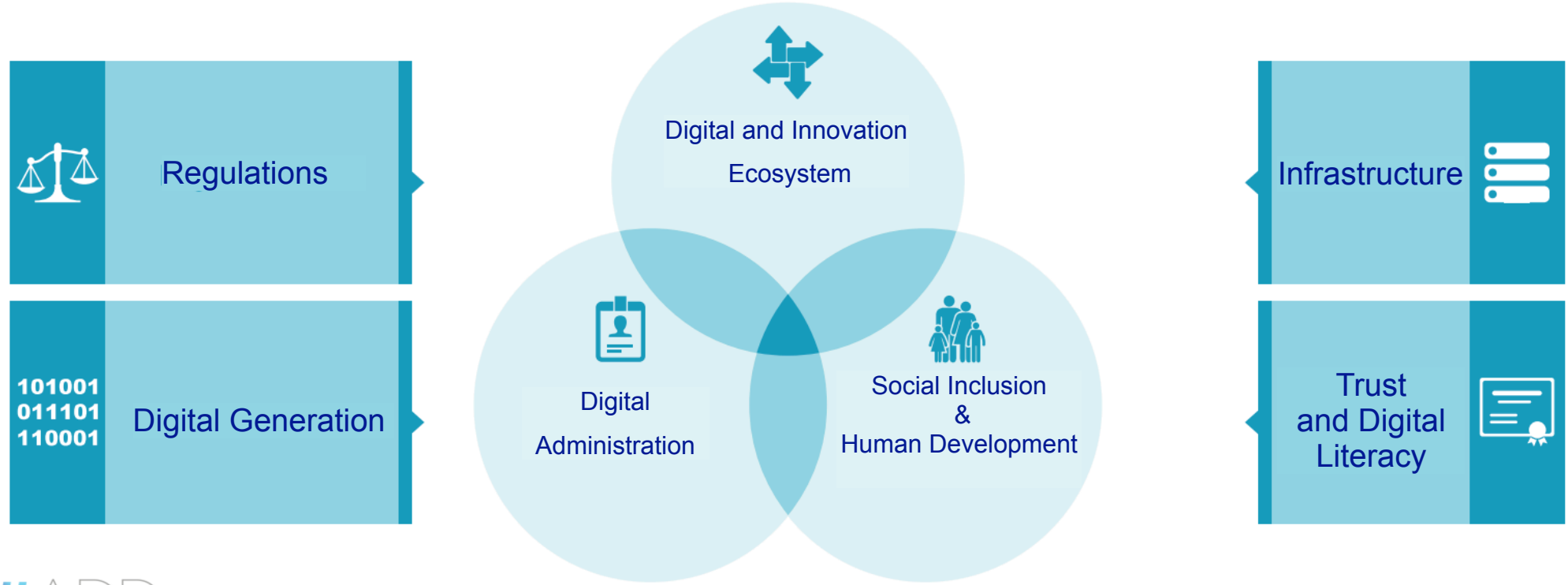
# Morocco's AI & Digital Roadmap 2025

Main strategic objectives:

- A digital administration at the service of citizens and businesses ;
- A competitive economy thanks to the performance gains brought about by AI & digital innovative ecosystem ;
- An inclusive society thanks to digital technologies.

# Digital Morocco 2025

## General orientations around three strands and four cross-cutting pillars




#ADD
Agence de Développement du Digital

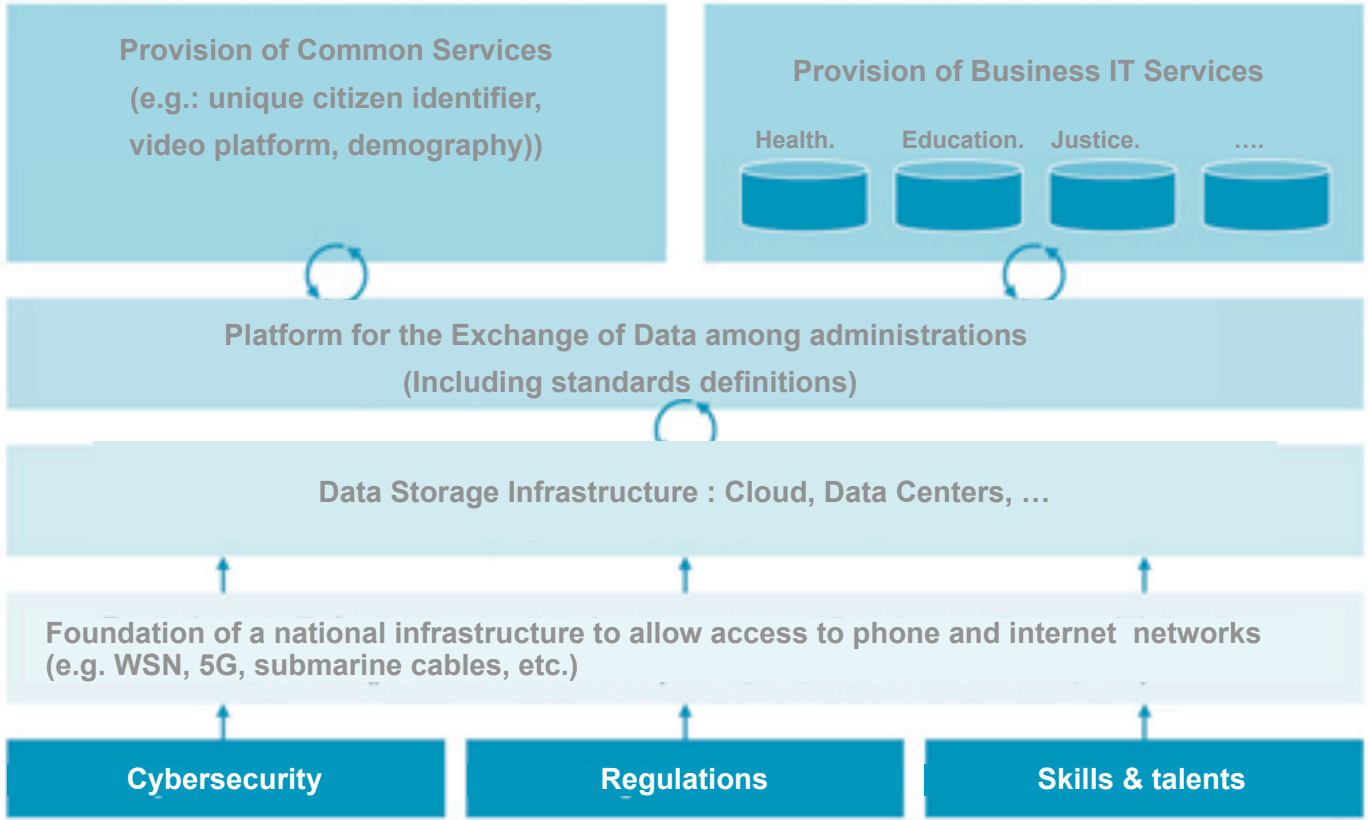
*Source: Note d'Orientations Générales pour du Digital au Maroc à horizon 2025, ADD, 2019.*

# Architecture of The Digital Government Platform

## Objectifs

- Administration publique intégrée
- **Integrated Public Services**
- **Integrated Industrial Development**
- **Data Sources Integration**
- **Integrated Control of IoT and Sensors Systems**
- **Integrated Data Analytics**

## Architecture

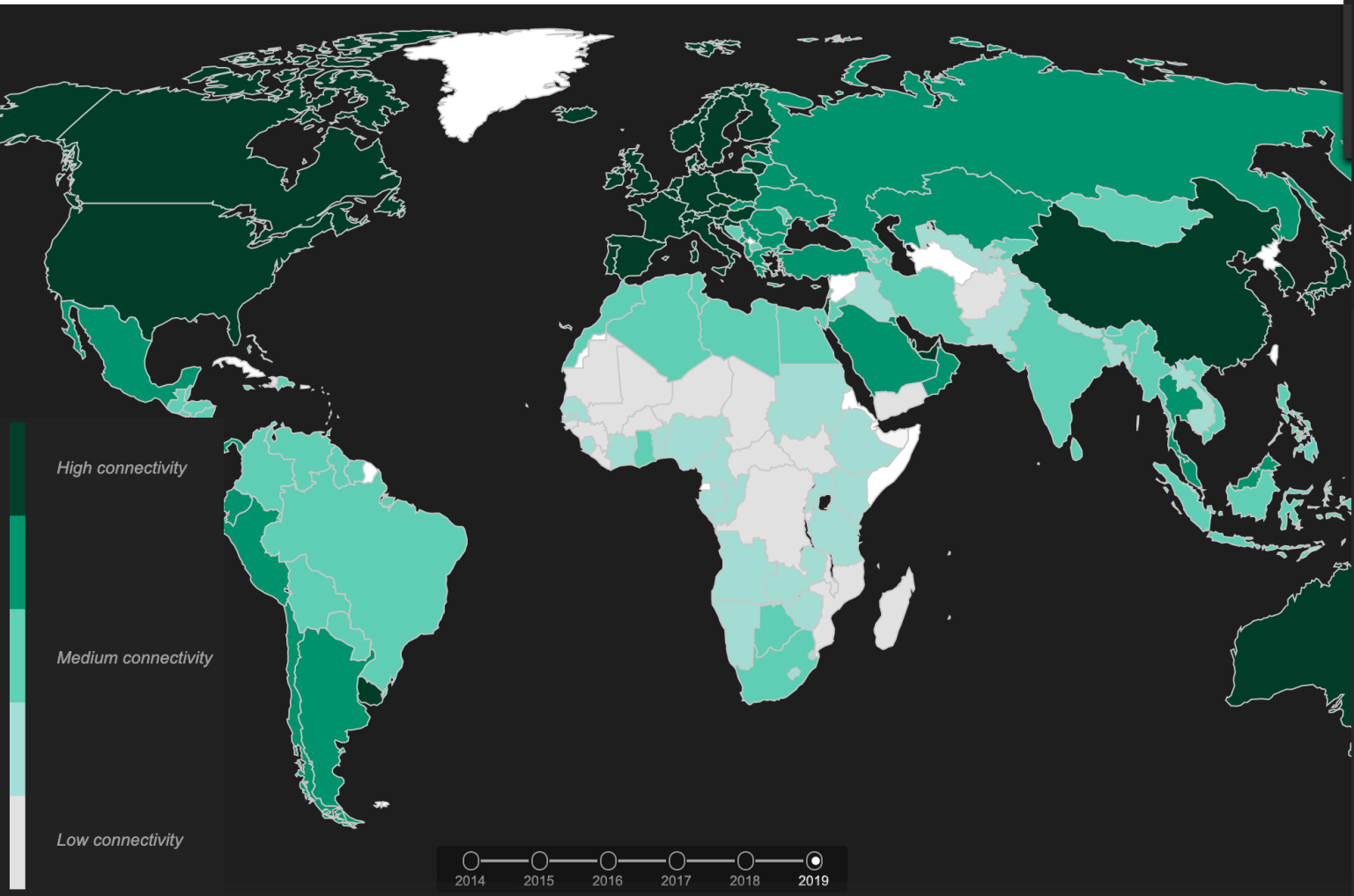



#ADD
Agence de Développement du Digital

# Data & Infrastructure

## Connectivity, Cloud, Datacenters, Opendata, Cybersecurity & Privacy

# Mobile Connectivity Index




x

## Morocco

INDEX SCORE **59.9**

| | |
|---|---|
| INFRASTRUCTURE | 66.3 |
| AFFORDABILITY | 56.3 |
| CONSUMER READINESS | 55.6 |
| CONTENT AND SERVICES | 62.0 |

View Country Analysis

### Key Metrics

| | |
|---|---|
| 99 | 3,090 |
| 3G Coverage (% of population) | GNI per capita ($PPP) |
| 120 | 37 |
| Mobile Connections (% penetration) | Rural Population (% of total) |

JAN 2021

# MOROCCO

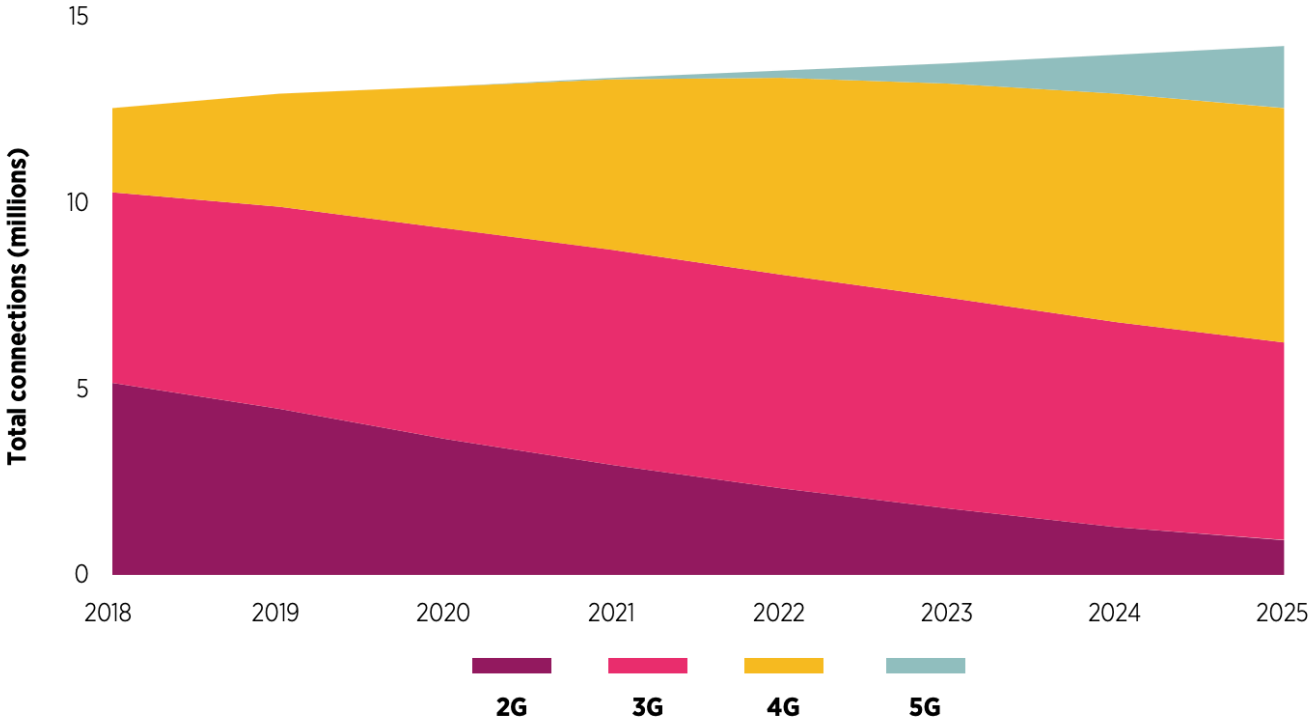
ESSENTIAL HEADLINES FOR MOBILE, INTERNET, AND SOCIAL MEDIA USE

*CHANGES TO DATA SOURCES FOR INTERNET USERS AND SOCIAL MEDIA USERS MEAN THAT VALUES ARE NOT COMPARABLE WITH PREVIOUS REPORTS*

MOROCCO

| TOTAL POPULATION | MOBILE CONNECTIONS | INTERNET USERS | ACTIVE SOCIAL MEDIA USERS |
|---|---|---|---|
| 37.13 MILLION | 43.47 MILLION | 27.62 MILLION | 22.00 MILLION |
| URBANISATION: 63.8% | vs. POPULATION: 117.1% | vs. POPULATION: 74.4% | vs. POPULATION: 59.3% |

# PROJECTIONS FOR CONNECTIONS BY TECHNOLOGY (2018 – 2025)




*Source: GSMA Intelligence.*

JAN 2021

# SMART HOME MARKET: ANNUAL VALUE GROWTH

YEAR-ON-YEAR CHANGE IN THE SIZE AND VALUE OF THE SMART HOME MARKET, WITH DETAIL FOR SUB-CATEGORIES

*REVISIONS TO HISTORICAL FIGURES MEAN VALUES ARE NOT COMPARABLE WITH THOSE PUBLISHED IN PREVIOUS REPORTS*

MOROCCO

ANNUAL CHANGE IN SMART HOME PENETRATION*

+10.1%

Y-O-Y VALUE CHANGE: OVERALL SMART HOME DEVICES MARKET

+24.5%

Y-O-Y VALUE CHANGE: SMART HOME CONTROL & CONNECTIVITY MARKET

+40.1%

Y-O-Y VALUE CHANGE: SMART HOME APPLIANCES MARKET

+21.0%

Y-O-Y VALUE CHANGE: SMART HOME SECURITY DEVICE MARKET

+24.5%

Y-O-Y VALUE CHANGE: SMART HOME ENTERTAINMENT DEVICE MARKET

+22.0%

Y-O-Y VALUE CHANGE: SMART HOME COMFORT & LIGHTING MARKET

+22.2%

Y-O-Y VALUE CHANGE: SMART HOME ENERGY MANAGEMENT MARKET

+36.0%

**SOURCE:** STATISTA MARKET OUTLOOK FOR THE SMART HOME CATEGORY (ACCESSED JAN 2021). SEE STATISTA.COM/OUTLOOK/DIGITAL-MARKETS FOR DETAILS. ***NOTES:** "PENETRATION" REFERS TO THE NUMBER OF HOMES WITH SMART HOME DEVICES. PENETRATION CHANGE FIGURES REPRESENT RELATIVE CHANGE IN PENETRATION VERSUS PREVIOUS YEAR'S FIGURES. "Y-O-Y VALUE CHANGE" FIGURES REPRESENT THE YEAR-ON-YEAR CHANGE IN ESTIMATES OF FULL-YEAR REVENUE FOR 2020 COMPARED WITH 2019. ◈ **COMPARABILITY ADVISORY:** BASE CHANGES.

we are social Hootsuite

# Morocco launches Africa's Most Powerful Supercomputer in 2021

**98th** GLOBALLY Top500

**1st** AFRICA

MOHAMMED VI POLYTECHNIC UNIVERSITY

**The supercomputer is intended to help the University coordinate research across Africa into a range of areas, including artificial intelligence and IoT technology**

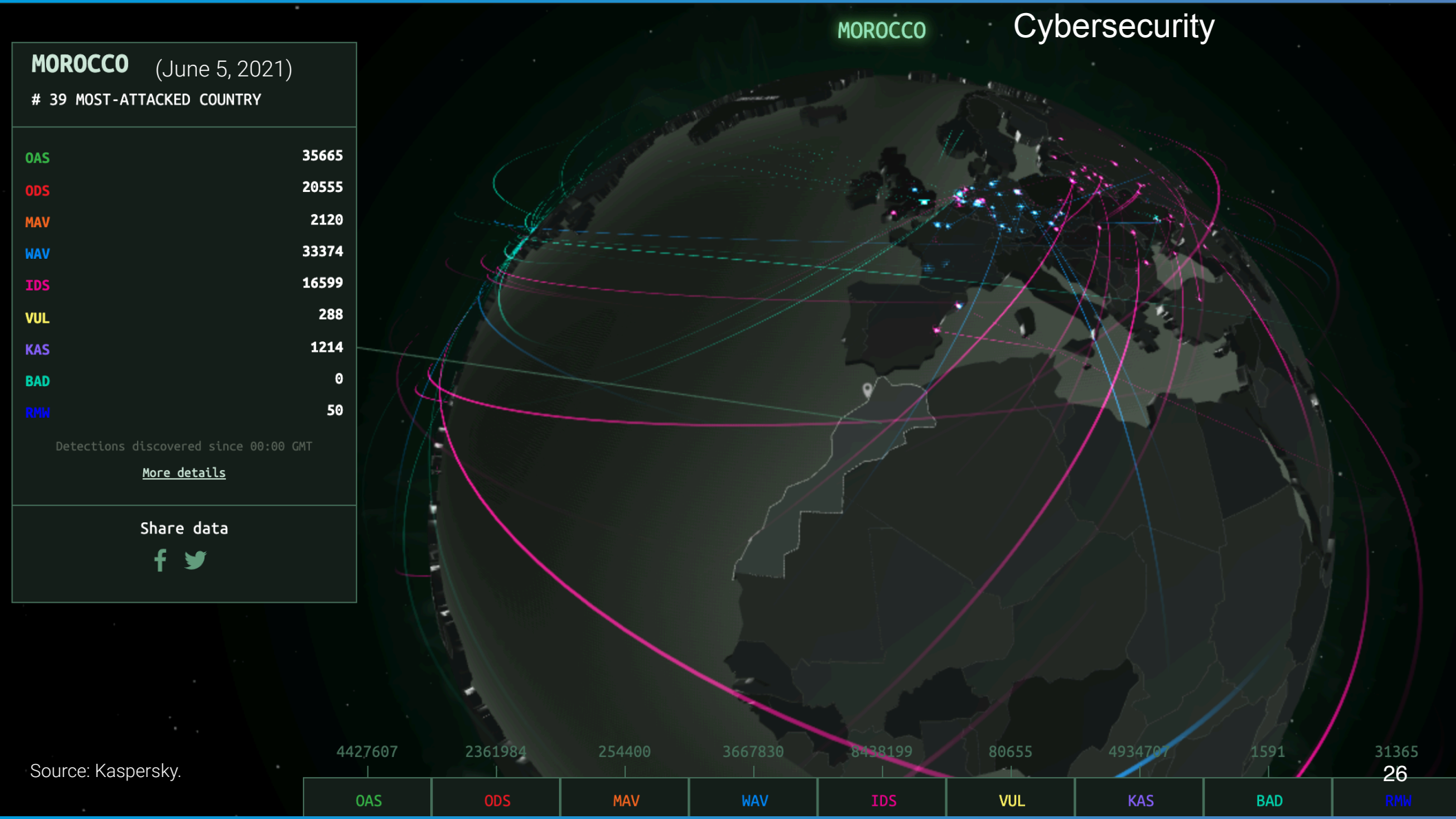
Africa's most powerful supercomputer

– Mohammed VI Polytechnic University

***Launched in Feb. 2021***

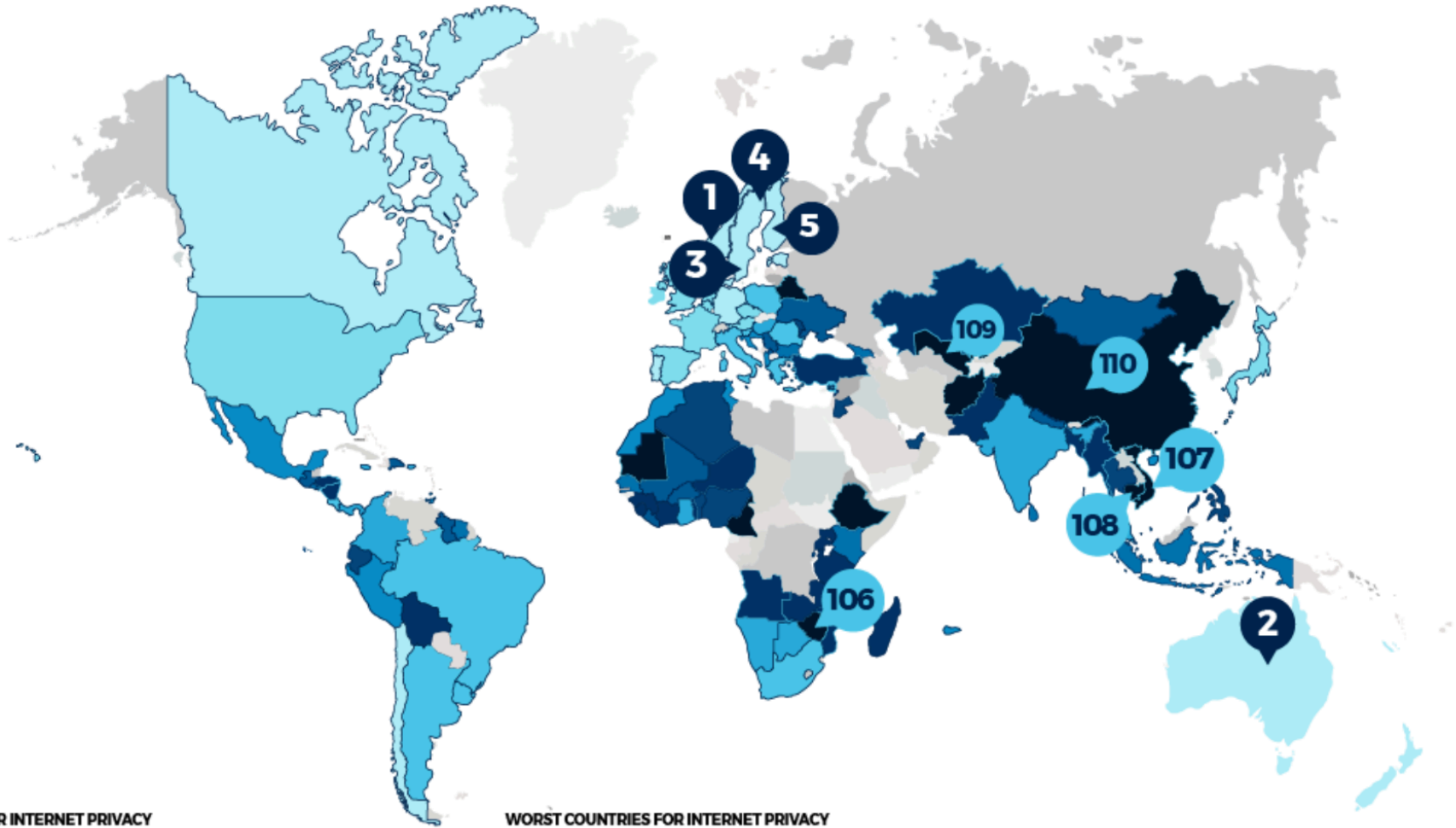
ODIN
by OPEN DATA WATCH
OPEN DATA INVENTORY 2020/21
ANNUAL REPORT
Country Profile
Morocco
2020
View Results
65
ODIN SCORE
Morocco
40th
GLOBAL RANK
OUT OF 187
1st
AFRICA RANK
OUT OF 53
57
COVERAGE SCORE
OUT OF 100
72
OPENNESS SCORE
OUT OF 100

# Cybersecurity




Source: Kaspersky.

# INTERNET PRIVACY BY COUNTRY




BEST COUNTRIES FOR INTERNET PRIVACY

WORST COUNTRIES FOR INTERNET PRIVACY

CHAMBER OF COMMERCE.ORG

# Human Capital

## AI Skills & Talents

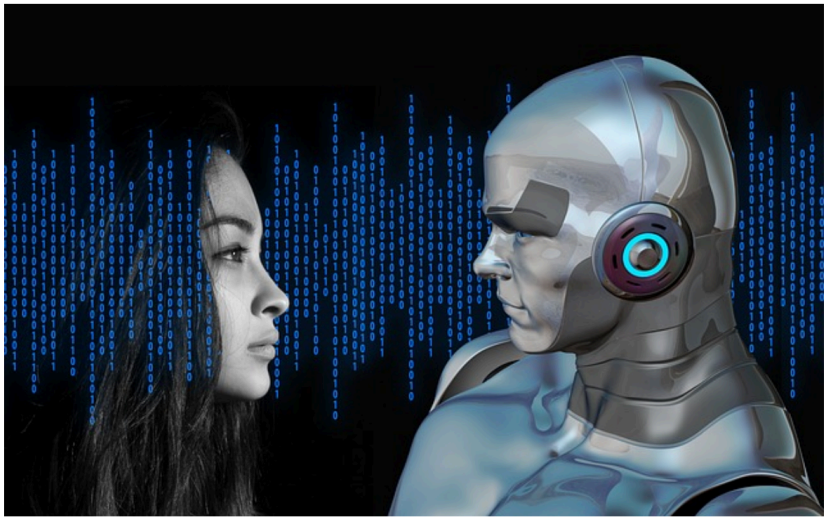
# Morocco's AI Skills & Talents

University Graduates

**Artificial Intelligence School to Open in Fez**

With artificial intelligence expected to generate more than 2.3 million jobs by 2020, Morocco has begun to prepare its students for the future by opening a school dedicated to AI training. *@ Euro-mediterranean University in Fez.*

Staff Writer July 12, 2019 5:20 p.m.



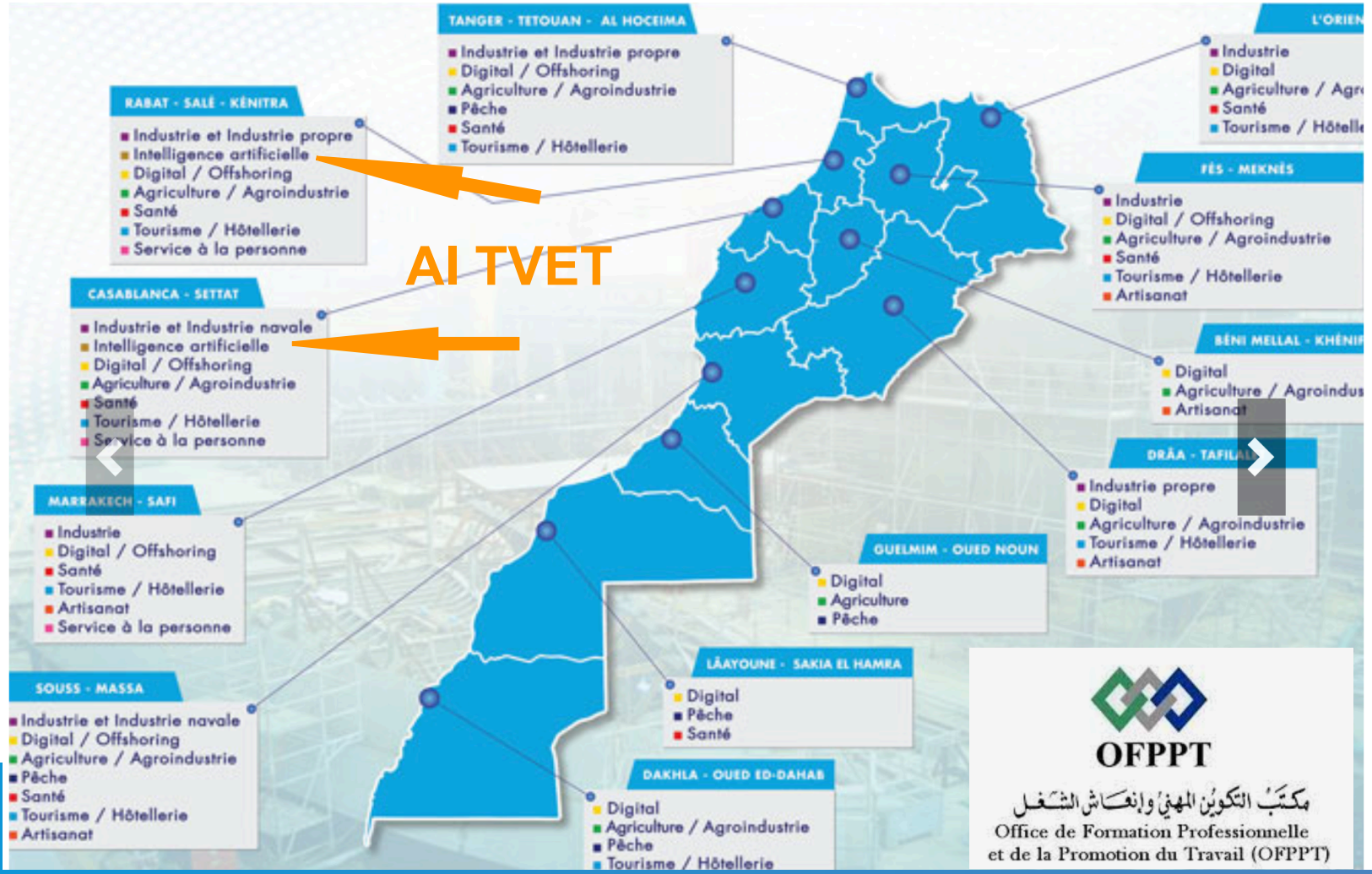
*Source: Morocco World News.*

- Almost all Moroccan Universities and Eng. Schools introduced AI Eng. & masters programs: ENSIAS, UM5 - Rabat, School of Computer Science, UM6P-Benguerir, etc.
- Strong prartnership with leading AI companies to roll out AI training & certification (e.g. Microsoft, IBM, Dell EMC, Huawei, etc.).
- This has already started providing a very important pool of AI talents which is expected to grow in the next few years.

# AI Morocco's Talents  Global Winners !

# Morocco's AI Skills & Talents

Vocational Training



# Innovation Ecosystem

## Universities, Research Centers
## Startups, Incubators and Accelerators

# GLOBAL INNOVATION INDEX 2020

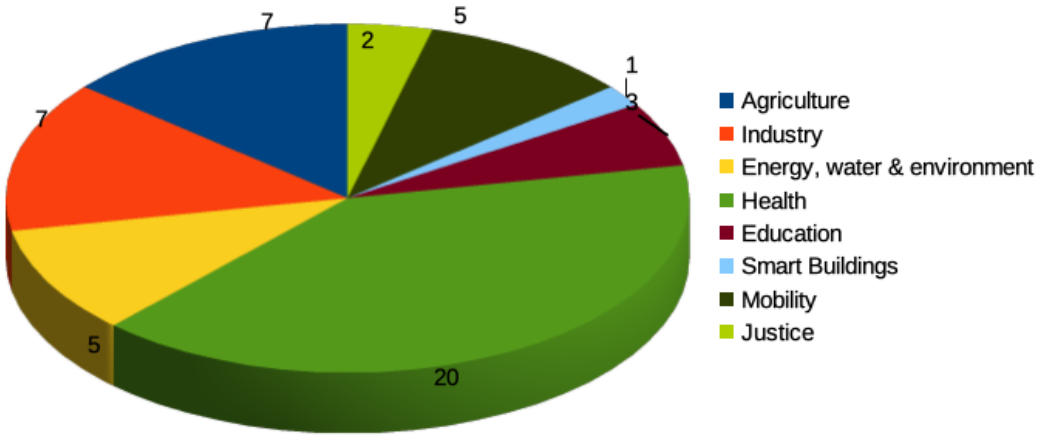
# MOROCCO

**75th** Morocco ranks 75th among the 131 economies featured in the GII 2020.

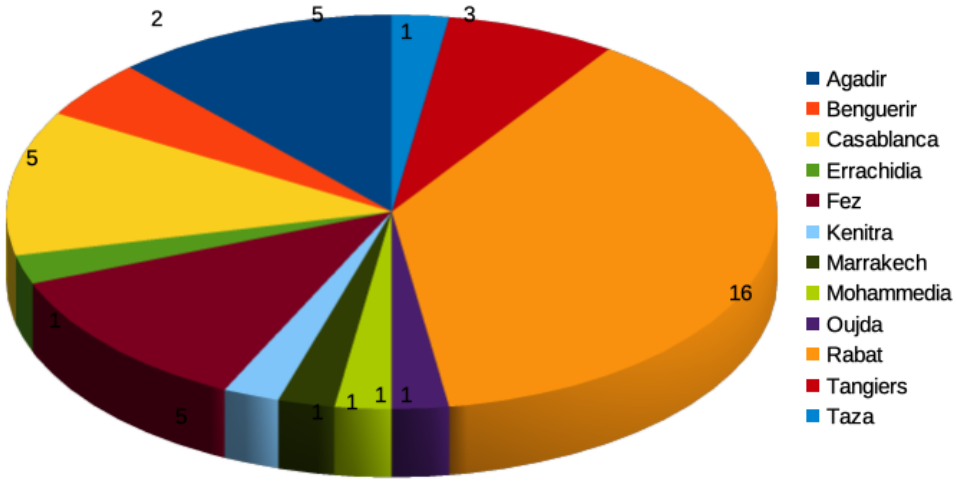
**8th** Morocco ranks 8th among the 29 lower middle-income group economies.

**10th** Morocco ranks 10th among the 19 economies in Northern Africa and Western Asia.

# Al-Khawarizmi AI Research Program Funded Projects Breakdown




Funded projects breakdown vs verticals




Funded projects breakdown vs PI cities

# Organisations Providing Acceleration or Incubation to Startups

- Caisse de Dépôt et de Gestion (CDG)
- La Factory
- La Factory Scalerator
- Réseau Entreprendre Maroc
- CEED Morocco
- Hub Africa
- Maroc Numeric Fund
- New Work Lab
- MIT REAP
- Endeavour
- HSeven
- SEAF
- Cluster Solaire
- Impact LAB
- R&D Maroc
- Startup Maroc
- CE3M
- Cluster MENARA
- BIDAYA
- ENACTUS
- Happy Venture
- Kluster CFCIM
- Morccan CISE
- Azur Partner

# MOROCCO STARTUP ECOSYSTEM MAPPING

### Tech4Commodities
Marqué par une politique économique volontaire en termes d'innovation énergétique et agricole et du fait d'un positionnement leader international, c'est sans surprise que l'on trouve des startups de qualité dans ces domaines.

### Industry 4.0
Depuis quelques années, le tissu industriel marocain prend le virage de l'innovation. Au-delà d'entreprises pionnière, la tendance aujourd'hui est à la généralisation d'intégration de solution IoT, Big Data et de smart logistique

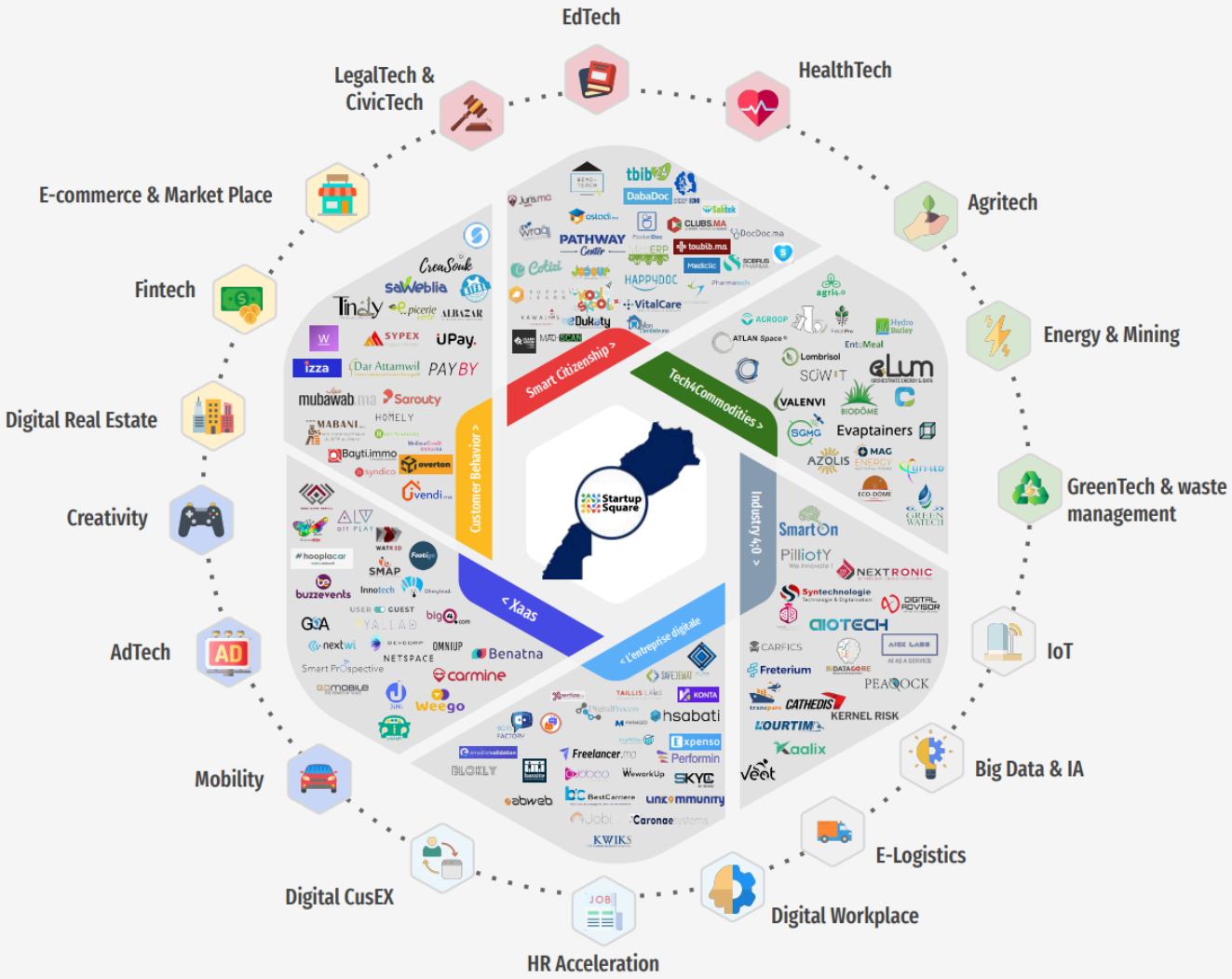
### L'entreprise digital
Également victimes du Covid, les processus internes des entreprises déjà en voie de digitalisation avant le Covid voient une accélération massive de la dématérialisation qu'assurent de nombreuses Startups multi-expertises attractivity.

### XaaS
Les modèles économiques des Startups évoluent vers des tarifications de services à l'usage et trouvent écho avec des entreprises en incertitude et en recherche de variabilisation des coûts dans les modèles XaaS

### Customer Behavior
Les usages des consommateurs évoluent au gré de l'arrivée des générations natives de l'Internet aux classes d'âges à forte intensité de consommation. Des Startups marocaines à forte croissance se positionnent pour adresser ce marché.

### Smart Citizenship
Les organisations sociales sont également à l'écoute des usages mais accusent un léger retard par rapport aux activités commerciales. Pour autant, les services de premières nécessités sont en phase d'évolution avec un sponsorship étatique générateur d'opportunités pour les startups du domaine

## LA CHAÎNE DE VALEUR DE L'ÉCONOMIE MAROCAINE AUGMENTÉE DE NOUVEAUX ACTEURS INNOVANTS




Powered by: Startup Square

# 2021 Top 10 AI Development Companies in Morocco

ETC Maroc

Hidden Founders

mutationevent

*Source: https://topsoftwarecompanies.co/ai-development/agencies/morocco/*

PLUGANDPLAY **Accelerator**

Morocco

# Plug and Play Morocco Accelerator

Based in Morocco, this platform will help startups across the African continent gain access to Plug and Play's network of corporations and venture capitalists, giving them support to expand and grow their businesses outside the region.

Apply for Batch 2

MOHAMMED VI POLYTECHNIC UNIVERSITY

# Our focus areas include:

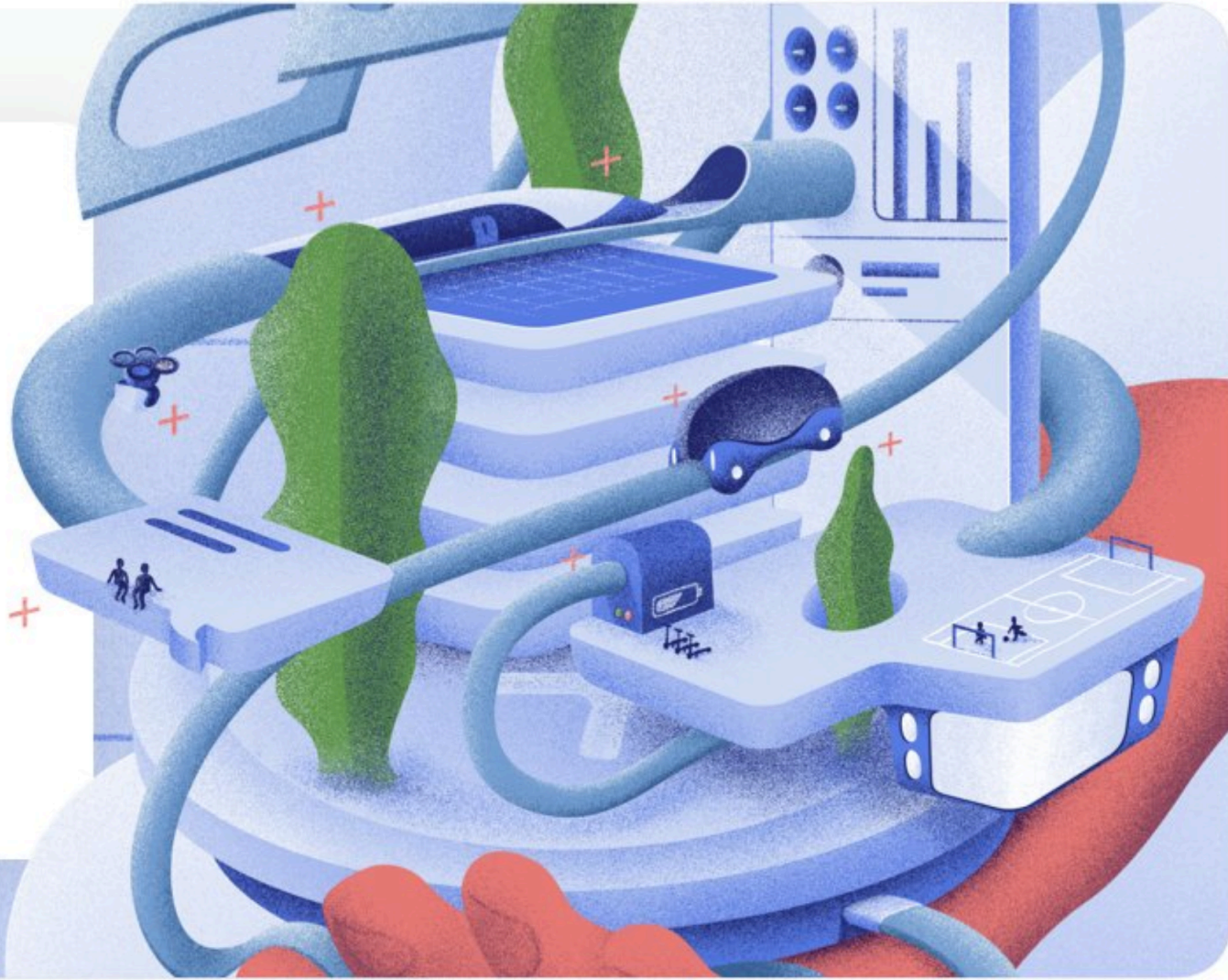
PLUGANDPLAY

- Shared Economy
- Mobility & IoT
- AI & Big Data
- Smart Buildings
- Logistics
- Healthtech
- Ed tech
- Energy

PLUG AND PLAY MOROCCO

Applications for **Smart Cities Hackathon in Morocco** open until July 11, 2021!

Apply Now



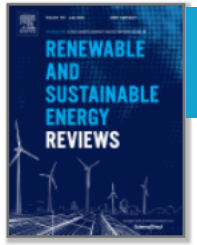
# Some Smart Cities AI Use Cases

## Health, Mobility, Education, Administration, ..

ELSEVIER

Renewable and Sustainable Energy Reviews

Volume 144, July 2021, 110969




30.5
CiteScore

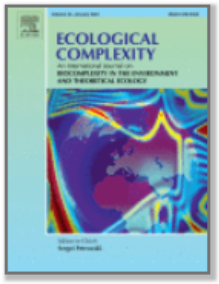
12.110
Impact Factor

# Intelligent building control systems for thermal comfort and energy-efficiency: A systematic review of artificial intelligence-assisted techniques

Ghezlane Halhoul Merabet [a, i], Mohamed Essaaidi [a], Mohamed Ben Haddou [b], Basheer Qolomany [c], Junaid Qadir [d], Muhammad Anan [e], Ala Al-Fuqaha [f, g], Mohamed Riduan Abid [h], Driss Benhaddou [i]

**A "Top-Journal" ranked 19th in All-fields-Journals -** https://scholar.google.com/citations?view_op=top_venues&hl=en

Ecological Complexity
Volume 45, January 2021, 100903



# Embedded Real-time Battery State-of-Charge Forecasting in Micro-Grid Systems

Youssef NaitMalek [a, b], Mehdi Najib [a], Mohamed Bakhouya [a], Mohamed Essaaidi [b]

Show more

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Wiley Online Library

Concurrency and Computation
Practice and Experience

SPECIAL ISSUE PAPER

# A platform architecture for occupancy detection using stream processing and machine learning approaches

Hamza Elkhoukhi, Youssef NaitMalek, Mohamed Bakhouya, Anass Berouine, Abdelhak Kharbouch, Fadwa Lachhab, Majdoulayne Hanifi, Driss El Ouadghiri, Mohamed Essaaidi

First published: 23 December 2019 | https://doi.org/10.1002/cpe.5651 | Citations: 3

# Towards Blockchain-Based Architecture for Smart Cities Cyber-Security

**Publisher: IEEE**

Cite This

PDF

Abla El Bekkali ; Mohammed Boulmalf ; Mohammad Essaaidi ; Driss El majdoubi

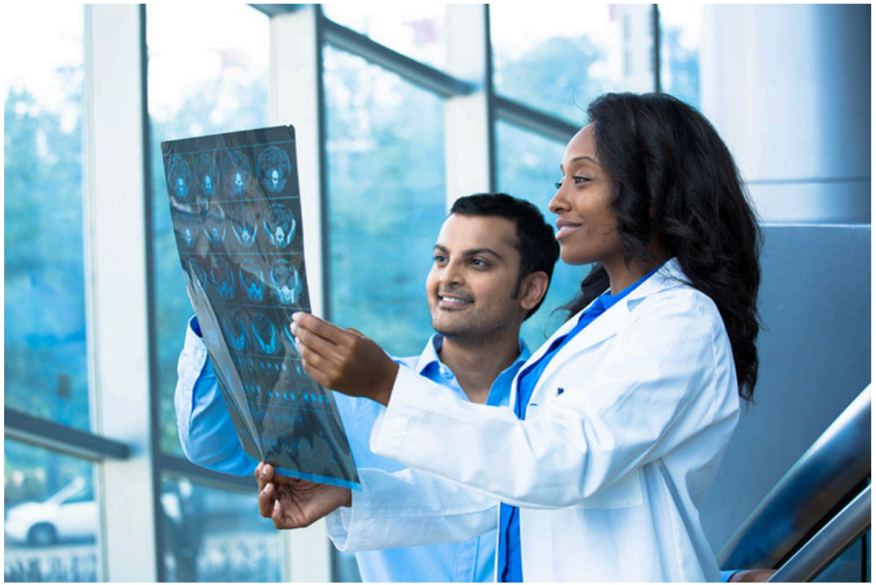
All Authors

123
Full
Text Views

# AI for Healthcare

## Five Moroccan Hospitals Integrate Artificial Intelligence into Healthcare Services

Amira El Masaiti Mar. 29, 2017 9:39 a.m. Morocco International News



Rabat - ***Five Moroccan hospital have started integrating Sophia Genetics' artificial intelligence programs into their clinics to aid the identification of diseases causing mutations in patients' genomic profiles.***

# Some Moroccan Startups Developing AI Based Apps For SC

| Energy | Energy | Mobility | Education |
|---|---|---|---|
| MSI Conseil<br>MANAGEMENT - SYSTEMES - INGENIERIE<br>Total Quality Management | Solar e Cycles<br>Empowering People | البديل لتقنية المعلومات | MATHSCAN |
| **Msi Conseil**<br>MOROCCO<br>A smart meter to monitor energy consumption in real time and react to overconsumption. | **Solar E-Cycles**<br>MOROCCO<br>Solar powered light electric vehicles. | **AlternativeIT**<br>MOROCCO<br>AlternativeIT has invented a solution to help bus companies plan schedules and crews. | **Take off quickly in maths**<br>Welcome to the only platform powered by artificial intelligence, for simple, effective and fast math learning.<br>**Primary - College - High school** (all streams)<br>Moroccan Program (French and Arabic) and Foreign Mission Program |

# Moroccan SC With International Recognition

Casablanca
2016 IEEE Core Smart City

IEEE Smart Cities

Rabat
Global Smart City Index 2020

SCO SMART CITY OBSERVATORY

Benguerir

Chefchaouen

UNESCO

2020
Global Network of Learning Cities
www.uil.unesco.org/learning-cities

# The IEEE IoT Global Cities Alliance

**Chair:** Joel Myers (UK)

Global collaboration between the IEEE IoT Initiative and cities worldwide, in order to work side-by-side with city leaders and stakeholders on:

- best practices and standards: use/improved communications of existing ones + building and prioritising new ones together
- co-hosting and speakers in the IEEE IoT Smart Cities Summits and the IEEE World Forum on IoT
- publishing of smart city strategies, frameworks, use cases and results in IEEE journals, magazines and newsletters reaching our 450k membership in 160+ countries worldwide
- production and communications of the "Smart Cities Webinar Series"

IEEE IoT/SA Smart Cities Survey: being sent out to IEEE members, smart city leaders and stakeholders with **currently 83 cities** onboard from: Australia – Brazil – Canada – China – Colombia – Ecuador – Finland - Hong Kong – India – Iran - Japan – Malaysia – Mexico – Morocco – Pakistan – Portugal – Senegal – Sweden – UK - USA

Regional chairs:

**Asia:** Nim Cheung (Hong Kong)
**Europe:** Rosaldo Rossetti (Portugal)
**India:** Sri Chandrasekaren (India)
**Latin America:** Victor Larios (Mexico)
**MEA:** Mohamed Essaaidi (Morocco)
**North America:** Fawzi Behmann (USA)

# Concluding Remarks

- Morocco's AI readiness is promising to  reach a high level of maturity soon given the outstanding comprehensive ecosystem put in place recently.
- AI based Smart Cities Initiatives in Morocco are gaining momentum across different verticals and areas.
- Great Research and Innovation opportunities for Universities, companies & startups and cities' authorities.
- This will  also have a very important impact on a sustainable and inclusive socioeconomic development of Morocco on the near future.

# Thank you !