FCP MAGAZINE

FÉDÉRATION DE LA CHIMIE ET DE LA PARACHIMIE

SPECIAL **INTERNATIONAL CHEMISTRY FORUM 2025** > May 2025

UNDER THE HIGH PATRONAGE OF HIS MAJESTY KING MOHAMMED VI

Responsible Care
FEDERATION DE LA CHIMIE ET DE LA PARACHIMIE

ROYAUME DU MAROC
MINISTÈRE DE L'INDUSTRIE ET DU COMMERCE

المملكة المغربية
وزارة الصناعة والتجارة

AMDIE
الوكالة المغربية لتنمية الاستثمارات و الصادرات
AGENCE MAROCAINE DE DÉVELOPPEMENT DES INVESTISSEMENTS ET DES EXPORTATIONS

3RD EDITION

INTERNATIONAL CHEMISTRY FORUM 2025

MOROCCAN CHEMICAL INDUSTRY AT THE HEART OF THE ENERGY TRANSITION AND STRATEGIC CHALLENGES

صاحب الجلالة الملك محمد السادس نصره الله

...our industry is called upon today, more than ever, to promote local production in a competitive manner in order to reduce this dependence, enhance our resilience, increase our competitiveness, and consolidate Morocco's position in promising sectors.

We also have to be fully prepared to enter a new industrial era in which the concept of sovereignty is both a goal and a means. To rise to this challenge, our country needs an industry that incorporates new activities and skills, and creates more jobs.

Therefore, the ability to provide steady jobs to young people should be our industry's foremost concern, given that we cannot achieve any of our industrial ambitions without highly qualified human resources.

This means the new industrial stakeholders should systematically seek to strike a balance between human capital and industrial project needs, in addition to enhancing managerial skills. To achieve that, we need to provide our youth with solid training that takes into account current developments and changes while being open to modern technology, within the framework of a stronger public-private partnership.

Accompanying mechanisms should also be put in place and expanded to strengthen technology and research within Moroccan companies. To this end, a system bringing together industry, academia and research centers should be set up to spur innovation and make it an engine for the growth of our industry.

Moreover, the industrial development we yearn for should be accompanied by efforts to accelerate carbon-neutral manufacturing, through the use of competitively-priced electricity from renewable sources, and greater energy efficiency.

Our industry must contribute to the preservation of water resources through water conservation measures and wastewater reuse, and also through the adoption of new technologies and solutions.

The Kingdom can thus become a reference in the field of responsible, sustainable, carbon-neutral production patterns, enabling us to attract foreigners looking for investment opportunities in the green economy.

*Excerpt from the message of **His Majesty King Mohammed VI,** May God Assist Him, addressed to the participants of the first edition of the «National Industry Day», March 29, 2023.*

تحت الرعاية السامية لصاحب الجلالة الملك محمد السادس

SOUS LE HAUT PATRONAGE DE SA MAJESTÉ LE ROI MOHAMMED VI

Responsible Care

FEDERATION DE LA CHIMIE ET DE LA PARACHIMIE

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AGENCE MAROCAINE DE DÉVELOPPEMENT DES INVESTISSEMENTS ET DES EXPORTATIONS

3ÈME EDITION

FORUM INTERNATIONAL DE LA CHIMIE

L'INDUSTRIE CHIMIQUE MAROCAINE AU CŒUR DE LA TRANSITION ÉNERGÉTIQUE ET DES ENJEUX STRATÉGIQUES

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21 ET 22 MAI 2025

AU MARRIOTT - RABAT

PARTENAIRES

FEDERATION DE LA CHIMIE ET DE LA PARACHIMIE

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MINISTÈRE DE L'INDUSTRIE ET DU COMMERCE

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The Moroccan Federation of Chemistry and Parachemistry (FCP), established in 1993, is a professional association with legal personality and financial autonomy. It brings together Moroccan and foreign companies operating in the chemical and parachemical sectors—both public and private.

In addition to its member companies, the Federation encompasses five professional associations :

A.M.D.M.P
Moroccan Association of Raw Material Distributors

A.M.G.I.M.
Association of Industrial and Medical Gas Industries

A.M.I.F.E
Moroccan Association of Fertilizer and Plant Nutrition Industries

C.O.S.M.E.M
Moroccan Cosmetics Association

A.M.P.P.E.C
Moroccan Association of Paint, Ink, Glue and Adhesive Industries

CROPLIFE
A non-profit association representing the plant protection industry.

The Federation believes that the future of Morocco's chemical and parachemical industry depends on comprehensive modernization. It actively promotes the professional development of its members, encourages bold and modern human resource policies, and provides the necessary tools for full regulatory compliance.

AMDIE – Moroccan Agency for Investment and Export Development is a next-generation institution, the result of the merger between the Moroccan Investment Development Agency, Maroc Export, and the Casablanca Trade Fair Office.

Its mission is to implement the national strategy for developing both domestic and foreign investment, as well as for promoting exports of goods and services. AMDIE plays a key role in sector-based promotion of Morocco's industrial and economic offering.

The Agency operates across three strategic areas :

1. Investor Support

- Investment advisory services
- Project facilitation and implementation support
- Networking with partners, suppliers, and potential clients
- Access to a portfolio of investment-ready projects
- Aftercare and investor services

2. Export Promotion

- Market development and international client outreach
- Connecting Moroccan exporters with foreign businesses and institutions
- Supporting Moroccan companies in international expansion
- Providing financing and export risk coverage solutions
- Offering detailed insights on high-potential international markets

3. International Exhibition Center

- Hosting exhibition spaces for both national and international organizers
- Organizing events linked to investment and export
- Offering expert support for exhibitors at domestic and international trade fairs

ORGANIZERS

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FEDERATION DE LA CHIMIE ET DE LA PARACHIMIE

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FEDERATION MAROCAINE DE PLASTURGIE
FMIIP IMPACT GLOBAL

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CONTEXT

Under the High Patronage of His Majesty King Mohammed VI, the Moroccan Federation of Chemistry and Parachemistry (FCP) reaffirms – through three successive editions – its driving role in Morocco's industrial and energy development.

Previous Editions Recap

- **1st Edition (May 17-18, 2023, Rabat) :** Under the slogan «The Kingdom Prepares to Become a Global Sector Hub,» this inaugural meeting established foundations for synergy between national and international stakeholders, fostering co-creation of sustainable partnerships and enhancing the global outreach of Morocco's chemical industry.
- **2nd Edition (May 15-16, 2024, Rabat) :** Bannered «Morocco, Future Global Chemistry Hub: The High-Performance Battery Industry,» the Forum spotlighted energy transition challenges and the strategic significance of next-generation batteries, solidifying the Kingdom's position in innovation and international alliances.

3rd Edition (May 21-22, 2025, Marriott Rabat)

The 3rd edition of the International Chemistry Forum positioned Morocco's chemical sector at the epicenter of energy transition and strategic imperatives. Representing nearly 30% of national industrial output, the industry stands as Morocco's leading industrial investor – generating 190 billion dirhams in revenue and over 180,000 direct/indirect jobs – cementing its status as a pivotal global player.

Guided by the slogan **«Morocco: Future Hub of Global Chemistry,»** this edition aimed to :

1. Stimulate dialogue on innovations and best practices ;
2. Promote Moroccan chemistry at both national and international levels;
3. Explore energy transition opportunities and strategic challenges.

Key themes addressed :

- High-performance batteries
- Green hydrogen
- Mineral and natural resource valorization

IN THIS ISSUE

DAY 1 - MAY 21, 2025

SPECIAL FEATURE

Energy Transition & Strategic Challenges Moroccan Chemical Industry at the Core of Global Transformation

- Overview of the High-Performance Battery Industry
- Green Hydrogen Deployment Roadmap & Future Prospects
- Valorization of Natural and Mineral Resources to Strengthen Industrial Sovereignty

DAY 2 - MAY 22, 2025

PANEL 1 : Moroccan Port Infrastructure: Enabling Global Chemical Supply Chains

PANEL 2 : Seawater Desalination: Chemistry's Contribution to Water Sovereignty

PANEL 3 : Research, Innovation & Talent: Building Morocco's Chemical Future

CLOSING REMARKS

- **Mr. Abed Chagar**
- **Message of Loyalty to His Majesty King Mohammed VI, May God Assist Him**
- **3rd Edition Highlights in Photos**

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EDITORIAL

Positioning our nation as a true global chemistry hub committed to equitable energy transition and shared prosperity

REINVENTING MOROCCAN CHEMISTRY: THE PATH TO SUSTAINABLE GROWTH

Under the High Patronage of His Majesty King Mohammed VI, the 3rd International Chemistry Forum held on May 21-22, 2025 at the Rabat Marriott demonstrated the Kingdom's unwavering commitment to industrial sovereignty and sustainable development. By convening experts, policymakers, industry leaders, and renowned researchers, this event charted the course for Moroccan chemistry's future.

At the dawn of a true energy revolution, our chemical industry stands at the heart of critical strategic challenges. High-performance batteries and green hydrogen centerpieces of this Forum embody Morocco's capacity to develop innovative solutions for global energy needs while leveraging its mineral and natural resources. These themes, inspired by the Royal Vision for industrial sovereignty and investment attractiveness, pave the way toward a more resilient, circular, and environmentally conscious chemical economy.

True to the Royal Vision, the Federation of Chemistry and Parachemistry (FCP) reaffirms its role as architect of a robust, innovative, and internationally oriented chemical sector. The time has come to transform shared ambitions into concrete projects: creating new value chains, training tomorrow's talent, and building sustainable partnerships.

In this special edition commemorating the 3rd International Chemistry Forum, we capture the essence of expert contributions while enriching it with a Special Feature dedicated to energy transition and strategic challenges. Discover comprehensive insights on high-performance battery innovations, the promising deployment of green hydrogen, and the valorization of our mineral and natural resources - cornerstones of Morocco's industrial sovereignty.

Together, let us continue writing this pivotal chapter in Morocco's industrial history, positioning our nation as a true global chemistry hub committed to equitable energy transition and shared prosperity.

M. Abed CHAGAR,

President of the Federation of Chemistry and Parachemistry (FCP)

THE 3RD INTERNATIONAL CHEMISTRY FORUM

Moroccan Chemical Industry at the Heart of Energy Transition and Strategic Challenges

Held under the High Patronage of His Majesty King Mohammed VI, the third edition of the International Chemistry Forum brought together industrial leaders, researchers, policymakers, and investors around a bold theme: "Morocco's Chemical Industry at the Heart of the Energy Transition and Strategic Challenges." This gathering served as a moment of both strategic assessment and forward planning to align Morocco's chemical sector with a sustainable, innovative, and sovereign industrial pathway.

True to its guiding motto, **"Morocco, Future Global Hub for Chemistry,"** the Forum pursued three complementary objectives:

1. To foster the exchange of ideas, expertise, and best practices between national and international stakeholders.
2. To promote Morocco's chemical sector on the global stage by highlighting its strengths and achievements.
3. To explore emerging opportunities and anticipate challenges tied to the energy transition and geopolitical shifts.

A Sector in Full Transformation

The chemical industry accounts for nearly 30% of Morocco's total industrial output, generating MAD 190 billion in revenue and over 180,000 direct and indirect jobs. Over the past few years, the sector has matured significantly—evolving from basic commodity production to delivering advanced technological solutions in energy storage, carbon footprint reduction, and the sustainable use of local resources.

To address today's pressing challenges, the Forum structured its discussions around three major strategic pillars:

- High-Performance Batteries: With surging global demand for electric vehicles and stationary storage, the development of a robust local battery industry has become essential. Discussions centered on advanced materials, eco-responsible manufacturing processes, and industrial scaling strategies.
- Green Hydrogen: Blessed with exceptional solar and wind potential, Morocco is ideally positioned to become a low-carbon hydrogen producer. Speakers explored financing mechanisms, infrastructure needs, and international partnerships essential for exporting this clean energy vector.

- Valorization of Mineral and Natural Resources: Phosphates, critical metals, biomass, and other local deposits represent strategic reserves for green chemistry. Sessions highlighted pilot projects and circular economy models that ensure responsible resource management.

DAY 1: INNOVATION & ENERGY SOVEREIGNTY

The Forum's first day opened with an in-depth focus on the sector's key strategic issues. Three panel sessions offered a space to deep-dive into each theme and share practical insights from industry leaders:

Panel 1: **High-Performance Batteries – Building a Local Industry :** This panel explored prospects for manufacturing next-generation battery cells in Morocco. Experts presented innovations in active materials and recycling techniques, while emphasizing the importance of an integrated ecosystem combining R&D, equipment suppliers, and automotive manufacturers.

Panel 2: **Green Hydrogen – Cornerstone of the Energy Transition:** Debates centered on how to structure a competitive hydrogen value chain, from production to distribution. Key topics included regulatory frameworks, public-private partnerships, and the integration of hydrogen with energy-intensive industries.

Panel 3: **Industrial Sovereignty through Resource Valorization:** This final panel emphasized the need to process Morocco's mineral wealth domestically. Case studies on the sustainable exploitation of phosphates and the extraction of critical metals demonstrated how local transformation can reinforce national autonomy.

DAY 2: DESALINATION, WATER SOVEREIGNTY, AND HUMAN CAPITAL

The second day shifted to operational strategies, focusing on three interconnected pillars.

Panel 1: **Port Logistics and the Chemical Supply Chain :** Discussions revolved around the modernization of port infrastructure, digitalization of logistics flows, and securing supply chains to support exports.

Panel 2: **Seawater Desalination and Water Sovereignty:** Chemistry plays a crucial role in improving membrane performance, developing more efficient catalysts, and reducing the energy costs of desalination. Experts discussed breakthrough innovations and how chemical engineering contributes to achieving water resilience in arid regions.

Panel 3 : **Research, Innovation, and Talent:** To ensure the sector's long-term sustainability, panelists emphasized the emergence of new university curricula, continuous training programs, and international partnerships aimed at preparing the next generation of engineers. A skilled and agile workforce was presented as a cornerstone of Morocco's industrial ambition.

Faced with challenges such as securing raw materials, scaling up industrial capacity, and optimizing energy processes, Morocco now benefits from an attractive regulatory framework, modernized infrastructure, and a growing talent pool ready to support the country's energy transition.

Under the leadership of His Majesty King Mohammed VI, Morocco has embraced an ambitious vision to develop its chemical sector as one of the key pillars of its industrial strategy. According to the Ministry of Industry and Trade's industrial survey conducted in June 2024, over 1,600 companies currently operate in the chemical and parachemical sectors, representing 22% of the national industrial fabric and 15% of employment, amounting to more than 220,000 direct and indirect jobs.

In 2022, the sector recorded MAD 11 billion in investments and MAD 184.4 billion in turnover, including MAD 120 billion in exports. These results place the chemical industry among Morocco's top three exporting sectors.

Special Feature: Energy Transition & Strategic Challenges

This issue includes an in-depth special feature exploring key shifts shaping the future:

- Battery Innovation: New alloys and cell designs, powered by AI integration for enhanced safety and performance.
- Green Hydrogen and Geopolitics: Export corridors, South–South cooperation, and international financing mechanisms.
- Value Chain Transformation: Resource traceability, circular economy integration, and territorial partnerships for sustainable raw material processing.

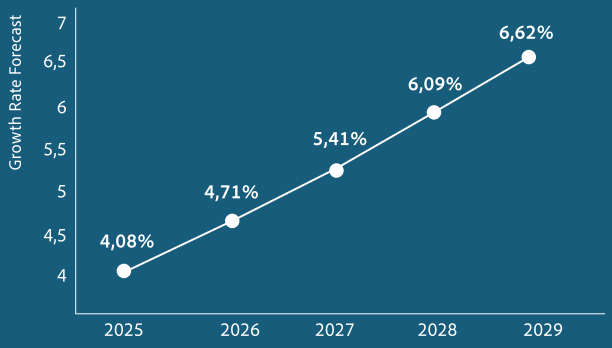
This Special Feature underscores the importance of continuous dialogue between industry leaders, researchers, and policymakers to bring national ambitions to life.

OUTLOOK, CHALLENGES AND PRIORITIES

The Moroccan chemical ecosystem includes major national groups and subsidiaries of multinational corporations, alongside hundreds of SMEs and mid-sized companies specializing in ten value chains: agrochemicals, polymers, paints and inks, detergents, pharmaceuticals, and more. It is closely interlinked with the aerospace, automotive, and energy industries—both upstream and downstream.

The report "Morocco Chemicals Market (2022–2031): Revenue & Analysis," conducted by 6Wresearch and updated in April 2025, projects that the sector will experience an average annual growth rate of 4.08% in 2025, rising to 6.62% in 2029, driven by domestic demand and export opportunities in sub-Saharan Africa and Europe.

Morocco Chemicals Market, Growth Rate Forecast (2025-2029)



Note : The market forecast is derived throogh analysis of correlations between key macroeconomic factors and market sales trends, followed by predective modeling to project future sale.

The same study identifies **five strategic priorities** to strengthen the ecosystem :

1. Transition to Green Chemistry: Adoption of low-carbon processes and replacement of toxic solvents.
2. Digitalization and Industry 4.0: Integration of smart technologies to optimize production and traceability.
3. Development of New Materials: Innovation in battery components, hydrogen membranes, and bio-based catalysts.
4. Regulatory Strengthening: Alignment with international environmental and safety standards.
5. Strategic Partnerships: Public-private alliances to secure raw material supply chains and build regional clusters.

A Success Story: OCP Group

A global leader in phosphates, OCP Group embodies Morocco's integrated approach to industrial development. In 2022, the group generated USD 11 billion in revenue and supported over 32,000 direct and indirect jobs.

Moroccan chemistry plays a pivotal role in the energy transition by enabling:

- The development of high-performance batteries for renewable energy storage.
- The production of green hydrogen from solar and wind resources.
- Recycling and circular economy models to reduce reliance on virgin raw materials.

Meeting these challenges will require reinforcing local production capacity, adapting logistics infrastructure, and providing robust support for scientific research and innovation.

With a supportive regulatory environment, upgraded infrastructure, and a dynamic pool of talent, Morocco's chemical ecosystem is well-positioned to become a regional and global leader. Its success will rely on consolidating partnerships, accelerating the energy transition, and investing in innovation.

OUTLOOK FOR MOROCCO'S CHEMICAL AND PARACHEMICAL SECTOR

Capacity, Current Trends, and Forecasts According to Bank Al-Maghrib

The latest monthly business surveys by Bank Al-Maghrib highlight mixed performances in Morocco's chemical and parachemical sector. Despite a capacity utilization rate (CUR) close to the national average, the segment faces persistent pressure on order volumes and stagnant employment levels, while industry stakeholders remain cautious in their short-term expectations.

Production Capacity and Equipment Utilization

In March 2025, the CUR for Morocco's industrial sector stood at 79%, a slight increase from 78% the previous month—an indication of modest recovery. However, conditions in the chemical-parachemical branch are more uneven: 33% of companies in this segment described their production environment as "difficult," compared to 20% across all sectors. Moreover, production either declined or stagnated, in contrast to the growth seen in the agri-food and mechanical industries.

This paradox can be attributed to extended maintenance cycles, output adjustments based on market demand fluctuations, and ongoing investments aimed at modernizing production facilities. Several operators have launched expansion and renewal projects, particularly in specialty chemical synthesis and technical polymers, but the full impact on effective capacity will only become apparent in the coming months.

Employment, Sales, and Cost Dynamics

One of the most notable findings from the survey is employment stagnation: 84% of companies in the chemical-parachemical sector made no new hires or layoffs in March 2025—a figure well above the national average. This cautious approach reflects conservative human resource management in the face of uncertain order books, which many production managers described as "below normal."

Commercially, sales in the sector increased modestly on both domestic and export markets. However, this growth was not sufficient to offset the drop in new orders recorded during the same month. More concerning is the sharp increase in unit production costs: 48% of chemical industry players reported cost hikes—mainly due to rising input prices and higher energy costs—compared to 35% across other sectors. This margin pressure impacts competitiveness and limits pricing flexibility in global markets.

Forward Outlook and Industry Expectations

Looking ahead over the next three months, chemical and parachemical manufacturers anticipate a decline in production and stable sales, in contrast with more optimistic projections from other sectors. Paradoxically, over one in five companies expressed uncertainty about future business conditions, citing volatile demand and supply chain strains.

However, several positive signals are beginning to emerge:

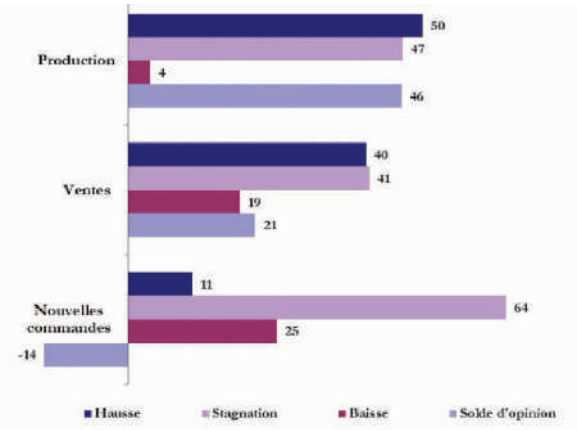
- Ongoing investments, especially in upgrading wastewater treatment stations and process water units, are expected to improve reliability and reduce operating costs.
- Targeted training programs, launched in collaboration with technical institutes and universities, aim to strengthen skills in electrochemistry and automated process control.
- Ramp-up of new high-value-added units—such as pharmaceutical specialties and technical resins—could help sustain mid-term growth across the segment.

Mixed Signals with Strategic Levers Ahead

The monthly surveys conducted by Bank Al-Maghrib paint a nuanced picture of Morocco's chemical and parachemical sector: while the capacity utilization rate remains close to the national average, the industry faces structural challenges—including order shortfalls, employment stagnation, and cost pressure—that continue to weigh on the recovery.

Still, programmed investments and efforts in skills development present promising levers for improvement. To reverse the current trends, stakeholders will need to accelerate modernization, boost local value chain integration, and diversify market outlets in order to strengthen the resilience of this strategic sector.

Key Indicators in the Chemical and Petrochemical Industries (Proportion of Respondents in %)



Source: Monthly Economic Survey - March 2025 - Industrial Sector, conducted by Bank Al-Maghrib.

Based on a 65% response rate.

THE GLOBAL CHEMICAL INDUSTRY ON THE EVE OF 2025

Moderate Growth, Regional Realignments, and the Sustainability Challenge

Despite a sharp rebound following the global health crisis, the global chemical industry is now entering a phase of more moderate growth. The market was valued at USD 6.2 trillion in 2023, with expected annual growth rates of 3.4% in 2024 and 3.5% in 2025. Amid technological innovation, geopolitical shifts, and increasing regulatory pressure, the sector is adapting its strategies to address both economic and environmental challenges.

Growth and Innovation

After near stagnation in 2023 (+0.3%), global chemical production is expected to grow by +3.4% in 2024 and +3.5% in 2025, according to the American Chemistry Council (ACC). This recovery is being driven by high value-added segments—pharmaceuticals, industrial specialties, and technical polymers—where margins remain resilient despite volatile raw material prices.

Industry leaders are leveraging automation and artificial intelligence to enhance operational efficiency. BASF, for example, has rolled out digital twin technology to monitor plant operations in real-time, while Dow Inc. is investing in IoT sensors to cut energy consumption in its reactors. Meanwhile, green chemistry is gaining traction, with more efficient catalysts, bio-processes for the production of bio-based polymers, and CO_2 capture integrated into synthesis units.

Regional Power Shifts

The Asia-Pacific region continues to dominate the industry, accounting for over 50% of global production, with China alone expected to grow by +6.8% in 2024, following an impressive +10.6% in 2023. In the United States, the shale gas boom is fueling a +1.9% rebound in chemical output in 2025, supported by reshoring of value chains incentivized through the Inflation Reduction Act (IRA).

The Asia-Pacific region continues to dominate the industry, accounting for over 50% of global production, with China alone expected to grow by +6.8% in 2024, following an impressive +10.6% in 2023

By contrast, Europe is facing setbacks due to high energy costs and intensifying global competition. After an 8.5% decline in 2023, recovery has been modest (+2.5% in H1 2024), and exports dropped to EUR 523 billion, down 5% from 2022. To strengthen its autonomy, the European Commission is finalizing its Battery Regulation and co-financing joint ventures in extraction and refining projects in Canada and Australia, aiming to embed European chemistry within more resilient value chains.

Sustainability and Regulation

Under mounting pressure from consumers and regulators, the green transition is gaining momentum. The European Union estimates the annual cost of environmental compliance for chemical companies to exceed USD 20 billion, covering effluent treatment and CO_2 emission reduction. These requirements are fueling growth in circular economy solutions: chemical recycling of plastics and batteries now aims for recovery rates above 90%, using pyrometallurgical and hydrometallurgical processes to extract polymers and precious metals.

According to Statista, the sector's carbon footprint is expected to decrease by 15% by 2030 under a «sustainable development» scenario. Companies are investing in CO_2 capture from methane reformers and in the use of non-food biomass as alternatives to petrochemical feedstocks. ISO 14001 Certification and the Responsible Care program have become standard benchmarks for best practices, reinforcing trust among stakeholders.

> The chemical industry is expected to reduce its carbon footprint by 15% by 2030 under a "sustainable development" scenario.

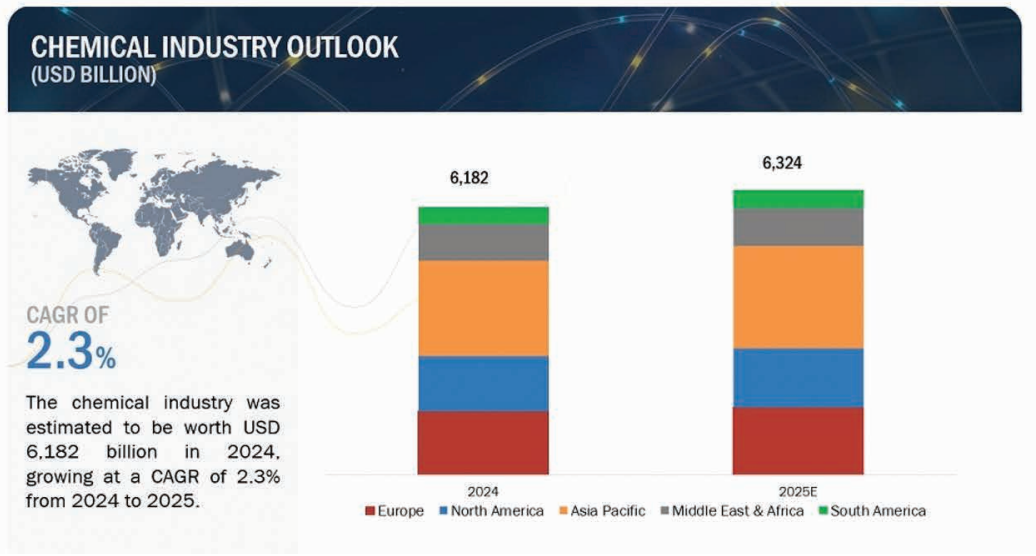
Emerging Outlooks

By 2030, growing global demand for advanced materials—such as batteries, catalysts, and bio-materials—is expected to spur local production of specialty chemicals. Gas-rich nations like the U.S. and Qatar, and low-energy-cost regions such as the Maghreb and the Middle East, could attract major investments in petrochemicals and basic chemistry.

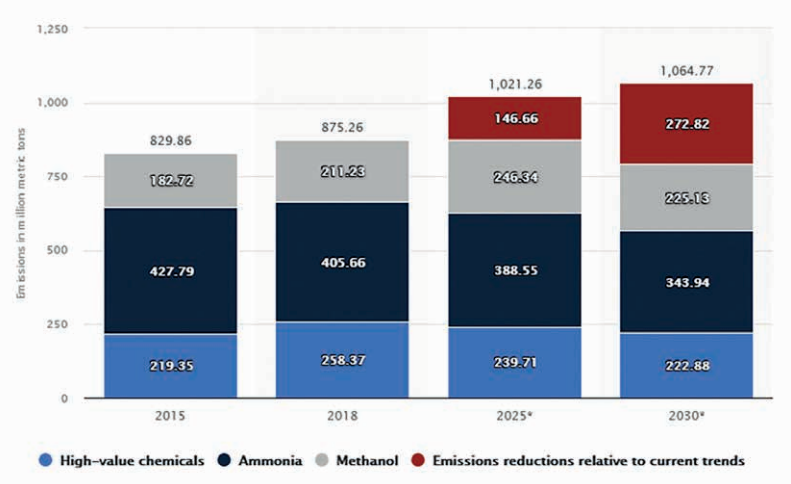
> An annual growth forecast of 6.1% through 2030 reflects optimism regarding market opportunities in specialty chemicals and emerging technologies.

For Morocco, whose chemical industry relies heavily on OCP and modernized industrial zones (such as Kénitra and Al Jorf), the opportunity is twofold: to enhance the value of phosphates in fine chemistry and to attract high-tech production units. By focusing on circularity, developing expertise in electrochemistry, and fostering local innovation, the Kingdom can position itself within the third wave of a more sustainable and resilient chemical industry, while also contributing to Africa's broader ambitions for industrial sovereignty.

Despite growing global uncertainty, the chemical industry continues to maintain moderate growth by leveraging innovation and ecological transition. Regional realignments offer new opportunities to relocate critical supply chains, while increasing regulatory pressures are accelerating the shift toward circular economy models. For emerging economies such as Morocco, the challenge lies in turning these transformations into drivers of sustainable development and industrial competitiveness.



Graphique : Émissions de CO_2 de la Production Chimique Mondiale (2015-2030)



Published by Statista Research Department, March 24, 2023.

Projections based on the sustainable development scenario. Direct CO_2 emissions include both energy-related and process emissions. Key chemicals include ethylene, propylene, benzene, toluene, mixed xylenes, ammonia, and methanol. Primary chemical production accounts for two-thirds of total energy use in the chemical and petrochemical sectors.

WELCOME ADDRESS

M. Abed CHAGAR,
Chairman of the Organizing Committee, 3rd Edition of the International Chemistry Forum

DAY 1

Mr. Secretary of State in charge of Foreign Trade,
Mr. President of the CGEM,
Excellencies, Ambassadors of Ethiopia and Kenya,
Ladies and Gentlemen, Presidents and CEOs,
Dear colleagues,
Honored guests,

It is with great honor and immense pride that I welcome you to the opening of the 3rd edition of the International Chemistry Forum.

Held under the High Patronage of His Majesty King Mohammed VI, may God assist Him, this edition carries exceptional significance. It reflects the strategic importance that His Majesty places on industrial development, innovation, energy sovereignty, and Morocco's role as a key player in the global energy transition.

This year, we are especially pleased to welcome official and business delegations from East Africa — notably Ethiopia, Kenya, and Tanzania. Their presence here in Rabat underscores our shared commitment to building strong industrial, commercial, and technological partnerships with this sister region of our continent.

Alongside the Forum, these delegations will take part in B2B meetings, targeted networking sessions, and visits to Moroccan industrial sites. These engagements are designed to foster concrete partnerships and initiate high-impact projects inspired by an integrated, sustainable, and mutually beneficial African vision.

The theme chosen this year — «The Moroccan Chemical Industry at the Heart of the Energy Transition and Strategic Challenges» — perfectly embodies our ambition to make chemistry a driver of industrial sovereignty, a force for innovation, and a source of responsible growth for Morocco.

Throughout this edition, leaders from major companies and international experts will address forward-looking topics, including:

- High-performance batteries
- Green hydrogen
- The valorization of natural and mineral resources
- Seawater desalination
- Education, research, and the emergence of tomorrow's talent

Thanks to its natural resources, strategic geographic position, and skilled human capital, Moroccan chemistry is poised to welcome new, future-oriented industries.

Allow me, in this spirit, to highlight some uplifting news for our country's scientific youth:

This week, young Moroccan high school students took first place at the International Chemistry Olympiad held in Paris. I warmly congratulate Yasmine Kadmiri Idrissi and Yassine Bekkaoui, supported by their physics and chemistry teacher, Ilham Chichaoui, and their technology teacher, Yassine Naji.

I also wish to extend my heartfelt thanks to:

AMDIE and the Ministry of Foreign Affairs for their support in organizing and hosting the delegations;

The Ministry of Industry and Trade;

The CGEM, OCP, and all our institutional partners and sponsors for their ongoing commitment.

A special mention as well for our scientific partner, Forvis Mazars Group SC, whose valuable support helped design the program of meetings with our East African counterparts.

Finally, I wish to recognize the entire team at the Federation for their unwavering dedication in preparing this Forum. Their professionalism and commitment have been exemplary.

Ladies and Gentlemen, welcome to each and every one of you.

May this 3rd edition be a source of inspiration, fruitful exchanges, shared pride, and collective opportunity.

> This year's theme perfectly reflects our ambition to make chemistry a driver of industrial sovereignty, a force for innovation, and a source of responsible growth for Morocco.

OPENING REMARKS

Mr. President of the Moroccan Federation of Chemistry and Parachemistry,

Distinguished representatives of national and international institutions,

Ladies and Gentlemen, in your respective capacities,

Dear friends,

First of all, please accept my apologies for not being able to join you today for this important edition of the International Chemistry and Parachemistry Forum. This gathering holds considerable importance on both the national and international industrial landscape.

I would also like to warmly congratulate the organizers for selecting such a timely and meaningful theme: "Chemistry at the Heart of the Energy Transition and Strategic Challenges." This subject could not be more relevant, as this industry — rightfully regarded as the "mother of all sciences" and the engine of all other industries — plays a pivotal role in the transformations currently underway in our country.

Today, the chemical industry stands at the very core of our industrial transformation, especially through the major investments we are seeing in the battery and energy storage sectors — areas that now account for a growing share of industrial investment directed toward Morocco.

But chemistry's role extends far beyond that. It continues to underpin strategic industries such as pharmaceuticals, fertilizers, and other sectors that are essential to our sovereignty and development. We are, collectively, at a turning point. Rarely has our country — and your industry — been offered such favorable conditions to grow, innovate, and contribute even more powerfully to national progress.

Several factors are converging to make this possible. First and foremost, a sovereign vision supported by bold ambition and clear industrial strategies. Second, the emergence of a new generation of highly trained, deeply motivated, and increasingly numerous talents — capable of initiating, steering, and realizing the industrial projects of tomorrow.

Moreover, in an industry like chemistry — known for its high energy demand — Morocco is now, for the first time in its history, gaining access to abundant, even virtually unlimited energy at highly competitive prices. This comparative advantage is reshaping our industrial potential and opening unprecedented new horizons.

M. Ryad Mezzour,
Minister of Industry and Trade

Today, more than ever, chemistry must play its part:

- At the heart of economic development,
- At the heart of industrial transformation,
- And at the heart of technological innovation.

Artificial intelligence, as you well know, does more than assist us — it challenges us. It pushes us to create, to invent.

An "augmented" chemist is now three, four, even five times more efficient than a traditional chemist working in a lab. It is up to us to embrace this technological transformation. It is up to us to harness this human potential, which we have never before possessed at such scale in our history.

It is also up to us to transform this energy, this intelligence, and this talent into added value, innovation, and prosperity for our country.

We are counting on you.

Once again, congratulations on all that you are doing, and I wish you an excellent and fruitful Forum.

> This year's theme could not be more relevant: chemistry rightly known as the mother of all sciences and the driving force behind all industries plays a central role in the transformations currently reshaping our country.

Ministers and Members of the Government,

Mr. President,

Mr. Director General,

Distinguished Guests, Ladies and Gentlemen,

As you know, the chemical industry plays a central role in supporting Morocco's energy transition. It contributes across several major dimensions: energy, circular economy, decarbonization of multiple sectors, and the development of green hydrogen. Our collective task today is to identify the key levers of transformation and anticipate the critical challenges ahead.

That is why it is a true honor for me to take part in this third edition of the International Chemistry Forum. I would like to sincerely congratulate the organizers for this initiative, which provides a valuable platform for dialogue around strategic issues shaping the future of Morocco's chemical industry.

Ladies and Gentlemen,

In line with the High Directives of His Majesty King Mohammed VI, may God assist Him, Morocco has made remarkable progress in several key sectors.

In electricity, for instance, we now have an installed capacity exceeding 12 GW, more than 5 GW of which come from renewable sources. As a result, the share of renewables in our energy mix has risen from 37% in 2021 to 45% as of April 2025.

Our national investment plan aims to deploy over 15 additional GW by 2030, representing a total investment of MAD 120 billion — of which 80% will be from renewable sources. These figures reflect Morocco's firm commitment to a sustainable and competitive energy model.

Hydrogen also plays a fundamental role in this transition. With its many applications — particularly in the production of ammonia, an essential ingredient in fertilizer manufacturing, and as a clean fuel for transportation — hydrogen represents a true industrial opportunity. In this regard, I would highlight the green investment program of OCP Group, which aims to produce 1 million tons of green ammonia by 2027, and 3 million tons by 2032.

Chemistry is critical to this hydrogen development process. It enables the optimization of production, storage, and transport methods, enhances the efficiency of chemical reactions, reduces environmental impact, and helps develop materials tailored to hydrogen's technical requirements.

Chemical research, for example, improves catalysts based on precious metals like platinum, while also exploring alternatives such as nickel or cobalt oxides. It also advances the development of proton exchange membranes and electrodes capable of withstanding extreme temperatures, humidity levels, and repeated usage cycles.

M^me^ Leïla Benali,

Minister of Energy Transition and Sustainable Development

> By intensifying efforts to optimize consumption and enhance international competitiveness, we are positioning Morocco's chemical industry at the heart of the transformation toward a greener, more resilient future.

Ladies and Gentlemen,

The chemical sector is fully aligned with our drive toward energy efficiency and sustainability. By intensifying efforts to optimize consumption and boost international competitiveness, we are positioning Morocco's chemical industry at the heart of the shift toward a greener, more resilient future.

Thanks to the joint mobilization of public authorities and industrial partners, Morocco is advancing steadily toward a low-carbon, competitive model capable of meeting tomorrow's challenges.

In closing, I wish to extend my warmest thanks to the organizers of this third edition of the International Chemistry Forum. I am confident that the discussions held here will generate concrete proposals to support our collective efforts.

Thank you for your attention.

Ladies and Gentlemen,

Mr. President of the Federation of Chemistry and Parachemistry,

Mr. President of the CGEM,

Your Excellencies, Ambassadors,

Distinguished Guests,

Valued Partners,

It is a great pleasure for me to speak at the opening of this third edition of the International Chemistry Forum, held under the High Patronage of His Majesty King Mohammed VI – may God assist Him. More than just an annual gathering, this event stands as a strategic platform for reflection and a springboard for concrete economic action, dedicated to a sector that lies at the heart of our industrial sovereignty, our urgent energy transition, and our pursuit of sustainable innovation.

Thanks to the enlightened vision of His Majesty the King, our Kingdom has made the bold choice to place the chemical industry at the center of its development model. Far from being a peripheral player, this sector now accounts for 25% of Morocco's industrial fabric, generates an impressive turnover of 19 billion dirhams, and sustains over 220,000 direct and indirect jobs. It is not merely a driver of economic growth — it is a fundamental pillar of our technological and economic sovereignty.

In light of today's decarbonization imperatives and the need to rethink global value chains in an increasingly unstable geopolitical environment, Moroccan chemistry has proven to be a strategic asset. It positions us at the forefront of the global energy transition. Just consider the rapid rise of the electric battery ecosystem or the boundless potential of green hydrogen. Blessed with abundant natural resources, exceptional wind conditions, and a unique geographic position, Morocco is steadily emerging as a key player in clean energy on the world stage.

Our country no longer limits itself to processing — it innovates. It no longer simply produces — it now shapes markets and asserts itself within the new global energy landscape. This industrial ambition is fully aligned with the royal vision, which has consistently called for a united, proactive, and sovereign Africa. As His Majesty has emphasized in numerous addresses, the development of our continent cannot be imported; it must be conceived, carried, and consolidated by Africans themselves.

It is in this spirit that we attach particular importance to the development of South-South cooperation. It reflects a shared determination to build lasting bridges between our economies in the service of true economic diplomacy among Southern nations. We must work together to build

M. Omar Hejira,
Secretary of State to the Minister of Industry and Trade, in charge of Foreign Trade

an integrated African economic space, where exchanges go beyond simple transactions and become mutually beneficial investments and joint industrial ventures driven by a shared vision of co-development.

Yet our export and outreach ambitions are not limited to our continent. Morocco is firmly engaged in multilateral cooperation, actively working to diversify its markets and increase its share in global trade. Given its quality and level of innovation, our chemical industry has a rightful place in the markets of Europe, Asia, the Americas, and beyond. We are actively working to remove trade barriers and promote our products to new destinations, capitalizing on the many bilateral and regional agreements at our disposal.

The holding of this forum, which brings together all the key players of the ecosystem, directly contributes to enhancing Morocco's attractiveness as a regional hub for innovative and sustainable chemistry. In closing, I would like to warmly acknowledge the President and the Federation of Chemistry and Parachemistry for their unwavering commitment and tireless dedication to advancing this strategic industry.

Together, let us continue working tirelessly for a Moroccan chemical sector that is innovative, responsible, sustainable, and a bearer of a brighter future for our nation.

Thank you for your attention.

Mr. Secretary of State,

Mr. President of the Federation of Chemistry and Parachemistry,

Your Excellencies, Ambassadors,

Ladies and Gentlemen, dear friends,

It is with genuine pleasure that I take the floor today at this third edition of the International Chemistry Forum, to speak about a sector that is both rooted in history and firmly focused on the future. Though often perceived as discreet, this industry is one of the silent pillars of our economy. It nourishes our industrial value chains, supports our agriculture, health, construction, and textile sectors, and plays a decisive role in our aspirations for industrial and energy sovereignty.

Before diving into the heart of the matter, I would like to warmly congratulate the Federation of Chemistry and Parachemistry, and its President, my friend Abed Chagar, for organizing this Forum, and more broadly for the remarkable work carried out both at the head of the Federation and within the Maroc-Industrie group.

The Moroccan chemical sector is essential to our economy: it represents 25% of industrial GDP and over 20% of our exports. It also plays a major role in employment, with 18,000 quality direct and indirect jobs. But beyond its economic weight, what truly sets this sector apart is its capacity to catalyze industrial development and enable the realization of our national ambitions.

His Majesty King Mohammed VI – may God assist Him – has set us a clear objective: achieving industrial sovereignty. Reducing our dependence on imports means building a strong chemical industry, one that can supply the essential inputs and commodities required by other sectors. It is also companies in this industry that develop the innovative processes needed to strategically harness our natural resources, such as critical minerals.

To make this vision a reality, we must accelerate investment in research and development. Innovation is a sine qua non condition for our move up the industrial value chain. The R&D fund, currently endowed with 300 million dirhams per year, must be strengthened, and its access procedures and reimbursement mechanisms need to be simplified for businesses.

Another key area for action is updating our regulatory framework. Much of our current legislation is outdated, in some cases even inherited from the colonial era. This legal obsolescence is a clear obstacle to sector growth. Moreover, the reform of vocational training

M. Chakib ALJ
President of the General Confederation of Moroccan Enterprises (CGEM)

> Reducing our dependence on imports requires building a strong chemical industry, capable of supplying the essential inputs and commodities for other sectors.

has become urgent if we are to connect our young talents to the industries of the future. Currently, only 1% of contributing companies benefit from it — this is a structural anomaly we must address. The broad rollout of apprenticeship contracts will allow young graduates to be operational from day one. The recent announcement to quadruple the number of students in work-study programs by 2026 is an excellent step forward.

The chemical sector is also central to Morocco's positioning as a leader in green energy and sustainable development. Thanks to the vision of His Majesty, our country is already recognized worldwide, with 40 to 45% of installed energy capacity coming from renewables, and the 2030 target is now expected to be achieved as early as 2027. We have successfully leveraged our natural assets in solar and wind energy.

The next great challenge is green hydrogen. And it is no longer a distant future — Morocco is already among the most advanced countries in this domain, with a projected capacity to meet 4% of global

demand by 2030. The prospects of this energy source for maritime and air transport, as well as for heavy industry, are already attracting international investors, with commitments totaling tens of billions of dollars.

Our chemical industry will need to support this momentum, by providing the tools for green hydrogen production and also by adding value to its downstream derivatives. It is also at the heart of the battery ecosystem, already bolstered by massive investments totaling several tens of billions of dirhams. This sector produces essential components for sustainable mobility. We have all the assets to become a strategic supplier for Europe.

In rising to these challenges, the chemical sector could profoundly transform Morocco's international positioning. The success of green hydrogen could place us within the exclusive club of net energy exporters, with major geopolitical implications. Furthermore, our already exceptional exports — around 45 billion dirhams in 2024 — could see accelerated growth, attracting more foreign direct investment and strengthening the convertibility of the dirham.

Ladies and gentlemen, Moroccan chemistry stands at a turning point. Perhaps more than any other industrial sector, it holds the keys to a new era of industrial and energy sovereignty for Morocco. It serves as the interface between our natural resources and concrete responses to our industrial, economic, and energy challenges. I am convinced that we can turn this industry into a regional champion of the energy transition, a pillar of industrial sovereignty, and a driver of prosperity for future generations.

To do so, we must continue mobilizing our efforts, working intelligently alongside public authorities, and removing the obstacles still standing in our way. I am confident that we will succeed.

I wish you an excellent Forum.

> The next great challenge is green hydrogen. And it is no longer a distant future: Morocco is already among the world's most advanced countries in this area, with a projected capacity to meet 4% of global demand by 2030.

Ministers,

Mr. Secretary of State,

Presidents,

Dear partners,

Ladies and Gentlemen,

It is with great interest and genuine pleasure that we take part today in this third edition of the International Chemistry Forum. This now-unmissable event offers us the opportunity to collectively reflect on the future of our industry. The theme of this edition — "The Moroccan chemical industry at the heart of the energy transition and strategic challenges" — aligns perfectly with the ambitions that drive our Group.

At OCP, we consider chemistry a decisive lever for building a more resilient, sovereign, and sustainable industrial model. The third phase of our strategy is centered around a modern and refined chemical industry that generates high value, and is structured around three key pillars: diversification, circular economy, and the development of future-oriented sectors such as fluorine, uranium, specialty fertilizers, and innovative technologies.

This integrated and forward-looking vision now guides our active contribution to the transformation of Morocco's national chemical industry. It is already reflected in tangible achievements driven by a clear and structured roadmap.

Among these impactful initiatives, we are supporting the emergence of new industrial segments with high added value: LFP batteries, fluorine, uranium, purified acid, specialty fertilizers, and feed products. Through these efforts, we aim to position Morocco as a key player in the value chains of the future.

Another major focus is seawater desalination, a true cornerstone of our climate adaptation strategy. As of today, our capacity has reached 200 million m^3 per year, supplying both our industrial sites and nearby cities. By 2030, we aim to reach 630 million m^3 to meet the growing demand from the industrial, urban, and agricultural sectors.

In the same spirit of sustainability, we are deploying circular solutions such as the reuse of phosphogypsum in construction materials, in partnership with national stakeholders. We are also investing in sulfur recovery — currently fully imported — to strengthen our autonomy and supply chain resilience.

M. Ahmed Mahrou
Managing Director SBU Manufacturing, Groupe OCP

> At OCP, we consider chemistry a decisive lever for building a more resilient, sovereign, and sustainable industrial model.

On the energy front, our integrated strategy aims to enhance autonomy and accelerate the transition to a low-carbon model. A significant portion of our energy is already self-produced through cogeneration, and is being complemented by renewable energy projects. Our objective is clear: to produce 3 million tons of fully decarbonized fertilizers by 2027, which would make OCP the first company in the world to bring such a quantity of zero-carbon fertilizers to market. We also aim for carbon neutrality on Scopes 1 and 2 by 2030.

Industrial innovation is another key driver, fostered through strong synergy with Mohammed VI Polytechnic University, InnovX, and the broader ecosystem. It is materializing through breakthrough solutions, patents born from Moroccan research, and the development of new capacities that support our technological sovereignty.

At the heart of every transformation, of course, are people. This is why we are currently nurturing the emergence of "ambidextrous" talents through training, mentorship, and career development programs — professionals capable of balancing exploration with execution.

All these initiatives aim to make Morocco a global hub for the chemical industry, fully aligned with national priorities in energy transition, industrial sovereignty, and sustainable innovation.

This ambition is taking shape through the development of high-value-added segments, the strengthening of the national industrial fabric, and the creation of integrated ecosystems where production, innovation, and education interact closely. This, in turn, reinforces local value chains and fosters industrial synergies.

Our ambition is to actively contribute — alongside all stakeholders — to building a Moroccan production base that is inclusive, innovative, and resilient. We firmly believe that it is through the alliance of public, industrial, and scientific actors that we will collectively overcome the challenges of tomorrow.

This Forum offers a valuable platform to build that vision together.

Thank you.

> Our objective is clear: to produce 3 million tons of fully decarbonized fertilizers by 2027, which would make OCP the first company in the world to bring such a quantity of zero-carbon fertilizers to market.

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KEYNOTES & EXPERTS

WHAT KIND OF ECOSYSTEM FOR MOROCCO'S STRATEGIC INDUSTRIES ?

How can we create the right conditions for the emergence of high value-added industrial sectors? What tools can help structure innovative ecosystems around promising industries such as batteries, green hydrogen, and advanced materials? At the 3rd edition of the International Chemistry Forum, three leading experts offered complementary insights into the key levers driving this transformation.

François Marchal, CEO of Société Générale Maroc, opened the keynote series with a reflection on the structuring role of sustainable finance and public-private partnerships in the emergence of new industrial sectors in Morocco. He emphasized the importance of an ecosystem-based approach, in which financing supports infrastructure development, training, and innovation.

Émile Detry, Managing Director and Partner at Boston Consulting Group (BCG), then provided a strategic outlook on how Morocco can attract transformative industrial investments, particularly in batteries, automotive, and green energy. He underlined the need to create an attractive environment, founded on competitiveness, regulatory stability, and coherent public policy.

Finally, Rachid Yazami, internationally renowned scientist and inventor of the graphite anode used in lithium-ion batteries, broadened the perspective by sharing his vision of a technological Morocco—capable of developing its own patents, startups, and research ecosystems in next-generation batteries, hydrogen, and sustainable innovation.

Three perspectives, one shared goal: to design and build a coherent, ambitious, and sovereign ecosystem that positions Morocco as a regional industrial and technological hub serving the global energy transition.

François Marchal
Chief Executive Officer
Société Générale Maroc

François Marchal is an experienced banker and currently serves as CEO of Société Générale Maroc. With an extensive international background, he has held several strategic positions within the Société Générale Group, including Deputy CEO and Head of Commercial Operations in Ghana, as well as Senior Inspector in France. A graduate of Paris II Panthéon-Assas University and HEC Paris, Marchal began his career as an international tax lawyer at CMS Bureau Francis Lefebvre before joining Ernst & Young as a risk management consultant. With nearly 20 years of banking experience, François Marchal combines financial expertise with strategic vision to drive Société Générale Maroc's growth. His leadership and deep understanding of African markets make him a key player in the banking sector's development across the continent.

Émile Detry
Managing Director & Partner
Boston Consulting Group
(BCG), Casablanca

Émile Detry is a Partner at Boston Consulting Group (BCG) in Casablanca, where he has been advising Moroccan and African companies on strategic transformation for over 15 years. A specialist in commodity markets, he focuses on the mining and chemical sectors, with particular expertise in energy transition and digitalization. His work addresses key challenges such as decarbonizing the mining industry, developing green hydrogen, and harnessing critical metals. He helps industry players adopt sustainable models that combine economic performance with environmental responsibility. Passionate about innovation, Émile Detry is actively shaping the evolution of extractive industries in Africa by promoting impactful technologies and forward-looking strategies.

Rachid Yazami
Scientist & Inventor
Pioneer of Lithium-Ion
Battery Technology

Rachid Yazami is a world-renowned Moroccan physicist and electrochemist, best known for his groundbreaking invention of the graphite anode, now used in over 95% of rechargeable lithium-ion batteries. Born in Fez in 1953, he studied in France at the Grenoble Institute of Technology (INP), where, in 1980, he made a major scientific breakthrough by demonstrating the reversible insertion of lithium into graphite. His pioneering work, which earned him the prestigious Charles Stark Draper Prize in 2014, paved the way for modern batteries—now essential in electronic devices and electric vehicles. He also developed fluoride-ion battery technology and founded several startups, including KVI PTE LTD in Singapore, focused on enhancing battery safety. Currently a professor at Nanyang Technological University in Singapore and holder of over 150 patents, Rachid Yazami continues to innovate to meet the energy challenges of tomorrow. His exceptional career makes him a major figure in global scientific research.

BANKS AND BATTERIES: THE STRATEGIC BET ON STRUCTURED SUPPORT

François Marchal, CEO of Société Générale Maroc, breaks down the stakes of an emerging industrial sector

As global economic challenges continue to mount from inflation and geopolitical tensions to the energy transition Morocco stands out for one key reason: its ability to generate endogenous growth, driven by structural reforms and an ambitious industrial vision. Speaking at a recent forum dedicated to the chemical industry, seasoned banker and key figure in Moroccan finance François Marchal shared his perspective, offering a cautious yet genuine sense of optimism. Here's a closer look at his enlightening analysis.

A Global Ambition

Morocco has substantial potential to become a competitive player in the battery industry, according to François Marchal. This ambition rests on three major strengths: access to critical raw materials (such as cobalt, fluorine, and phosphate), a geostrategic position between Europe and Africa, and strong political will. However, the ecosystem is still in its infancy.

"We're not starting from scratch, but the road ahead is long. We need to build a fully integrated value chain—from raw material extraction to battery cell manufacturing—while investing in R&D and workforce training," he explains.

The battery industry is capital-intensive: building a single gigafactory—a large-scale battery manufacturing plant—requires between $2 and $5 billion in investment. These projects cannot be financed through traditional loans. They require hybrid financing models that combine bank loans, sovereign funds, green bonds, and international partnerships. A further challenge lies in the lack of local expertise in electrochemical engineering and large-scale project management. "We need to train a new generation of technicians, engineers, and specialized bankers. Without that, these projects risk remaining dependent on foreign expertise," Marchal emphasizes.

> The battery industry is capital-intensive: building a single gigafactory a large-scale battery manufacturing plant requires between $2 and $5 billion in investment.

The Essential Triad

According to François Marchal, success hinges on close collaboration between three actors: the State, industry, and the banking sector. Each plays a distinct yet complementary role. The State, as guarantor of strategic vision and regulatory stability, must drive, secure, and coordinate development efforts. This includes providing sovereign guarantees to reassure international investors, offering targeted tax incentives—such as VAT exemptions or R&D tax credits—adapting environmental regulations and policies around critical minerals, and financing key infrastructure like dedicated industrial zones or logistics hubs.

> Without the public support, banks wouldn't be able to take on the risk of financing such capital-heavy projects.

A concrete example of this synergy is the gigafactory project spearheaded by the Moroccan group Managem in partnership with a European firm. The project benefits from a loan 70% guaranteed by the government, along with customs exemptions for importing advanced technologies. "Without this public support, banks wouldn't be able to take on the risk of financing such capital-heavy projects," Marchal points out.

Banks, for their part, must navigate between caution and innovation. "We're not venture capitalists. Our role is to support—not to gamble on—industrial ventures," the banker reminds us. To address the unique needs of the battery sector, financial institutions are developing tailor-made instruments: project loans indexed to technical milestones (such as prototype validation), co-investment funds with institutions like the EBRD or AFD, and hedging solutions to mitigate currency or raw material price volatility. "The challenge is to strike a balance between boldness and discipline. A poorly structured project today will scare off investors tomorrow," he warns.

Financial Engineering

Financing the battery industry requires a break from traditional models. Conventional senior debt alone is not enough. A blend of debt, equity, and hybrid instruments is essential. Among the key levers are green bonds, a tool Morocco has already pioneered in

Africa through green issuances by OCP. The Kingdom could now lead the way with "battery bonds" linked to sustainable industrial projects.

Sovereign wealth funds, such as the Mohammed VI Investment Fund, could take minority equity stakes to attract additional private capital, while public-private partnerships (PPPs) would play a central role in building dedicated energy infrastructure—such as solar power plants to supply gigafactories.

One textbook example of this complexity is the Battery Valley project in Ben Guerir, supported by Mohammed VI Polytechnic University. The financing structure includes a $1.2 billion syndicated loan—coordinated by Société Générale and Attijariwafa Bank—an EU grant for R&D, and equity investment from a Qatari fund. "Putting together a deal like this requires close collaboration between local and international players, along with deep expertise in risk management," explains Marchal.

Morocco on the Global Chessboard

The battery race is also a geopolitical battle. The United States, through its Inflation Reduction Act, and Europe, with its Critical Raw Materials Act, are heavily subsidizing their domestic industries. "Morocco must leverage its key advantages: political stability, proximity to Europe, and access to critical raw materials," explains Marchal.

> Morocco must leverage its key advantages: political stability, proximity to Europe, and access to critical raw materials

The Kingdom holds 70% of the world's phosphate reserves, a mineral that is essential to Lithium Iron Phosphate (LFP) batteries. However, extracting raw materials alone is not enough.

"We need to process them locally, through joint ventures with global players like CATL or Northvolt, in order to capture the full value chain," he insists.

On the diplomatic front, Morocco is expanding its network of free trade agreements—with both the United States and the European Union—and forging new mining partnerships, particularly with Rwanda and the Democratic Republic of the Congo for cobalt.

"Our economic diplomacy must advocate for fair access to markets and technology. Without this, we'll remain dependent on global value chains controlled by others," says Marchal.

The Foundation for Success

"Without local expertise, no project is bankable," Marchal emphasizes. The challenge is threefold: training specialized engineers, educating bankers on the unique dynamics of the sector, and raising awareness among public policymakers about industrial challenges. Institutions such as the National School of Mines in Rabat and Mohammed VI Polytechnic University (UM6P) have already launched master's programs in energy storage. Meanwhile, risk assessment modules are being developed in collaboration with HEM Business School and École Centrale Casablanca. "We need to create a common language between engineers, financiers, and regulators," he explains.

In parallel, think tanks like the OCP Policy Center are working on policy recommendations to build a coherent national industrial strategy. "The credibility of the entire battery value chain will also depend on our ability to recycle used batteries and manage mining waste. That requires stringent standards and major investment in the circular economy," he adds.

The "2030 World Cup Effect"

Beyond stadiums and sporting events, the tournament is catalyzing major structural investments: extension of the high-speed rail line (LGV Casablanca–Marrakech), the development of logistics hubs in Dakhla and Nador, and a surge in renewable energy capacity to power new infrastructure. "These are not short-term projects. They're redrawing Morocco's economic landscape for the next 20 years," stresses François Marchal.

The Time for Action

« Words aren't enough. Credibility will come from the first operational factories and signed export contracts," concludes François Marchal. The coming months will be decisive, as construction begins on two gigafactories and major technology partnerships are announced. To keep up the momentum, several priorities are on the table: Finalizing an industrial pact between the State, banks, and manufacturers to coordinate incentives; attracting one or two global leaders such as Tesla or BYD with "turnkey" investment offers; and launching a dedicated start-up fund for battery innovation, with an initial capital of $200 million.

"Morocco holds all the cards to become a strategic hub for Africa and the Mediterranean. Now is the time to act collectively—with pragmatism and ambition," Marchal concludes. Success will depend on the ability of all stakeholders to transform an ambitious vision into real, on-the-ground results—without falling into the traps of haste or fragmentation. "The challenges are immense—job creation, trade deficits, a just transition—but the foundations are solid. The coming decade will define Morocco's industrial maturity."

KEYS TO SUCCESS

- **Political stability:** A rare asset in the region, reassuring for investors.
- **Energy vision:** 52% renewable energy by 2030 — a strong foundation for green industry.
- **Financial innovation:** A dynamic capital market (e.g., the success of OCP's green bonds).

CHALLENGES TO WATCH

- **Territorial equity:** Bridging the gap between Casablanca and rural areas.
- **Vocational training:** Aligning skills development with the needs of future industries.
- **Fiscal competitiveness:** Balancing investment attractiveness with social equity.

MOROCCO: A KEY PLAYER ON THE GLOBAL DECARBONIZATION CHESSBOARD

Strategic Levers to Position the Kingdom as a Key Actor in the Energy Transition

As the fight against climate change intensifies, Morocco is emerging as a pivotal player in the reconfiguration of global energy and industrial value chains. At a recent forum focused on chemistry and energy, Émile Detry, Managing Director at the Boston Consulting Group (BCG), outlined the Kingdom's unique assets in meeting this global challenge. From strategic natural resources and geopolitical alliances to a forward-looking industrial vision, Morocco holds the cards to transform the energy transition into a lever for economic sovereignty.

70% of Global Emissions

"If one figure were to encapsulate the climate challenge, it would be 70%," says Émile Detry, Managing Director and Partner at BCG. That figure represents the share of global greenhouse gas emissions generated by the burning of fossil fuels. Solving the climate crisis, therefore, begins with phasing out coal, oil, and gas.

Decarbonizing the planet, in other words, means ending our reliance on fossil fuels. But how can this be achieved? Five main levers exist—two of which, in particular, offer strategic opportunities for a country like Morocco.

The first lever is to reduce energy consumption. Utopian? Not entirely. Yet, in practice, economic growth remains strongly correlated with energy availability. While slowdowns may occur in developed economies, this alone won't suffice to reach carbon neutrality.

The second lever is energy efficiency. While essential, its scope is limited in sectors such as chemicals, where performance is already nearing physical limits. On its own, this lever will not lead to a major breakthrough.

The third lever involves substituting fossil fuels with bioenergy. Biofuels offer some degree of carbon circularity, but large-scale deployment faces limitations, notably competition with food crops and food security concerns.

> L'efficacité énergétique et les bioénergies offrent un véritable potentiel de transformation et c'est là que le Maroc a un rôle stratégique à jouer

The last two levers, however, hold real transformative potential—and this is where Morocco plays a strategic role:

- Transitioning to a decarbonized electricity mix: This involves both electrifying end uses and generating enough low-carbon electricity.
- Developing alternatives for high-heat or mobile uses: Solutions include green hydrogen, blue hydrogen, and hydrogen combined with captured carbon.

Four Strategic Cards for Morocco

1. Becoming a Supplier of Low-Carbon Uranium

While Morocco is widely recognized for its phosphate reserves, a lesser-known opportunity lies in their uranium content. According to the International Energy Agency (IEA), Morocco's phosphate deposits may contain nearly twice the uranium reserves of Australia, the world's second-largest producer. "This uranium, currently unexploited, represents a multi-hundred-million-dollar opportunity. It could make Morocco a key supplier of yellowcake—the raw material for civilian nuclear power," explains Detry.

Nuclear energy, which emits 40 times less CO_2 than fossil fuels, is experiencing renewed global interest in response to the climate emergency. The Moroccan group Innovix, through its subsidiary Uranex, is developing chemical extraction processes for this uranium. "It's not just a technological challenge—it's a geopolitical lever. Morocco could help diversify global supply chains and support the revival of nuclear energy in Europe and Asia," Detry emphasizes.

> The currently unexploited uranium represents a multi-hundred-million-dollar opportunity. It could make Morocco a key supplier of yellowcake

2. Taking a Lead in Critical Metals Processing

The global economy is shifting from an oil-based model to one centered around critical metals—lithium, graphite, rare earths, cobalt. These are essential for batteries, renewable energy, and digital technologies. "Morocco holds attractive reserves of several of these metals. But the real value doesn't lie in extraction—just 20% of a project's value—but in transforming them into advanced chemical products: rare earth oxides, cobalt salts, graphite anodes," Detry points out.

Today, China dominates these transformation processes, creating a strategic dependency for the West. Morocco, through players like Managem, is positioning itself as an alternative. Its subsidiary, Managem Critical Metals, has formed partnerships with Asian specialists to supply purified metals to Western markets. "Tesla is delaying production targets due to rare earth shortages, and the West is actively seeking secure supplies. Morocco can help fill this gap," asserts Detry.

3. Positioning Morocco as a Competitive Hub for the Battery Industry

Morocco's third major asset lies in its capacity to develop an integrated battery ecosystem, built upon five strategic pillars :

1. **Free trade agreements** (with the EU and the United States), enabling seamless access to key export markets.
2. **Skilled workforce and efficient port logistics,** with immediate proximity to Europe.
3. **A well-established automotive industry,** ensuring large-scale industrial demand.
4. **Competitive access to green energy,** a decisive factor for battery manufacturers concerned with carbon footprint.
5. **Abundant phosphate resources,** critical to the production of LFP (Lithium Iron Phosphate) batteries—a segment currently dominated by China.

"China, the global leader in LFP batteries, must now prioritize its phosphate use for agriculture. Morocco, through OCP, is emerging as a vital partner," explains Detry. The state-owned Moroccan group is already investing in purified phosphoric acid, a critical precursor in battery manufacturing.

Yet the real challenge lies in mastering battery chemistry—precursors, anodes, and cells. "Europe failed by trying to go it alone. Morocco should instead position itself as a neutral platform, bridging Chinese expertise and Western industrial anchoring," advises Detry. Projects such as those led by CNGR and Mada are already emblematic of this hybrid approach.

> Europe failed by trying to go it alone. Morocco should instead position itself as a neutral platform, bridging Chinese expertise and Western industrial anchoring

4. Developing the Power-to-Chemicals Segment

Morocco's fourth strategic lever is Power-to-Chemicals: the conversion of renewable electricity into synthetic chemicals such as methanol, ammonia, or e-fuels. "Morocco is among the most attractive countries in the world for green hydrogen production, thanks to abundant sunlight, vast land, and geographic proximity to Europe," notes Detry. However, despite these advantages, project deployment has been slow—caught between rising interest rates and falling fossil fuel prices.

The key? Targeting segments with a "green premium"—markets where buyers are willing to pay more for low-carbon products. Examples include Sustainable Aviation Fuel (SAF), green methanol for maritime transport, or low-emissions steel. "But this requires regulatory alignment. A SAF produced in Morocco must be recognized under the European Union's Emissions Trading System (ETS)," emphasizes Detry.

Key Figures Behind Morocco's Ambition

- Doubling uranium reserves: Morocco's potential may surpass that of Australia.
- 40× fewer CO_2 emissions: Nuclear energy's carbon advantage over fossil fuels.
- 70% of project value: Attributed to the transformation of critical metals.
- $1.2 billion: Investment in the Battery Valley project in Ben Guerir.

Three Levers to Turn Vision into Reality

To transform these assets into a concrete industrial reality, Émile Detry identifies three key priorities:

1. Securing competitiveness through partnerships with leading technology players.
2. Unlocking infrastructure by developing dedicated industrial hubs (such as Jorf Lasfar) and connecting renewable energy zones in the south to processing centers.
3. Forging strategic alliances, particularly by aligning Moroccan regulations with the European ETS system..

"Morocco must become a strategic pivot between East and West, offering a neutral and high-performance platform," summarizes Detry.

"The energy transition is a global chess match. Morocco has a few moves ahead—but it's no longer enough to hold good cards; they must be played wisely," he concludes. From uranium and critical metals to batteries and green hydrogen, the Kingdom holds all the levers to evolve from a raw materials supplier into a true architect of decarbonization. The coming months will be decisive: initiating the first gigafactories, finalizing key technology partnerships, and structuring innovative financing models.

"Morocco must not remain a mere pawn—it has the potential to become a queen on the chessboard. With pragmatism and vision, it can embody the model of a just and competitive transition," insists Detry. The ball is now in the court of industrial leaders, financiers, and policymakers to bring this vision to life.

TRAINING YOUTH, BUILDING STARTUPS, INVESTING IN MATERIALS, AND PRODUCING LOCALLY

Morocco Has What It Takes to Become a Leading Player in the Global Battery Economy

As the world accelerates its shift toward electromobility, Morocco is emerging as a vibrant laboratory of innovation, powered by world-class scientists. During his keynote, Rachid Yazami the inventor of the graphite anode, a critical component in lithium-ion batteries announced a major breakthrough: an ultra-fast charging technology developed in Morocco, capable of recharging an electric vehicle battery pack in under 30 minutes, compared to the usual four hours or more. This revelation could reshape global clean energy standards and position Morocco as a key player in the green economy.

A Technological Breakthrough

With both pride and humility, Rachid Yazami shared the news of this groundbreaking achievement. Prompted by a journalist eager for a "scoop" ahead of his speech, the Moroccan physicist unveiled what could be a revolution in battery science: «For the first time, we've managed to charge an electric vehicle battery in under 30 minutes, when it used to take more than four. And we're now targeting 10 to 15 minutes. It's a technological feat born in Morocco.»

The innovation, tested and validated at the Private University of Fez, involves a battery fully designed and built in Morocco, combining local materials with a patented technology. «The goal isn't just to break records—it's to make electric vehicles as practical as gasoline cars. Imagine recharging your car while sipping a coffee—that's the real revolution,» Yazami explained. His team is already working with manufacturers such as Renault and Stellantis, both present in Morocco.

A «Made in Morocco» Ultra-Fast Battery

During his keynote, Rachid Yazami revealed a world first: an electric vehicle battery was charged in under 30 minutes in Morocco, compared to the standard four hours. This breakthrough, made possible by an ultra-fast charging technology developed by Yazami himself, could soon revolutionize everyday life for drivers.

If scaled to industrial production, this performance could position Morocco among the global leaders in tomorrow's electric mobility—with a clean, fast, and exportable technology.

Yazami sees this as a tangible opportunity for Morocco's battery industry, provided the country supports local production of key components—such as lithium salts—and invests more heavily in university-based research.

Demystifying the Lithium-Ion Battery

In an accessible and engaging presentation, Rachid Yazami took time to explain the fundamentals of lithium-ion battery technology to an audience of experts, students, and curious minds.

A lithium-ion battery is built on three core components:

1. The anode (negative electrode), usually made of graphite;
2. The cathode (positive electrode), typically a metal oxide or phosphate;
3. The electrolyte, a liquid or polymer medium that allows lithium ions to move between the two electrodes.

> Imagine charging your car while sipping coffee that's the real revolution. And this battery? It's made right here, with our ingenuity and our own resources.

When charging, lithium ions migrate from the cathode to the anode, where they embed themselves within the graphite layers. This process is fully reversible: during discharge, the ions flow back to the cathode, generating an electric current that powers our devices.

This finely orchestrated ionic movement can repeat hundreds or even thousands of times without significant material degradation—one of the reasons modern batteries are so long-lasting.

Layered Safety Mechanisms

Yazami also emphasized a lesser-known aspect of battery technology: safety. «A lithium-ion battery stores a lot of energy in a small volume, so caution is absolutely essential,» he warned.

- A venting disk releases pressure in the event of overheating;
- A PTC (Positive Temperature Coefficient) device cuts off the current if temperatures exceed 60°C;
- A microporous separator between the anode and cathode closes automatically when heated, blocking ion flow and preventing thermal runaway.

«Thanks to these innovations, the risk of fire is about one in a hundred million. But we aim for zero defects,» insisted Yazami. His latest work includes a revolutionary patent that detects internal micro-short circuits—a global first.

Graphite: The Turning Point in Battery Technology

Reflecting on his landmark discovery, Yazami recalled how graphite transformed the future of lithium-ion batteries. In 1979, while pursuing his doctorate in Grenoble, he replaced metallic lithium—unstable and hazardous—with graphite in the anode. «Graphite works like an ion sponge: it absorbs and releases lithium without changing shape, making the batteries both rechargeable and safe,» he explained.

This innovation enabled Sony to commercialize the first lithium-ion battery in 1991. One telling anecdote: in 1990, during a visit to Sony's R&D center in Yokohama, Yazami learned from Mr. Nishi, director of the lithium program, that he was "the first non-Japanese scientist to be informed of the launch." A historic moment, though not without some regret: «We could've developed this technology in Europe, but the synergies were lacking,» he said.

A Tribute to the Pioneers

In a heartfelt tribute, Rachid Yazami honored his fellow Nobel laureates and co-inventors:

John B. Goodenough (d. age 101), developer of cobalt-oxide (LCO) and iron-phosphate (LFP) cathodes;

Akira Yoshino, the first to design a stable commercial prototype;

Mr. Nishi, the Sony engineer who took the bold gamble to commercialize the battery after a Canadian company's earlier failure.

Yazami noted the lithium-ion battery could have been born entirely in Europe—he was in Grenoble and Goodenough in Oxford—but history had other plans.

Morocco: Land of Strategic Materials

Turning to Morocco's national strategy, Yazami highlighted the country's abundant resources: fluorine, phosphorus, and now lithium—all essential for producing $LiPF_6$ electrolyte salt, the battery's most expensive component. Despite resource availability, this salt isn't yet made locally. «We simply need to mobilize young talent, like those who excelled in recent chemistry olympiads,» he urged, extending a collaborative challenge to OCP.

He also spotlighted a cutting-edge innovation: Yazami recently patented a fluoride-ion battery, where fluoride anions (F^-) replace lithium cations. These smaller, more mobile ions could enable higher energy density. He called for exploring this technology at Mohammed VI Polytechnic University in Benguerir or Rabat, emphasizing technological sovereignty and diversification.

Train, Innovate, Industrialize

For Yazami, Morocco's next step is clear: train youth, launch startups, invest in materials, and ramp up local production. The expertise and resources exist—now the nation must build a cohesive ecosystem.

The proof? A battery charged in under 30 minutes on Moroccan soil—a successful tech-transfer model blending pure invention with local industrial roots.

Through his simple yet powerful words, Rachid Yazami outlined a clear trajectory: Morocco can become a global battery leader by betting on intellect, training, R&D, and local manufacturing.

Merging strategic vision, scientific innovation, and youth empowerment, he stands as both an inspiration and a catalyst. His message left no doubt: the energy revolution can also be written in Arabic, Amazigh, and Darija—from the labs and factories of the Kingdom.


DRIVING A JUST AGRICULTURAL TRANSITION TO ENSURE FOOD SECURITY WHILE COMBATTING CLIMATE CHANGE AND PRESERVING THE ENVIRONMENT ACROSS AFRICA AND BEYOND.
OCP

PERSPECTIVES ON THE CHEMISTRY OF TOMORROW

The Six Panels of the 3rd International Chemistry Forum

Held under the theme: "The Moroccan Chemical Industry at the Heart of the Energy Transition and Strategic Challenges", the 3rd edition of the International Chemistry Forum reaffirmed the growing importance of the sector in Morocco's structural transformations. At a time when the world is fast-tracking its energy, industrial, and geopolitical transitions, Morocco is betting on chemistry as a lever for sovereignty, innovation, and green growth.

In this spirit, the 3rd edition of the ICF structured its discussions around six thematic panels, spread over two days. This high-level platform brought together industrial leaders, researchers, entrepreneurs, and policymakers to confront perspectives, share experiences, and sketch the outlines of a bold Moroccan chemistry—deeply rooted in local territories and resolutely oriented toward the future.

DAY 1 – TOWARD GREEN INDUSTRIAL SOVEREIGNTY

The first day opened with a focus on three strategic pillars:

- **High-performance batteries,** at the heart of electric mobility and energy storage, with a spotlight on the emergence of an integrated industrial ecosystem in Morocco.
- **Green hydrogen,** widely considered the next great energy frontier, where Morocco holds a unique mix of advantages: abundant renewable resources, regulatory stability, geographic proximity to Europe, and strong industrial ambition.
- **Valorization of natural and mineral resources,** particularly phosphates and critical metals, through transformative chemistry that strengthens Morocco's industrial autonomy.

DAY 2 – INFRASTRUCTURE, RESOURCES, AND TALENT IN SUPPORT OF A COMPETITIVE CHEMICAL INDUSTRY

The second day turned to the enabling environments that underpin competitiveness:

- **Moroccan ports,** as strategic logistics hubs, were explored as key drivers of chemical supply chain competitiveness—capable of rivaling global benchmarks such as Rotterdam or Antwerp.
- **Seawater desalination,** a strategic response to water scarcity, was revisited through the lens of chemical innovation—balancing efficiency, sustainability, and scalability.
- **Human capital and research** were the closing focus of the day, highlighting a shared conviction: without local innovation and the upskilling of younger generations, no industrial strategy can truly fulfill its promise.

A Structural Momentum

From strategic geology to green molecules, from logistics integration to low-carbon technologies, all discussions converged around a common conviction: Morocco possesses the resources, the ambition, and the talent to make chemistry a pillar of its renewed industrial and energy sovereignty.

Through this momentum, the country is steadily carving out its place on the global map of tomorrow's industries—a positioning in which chemistry is no longer just a sector, but a transversal engine of national transformation.

DAY 1: CHEMICAL INNOVATION AS A LEVER FOR INDUSTRIAL SOVEREIGNTY - STRATEGIC PANELS AND CASE STUDIES

P1 **THE HIGH-PERFORMANCE BATTERY INDUSTRY: AN EMERGING SECTOR IN MOROCCO**

P2 **GREEN HYDROGEN : PROSPECTS FOR A FUTURE ENERGY LEADER**

P3 **CHEMISTRY IN SUPPORT OF MOROCCO'S INDUSTRIAL INTEGRATION AND SOVEREIGNTY THROUGH THE VALORIZATION OF NATURAL AND MINERAL RESOURCES**

PANEL 1: SUMMARY

THE HIGH-PERFORMANCE BATTERY INDUSTRY

An Emerging Sector in Morocco

The first panel of this edition opened a strategic conversation on a fast-growing sector: high-performance batteries. Positioned at the crossroads of energy transition, technological innovation, and industrial development, this industry is becoming a cornerstone of the new low-carbon economy.

Moderated by Gabriel Constantin, Managing Director of Air Liquide Morocco, the session brought together for the first time the key representatives of Morocco's battery ecosystem. This unprecedented convergence of national and international experts underscored the growing importance of this industry in the country's industrial ambitions.

Discussions revolved around several key pillars:

- Vertical integration of the value chain: From active material production to cell assembly, each speaker shared insights on building a resilient and fully integrated ecosystem.
- Morocco's attractiveness for industrial investment: Political stability, strategic geographic location, strong logistics infrastructure, and a proactive industrial policy were all praised.
- Energy competitiveness: All speakers highlighted Morocco's comparative advantage in renewable energy—an essential lever for producing low-carbon "green" batteries.
- Human capital development: The need to train highly skilled technical profiles and strengthen local R&D capacity emerged as a central concern.
- Industrial and technological sovereignty: Panelists emphasized the strategic importance of mastering critical technologies in a global context marked by energy transition and industrial reshoring.

This panel laid the groundwork for a structured national dialogue on the future of batteries in Morocco, confirming the country's forward momentum and the shared will to establish it as a regional hub for production, innovation, and expertise in this strategic field.

Gabriel Constantin
–> Moderator
Managing Director – Air Liquide Morocco

With a long-standing career in the chemical industry, Gabriel Constantin oversees all operations of Air Liquide in Morocco. His expertise in industrial innovation and energy transition makes him a committed player in the development of sustainable technological ecosystems.

Peter Yang
CEO – BTR New Material Group

An international expert in advanced materials for new energy solutions, Peter Yang has held executive roles at DuPont, Armacell, TDK, Molex, and Siemens. He currently leads BTR's strategy in Morocco, advocating an integrated vision of R&D, manufacturing, and global supply chain.

Khalid Qalam
Chairman & CEO – Gotion Power Morocco

A central figure in the industrial rollout of battery manufacturing in Morocco, Khalid Qalam leads the region's first Gigafactory. Formerly an executive at Valeo and Magneti Marelli (Stellantis), and a former advisor to the Ministry of Industry, he has been instrumental in spearheading major investment projects. He now heads Gotion Power Morocco, a key player in battery production.

Zineb Zeryouhi
Deputy General Manager – COBCO S.A.

Heading the financial strategy of COBCO—a joint venture between Al Mada and CNGR—Zineb Zeryouhi is developing the first integrated solutions for advanced battery materials across the pan-African region. A former executive at Lafarge and the African Development Bank, she holds a degree from ESCP Business School.

Mohamed Bachiri
CEO – Renault Group Morocco

A trailblazer of the Moroccan automotive industry, Mohamed Bachiri has managed Renault's Casablanca and Tangier plants, playing a major role in structuring the sector. He was decorated by His Majesty the King in 2012 and currently serves on several bodies within the CGEM, notably as head of the Industrial Development Commission.

Hicham Slaoui
CEO – Mera Batteries

With over 20 years of experience in the automotive industry, Hicham Slaoui has led development projects for components validated by Renault and Stellantis. He was also involved in creating Africa's first automotive testing and validation center. Now at the helm of Mera Batteries, he is working to position the company at the core of the battery value chain.

PANEL 1

BATTERIES: MOROCCO CHARTS ITS PATH TOWARD ENERGY SOVEREIGNTY

An emerging sector, ambitious goals, and an unprecedented mobilization of the industrial ecosystem to build a high-performance, integrated battery industry

At the intersection of energy transition, industrial sovereignty, and technological innovation, Morocco is multiplying initiatives to establish a competitive, high-performance battery industry. The opening panel of the International Chemistry Forum gave the floor to six leading figures in the sector, who shared their visions, accomplishments, and commitments to positioning the Kingdom as a key player in this energy revolution.

A Foundational Moment

The battery industry is no longer simply a matter of technological innovation—it has become a pillar of strategic sovereignty. With Europe targeting a ban on internal combustion engines by 2035 and energy storage emerging as a cornerstone of renewable energy deployment, Morocco has made the choice to enter this global race. The Forum's first panel offered a unique platform to battery industry stakeholders, bringing together, for the first time, the main architects of Morocco's growing battery sector.

For Gabriel Constantin, Managing Director of Air Liquide Morocco and panel moderator, this was a historic moment: "It is probably the first time that the entire Moroccan battery ecosystem is gathered around the same table." A powerful symbol, reflecting public-private alignment around a major strategic

priority. The battery industry is not only about electric mobility—it forms the backbone of a low-carbon economy, a pathway to energy autonomy, and a new industrial compact.

The Renault Experience

Mohamed Bachiri, CEO of Renault Group Morocco, opened the conversation by looking back at the success of Morocco's automotive ecosystem: "In 2005, Renault was producing 15,000 vehicles per year in Morocco. In 2023, we passed the 413,000 mark. This growth was built on effective public-private partnerships, a strong network of suppliers, and a strategy of gradual local integration."

According to him, this experience serves as a blueprint for the battery sector. The group achieved a 65% local integration rate in 2022, aiming for 80% by 2030. "What we achieved in automotive can be replicated in batteries, by leveraging the same drivers: local industrialization, upskilling, and strong territorial roots."

> The battery isn't just a component it's a strategic lever to democratize electric mobility.

Bachiri also emphasized the technological stakes: "Producing batteries isn't enough. We must master their design, testing, and recycling." Renault is focusing on NMC technology for long-range vehicles, LFP for more accessible batteries, and will soon introduce a new generation of "cell-to-pack" batteries with enhanced performance.

GOTION: A Shift in Scale

Fulfilling this ambition requires massive investments. GOTION Power Morocco, a subsidiary of the Chinese-European giant GOTION High Tech, embodies this industrial leap. Leading the project, Khalid Qalam declared: "We are building the region's first battery Gigafactory here, with an initial investment of $5.6 billion."

The first phase, with a capacity of 20 GWh, is set to be operational in 2026. At full capacity, the plant will reach 100 GWh and create 10,000 jobs. Most importantly, GOTION aims to reach 70% local integration from the very first phase. "Our real competitors are not here. They are in China, with ultra-low production costs and limited import taxes in Europe. To remain competitive, we must manufacture top-quality batteries in Morocco at controlled costs."

Qalam also highlighted the factory's dual focus: "On one hand, we'll serve the automotive industry, particularly through Renault and Stellantis. On the other, we're targeting the energy storage market, especially in Africa and the Middle East. In 2023, two-thirds of our global revenue came from storage."

> With the launch of the Giga Factory, we aim to produce competitive, integrated batteries for both African and European markets.

COBCO: Cornerstone of Active Materials

At the upstream end of the value chain, COBCO plays a pivotal role in the manufacturing of active battery materials. Born from a joint venture between Al Mada and CNGR—a global leader in battery precursors—the company specializes in NCM precursors, LFP materials, and black mass recycling.

"We launched our first production line in January 2024. Initial deliveries to clients are underway. We've already signed a contract with Umicore to supply NCM precursors starting in 2026,"

explains Zineb Zeryouhi, Deputy CEO. According to her, "Morocco can become a strategic supplier to Europe, provided we consolidate a coherent and circular battery value chain."

COBCO is targeting a total production capacity equivalent to 70 GWh, enough to power one million electric vehicles. Its focus on local refining and large-scale recycling makes it a cornerstone of Morocco's vertical integration strategy.

> Morocco can become a strategic alternative for Europe. The path to vertical integration is already underway.

BTR: A Global Powerhouse

Chinese giant BTR, the world's number one battery materials producer, is also betting on Morocco. Its CEO, Peter Yang, emphasized: "We chose Tangier Tech for its logistics, access to green energy, and strong support from Moroccan authorities." Two projects are currently underway, totaling a $50 million investment, with a 60,000-ton capacity and the creation of 2,500 jobs.

> Local expertise is our top priority: we've laid out a three-phase strategy for training, tech transfer, and local innovation.

Already a key supplier to BYD, Tesla, and CATL, BTR holds over 500 patents and invests heavily in R&D. "Materials account for up to 60% of a battery's cost. By locating here, we're bringing production closer to the European market while optimizing costs," summarized Yang.

He also stressed the importance of investing in talent: "Even Europe lacks enough electrochemical engineers. We aim to co-develop R&D and training programs with Moroccan universities."

Innovx: The Vision of an Integrated Model

Innovx, the industrial arm of Mohammed VI Polytechnic University (UM6P), completes the ecosystem with a strategy rooted in full vertical integration. Hicham Slaoui, CEO of MERA Batteries, one of its subsidiaries, affirmed: "Our vision is clear: to industrialize Moroccan research, develop proprietary technologies, and support the rise of a national champion."

"We are engaged in the production of LFP, LMFP, and NCM batteries. Our value chain spans from raw materials to the final battery pack," Slaoui emphasized. The goal is not only to offer a competitive product, but also a sustainable one: "Morocco should not settle for being just a production workshop. It has the potential to become a reference industrial and technological laboratory."

Challenges Ahead

Despite the momentum, several challenges remain. Mohamed Bachiri identified three critical areas: "Technology, deep integration, and human capital. We absolutely must anchor industrial know-how locally." He advocates replicating the IMTIA model—a flagship vocational training program developed for the automotive industry—within the battery sector: "We've delivered 3 million hours of training in the automotive field. The same effort is needed for batteries."

Peter Yang echoed the concern: "Electrochemical expertise is not a given. We must develop strong academic and industrial partnerships to bridge the gap."

Même son de cloche chez Peter Yang : « Les compétences électrochimiques ne sont pas une évidence. Il faut développer des partenariats académiques et industriels pour combler le manque. »

A Dual Market

The panelists unanimously identified two major growth avenues: Electric mobility, whose acceleration depends on cost reduction, and stationary storage, which is experiencing exponential growth. "By 2035, Europe will ban the sale of internal combustion vehicles. Morocco must be ready to deliver affordable and durable batteries," warns Khalid Qalam.

Storage already represents a significant share of GOTION's business. And it presents unique opportunities for Morocco, a country blessed with over 300 days of sunshine per year. "Residential users, industries, and large-scale green energy projects will all require storage solutions. This market is growing at an unprecedented pace."

Morocco is no longer a follower. Through large-scale projects, strategic partnerships, and strong political will, the country is emerging as a future hub for sustainable batteries. The ecosystem is taking shape, the first industrial foundations have been laid, and a collective momentum is underway.

"What we're witnessing today is no longer a matter of ambition—it's achievement," concluded Gabriel Constantin. A new industrial chapter is being written—with lithium, phosphate, and collective intelligence as its ink.

The Pillars of Morocco's Future Battery Ecosystem

1. Integrated local production: GOTION Power Morocco will reach 70% local integration in its first phase, manufacturing cathodes, anodes, modules, and packs.

2. A sustainable approach: Thanks to a low-carbon energy mix and circular economy strategies (e.g. COBCO), Morocco is shaping a greener battery industry.

3. Local training and R&D: Structured efforts are underway to train engineers and technicians in electrochemistry, embedded software, electronics, and supply chain management.

4. A catalytic effect: Numerous projects, announced or already underway (TINCY, Innovx, BTR, COBCO), point to the rapid expansion of the ecosystem.

PANEL 2 : SUMMARY

GREEN HYDROGEN

A Strategic Vector for Morocco's Energy Sovereignty

The second panel of the International Forum on Chemistry focused on a rapidly emerging domain: green hydrogen. At the crossroads of energy transition, industrial sovereignty, and technological innovation, this growing sector offers Morocco a unique opportunity to reposition itself strategically on the global map of clean energy.

Moderated by Zineb Bessa, Senior Manager at Forvis Mazars, the panel brought together five high-level experts — from industry, research, and project development — around a common goal:

How to build a competitive, integrated, and locally rooted green hydrogen sector?

The discussions brought to light several key themes:

- **Morocco's geostrategic positioning** — combining abundant sunshine, available land, political stability, and proximity to European markets — was unanimously recognized as a decisive competitive advantage.
- **Structuring the value chain,** from production to industrial use (chemicals, logistics, mobility, steelmaking), including storage and export, was deemed essential.
- **Technological innovation,** with pilot projects led by players like Hydrojeel and applied research at UM6P, highlighted the growing alignment between R&D and industrial needs.
- **The financing challenge,** given the significant capital investments required, calls for innovative financial engineering involving public funds, private capital, and development banks.
- **Skills development,** both at the level of engineers and university programs, was identified as the determining factor in successfully scaling the industry.
- **Partnership integration** was emphasized as a key success factor: aligning efforts among industrial players, researchers, the state, and investors is now a necessity.

This panel reaffirmed Morocco's ambition not to remain a mere molecule supplier, but to become a global actor across the entire green hydrogen value chain: producer, transformer, exporter, and innovator. It marked a pivotal step toward energy independence and a sustainable industrial future for the Kingdom.

Zineb Bessa –>
Moderator
Senior Manager – Strategy, Management & Sustainability Consulting – Forvis Mazars

A graduate of ESCP Business School, Zineb Bessa brings solid experience in strategic and corporate finance consulting. Before joining Forvis Mazars, she held senior roles in industry (SOMITEX) and investment (Fipar Holding). Her career has given her a deep understanding of sustainable transition and industrialization challenges.

Salima Bendoumali
Chief Technology Officer, Green Hydrogen – HYDROJEEL (OCP Group / INNOV'X)

A graduate of EPFL Lausanne, Salima Bendoumali is an expert in chemical engineering and industrial project management. She has held senior positions at STMicroelectronics and Air Liquide, and currently oversees technological development for green hydrogen and renewable ammonia projects at Hydrojeel.

Mohamed Yahya Zniber
President – Cluster Green H2

Mohamed Yahya Zniber blends strategic vision with operational execution. A former Vice-President of CGEM and the Federation of Plastics, he now leads Cluster Green H2, a network of stakeholders committed to developing the hydrogen sector. He also serves on the boards of several leading industrial companies.

Pr. Fouad Ghamouss
Professor – UM6P

An internationally recognized expert in electrochemical systems, Prof. Ghamouss spent over 12 years leading research projects at the University of Tours, in collaboration with major industrial players (SAFT, Solvay, Arkema, Umicore...). He currently leads executive programs at UM6P in energy storage, materials science, and hydrogen, while spearheading applied research on batteries and supercapacitors.

Nicolas Poirot
CEO Africa / Middle East / South & Central Asia – Air Liquide

A chemical engineer trained at the École des Mines de Paris, Nicolas Poirot has spent his entire career with the Air Liquide group. He previously served as Director of Southeast Asia, then Vice-President for Southwest Europe, and led the group's China operations before assuming his current regional leadership. He is also Chairman of the AICM (Association of International Chemical Manufacturers).

Amine Bouchama
Development Director – EDF Renouvelables Maroc

An engineer with an MBA from École des Ponts, Amine Bouchama has over a decade of experience in energy project development, notably with Vinci Energies and EDF Renewables. He now leads strategic projects related to renewable energy and hydrogen in Morocco, with a holistic approach to value chain integration.

PANEL 2

GREEN HYDROGEN: MOROCCO POSITIONS ITSELF AS A FUTURE LEADER IN CLEAN ENERGY

Capturing Tomorrow's Industrial Value Chains and Reinforcing Energy Sovereignty

As the global energy transition accelerates, Morocco is laying the foundations of a future-proof energy model based on green hydrogen. This molecule, produced using renewable energy, is emerging as a key driver for decarbonizing heavy industries, transport, and the chemical sector. During the second panel of the International Forum on Chemistry, the experts in attendance outlined the contours of a solid industrial ambition - grounded in concrete projects, strong partnerships, and a clear commitment to developing local expertise.

A Geopolitical Advantage

For Mohamed Yahya Zniber, President of the Cluster Green H2, Morocco holds two major advantages: "First, a natural one — with exceptional solar and wind resources and geographical proximity to Europe, our main market. Second, a strong political will and regulatory stability that reassure investors."

This unique combination makes Morocco an attractive player in the global race for green hydrogen. The country aims not only to produce hydrogen for export, but also to build high value-added industrial ecosystems around its use. "The goal is to position Morocco as a competitive producer and industrial transformation hub, not just a molecule supplier," Zniber emphasized.

> Morocco benefits from exceptional natural resources and regulatory stability that gives investors confidence.

Concrete Industrial Projects

This vision is already taking shape through structuring industrial projects. Salima Bendoumali, Chief Technology Officer at Hydrojeel (a subsidiary of the OCP Group), presented two flagship initiatives that reflect the sector's growing momentum.

The first, GH2 Toubkal, is being developed in Jorf Lasfar and aims to produce 100,000 tons of green ammonia per year, using 20,000 tons of green hydrogen. What sets this project apart is its innovative approach to technology de-risking: "We'll be testing three types of electrolysis technologies — alkaline, PEM, and solid oxide — to assess their combined performance under real-world conditions."

> We will be testing three electrolysis technologies to assess their combined performance under real-world conditions.

The second and more ambitious project is Tarfaya Green Ammonia (TGA), targeting a capacity of 1 million tons of green ammonia annually. Located in a region with outstanding solar and wind load factors, this project is designed with competitiveness in mind. "Our ambition is to structure a green chemistry industrial ecosystem that creates jobs and generates strong local impact."

Existing Industrial Demand

Nicolas Poirot, CEO of Air Liquide for Africa, the Middle East, and Central Asia, reminded the audience that hydrogen is already used across various sectors: "We've used hydrogen for decades — in glassmaking, semiconductors, food processing, and aerospace. But its dominant application remains in refining, where it's used to desulfurize fossil fuels."

The challenge today is to shift from grey hydrogen (produced from natural gas) to green hydrogen, derived from renewable sources. "We've already launched three €500 million projects with TotalEnergies in Europe to decarbonize production chains."

Looking ahead, green hydrogen is expected to play a vital role in decarbonizing steel production, ammonia synthesis, and heavy-duty transport — trucks, buses, trains, and even aircraft. But several hurdles remain to be cleared.

> Hydrogen should not be an end goal, but a tool to transform entire industrial value chains.

A Delicate Balance to Strike

The economic competitiveness of green hydrogen is still the major short-term challenge. "We're seeing a scissors effect between rising interest rates and falling fossil fuel prices," Zniber explained. As a result, many investors are hesitant to commit to long-term contracts, waiting for costs to drop. "But for costs to fall, we need massive investment now. The first-mover dilemma is very real."

The solution? Target market segments where a "green premium" is viable — products for which customers are willing to pay more for low-carbon solutions. Among them: sustainable aviation fuel (SAF), green methanol, green ammonia, and low-carbon steel. However, regulatory support is essential: "Morocco must secure recognition for its green molecules under the EU Emissions Trading Scheme (ETS) — otherwise, they risk being shut out of major markets," Zniber warned.

A Strategic Positioning

Morocco holds a major advantage: scale. Thanks to its vast available land, particularly in the southern regions, the country can host large-scale green ammonia and methanol production projects—something that otherwise competitive nations struggle with due to limited land availability. "We've already allocated more than 30,000 hectares to green hydrogen projects. Very few countries can say the same," emphasizes Zniber.

In addition, Morocco enjoys a balanced geopolitical stance, which helps reassure industrial stakeholders. "Morocco can become a neutral platform between Europe, Africa, and the Middle East," argues Poirot. "This is a strategic asset in a world where supply chain security is now as critical as pricing."

Building Talent and Expertise

All the panelists agreed: the success of green hydrogen in Morocco hinges on rapid capacity building. From training engineers and structuring academic pathways, to developing a robust R&D ecosystem, the efforts required are substantial.

"We need electrochemists, materials specialists, and highly trained chemists," warns Bendoumali. Hydrojeel has already forged partnerships with universities and research centers, but a national-scale mobilization is now needed.

Zniber also stressed the importance of partnership: "We need to build a virtuous model that brings together the state, industry, financial institutions, and the research sector. The entire ecosystem must level up."

Cutting-edge research

Professor Fouad Ghamouss from Mohammed VI Polytechnic University (UM6P) emphasized the need for applied research aligned with Morocco's industrial ambitions. "Morocco already has strong competencies in electrochemistry and materials chemistry. But we must align academic research with the needs of green hydrogen industries."

His lab is currently working on optimizing catalysts and membranes for electrolysis systems. He insists on the need for closer collaboration between academia and industry to shorten the gap between scientific innovation and field deployment.

"Industrial players can be reluctant to invest in local R&D. We need to show them that Moroccan research is competitive, relevant, and value-generating."

> We must align academic research with the actual needs of green hydrogen industries.

A Global Energy Player Offering Support

Amine Bouchama, Director of Development at EDF Renewables Morocco, shared the perspective of a global energy group on how best to move forward: "We need a pragmatic approach. Projects must be bankable and tied to concrete industrial applications."

EDF Renewables is already engaged in several green hydrogen projects in Morocco, in collaboration with stakeholders from the chemical and logistics sectors. The group advocates for an integrated model—spanning production, transport, transformation, and export.

"Morocco is strategically positioned to serve the European market. But economic competitiveness is key. That means lowering the cost of capital, ensuring contractual stability, and securing access to ultra-low-carbon energy."

> We need to develop bankable projects grounded in real industrial applications.

Unlocking Access to Finance

Developing a green hydrogen ecosystem also hinges on access to financing. The investments required are massive—several billion euros per project. Morocco will therefore need to rely on innovative financial engineering that combines public funds, private capital, development banks, and green financing mechanisms.

"Europe has launched massive subsidies under the Green Deal. Morocco, for its part, must identify equivalent tools adapted to its specific context," explains Poirot. Instruments such as Contracts for Difference, green certification schemes, and public guarantees can play a decisive role.

Toward Industrial Sovereignty

Ultimately, Morocco's hydrogen strategy is about far more than simply producing clean energy. The real ambition is to lay the foundations for a new form of industrial sovereignty, by localizing the entire value chain—from production and transformation to logistics and end-use.

"Hydrogen should not be seen as an end in itself, but rather as a lever to develop competitive and sustainable industrial ecosystems," concluded Nicolas Poirot.

The panel clearly demonstrated that Morocco has what it takes to rise to the challenge: abundant natural resources, a clear strategic vision, concrete projects underway, and a network of committed stakeholders. The road ahead remains complex, but the first milestones are already in place.

Five Conditions to Capture a Green Premium

According to the panel's experts, for Morocco to maximize the value of its low-carbon products in global markets—particularly in Europe—it must focus on segments where a «green premium» is achievable: that is, where clients are willing to pay more for a more sustainable product. To unlock this potential, five key conditions must be met:

1. **High regulatory pressure:** A legal framework that strongly incentivizes industrial decarbonization.
2. **Carbon pricing systems:** Existence of a carbon market or an effective CO_2 tax mechanism.
3. **Investor expectations:** Clear demands from financiers regarding emissions reduction targets.
4. **Risk of supply shortages:** Anticipated scarcity of the low-carbon product in question.
5. **Impact on final carbon footprint:** A measurable and significant effect on the lifecycle emissions of the end product.

High-potential products identified by the panel: Sustainable aviation fuel (SAF), green methanol, green ammonia, low-carbon steel, and low-carbon aluminum

PANEL 3 : SUMMARY

MINING RESOURCES AND TRANSFORMATIVE CHEMISTRY

Toward a Sustainable and Integrated Model of Industrial Sovereignty in Morocco

The third panel of the International Forum on Chemistry spotlighted a strategic ambition at the heart of Morocco's industrial development: leveraging the country's natural and mineral wealth by scaling up its local chemical industry.

Moderated by Hicham Bouzekri, an expert in energy transition, the panel brought together six prominent figures from the mining, academic, industrial, and technology sectors to discuss how Morocco can transform its subsoil resources into productive industrial value.

Morocco, endowed with exceptional reserves—particularly in phosphates, critical metals, and fluorine—is seeking to shift from a model of raw material export to one of high value-added local transformation. This drive for sovereignty is rooted in applied research, the development of industrial value chains, and alignment between national strategies and investment dynamics.

Several structural themes emerged from the discussion:

- **Smart valorization of mineral resources,** building on geological, energy, and environmental innovations—especially in sustainable extraction and water reuse.
- **Creation of locally rooted industrial value chains,** integrating chemical, metallurgical, and energy components drawn from Morocco's natural resources.
- **Acceleration of local R&D,** with laboratories such as those at UM6P and CRES leading projects on graphite, phosphate, rare earth elements, and locally sourced polymers.
- **Emergence of a Moroccan industrial ecosystem,** with players like Fluoralpha and CMT committed to leveraging both national and international markets while mastering full transformation chains.
- **Knowledge transfer and training,** deemed essential to support industrialization and secure Morocco's technological autonomy.
- **The need for strategic governance,** combining industrial vision, energy sovereignty, and innovation to ensure lasting impact.

This panel highlighted a paradigm shift: moving from exporting raw materials to generating domestic value. As moderator Hicham Bouzekri put it: "Morocco is shifting from «Yes we can' to 'Yes we do.»

Hicham Bouzekri
–> *Moderator*
CEO – African Technical Advisor

An expert in energy transition with 30 years of experience, Hicham Bouzekri has led R&D and industrial operations at MASEN, chaired IFMEREE, and headed MAScIR. An engineer by training and PhD in electrical engineering, he has held international roles in microelectronics and renewable energy and has co-authored more than 100 scientific publications and industrial standards.

Oussama Khadiri Yazami
Head of Georesources & Strategic Development – OCP Group

A specialist in geosciences, Oussama leads OCP's phosphate resource exploration and valorization initiatives. He oversaw flagship projects such as the Khouribga–Jorf Lasfar pipeline, significantly reducing water consumption. His work integrates efficiency, sustainability, and advanced modeling of deposits, aligned with the Group's environmental commitments.

Pr. Hassan Hannache
Professor – Mohammed VI Polytechnic University (UM6P)

A renowned researcher in materials engineering, Prof. Hannache heads a UM6P lab focused on industrial applications of Moroccan materials. He explores innovative solutions such as the valorization of domestic oil shale and the development of sustainable geopolymer materials. His work bridges academic rigor with industrial relevance in sectors such as aerospace, automotive, and eco-construction.

Jalil Skali
CEO – Fluoralpha

Formerly at the helm of Dolidol and a prominent figure in Moroccan industry, Jalil Skali now leads Fluoralpha, a pioneering company in the strategic exploitation of fluorine. With over 20 years of experience in the textile, automotive, and industrial sectors, he is working to position Morocco in high-value-added markets through fluorine chemistry, aligned with the needs of advanced industries such as electronics, energy, and defense.

PANEL3

CHEMISTRY AND SOVEREIGNTY: BUILDING AN INDUSTRY ROOTED IN MOROCCO'S SOIL

Toward a Strategic Integration Around the Kingdom's Mineral and Natural Resources

The global energy transition and the reshaping of value chains have placed natural resources at the heart of the new sovereignty agenda. Rich in minerals and phosphates, Morocco is determined to move beyond the traditional extractive model and develop a high value-added chemical industry one that generates jobs, knowledge, and technology. This is the shared direction outlined by experts in the third panel of the International Forum on Chemistry.

Titled «Chemistry for Moroccan Industrial Integration and Sovereignty,» the panel, moderated by energy transition expert Hicham Bouzekri, revealed a common ambition: to transform Morocco's subsoil wealth into lasting economic, scientific, and industrial strength.

A New Geostrategic Reality

In his opening remarks, Hicham Bouzekri described a world in flux—marked by geopolitical tensions, industrial reshoring, and the regionalization of trade. "We're moving from a logic of simple commodities to one of geostrategy. Minerals have become instruments of power," he declared.

This shift creates unique opportunities for Morocco—if the country invests in the entire transformation chain, from research to industry. "Morocco's mining sector must no longer limit itself to exporting raw rocks. It needs to evolve toward value creation, innovation, and sustainability," he emphasized. In this context, chemistry becomes a key lever for industrial integration, bridging natural resources with cutting-edge technologies.

Geosciences and Sovereignty

Oussama Khadiri Yazami, Head of Georesources at OCP, opened the discussion by stressing the strategic importance of subsurface knowledge. "Sovereignty begins beneath our feet. Geology must be seen not as a pure science, but as a strategic asset," he asserted.

At OCP, geosciences have become a foundational pillar of transformation. "We've created a new platform called 'Future is Mine' to reinvent the mining cycle—from exploration to the integration of advanced technologies," he explained. The initiative is also exploring new resources such as potash and carbonatites, significantly broadening the company's mining perimeter.

The ambition is clear: to shift from a mindset of mining waste to one of circular valorization. "What was once considered waste is now becoming a source of industrial revenue. That's a major paradigm shift," said Khadiri Yazami.

> Sovereignty begins beneath our feet. Geology must be seen not as pure science but as a strategic asset.

Bridging Science and Industry

Prof. Hassan Hannache, professor at UM6P, emphasized the pivotal role of research in value creation. "Morocco has long struggled with underfunded scientific research. But today, concrete responses are emerging," he observed.

He praised the partnership between the Ministry of Higher Education and OCP, which released one billion dirhams for public research. "800 million for research, and 200 million to bring back scientific talent from the diaspora—this sends a strong signal," he said.

According to Prof. Hannache, universities must go beyond the traditional academic framework: "We need to move past TRL 3 or 4 [Technology Readiness Level], which is typically the limit in research labs. Industry demands TRL 7 and above." That's why UM6P has innovated, with partnerships such as the one with Maghreb Steel, to bridge the infamous 'valley of death' in innovation.

He also called for multidisciplinary research, aligned with the real needs of industry: "We have the talent, the labs, the partnerships. It's time to generate Moroccan solutions—rooted in our soil and powered by our collective intelligence."

> Industry demands TRL 7 and above. That's why UM6P innovated through partnerships like the one with Maghreb Steel to cross the 'valley of death' in innovation.

Fluor: A Success Story in the Making

JJalil Skali, CEO of Fluoralpha, offered a tangible example of how mining by-products can be turned into high-tech materials. "We are building Morocco's first fluor valorization plant, along with a second specialized facility. These two sites, expected to be operational by year-end, mark a major milestone," he detailed. "Pre-commissioning is set for late 2025, with full production slated for mid-2026," he added. He noted the untapped potential: "Our pilot plant will consume just 4% of the by-product supplied by OCP. That gives you a sense of the scale of the opportunity we're dealing with."

> It's not enough to produce we must innovate. We cover the entire value chain, from food-grade to military-grade. This local expertise gives us a real global edge.

The potential outlets are numerous: LFP batteries (via $LiPF_6$), semiconductors, pharmaceuticals, and defense. "We already have two international partners who will be producing electrolytes based on our fluorine directly in Morocco. The country can become a leader in this advanced field of chemistry," declared Jalil Skali. And with clear ambition, he added: "When we assess the full potential, our goal is to become a champion in fluorine-based products, with a target revenue of $1 billion. While ambitious, this is a realistic figure, thanks to our move upmarket and the diversification of applications."

The CEO emphasized the role of innovation: "It's not enough to produce—we must innovate. We cover the entire value chain, from food-grade to military-grade. This local expertise gives us the ability to compete internationally."

Skali also discussed Fluoralpha's efforts in certification and standardization, aimed at meeting international industrial quality benchmarks. "We develop tailor-made solutions for various sectors, in close collaboration with Moroccan universities and research centers. This shows that Moroccan chemistry is ready to compete on the global stage." He stressed that compliance with global norms is essential to achieving this vision.

A Paradigm Shift

In closing, Hicham Bouzekri delivered a powerful synthesis of Morocco's current industrial transformation: "Morocco's industrial sovereignty will not be built solely through factories. It begins with knowing our land, continues in our laboratories, and culminates in fully realized industrial value chains."

For him, this momentum marks a historic turning point: "For decades, we exported rocks and imported value. What we're witnessing now is a rupture: we're generating technology, skills, and high-value-added products. Morocco is moving from 'Yes we can' to 'Yes we do.'"

He also underscored the need for shared responsibility: "Researchers, industry leaders, public decision-makers—we each hold a piece of the puzzle. Now is the time for strategic cooperation and collective boldness."

This panel clearly illustrated the emergence of a national industrial ambition, rooted in Morocco's geological realities and fueled by the transformative power of chemistry. It is no longer a vision of a future industry—it is a future that is already being built, here and now.

> Morocco is moving from 'Yes we can' to 'Yes we do.

Chemistry & Sovereignty — The Pillars of Morocco's Industrial Transformation

1. Strategic Resource Integration : Morocco is capitalizing on its mineral wealth (phosphates, fluorine, potash) to transition from an extractive model to a high-tech chemical industry. The goal: connect subsoil resources (OCP, georesources) with innovative sectors (batteries, semiconductors, pharmaceuticals).

2. Industrial Transformation

   - Fluoralpha exemplifies this ambition with two plants under construction, aiming for full operation by mid-2026 and a strategic presence in key markets (defense, energy).
   - OCP is reinventing the mining cycle through its "Future is Mine" platform—turning waste into value and exploring new resources (e.g., carbonatites).

3. Research and Partnerships

   - A joint State-OCP investment of 1 billion dirhams supports public research and the return of scientific talent from the diaspora.
   - UM6P, through partnerships like Maghreb Steel, is helping bridge the gap between academic research (TRL 3–4) and industrial application (TRL 7+).

4. Collective Vision : Industrial sovereignty relies on an integrated chain: geological knowledge, labeled innovation (international standards), and collaboration between public, private, and academic stakeholders.


Air Liquide


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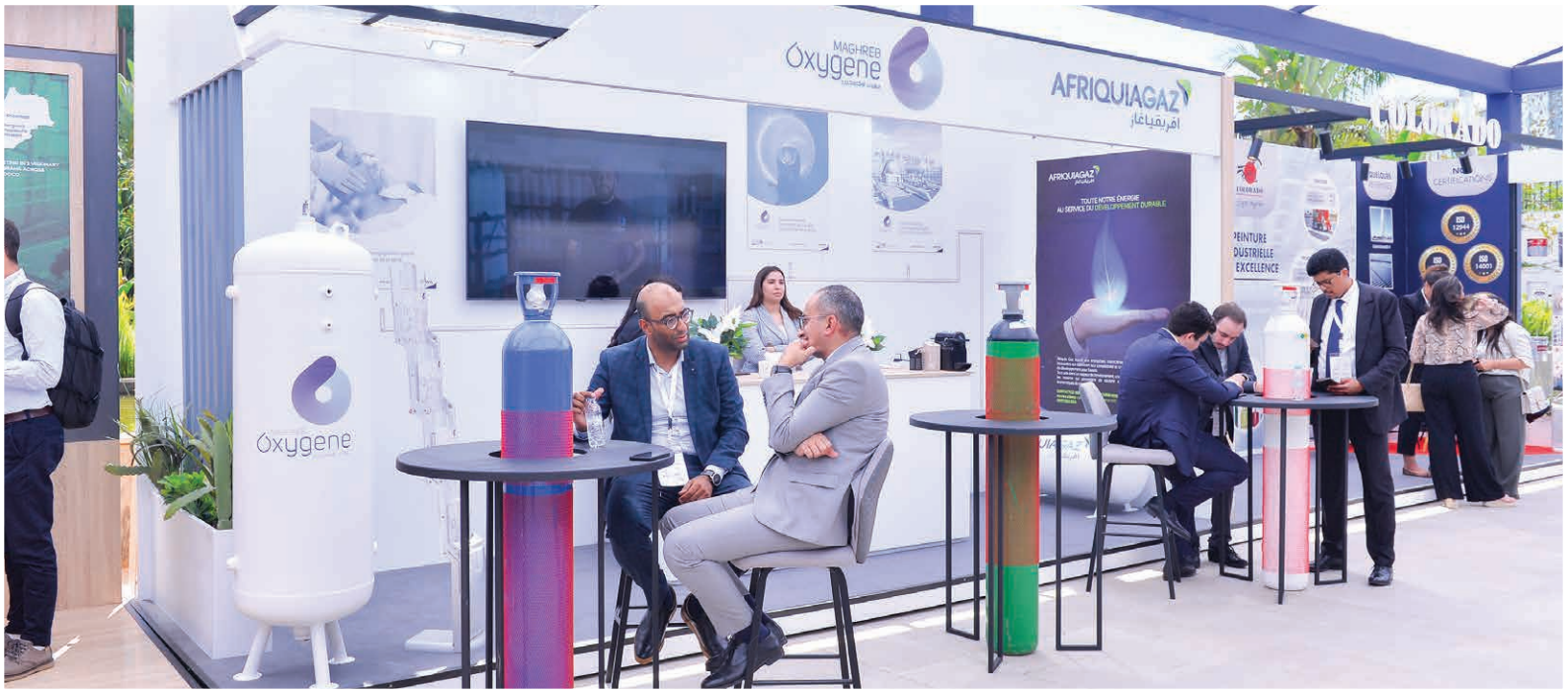
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SPECIAL FEATURE

The Energy of Tomorrow: Innovation and Low-Carbon Sovereignty

Green hydrogen, next-generation batteries, and industrial strategies for a sustainable energy revolution

In a time of rapid transformation, where the climate crisis demands a fundamental rethinking of how we produce and consume energy, this special feature serves as a timely guide through the energy transition. We examine the groundbreaking innovations reshaping the sector—from green hydrogen to next-generation batteries—while emphasizing the crucial role of clean technologies in industrial decarbonization.

Morocco, with its exceptional renewable potential and ambitious projects, is emerging as a regional leader, turning climate challenges into economic and social opportunities. This issue presents a comprehensive overview of the strategic issues that will define our energy future—highlighting international partnerships, technological breakthroughs, and national policy directions.

It calls for a reimagining of our industrial models to establish a lasting balance between development, environmental preservation, and social equity, paving the way for a truly low-carbon future.

THE GLOBAL ENERGY TRANSITION: NAVIGATING AMBITION, REALITY, AND FRAGMENTATION

Assessing Global Progress and Persistent Disparities in the Energy Transformation

Confronted with climate disruption and the urgent need to decarbonize economies, the energy transition has become a global imperative. While investments are on the rise and renewables continue to break records, deep disparities remain between continents, economic models, and financial capabilities. This article provides a snapshot of an energy transformation that is global in ambition, yet still uneven in execution.

Asia and Europe Take the Lead

According to BloombergNEF, global investment in the energy transition reached $1.77 trillion in 2023—a 17% increase from the previous year. Asia accounted for nearly half of this spending, with China alone absorbing over $600 billion, driven largely by wind, solar, and battery deployment. Europe followed, buoyed by Green Deal targets and mounting regulatory pressure.

North America, particularly the United States, has picked up speed thanks to the Inflation Reduction Act, which allocates more than $370 billion in tax incentives to support domestic green technology production. Africa and Latin America, despite their immense renewable potential, captured just 3% of global investment flows, hampered by infrastructure gaps and limited access to structured financing.

This imbalance creates a clear risk: a two-speed transition where the Global North rapidly decarbonizes its economies, while the Global South struggles to meet rising energy demands without resorting to cheap coal and oil.

> Global investment in the energy transition reached $1.77 trillion in 2023 a 17% increase from the previous year

Unprecedented Momentum—But Not Enough

The International Energy Agency (IEA) forecasts that global renewable electricity capacity will surpass coal as early as 2025. In 2023, more than 75% of new power generation capacity worldwide came from renewables, with solar accounting for 60% and wind for 25%. China, India, and Europe remain the driving forces behind this surge.

Yet global energy demand continues to grow, especially in emerging economies. Fossil fuels still dominate electricity production in several regions—particularly Sub-Saharan Africa, Southeast Asia, and the Middle East—where hydrocarbons remain abundant and heavily subsidized.

Meanwhile, investment in grid infrastructure, storage, and interconnection is lagging, limiting the integration of variable renewable energy. The IEA estimates that investment in electricity networks must triple by 2030 if net-zero targets are to be met.

Green Technologies and Critical Materials

The global energy transition increasingly relies on advanced technologies such as lithium-ion batteries, green hydrogen electrolyzers, heat pumps, and photovoltaic modules. According to Rystad Energy, the global battery market is expected to exceed 400 GWh of annual installed capacity by 2025.

However, this technological shift is putting unprecedented pressure on strategic mineral resources: lithium, cobalt, nickel, copper, rare earth elements, and more. The 2024 IRENA report forecasts that global lithium demand could increase twelvefold by 2040. Yet extraction is highly concentrated—in countries like Australia, the DRC, Chile, and China—and China dominates the refining stage, with an 80% market share.

Securing supply chains has become a major geopolitical challenge. The United States and the European Union are working to reshore segments of the value chain through mining alliances and production incentives. Still, most developed economies remain heavily dependent on China for both technology and minerals.

Green Hydrogen Global Promise, Uneven Realities

Long hailed as the «holy grail» of the energy transition, green hydrogen—produced through water electrolysis powered by renewable electricity—is now generating as much scrutiny as it does enthusiasm.

According to the Hydrogen Council, nearly 90% of global hydrogen projects announced in 2023 remain in the pre-development stage. While Europe (notably Germany, Spain, and the Netherlands) is leading in announcements, China has already taken the lead in hydrogen fuel cell and electrolyzer manufacturing.

Countries in the Global South—led by Morocco—are seeking to position themselves as green hydrogen exporters, leveraging solar potential and land availability. But the challenges are considerable: high costs, lack of infrastructure, non-standardized applications, and environmental acceptance. In the short term, green hydrogen remains a niche technology rather than a mainstream solution.

Public Policy, Climate Finance, and Climate Justice

Climate policies are gaining traction, but efforts still fall short of the pathways outlined by the Paris Agreement. Fewer than 20 countries worldwide have legally binding net-zero commitments. The IPCC estimates that global CO_2 emissions must drop by 43% by 2030 to limit warming to 1.5°C—an increasingly unattainable goal, according to many scientists.

Financing remains a critical bottleneck, particularly for low- and middle-income countries. The failure of wealthy nations to fulfill their $100 billion annual climate finance pledge has eroded trust. The 2023 Paris Summit for a New Global Financing Pact attempted to reignite momentum, but without binding commitments.

The energy transition also raises questions of social justice: how to retrain workers from fossil fuel industries, how to ensure universal access to electricity, and how to combat energy poverty. According to the United Nations, nearly 760 million people around the world still live without electricity, the vast majority in Africa.

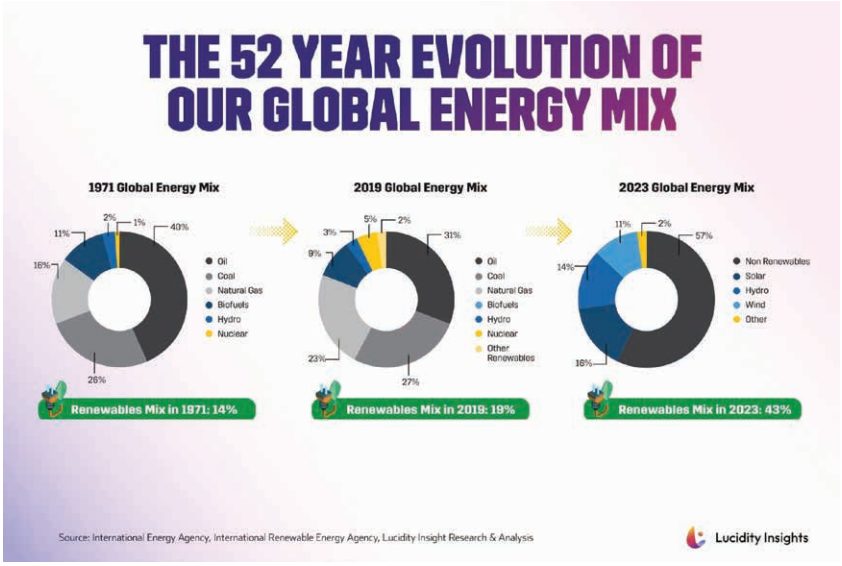
The global energy transition is indeed underway, driven by innovation, climate urgency, and emerging economic opportunities. Yet it remains deeply imbalanced—geographically, financially, and technologically. There is a real risk of a multi-speed world, with winners—those who can innovate, invest, and secure resources—and those left behind.

To prevent such a divide, international cooperation must once again become central: technology sharing, equitable financing, support for vulnerable economies, and reform of multilateral energy governance are now essential.

Beyond the numbers, the energy transition must succeed as a systemic transformation—one that fosters a more just economic, social, and environmental model. It must not be only a climate response, but an opportunity to redefine our collective future.

Energy Transition Three National Models in Focus

- Denmark: A European pioneer, Denmark has reduced emissions by 70% compared to 1990 levels. Its strategy relies on offshore wind (accounting for 50% of electricity production), a high carbon tax, and strong local governance in project implementation. The country aims to achieve carbon neutrality by 2045.
- Chile: An emerging champion, Chile is betting on solar energy (over 25% of its electricity mix) and green hydrogen, particularly in the Atacama Desert. With a clear regulatory framework that attracts investors, the country aspires to become a global leader in clean energy by 2035.
- India: A complex giant. Despite its heavy reliance on coal (70% of electricity), India ranks as the world's third-largest solar market. The government has pledged carbon neutrality by 2070, pursuing a dual strategy of green growth and accelerated industrialization.



ENERGY TRANSITION AND STRATEGIC STAKES

Morocco at the Crossroads of Climate Ambitions and Sustainable Development

Morocco is establishing itself as a key player in Africa's energy transition, articulating its climate ambitions through bold national strategies. Through massive investments, legislative reforms, and international partnerships, the Kingdom is charting a distinctive path toward a low-carbon future.

Looking Ahead to 2050

Under the leadership of His Majesty King Mohammed VI, Morocco unveiled its 2050 Low-Carbon Strategy in 2024. Structured around four main pillars—massive deployment of renewable energy, electrification of transport and industry, sustainable agriculture, and the development of smart cities—the roadmap aims to achieve carbon neutrality by 2050, create 400,000 jobs, and drive 5% GDP growth.

The Kingdom plans to reach 56% renewable energy in its electricity mix by 2027, surpassing its original 2030 target of 52%. This acceleration is supported by landmark projects such as the Noor Ouarzazate solar complex and the Tarfaya wind farm.

In parallel, Morocco is investing heavily in green hydrogen, allocating one million hectares to dedicated projects aimed at producing green ammonia and methanol for export.

Key Figures of Morocco's Energy Transition

- 56%: Target share of renewables in the electricity mix by 2027
- MAD 15 billion: Planned annual investment in renewable energy between 2024 and 2027
- 1 million hectares: Land allocated to green hydrogen projects
- 400,000: Jobs targeted by the 2050 Low-Carbon Strategy
- £22 billion: Value of the Xlinks project connecting Morocco to the United Kingdom

Toward a Circular and Sustainable Economy

The 2035 National Sustainable Development Strategy (SNDD), aligned with the New Development Model, seeks to transform Morocco's economy into a green and inclusive one. It is built around six key pillars, including the enhancement of human capital, territorial resilience, and the promotion of innovation.

Circular economy principles are at the heart of this strategy, with an ongoing revision of Law 28-00 on waste management and pilot projects in six host cities of the 2030 World Cup. These initiatives aim to reduce waste at the source, implement selective collection, and develop waste-to-energy solutions.

In the mining sector, Morocco is undertaking a deep reform focused on digitalization, streamlined administration, and greater industrial value-added from minerals, in order to attract investment and foster responsible territorial development.

Massive Investments Driving the Shift

Between 2024 and 2027, Morocco plans to invest 15 billion dirhams annually (approximately $1.5 billion) in renewable energy—quadrupling its previous levels of investment. These funds will support the development of solar, wind, and green hydrogen projects.

International partnerships are strengthening this momentum. One of the most high-profile is the £22 billion Xlinks project, which aims to transmit solar and wind power from Morocco to the United Kingdom via the world's longest subsea cable—supplying up to 8% of Britain's electricity demand.

In addition, major companies such as ACWA Power are making significant investments in Morocco. A recent $800 million wind and battery storage project further cements the country's role as a regional energy hub.

The success of Morocco's energy transition will depend on its ability to secure long-term project financing, develop specialized technical skills, and maintain a stable regulatory environment. Public-private partnerships, international green financing, and strong engagement from local governments will be critical to achieving these goals.

Thanks to its strategic vision and concrete commitments, Morocco is emerging as a leader in Africa's energy transition. By combining sustainable development, technological innovation, and international cooperation, the Kingdom is setting a benchmark for a low-carbon future—offering an inspiring model for other nations seeking durable solutions to the global climate crisis.

CESE Recommendations to Accelerate the Transition

1. Scale Up Renewable Energy :

- Reach 96% renewables in the electricity mix by 2050 (vs. 34% in 2019)
- Prioritize wind (350 TWh/year) and solar PV (150 TWh/year), supported by storage (pumped hydro, hydrogen)

2. Reform Energy Governance :

- Activate ANRE (national energy regulator) to oversee market liberalization and decentralized production
- Unbundle ONEE's functions (generation/transmission/distribution) and clarify MASEN's role

3. Decarbonize Key Sectors :

- Transport: Electrify vehicles (buses, taxis), deploy charging stations, and ban polluting cars in cities
- Industry: Replace fuel oil with natural gas and green hydrogen (e.g., synthetic ammonia for OCP)

4. Foster Innovation and Finance :

- Power-to-X (PtX): Develop green hydrogen for export (targeting 4% of global market share)
- Establish a national energy efficiency fund and introduce green tax incentives

5. Ensure Social and Regional Inclusion :

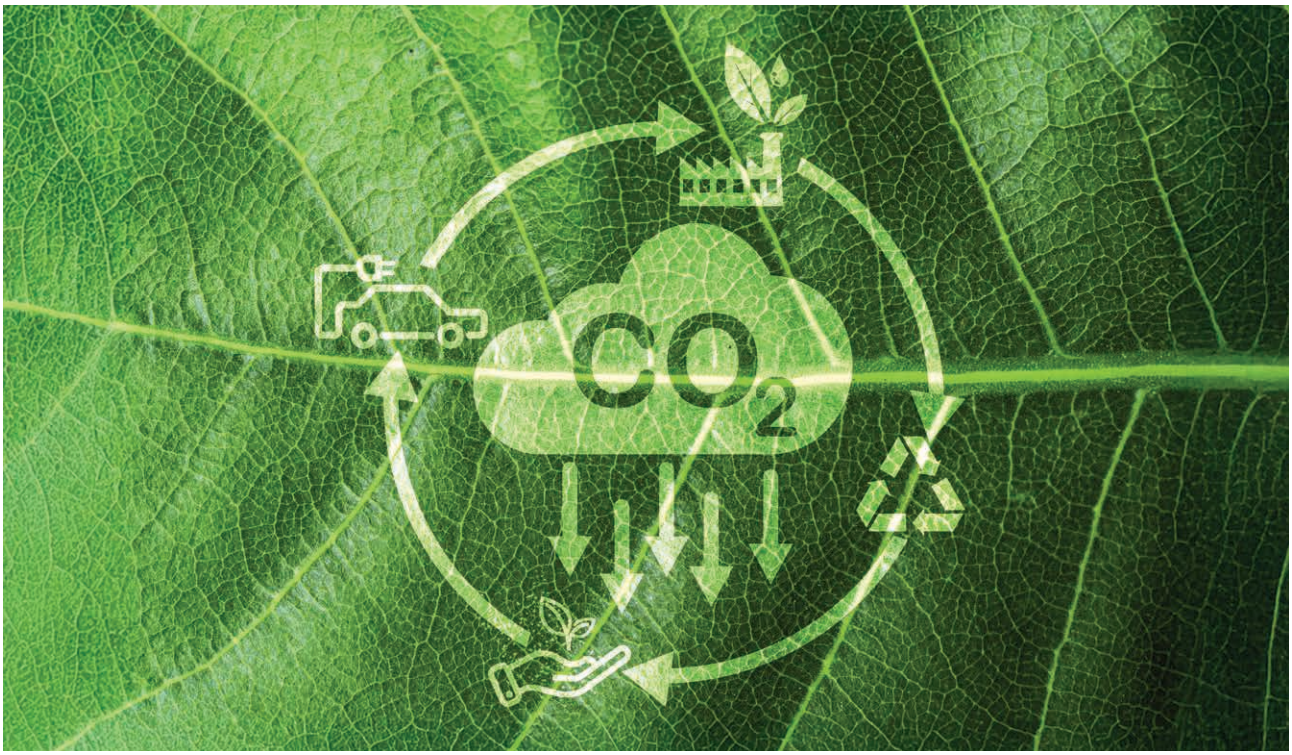
- Introduce a National Energy Transition Charter engaging citizens, local authorities, and the private sector
- Launch solar-powered desalination programs (costing MAD 5.2/m^3) to secure water for domestic and agricultural use

Source: CESE Scenarios (2023), recommendations for 2030–2050

ENERGY TRANSITION AND STRATEGIC STAKES

Morocco's Chemical Industry at the Heart of Global Shifts

Amid a rapidly accelerating global push toward decarbonization and energy sovereignty, the chemical industry is emerging as a critical backbone of the new industrial era. For Morocco, this sector represents more than just a pillar of production it is a strategic lever for economic development, innovation, and geopolitical positioning. Between industrial ambitions, regulatory challenges, and a shifting global landscape, the Kingdom is steadily forging its path within the low-carbon economy.



A Central Role in Decarbonization

The global energy transition hinges on technologies in which chemistry plays an indispensable role: batteries, hydrogen, carbon capture, composite materials, and more. The production of these technologies demands advanced chemical processes, specialized materials, and controlled supply chains. In this context, Morocco—blessed with abundant solar and wind resources, as well as mineral wealth—is positioning itself to be more than just a supplier of raw materials.

The Kingdom's strategy involves moving up the value chain of its industrial base. The OCP Group (Office Chérifien des Phosphates), for example, has evolved well beyond phosphate extraction and export. It is now investing heavily in chemical transformation, smart fertilizers, and green ammonia production. These efforts are part of a broader push toward technological sovereignty, with the aim of establishing Morocco as a global player in green chemistry.

In parallel, companies such as Fluoralpha, COPCO, and Gotion Power Morocco exemplify this momentum toward industrial integration. They are investing across the entire value chain—from raw material extraction to the production of battery components and fluorinated electrolytes. This vision goes beyond traditional export logic, aiming instead to generate localized value aligned with international environmental standards.

Persistent Structural Barriers

Despite tangible progress, several structural barriers continue to hinder the full development of a competitive chemical ecosystem. Chief among these is the regulatory framework. Industry leaders have voiced concerns over the outdated regulations governing chemical products, safety standards, and the management of industrial waste. This legal uncertainty discourages investment—especially from international players who prioritize compliance and transparency.

Innovation financing presents another challenge. While mechanisms such as the Industrial Innovation Support Fund exist, access remains limited to a small number of firms, and the rollout often lacks clarity. In a sector like chemistry—where R&D is foundational—this lack of agility can delay the emergence of local solutions tailored to energy transition needs.

Finally, the shortage of specialized technical skills remains a pressing concern. While partnerships like the one between the Federation of Chemistry and ENSC Kénitra are paving the way for engineering programs aligned with industry demands, needs in areas such as electrochemistry, formulation science, safety, and process engineering continue to grow. A national-level rethink of training curricula and work-study models is urgently needed to keep pace with the increasing complexity of the sector.

Chemistry and Energy Sovereignty

In an era shaped by recurring energy crises—from the war in Ukraine to disruptions in the Red Sea gas trade—energy sovereignty has returned to the forefront of national priorities. For Morocco, the challenge is twofold: securing its own energy supply while positioning itself as a strategic supplier to European countries.

The chemical industry lies at the heart of this dual ambition. The production of green hydrogen, low-carbon ammonia, and bio-based methanol relies on high-level chemical expertise. Projects like GH2 Toubkal, led by Hydrojeel in Jorf Lasfar, and the OCP's "Future is Mine" platform illustrate the Kingdom's determination to anchor new energy vectors in advanced chemistry.

In the medium term, such initiatives could enable Morocco to export green energy in the form of stabilized chemical derivatives—facilitating their transport to Europe. This model is already being explored through energy corridors such as the Nigeria-Morocco gas pipeline, which could transform the Kingdom into a strategic energy and chemical hub at the crossroads of South-South and North-South value chains.

What Green Chemistry Really Means Between Innovation, Safety, and Sovereignty

Behind the appealing term green chemistry lies a far-reaching transformation. It's not just about reducing emissions—it's about rethinking the entire lifecycle of chemical products, from raw material extraction to waste management. This shift demands new safety standards, innovative formulations, and, above all, anticipatory planning to avoid technological dependence on other global blocs. For emerging economies like Morocco, green chemistry is increasingly a tool of sovereignty—but only if it can master its own patents, applied research, and local engineering capabilities.

Toward an Integrated Industrial Hub

The success of Morocco's chemical strategy also hinges on strong regional anchoring. Jorf Lasfar stands as a flagship example: a specialized port connected to chemical industrial zones, equipped with dedicated terminals, and integrated into an innovation-driven ecosystem. Other initiatives, such as the planned redevelopment of the Mohammedia port or the advanced digitalization of port operations via the PortNet platform, are further strengthening logistical efficiency.

This logic of integration lies at the heart of current discussions on Morocco's chemical future. The goal is no longer merely to produce, but to structure complete value chains: from raw material extraction and transformation to logistics, workforce training, and innovation. Multiple voices are now calling for the creation of a joint coordination body, bringing together industry stakeholders, public authorities, and research centers, to guide a shared national roadmap.

Moreover, Morocco enjoys institutional stability and a strategic geographic location—two valuable assets in an increasingly fragmented global landscape. The ongoing U.S.–China tensions and the reshoring of industrial activities to the Mediterranean region make the Kingdom a credible alternative in global chemical supply chains—provided that regulatory alignment and investment efforts are sustained.

Morocco's chemical industry now stands at a crossroads. Confronted with environmental pressure, technological acceleration, and the imperative of sovereignty, it has been entrusted with a central role in shaping the country's economic future. The International Forum on Chemistry brought these issues to light—its promises, obstacles, and, above all, the levers of change that need to be activated.

With a clear vision, smart partnerships, and collaborative governance, Morocco has what it takes to turn its potential into regional leadership. But to do so, the country must accelerate the reform of its regulatory framework, secure financing for applied research, and upskill its human capital.

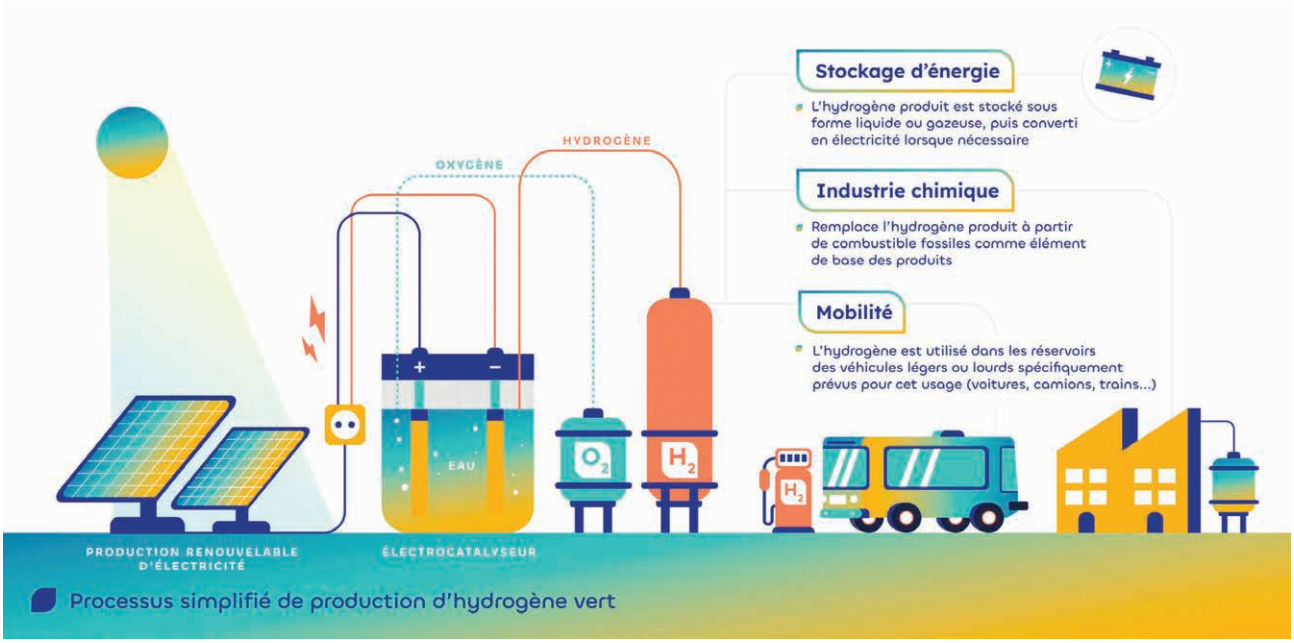
The chemical sector is no longer just one industry among many. It has become a strategic pillar at the core of global geo-economic shifts. For Morocco, it represents one of the most direct paths to energy sovereignty and long-term industrial prosperity.

The Chemical Engineer
A Career for the Future
A Key Player in the Energy Transition

In a post-carbon world, new skill sets are in high demand—and chemical engineers are at the forefront. Their role today goes far beyond designing products: they develop sustainable solutions—cleaner catalysts, energy-efficient processes, materials for batteries or hydrogen production... The demand is enormous. Morocco has already taken the lead, launching targeted training programs, such as those at ENSC Kénitra. With the rise of an integrated chemical industry, this profession now encompasses project management, coordination, and R&D leadership. Once discreet, chemistry is rapidly becoming a major driver of high-skilled employment.

THE GLOBAL GREEN HYDROGEN MARKET
Between Climate Promises and Industrial Realities

At a time when 99% of hydrogen production remains fossil-based, green hydrogen produced through electrolysis powered by renewable energy has emerged as a key pillar of the energy transition. It holds the promise of helping achieve climate targets, even as significant technological and economic hurdles continue to slow its industrial rollout. Massive investment is required to optimize production and pave the way for a sustainable future.



A Growing Yet Marginal Market

Current projections indicate that the global green hydrogen market is expanding rapidly. According to various studies, the sector could reach $1.4 billion by 2025, with forecasts climbing to $19.2 billion by 2032. Yet paradoxically, despite the buzz surrounding green hydrogen, it still represents only a tiny fraction of global hydrogen production, which is still overwhelmingly dominated by grey hydrogen derived from fossil fuels.

A report by Global Market Insights highlights this dynamic, estimating that the value of the green hydrogen market in 2023 stood at approximately $7.7 billion, with an anticipated annual growth rate of 41.6% from 2024 to 2032. These figures reflect not only the enthusiasm of industry players but also the urgency to scale up investment in low-carbon production technologies.

> Valued at $1.4 billion in 2025, this market is redefining the challenges of global energy geopolitics.

The Cost of Transition

One of the major obstacles to green hydrogen lies in its production cost. Currently, prices range between €3 and €5 per kilogram, significantly higher than the €1.5/kg cost of grey hydrogen. This gap is mainly due to the maturity of fossil-based technologies versus electrolysis methods, which, despite using renewable resources, have yet to achieve significant economies of scale.

To tip the balance, breakthroughs are needed in electrolyzer technology—whether alkaline, PEM (Proton Exchange Membrane), or solid oxide—as well as large-scale industrial deployment backed by substantial capital investment. As the cost of renewables continues to drop, green hydrogen is expected to become increasingly competitive, paving the way for more controlled, industrial-scale production.

Shades of Hydrogen Understanding the Color Code

Although hydrogen itself is colorless and odorless, the industry uses color codes to indicate its production methods and environmental impact:

- **Grey Hydrogen:** Produced from natural gas via steam methane reforming; the most widespread form today, but it releases significant greenhouse gases. Accounts for roughly 95% of global hydrogen production.
- **Blue Hydrogen:** Also derived from natural gas, but paired with carbon capture and storage (CCS); somewhat cleaner but still carbon-intensive.
- **Green Hydrogen:** Generated through electrolysis using renewable electricity; considered the cleanest and most sustainable, though currently more expensive. Represents only about 2% of total global production.
- **Brown Hydrogen:** Made from coal gasification, it is highly polluting and not aligned with sustainability goals.
- **Black Hydrogen:** Produced from anthracite, it is even more polluting than brown hydrogen and the least sustainable of all

The Emerging Energy Hub

North Africa is quickly positioning itself as a strategic player in the global green hydrogen race. With abundant sunshine and vast expanses of land ideal for solar and wind farms, the region offers optimal conditions for low-cost green hydrogen production. Ambitious initiatives like the SoutH2 Corridor—a project connecting Algeria, Tunisia, Italy, Germany, and Austria via a 3,300-kilometer hydrogen pipeline—aim to channel renewable hydrogen directly to Central Europe.

In Morocco, the Guelmim-Oued Noun green hydrogen project, developed in partnership with TotalEnergies, highlights the Kingdom's deep commitment to the energy transition. Algeria is also entering the scene with Project Taqaty+, which plans to harness its expansive Saharan territory to produce and export green hydrogen, transforming natural advantages into both economic leverage and geopolitical influence.

Soaring Demand From Europe

Facing a heavy dependency on foreign energy—over 90% of imports from non-EU countries—the European Union is making an unprecedented push to secure decarbonized energy sources. The bloc's ambitious goal is to produce 10 million tons of green hydrogen by 2030.

To meet this target, Europe is rolling out large-scale initiatives such as the "hydrogen valleys" in Germany and France, and constructing a Mediterranean hydrogen pipeline linking Spain and Portugal.

These efforts are backed by strict sustainability policies. The revised Renewable Energy Directive (RED III), adopted in February 2025, mandates that imported green hydrogen must have a carbon footprint below 3 kg CO_2 per kg of H_2, ensuring genuine climate benefits across the entire product lifecycle.

> Ambitious projects, such as the SoutH2 Corridor, exemplify the commitment to a decarbonized and innovative future.

Optimizing the Value Chain

Beyond cost, transport and storage remain major technical challenges. Liquefying hydrogen, necessary for long-distance transport, consumes around 30% of its energy content, leading to substantial efficiency losses.

To overcome this, alternative solutions are emerging. Ammonia conversion allows for more stable, lower-energy transport, while existing gas pipeline infrastructure is being explored for hydrogen compatibility. Bold initiatives like subsea pipelines between Algeria and Italy exemplify efforts to build the next-generation logistics for this energy vector.

Industrial Applications and Future Outlook

The benefits of green hydrogen extend far beyond electricity generation. It holds transformative potential for heavy industry, where it can replace grey hydrogen in refining, steelmaking, and fertilizer production.

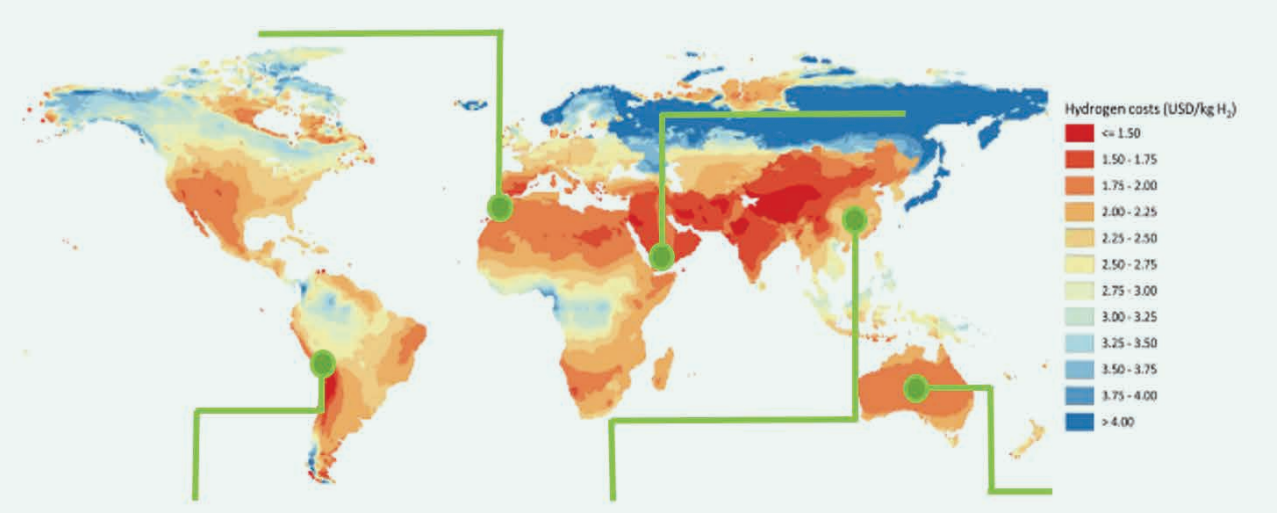
In the transport sector, green hydrogen is being explored to decarbonize road freight, maritime shipping, and even aviation. Airbus, for example, plans to launch a zero-emission aircraft by 2035, while shipping giants like CMA CGM are already testing liquid hydrogen-powered vessels.

Energy storage is another promising application. By converting excess renewable electricity into hydrogen, countries can ensure a steady power supply, even during periods of low generation. Projects like HyEx in Chile illustrate this synergy—using solar energy and electrolysis to provide continuous industrial power.

> Despite cost and logistical challenges, green hydrogen is paving the way for a climate-friendly industrial revolution.

Morocco and the International Renewable Energy Agency (IRENA) are joining forces to advance the country's renewable hydrogen economy and accelerate renewable energy adoption. The goal is to position Morocco as a major producer and exporter of green hydrogen. The nation has developed a comprehensive roadmap and incentive package to facilitate investments in green hydrogen and establish the Kingdom as a global leader in this sector.

Oman's government has announced plans to begin construction of the world's largest green hydrogen plant. Most of its output will be exported to Europe and Asia. Upon completion, the facility is expected to produce 1.8 million tonnes of green hydrogen and 10 million tonnes of green ammonia annually.



Chile unveiled its National Green Hydrogen Strategy in November 2020, targeting three main objectives:

- Develop 5 GW of electrolysis capacity by 2025
- Produce the world's cheapest green hydrogen by 2030
- Become one of the top three hydrogen exporters globally by 2040

China's ambition to achieve carbon neutrality by 2060 is accelerating hydrogen development. Hydrogen has been included in the country's latest Five-Year Plan (14th Five-Year Plan, 2021-2025) among the emerging industries prioritized by policymakers. This designation is likely to trigger increased state support through capital investment and human resources, signaling a promising growth trajectory for hydrogen.

The Australian government has already allocated US$355 million to hydrogen projects, including US$53.3 million dedicated to hydrogen export hubs.

A Transition With Geopolitical Stakes

The rise of green hydrogen is reshaping global power dynamics. North Africa and regions like Australia boast unparalleled natural potential, while Europe, Asia, and North America dominate the technologies and manufacturing capabilities. Without safeguards, this imbalance could lead to a new form of energy neocolonialism, unless contractual frameworks include technology transfers and local job creation clauses.

The success of this transition will depend not only on driving down production costs but also on forging equitable and resilient partnerships. By investing in local electrolyzer manufacturing and supporting regional R&D ecosystems, industrial powers like the European Union aim to reduce import dependency while fostering skills development in producing nations.

Towards a Decarbonized and Competitive Future

Despite its current challenges, green hydrogen is gradually establishing itself as an essential lever to achieve carbon neutrality targets. Technological advancements, combined with the continuous decline in the cost of renewable energies, have the potential to transform this market into a globally competitive source of clean energy. Moreover, the introduction of carbon pricing systems and the establishment of carbon credit markets provide a favorable financial framework for the adoption of this technology. As international partnerships take shape and massive investments flow in, the coming decade could mark a decisive turning point for green hydrogen, paving the way for a new energy era that is both environmentally sustainable and economically viable.

In conclusion, the global green hydrogen market stands at a crossroads, balancing ambitious climate promises with complex industrial realities. While North Africa and Europe redraw the geopolitical map of energy, technological progress and international collaborations will play a crucial role in turning this enthusiasm into a lasting solution for global decarbonization. The future looks ambitious, and it is up to the stakeholders in the sector to align innovation, sustainability, and equity to meet the energy challenge of the 21st century.

THE MOROCCAN GREEN HYDROGEN INITIATIVE: NEW HORIZONS 2025-2050

Towards a Decarbonized Economy Based on a Controlled Renewable Mix

By 2025, Morocco is solidifying its status as Africa's green hydrogen pioneer, backed by a revised national roadmap and public-private investments estimated at 90 billion dirhams by 2030 and 760 billion dirhams by 2050. Leveraging exceptional solar and wind resources, the Kingdom is committed to covering up to 40 TWh of domestic consumption and exporting 115 TWh by 2050, while structuring the sector around green ammonia, methanol, and Power-to-X technologies.

Renewable Potential and Infrastructure

Morocco boasts a technical solar potential estimated at 49,000 TWh/year and wind potential of 11,500 TWh/year, according to methodologies from IRENA and KTH, placing the country among the global frontrunners for producing decarbonized hydrogen. Since 2021, the national photovoltaic fleet surpassed 3,000 MW, and wind capacity has reached 2,200 MW, strengthening grid stability and ensuring energy availability for large-scale electrolysis.

To support this growth, Morocco completed in 2024 a high-voltage connection between the Ouarzazate solar complex and the Jorf Lasfar port, facilitating the transmission of renewable power to industrial sites. Decentralized control centers equipped with predictive algorithms optimize energy flows and guarantee capacity factors above 45% for photovoltaics and 35% for wind power, even under variable weather conditions.

Additionally, the industrial zones of Al Jorf and Kenitra already host seawater desalination infrastructure and pilot Proton Exchange Membrane (PEM) electrolysis plants with unit capacities of 100 MW. These demonstrators validate precious-metal-free catalysis technologies and optimize energy conversion efficiencies, paving the way for large-scale deployment by 2030.

Morocco Green Hydrogen Offer Flagship Projects and Selected Consortiums

In March 2025, the steering committee of the "Morocco Offer" selected five international and national consortiums to deploy six green hydrogen mega-projects across the three southern regions of the Kingdom, with a combined investment of 319 billion dirhams.

- ORNX Consortium (Green Ammonia) – Comprising American Ortus, Spanish Acciona, and German Nordex, it will develop a green ammonia plant using PEM electrolysis, integrated desalination, and high-voltage connection to ensure annual production of several hundred thousand tons.
- Taqa & Cepsa (Ammonia and Industrial Fuels) – The Emirati-Spanish duo will develop two complementary sites dedicated to synthesizing ammonia and second-generation industrial fuels for local heavy industries and export.
- Nareva (Ammonia, Industrial Fuels, Green Steel) – The energy subsidiary of the Al Mada group will successively invest in three units: ammonia production, green fuel refining, and Morocco's first green steel mill, demonstrating an upgrade towards decarbonized heavy chemistry.
- ACWA Power (Green Ammonia) – The Saudi operator, already active in Moroccan renewables, will expand into green ammonia production, leveraging its expertise in large PV and CSP projects.
- UEG & China Three Gorges (Green Ammonia) – This Chinese consortium will integrate a full chain from offshore wind to green ammonia, focusing on optimizing high-pressure electrolysis and port logistics.

Additionally, two agreements signed in October 2024 complement these initiatives: a Total Energies–Morocco partnership for a first green hydrogen gigafactory and an OCP–ENGIE program encompassing five projects including green electrolysis.

With a land cap of 30,000 hectares per project and an administrative one-stop-shop accelerating permit issuance, the "Morocco Offer" aims to anchor Morocco among the world's exporters of green ammonia and derivatives, while catalyzing local manufacturing sectors for electrolyzers, desalination, and green chemistry.

Demand and Investments

National demand for green hydrogen, revised upward in 2025, reaches 5 TWh supported by 2.5 GW of installed renewable capacity, compared to the initial 4 TWh forecast for 2030. On the export front, the first green ammonia contracts have been signed with Northern Europe for 3 TWh starting in 2026, marking Morocco's entry into the global green molecules market.

To meet these requirements, the state and private partners have allocated 90 billion dirhams for the 2020–2030 phase, covering the construction of electrolyzers, grid connections, and refueling stations for hydrogen bus fleets. European funds, through the European Recovery and Resilience Facility, contribute €1.2 billion in co-financing, reinforcing synergy with Green Deal initiatives.

Beyond ammonia and methanol, the 2025 portfolio includes production of methylcyclohexane (MCH) cation for decarbonized maritime transport. The first pilot lines, funded by a Franco-Japanese consortium, target an output of 50,000 tons per year by 2030, opening the way to green corridors linking Tanger Med to major European maritime hubs.

Roadmap and Governance

The National Green Hydrogen Commission, chaired by the Ministry of Energy, Mines and Environment, was restructured in 2025 to accelerate the granting of concessions and simplify environmental authorization procedures. A digital one-stop platform now consolidates water licenses, land use permits, and production certificates, reducing processing times from six to two months.

Concurrently, a capacity-building program was launched involving Mohammed VI Polytechnic University, the National School of Mines, and international partnerships to train 1,200 specialized engineers by 2030, supported by scholarships and research center internships.

Applications and Innovation

Green ammonia remains the primary industrial outlet, supplying OCP fertilizer units and achieving an estimated 15% reduction in their carbon footprint. Green methanol is directed toward the fine chemicals and synthetic fuels sectors, with projected volumes of 1 million tons by 2035.

In heavy transport, the Moroccan National Railways Office (ONCF) expects its first hydrogen truck fleet by 2027, while Casablanca's urban buses will benefit from the first fast refueling stations starting in 2026. Power-to-Heat pilot projects, coupled with industrial boilers, also provide heat to over 50,000 households in off-grid rural areas.

Finally, the aerospace industry, through partnerships with Airbus and Safran, will develop sustainable aviation fuels (SAF) based on green methanol and hydrogen, with a first test flight scheduled for 2029. These innovations strengthen Morocco's image as a demonstration platform for PtX (Power-to-X) technologies.

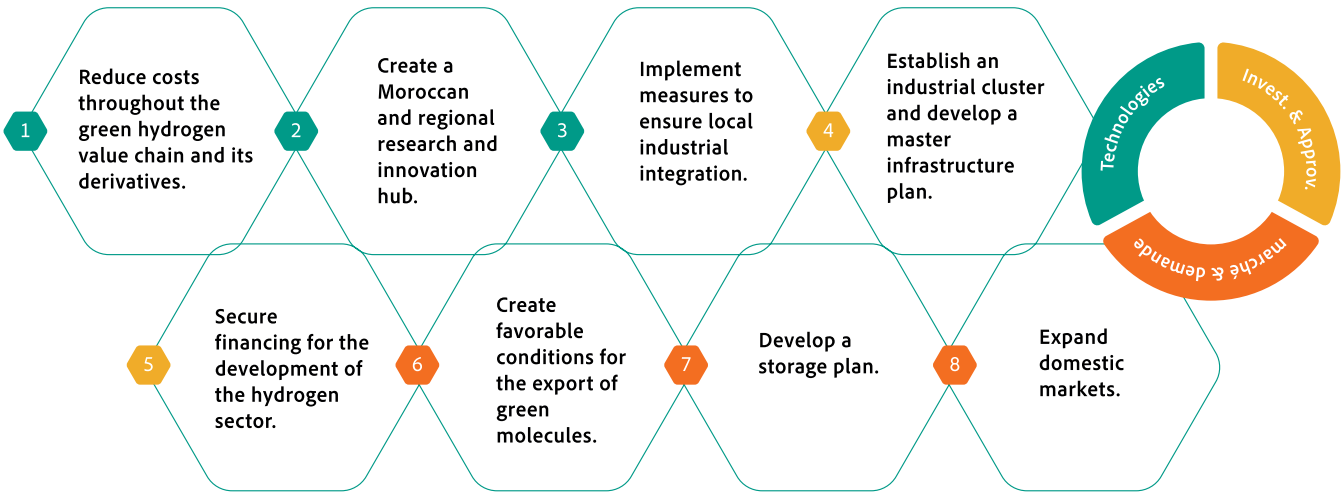
By updating its green hydrogen strategy, Morocco confirms its regional leadership and its ability to turn climate challenges into industrial opportunities. Thanks to a high-performance renewable mix, a streamlined institutional framework, and strong partnerships, the Kingdom aims not only for energy self-sufficiency but also for a significant contribution to global decarbonization, placing green hydrogen at the core of its sustainable growth for 2025-2050.

Green Hydrogen: 40 Projects Under Evaluation

Morocco is currently reviewing about forty projects led by national and international stakeholders in the green hydrogen sector, according to Minister Leila Benali's statement to Parliament in late June 2025.

MASEN, designated as the focal point, drives this dynamic and supports investors. This approach ensures informed decision-making and a comprehensive vision of the opportunities and risks related to this strategic market.

Plan d'Action de la Feuille de Route Hydrogène



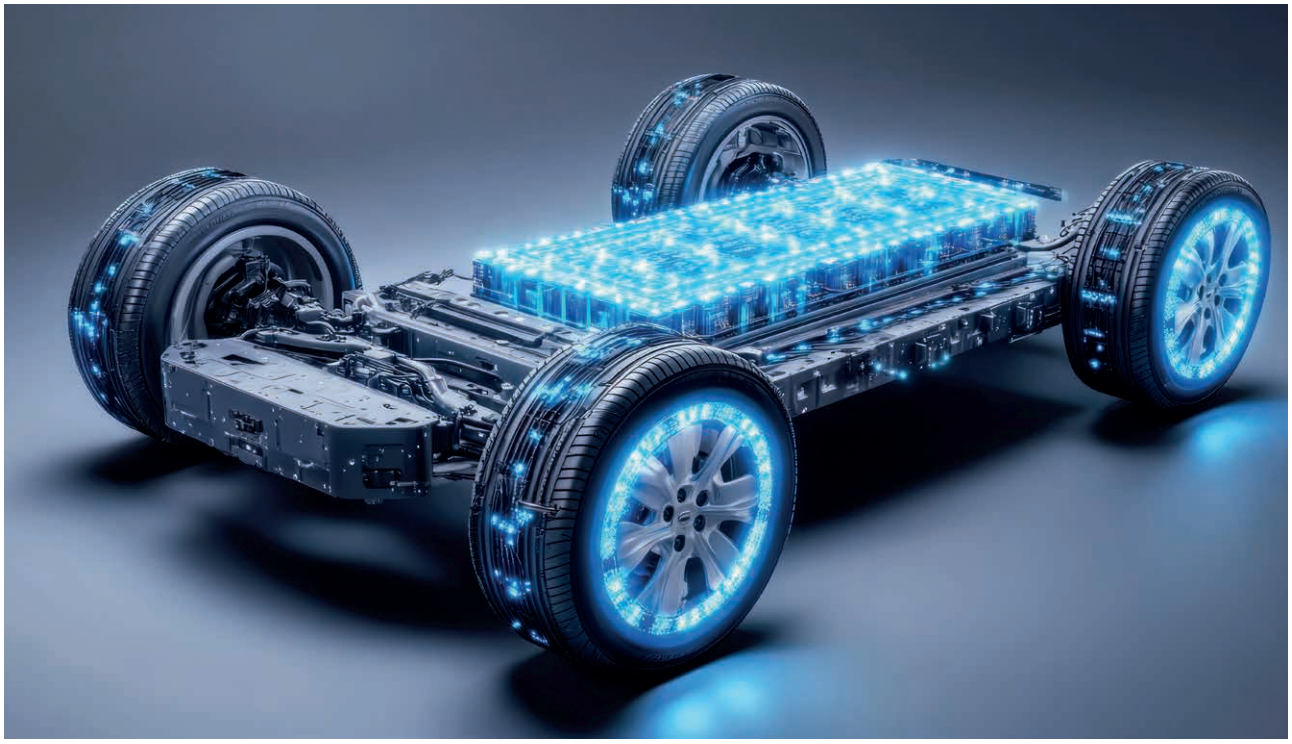
NOTRE ENGAGEMENT: CONTRIBUER À ASSURER LA SÉCURITÉ ALIMENTAIRE MONDIALE TOUT EN LUTTANT CONTRE LE CHANGEMENT CLIMATIQUE.

OCP

MOROCCO TAPS INTO THE FUTURE OF BATTERIES

Towards an African Hub for Tomorrow's Energy

Thanks to its strategic resources, robust industrial infrastructure, and a surge of foreign investments, Morocco is laying the groundwork for a high-performance battery ecosystem. Balancing industrial ambitions, geopolitical stakes, and job creation promises, the country is playing a pivotal role in the global energy transition.



A Weighty Ambition

The Kingdom holds over 70% of the world's phosphate reserves, the raw material for lithium iron phosphate (LFP) batteries, valued for their safety and thermal stability. Adding value to these phosphates domestically could reduce logistical costs and foster a local cathode manufacturing sector, rather than exporting the low-value raw mineral.

Meanwhile, exploration projects for cobalt, manganese, and nickel are multiplying under the leadership of Managem and other international operators. These metals feed into high-nickel NMC cathodes (e.g., NMC 811), with energy densities exceeding 250 Wh/kg. Their extraction and refining on Moroccan soil are deemed critical to securing the supply chain.

Beyond phosphates, Morocco's subsurface contains cobalt, manganese, and promising nickel deposits—metals essential to conventional lithium-ion batteries. Mining company Managem, for example, has already intensified exploration efforts in this direction. The goal? To develop these resources locally rather than exporting them cheaply as in the past.

Finally, optimizing the extraction and processing of these resources is creating industrial synergies: co-production of phosphate fertilizers and active battery materials, along with shared use of Tanger Med port infrastructure for exports. This circular model, combining raw materials and low-carbon industries, establishes an integrated, competitive, and resilient value chain.

The Kingdom holds over 70% of the world's phosphate reserves, the raw material for lithium iron phosphate (LFP) batteries, valued for their safety and thermal stability

The Investment Magnet Effect

The Tanger Med and Kenitra free zones play a key role by offering logistical and fiscal advantages. It is here that Gotion High Tech's gigafactory is located, with an initial capacity of 20 GWh set for 2026 and scaling up to 100 GWh, producing cells with nickel- and cobalt-enriched electrodes to enhance energy density and lifespan.

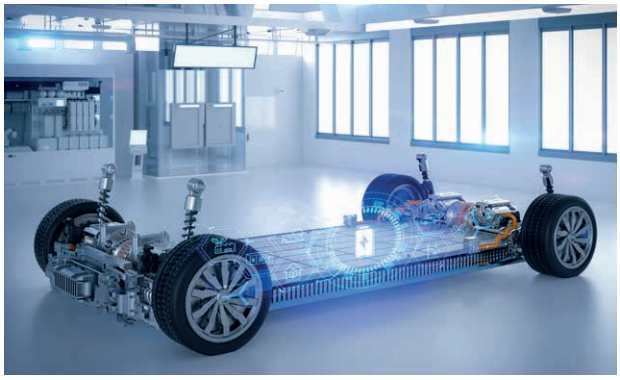
Similarly, BTR New Material Group is developing a 50,000-ton annual cathode production plant near Tangier, while the joint venture COBCO (CNGR & Al Mada) already operates in Jorf Lasfar supplying cathode precursors (PCAM). These investments go beyond mere technology transfer—they include local workforce training and the creation of R&D clusters.

These operations are deeply tied to economic diplomacy and bilateral agreements with China. They reflect investors' confidence in Morocco's political stability and the quality of its industrial ecosystem. In the long term, these projects are expected to generate over 25,000 direct and indirect jobs, while structuring a value chain capable of competing on the global market.

Building a Value Chain

Despite this momentum, Morocco is still in a structuring phase. While investments in advanced component production are accelerating, local manufacturing of battery cells—a crucial link in the chain—is not yet operational. Developing specialized expertise, patents, and R&D infrastructure is therefore essential.

Another challenge is local integration. To ensure industrial projects generate lasting ripple effects, the emergence of suppliers, subcontractors, and national skills must be supported. The government has recognized this, multiplying targeted vocational training through the Institutes of Training in Automotive Industry Trades (IFMIA) and partnerships with universities.



Focus on Quality and Qualification

Morocco is investing in setting up qualification laboratories where cycling tests, mechanical shocks, vibrations, and thermal cycling from –20 °C to +60 °C are performed.

These centers, equipped with automated test benches, ensure compliance with UL 2580, IEC 62660, and UN 38.3 standards.

ISO 9001 and ISO 14001 audits strengthen traceability, while partnerships between ENSAM-Rabat and Hassan II University develop evaluation protocols for solid-state batteries and integrate smart sensors to monitor cell health.

African Prospects

One of Morocco's major assets is its strategic location at the gateway to Europe and the rest of Africa. Thanks to the African Continental Free Trade Area (AfCFTA), the country could quickly become a regional supplier of batteries and energy storage systems—not only for the automotive industry but also to meet rural electrification needs and power isolated industrial units.

By integrating into this pan-African dynamic, Morocco could offer a competitive, green, and reliable supply in response to supply chain risks linked to the war in Ukraine, Sino-American tensions, and instability in cobalt-producing countries such as the Democratic Republic of Congo.

Morocco could quickly become a regional supplier of batteries and energy storage systems not only for the automotive industry but also to meet rural electrification needs and power isolated industrial units.

A Green Transition... To Be Managed

However, the success of this ecosystem will also depend on its ability to minimize its environmental footprint. Battery manufacturing processes are water- and energy-intensive and generate chemical waste. Ongoing projects will need to incorporate high standards for effluent treatment, recycling, and materials recovery.

In the medium term, the circular economy will become an essential step: recycling end-of-life batteries, reusing precious materials, and offering second-life applications for batteries in stationary uses. Moroccan startups and public laboratories are beginning to focus on these sustainability challenges.

A Long-Term Industrial Vision

Morocco does not hide its ambitions: by 2030, the country could produce between 150 and 200 GWh of batteries annually, positioning it among the world's top 10 producers. This ambition is all the more realistic given the country's stable regulatory framework, coherent industrial strategy, and long-term vision championed by the authorities.

For policymakers, the goal is not only to create wealth and jobs—more than 25,000 direct jobs are projected in the sector within five years—but also to reduce energy dependence and support the electrification of mobility and national infrastructure.

Morocco's battery ecosystem is in full bloom. If the conditions remain favorable—investment, training, innovation, and environmental respect—the Kingdom can establish itself as an African pioneer in clean energy. It possesses one of the most valuable resources of the 21st century: strategic vision.

Morocco's Strengths

- Political Stability and Legal Security: A solid institutional climate with ongoing reforms to facilitate foreign investment and protect industrial stakeholders' rights long-term.
- Wealth of Strategic Raw Materials: Reserves of phosphates (core to LFP batteries), growing deposits of cobalt, manganese, and nickel exploration projects to supply advanced cathodes.
- Ideal Geographic Position: A crossroads between Europe, sub-Saharan Africa, and the Middle East, served by ultra-modern ports (Tanger Med) and logistical corridors to major global markets.
- Industrial Infrastructure and Free Zones: Technology parks and industrial zones (Kenitra, Jorf Lasfar) offering tax exemptions, integrated services, and direct access to power grids and railways.
- Human Capital and Growing Expertise: Young engineers and technicians trained in the latest electrochemistry techniques, supported by university-industry collaborations to accelerate local R&D.
- Innovation Incentive Framework: Public-private research support programs, tax credits, and targeted subsidies for developing advanced manufacturing processes and recycling solutions.

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SCAN ME

RARE EARTHS AND HIGH-PERFORMANCE BATTERIES: GEOPOLITICAL STAKES AND MOROCCO'S STRATEGIC ROLE

When control over strategic elements reshapes global balances

At the heart of the energy transition, rare earths play a critical role in the manufacturing of high-performance batteries. While China dominates both production and processing, the United States, Australia, and Europe are actively seeking to diversify their supply chains. With its phosphate wealth and emerging extraction projects, Morocco could secure a strategic foothold in this global value chain.

The Gatekeepers of the Rare Earths Market

Global production of rare earths—a group of 17 elements essential for permanent magnets and battery electrodes—is overwhelmingly controlled by China, which accounts for nearly 60% of extraction and over 80% of refining into oxides and pure metals. Australia ranks second, thanks to its high-grade deposits, notably at Mount Weld, while the United States is reviving mining operations at Mountain Pass in a bid to reduce its dependency. In Europe, efforts such as the Norra Kärr deposit in Sweden face delays due to stringent environmental regulations and high investment costs.

This concentration creates a critical bottleneck. Should Beijing decide to limit its exports to safeguard its own battery and magnet industries, the automotive and renewable energy sectors in the West would be significantly disrupted. In response, Washington and Brussels are rapidly multiplying bilateral agreements with Australia, Canada, and select African nations to secure supply and build local refining capacity—now seen as the second most critical link after extraction.

Securing the Supply Chain

The production of high-performance lithium-ion batteries depends on four tightly connected stages—from raw material extraction to final assembly (see inset). Each step represents a potential vulnerability. Raw materials are often shipped abroad for refining and then re-imported as ready-to-use components.

For example, Australia mines neodymium and praseodymium but sends its rare earths to China for processing, before they are exported again as magnets or powders destined for batteries in Asia or Europe. This fragmented logistics chain inflates costs, increases lead times, and exposes manufacturers to geopolitical volatility, particularly during periods of trade tension.

To mitigate these risks, major powers are investing in reshoring critical segments of the value chain. The United States, under the Inflation Reduction Act (IRA), has introduced tax credits to attract refining and manufacturing operations back to its territory.

The European Union is preparing its «Batteries Regulation,» which will require minimum local content in imported battery packs starting in 2027. Japan, for its part, is forging strategic partnerships with leading South Korean and European automakers to establish integrated production lines—from raw material processing to EV assembly—aimed at gaining greater strategic autonomy.

High-Performance Battery Supply Chain

The assembly of a cutting-edge lithium-ion battery involves four inseparable steps:

1. Raw Material Extraction: Lithium, cobalt, nickel, and—in certain technologies—rare earth elements are extracted from deposits worldwide.
2. Processing and Refining: These raw materials are transformed into highly purified chemicals, such as lithium oxides and salts—a step still largely outsourced to China.
3. Cell Manufacturing: Involves electrode preparation and coating, film stacking, and sealing in controlled environments.
4. Module and Pack Assembly: Incorporates thermal and electronic management systems before delivery to vehicle manufacturers and stationary storage suppliers.

Any disruption at these stages can create bottlenecks—driving up costs, causing delays, and increasing end-users' geopolitical vulnerability.

Geopolitical Tensions and Strategic Dependencies

Control over rare earths has rapidly become a lever of global influence. China has previously halted exports to certain countries, showcasing its ability to wield this resource as a diplomatic tool. The United States now considers these materials vital to national defense—used in radars, missiles, and military vehicles—and has designated rare earth access as a strategic priority, allocating funding for exploration and refining initiatives.

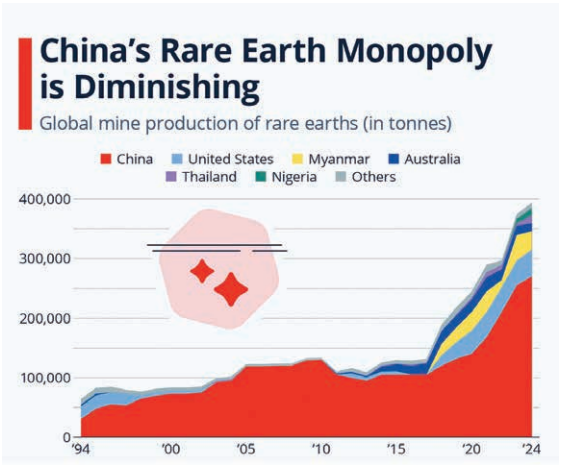
Meanwhile, growing tensions surrounding the control of communication routes—such as maritime trade lanes, gas pipelines, and mining corridors—are reshaping alliances. In this evolving context, Africa, with its rich reserves of cobalt (DR Congo), lithium (Zimbabwe, Mali), and rare earths (Kenya, Malawi), is emerging as a key player. Public-private partnerships backed by China and Western consortia are proliferating, each vying to secure mining concessions and enforce local processing clauses.

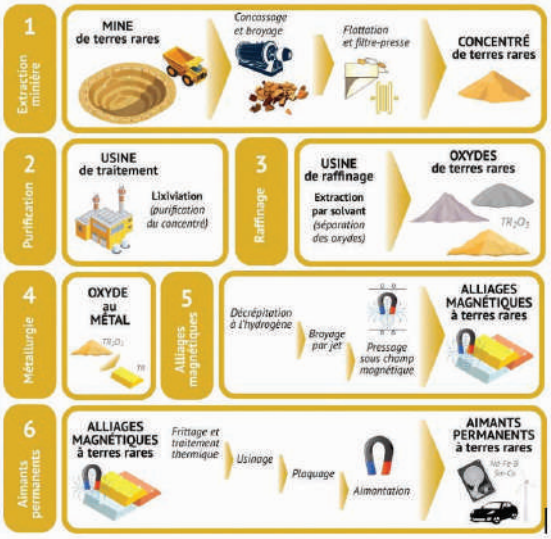
Morocco's Challenge: From Phosphate to Rare Earths

While lacking conventional large-scale rare earth deposits, Morocco holds a unique asset: its global leadership in phosphate production. The byproducts of phosphate processing—known as phosphogypsum—contain several dozen rare earth elements. In partnership with Mohammed VI Polytechnic University and specialized start-ups, OCP is piloting hydrometallurgical processes to extract these rare oxides at a pre-industrial scale, with an estimated potential of several tens of thousands of tonnes per year. If this technological gamble leads to cost-effective industrialization, the Kingdom could become a significant alternative source for global manufacturers.

Beyond extraction, Morocco can capitalize on its industrial zones (Kénitra, Al Jorf) and its Tanger Med port hub to establish local refining and fine chemical production units. The lithium-ion battery gigafactory projects currently underway could be expanded to include rare earth processing modules and end-of-life recovery lines for critical metals—completing a truly circular economy.

As rare earth geopolitics reshapes alliances and supply blocs, Morocco has a strategic card to play thanks to its phosphate expertise, modern infrastructure, and industrial ambition. To convert its potential into real leverage, it must accelerate the industrialization of refining, secure financing, scale up training programs, and ensure a genuinely sustainable transition. In doing so, the Kingdom could not only diversify global sources of rare earths but also position itself as a key player in the high-performance battery value chain and the global energy transition.





Key Challenges and Outlook

Several structural challenges must be addressed for Morocco to fully integrate into the rare earths and battery value chain:

1. **Scaling Up Refining Operations:** Transitioning from pilot projects to industrial-scale facilities requires convincing investors to fund oxide separation plants and rare compound production, with guarantees of profitability and legal certainty.
2. **Skills Development and Training:** There is urgent need to train engineers and technicians in electrochemistry and hydrometallurgical processes. Expanding school-industry partnerships and on-site continuous training is essential.
3. **Recycling and Circular Economy:** Establishing a national collection and processing network for used batteries is key to recovering lithium, cobalt, nickel, and rare earths—reducing reliance on imported primary ore.
4. **Environmental Compliance:** Implementing effluent treatment stations, recycling process water, and calculating carbon footprints will be crucial to meet international standards (ISO 14001, EU directives) and minimize ecological impact.

AL JORF INDUSTRIAL ACCELERATION ZONE: MOROCCO'S NEW GREEN INDUSTRY EPICENTER

A 283-hectare hub dedicated to EV batteries, advanced chemicals, and electronics

Located 100 km south of Casablanca, the upcoming Al Jorf Industrial Acceleration Zone embodies Morocco's ambition to position itself as a continental leader in clean technologies. Spanning 283 hectares and backed by an investment of 24 billion MAD, the site will host electric vehicle battery plants, chemical production units, and mining-related workshops creating 4,000 jobs and boosting the entire industrial value chain.

National Context and Strategic Objectives

In response to the global electric vehicle boom and the urgent need to strengthen its energy sovereignty, Morocco launched the development of an industrial zone entirely dedicated to battery manufacturing. Ryad Mezzour, Minister of Industry and Trade, announced that three flagship pilot projects—totaling 24 billion MAD—would lay the groundwork for a gigafactory, fine chemical plants, and advanced metallurgy infrastructure. This concentration of public and private investments reflects the Kingdom's intent to capture a larger share of the clean technology value chain, traditionally imported in the form of finished products.

The success of the initiative relies on a clear strategy: building an integrated industrial hub that combines R&D, production, and services. Strategic partnerships with Chinese and African groups—such as leading cathode producer CNGR and investment fund Al Mada—will bring cutting-edge technologies and ensure industrial know-how transfer. In parallel, the government is rolling out targeted training programs in collaboration with local engineering schools, to provide the zone with a skilled workforce ready to meet the demands of high-performance electrochemistry.

Strategic Location and Competitive Advantages

The selection of Al Jorf is no coincidence. Just 100 km from Casablanca, the site lies adjacent to OCP's industrial complex—the world's second-largest phosphate producer—offering a key advantage for manufacturing lithium iron phosphate (LFP) batteries. The proximity to phosphate reserves, as well as exploration projects for cobalt, manganese, and nickel, ensures secure and cost-effective access to essential raw materials.

Moreover, Al Jorf's geographic location offers direct connectivity to road and rail corridors leading to Tanger Med, one of Africa's largest ports. This infrastructure facilitates exports to Europe and sub-Saharan Africa while providing suppliers with a favorable fiscal environment. Free trade zones in Kénitra and Tanger Med offer customs and VAT exemptions, further consolidating Morocco's appeal as a competitive industrial hub on the African continent.

Flagship Projects and Scale-Up Strategy

The first major project underway—a joint venture between CNGR and Al Mada—will install lithium-ion cell production lines with an initial capacity of 20 GWh by 2026, scaling up to 100 GWh in the medium term. These cells are engineered to reach energy densities above 250 Wh/kg and more than 3,000 lifecycle charges, meeting the stringent performance standards of premium electric vehicles and stationary energy storage systems.

In parallel, two additional plants are under development: one focused on fine chemistry, producing high-purity phosphate derivatives for catalysts and electrolytes; the other dedicated to advanced metallurgy, converting cobalt and manganese into high-nickel NMC cathodes (NMC 811). These facilities will be complemented by state-of-the-art testing and qualification laboratories for cycling, mechanical shock, vibration, and thermal cycle testing, all in compliance with UL, IEC, and UN 38.3 international standards.

Other Key Battery Sector Zones

Nador West Med (300 ha)

Located on the Mediterranean coast, this zone benefits from a deep-water port and a direct rail link to Europe. With infrastructure such as roads, electricity, and water already in place, it is ideally suited for the establishment of battery cell and module manufacturing plants. Public-private partnerships are actively supporting investment, enabling rapid access to European and regional markets.

Mohammed VI Tangier Tech City (467 ha, including 380 ha in Phase 2)

Near the Tanger Med port, this industrial platform hosts major automakers and Tier 1 suppliers. Its second development phase is expanding R&D and assembly capabilities, making it a strategic location for gigafactory deployment. The goal is to secure energy supply for nearby automotive plants while benefiting from tax incentives and optimized logistics.

Logistical and Industrial Synergies

Together, these sites form a coherent port-rail network, interconnected with testing and certification centers. This structure ensures a fully integrated local value chain—from mineral extraction to battery cell production and recycling—providing the Moroccan battery industry with competitiveness, long-term resilience, and environmental sustainability.

Challenges, Synergies, and Future Outlook

The Al Jorf project is expected to generate substantial economic and social benefits: the creation of 4,000 direct jobs, the development of specialized skills, and the revitalization of surrounding territories. However, several key challenges remain: the rapid training of electrochemistry engineers, the establishment of efficient recycling streams to ensure a circular economy, and strict compliance with environmental regulations—covering effluent treatment, water management, and the reduction of carbon emissions from production sites.

Beyond manufacturing, Al Jorf aims to become a hub for innovation and continuous learning. University partnerships will help align academic curricula with industrial needs, while public-private R&D programs will support the development of disruptive technologies—particularly solid-state batteries. By fully integrating the value chain—from raw material extraction to end-of-life cell recycling—Morocco is positioning itself among the global leaders in high-performance batteries, ready to play a strategic role in Africa's energy transition and beyond.

With the Al Jorf Industrial Acceleration Zone, Morocco marks a decisive step in its green industrialization journey. Thanks to a coherent strategy that combines public investment, international expertise, local resources, and workforce training, the Kingdom is poised to become a benchmark hub for battery manufacturing and a modernized chemical industry—strengthening its energy sovereignty and creating thousands of jobs.

Key Challenges and Levers for the Battery Sector

Rapidly training electrochemistry engineers: The development of gigafactories and advanced laboratories has created an urgent demand for specialized talent. In addition to expanding university programs, practical training must be enhanced through school-industry partnerships, short certification tracks in active material synthesis and battery engineering, and mentorship programs within factories to accelerate skills acquisition.

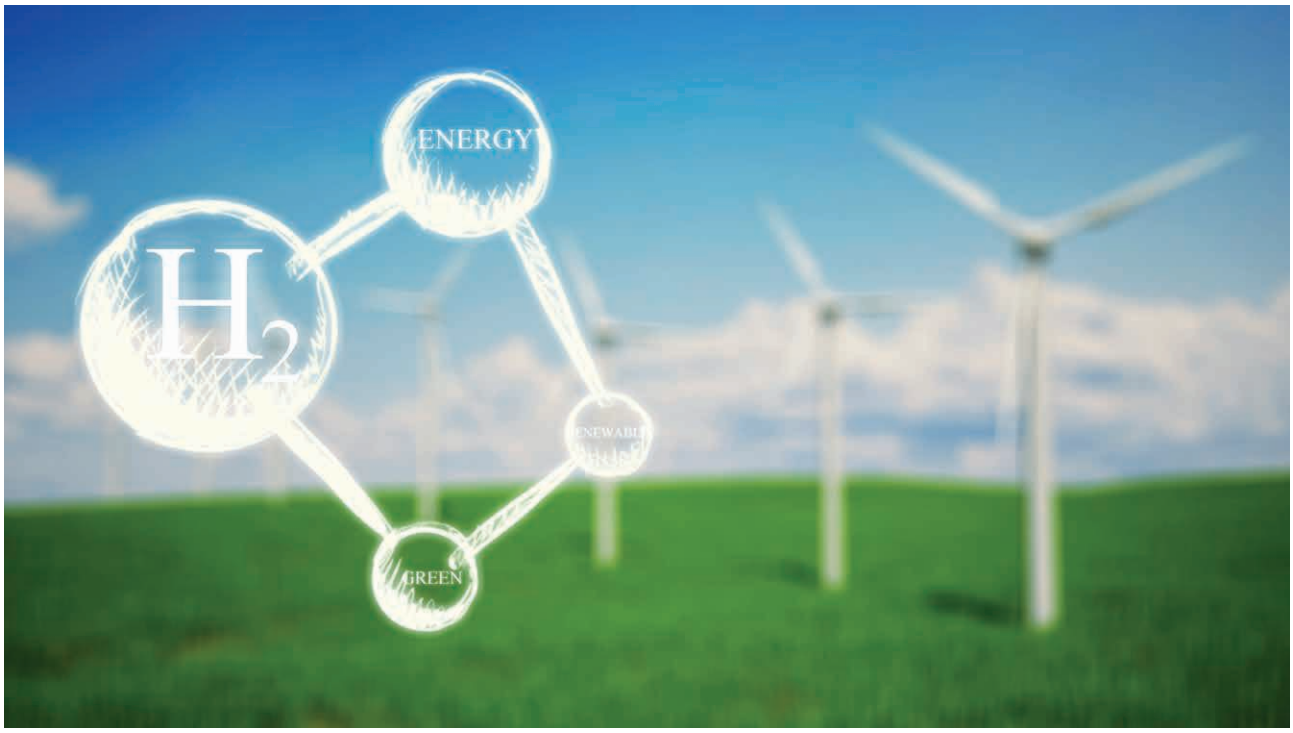
Establishing efficient recycling ecosystems: Ensuring the circularity of critical materials—such as lithium, cobalt, and nickel—requires a national network of collection and processing units. These facilities must combine pyrometallurgical and hydrometallurgical techniques to achieve recovery rates above 90%, while minimizing energy use. Supporting recycling startups and promoting Extended Producer Responsibility (EPR) schemes are key to building reverse logistics and ensuring the effective recovery of end-of-life cells.

Meeting the highest environmental standards: Battery production generates chemical effluents and consumes large amounts of water and electricity. Each site must implement physico-chemical treatment stations to recycle process water, systems to capture and valorize volatile emissions, and comprehensive carbon footprint assessments to monitor and reduce CO_2 emissions. Securing ISO 14001 certification and approval from the National Ports Agency (for port-based facilities) will ensure compliance and long-term sustainability.

R&D: A CATALYST FOR GREEN INDUSTRIAL SOVEREIGNTY IN MOROCCO

How R&D and training-industry alignment are transforming the chemical sector into a driver of decarbonization

With less than 1% of its GDP allocated to R&D, Morocco is positioning its chemical and para-chemical industries as strategic laboratories for its green transition. Driven by initiatives from the FCP and OCP, the country's scientific-industrial ecosystem is accelerating low-carbon innovation, closely tied to a targeted educational overhaul. This model backed by national strategies such as the Green Hydrogen Plan and the International Chemistry Forum 2025 embodies the alliance between industrial sovereignty and carbon neutrality.



Chemistry: Backbone of the Transition

Morocco has structured its decarbonization efforts around ambitious goals: cutting greenhouse gas emissions by 45.5% by 2030 and producing one million tons of green ammonia by 2027. The chemical industry plays a pivotal role in achieving these targets by optimizing energy-intensive processes through R&D in advanced catalysts and high-efficiency electrolyzers. OCP Group exemplifies this momentum, with major investments in waste valorization (targeting 630 million m^3 of recycled water by 2030) and the production of three million tons of low-carbon fertilizers.

Minister Leïla Benali emphasized that 45% of the national electricity mix is already sourced from renewables—an asset supporting electrification and countering the effects of the EU's Carbon Border Adjustment Mechanism (CBAM). This transition is supported by a modernized legislative framework (Laws 40-19 and 82-21), which facilitates public-private partnerships and regional integration of clean energy. The Hydrogen Strategy positions Morocco as a future net energy exporter, with significant export capacity expected by 2030.

However, regulatory hurdles remain. Chakib Alj, President of the CGEM, warned of "obsolete regulations, in some cases dating back to the Protectorate era," which continue to stifle innovation. At the 2025 International Chemistry Forum, he called for urgent reform, strengthened by an expansion of the Tatwir R&D Fund (MAD 300 million annually), and the introduction of apprenticeship contracts to train operational talent.

R&D–Production Synergies

Two key ecosystems are structuring the sector: green chemistry (plant extracts, organic cosmetics) and organic chemistry (resins, technical coatings). The former is responding to a global demand that has grown over 10% since 2010, aiming for an additional MAD 14.6 billion in turnover. The latter relies on integrated 4.0 lab-factory platforms located on university campuses, equipped with reverse osmosis skids and industrial-scale testing benches for biomolecule formulation.

Designated industrial zones (Jorf Lasfar, Safi) host R&D–Industry 4.0 platforms that accelerate the scale-up of innovations. The Green H2 Morocco cluster pools public and private funding to train electrolysis technicians and position Morocco as a continental hydrogen hub. These infrastructures have led to a 30% increase in patent filings since 2020, with a growing share now industrially exploited, particularly in LFP batteries and critical materials.

OCP is emblematic of this synergy. Its green ammonia pilot plant is testing next-generation membranes co-developed with MAScIR, while its industrial hackathons ("Innovation CO_2") generate solutions applicable in agriculture and water treatment. This place-based approach is fostering integrated value chains, connecting academic clusters, tech parks, and SME networks.

Dedicated industrial zones such as Jorf Lasfar and Safi host integrated R&D–Industry 4.0 platforms that accelerate the commercialization of innovations. The Green H2 Morocco cluster brings together public and private funding to train electrolysis technicians and position Morocco as a continental hydrogen hub. These infrastructures have led to a 30% increase in patent filings since 2020, with 40% of them now industrially exploited—particularly in LFP battery technologies and critical materials.

FCP ENSCK Partnership: A Game-Changing Model for Chemical Education

On January 10, 2023, the Federation of Chemistry and Parachemistry (FCP) and the National Higher School of Chemistry of Kenitra (ENSCK) signed a landmark framework agreement, sealing a strategic alliance aimed at aligning academic training with industrial needs. Overseen by a joint committee, this partnership has led to the creation of three key specializations: Formulation, Process Engineering, and QSE (Quality–Safety–Environment), directly addressing the critical skill shortages identified by industry players. As early as 2024, the results were striking: 100% of the first cohort in these tracks was hired before graduation—an unprecedented rate in Morocco.

At the closing session of the 3rd International Chemistry Forum in 2025, Abed Chagar, President of the FCP, offered a candid assessment:

"We need operational talent—people who can immediately contribute to industrial performance. That means it is the university that must adapt to this reality, not the other way around. I know that may sound blunt, but it's the truth.

Our partnership with ENSCK created two critical specializations: formulation and process engineering. The entire 2024 class has already been hired—some even before graduation!

We even co-developed a third specialization in QSE at the request of the sector.

In chemical industries, there is no plant without a lab. Whether we're talking about paint, cosmetics, or heavy processes, R&D is inseparable from production.

That demands well-trained, pragmatic professionals who understand industrial realities. Our vision rests on two pillars: work–study programs that bring students closer to the professional world, and involving companies directly in the governance of educational institutions."

Where Industry Meets Academia

LThe success of Morocco's green transition hinges on aligning education with industrial needs. The FCP–ENSCK model, formalized through a framework agreement in 2023, mandates that 60% of student time be spent in factories or laboratories. This intensive work-study approach has yielded exceptional job placement rates among 2024 graduates. Three custom-designed specializations have emerged: Process Engineering (for green manufacturing), Formulation (bio-based R&D), and QHSE (carbon auditing).

Academic governance now includes 30% industry representation within university boards. These joint committees co-develop curricula and oversee applied R&D projects, such as catalyst optimization and solvent recycling. At the same time, dual-degree programs with European and Asian institutions are reinforcing expertise in biorefining and circular chemistry.

This symbiosis is addressing the skills shortages flagged by CGEM. The Innovation Support Fund covers up to 60% of the cost of collaborative projects, while "Rotating Experts"—engineers from OCP and FCP embedded in academic programs—ensure continuous technology transfer. The results speak for themselves: 85% of work-study students secure employment within six months, mainly in green chemistry.

The Financial Artery of Innovation

Financing for chemical R&D is anchored in agile mechanisms. The Innovation Support Fund subsidizes up to 60% of applied project costs, such as catalytic desalination or electrolyzer development. Green bonds have mobilized MAD 2 billion for industrial demonstrators, attracting international investors like Bpifrance through its "Explore & Match" Industry 4.0 program.

The Green H2 Morocco cluster has become the nucleus of these synergies. It brings together academic institutions (e.g., MAScIR), industrial players (e.g., OCP), and foreign partners to co-develop research chairs focused on hydrogen and critical materials. This dynamic is underpinned by international academic networks and dual-degree programs in Europe and Asia that facilitate technology transfer.

However, challenges remain. Dependence on foreign direct investment (FDI) leaves the sector vulnerable to global market fluctuations, and regional disparities continue to concentrate infrastructure in Casablanca and Rabat. To address this, the Ministry of Industry is promoting decentralization through Fab Labs now being deployed in Agadir and Fez, while anchoring SMEs within local innovation ecosystems.

The Winning Triangle

Morocco has successfully transformed chemical R&D into a driver of green industrial sovereignty. Three pillars underpin this achievement: territorialized ecosystems (R&D–Industry 4.0 platforms in Jorf Lasfar), educational symbiosis (co-designed curricula with exceptional job placement rates), and agile financing (green bonds, the Tatwir R&D Fund). The outcomes are tangible: decarbonized value chains, a growing share of industrially exploited patents, and improved export competitiveness under the EU's CBAM.

Yet, several challenges call for renewed vigilance. Regional inclusivity remains incomplete, internship funding lacks long-term sustainability, and greater upskilling is needed in AI and biotechnology. With economic growth projected at 5% in 2025, and major events such as the 2025 AFCON and 2030 FIFA World Cup on the horizon, Morocco has clear levers to accelerate progress. Targeting 400,000 green jobs by 2050, the kingdom is now exporting a model of integrated ecosystems—where factories, laboratories, and universities form a single accelerator of sovereignty.

Morocco has successfully transformed chemical R&D into a driver of green industrial sovereignty. Three pillars underpin this achievement: territorialized ecosystems, educational symbiosis, and agile financing

UM6P: An Integrated R&D and Training Model for the Chemical Industry

UM6P (Mohammed VI Polytechnic University) has established a unique ecosystem combining applied research with higher education, directly aligned with Morocco's industrial needs. Its structured collaboration with the Federation of Chemistry and Parachemistry (FCP), formalized through a framework agreement in March 2025, aims to bolster the R&D capabilities of Moroccan companies in the sector. This strategic partnership creates an optimal setting for developing technical and scientific synergies, building on the university's strong expertise in technology transfer and industrial innovation.

The Master's in Materials Science and Engineering (accredited by the Ministry of Higher Education) exemplifies this approach. This two-year intensive program (1,200 hours), taught in both French and English, offers four specialized tracks: surface Treatment, energy Materials, sustainable Mining Development and polymers & Composites.

Its pedagogical framework is based on Living Labs—experimental farms, OCP pilot plants in Benguerir and Safi, and mining platforms—allowing students to experiment at full scale with industrial processes such as phosphate valorization and eco-design. A six-month final internship in a professional environment validates the acquisition of transversal skills (project management, entrepreneurship).

The industrial impact of this model is multifaceted. On the one hand, it positions Morocco as a global benchmark in phosphate research through networks such as Phoresnet (1,445 researchers from 25 countries in 2020) and supports technology transfer to key sectors like fertilizers and critical materials.

On the other hand, it fuels the country's national renewable energy strategy (target: 52% by 2030) by training immediately deployable talent in industries such as e-mobility, polymer recycling, and sustainable catalysis.

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DAY 2 : OUTSTANDING PANELS, STRATEGIC DISCUSSIONS & CONCRETE SOLUTIONS FOR THE CHEMISTRY OF TOMORROW

P1 **MOROCCO'S PORT PLATFORM: BACKBONE OF THE GLOBAL CHEMICAL SUPPLY CHAIN**

P2 **SEAWATER DESALINATION: THE ROLE OF CHEMISTRY IN ACHIEVING WATER SOVEREIGNTY**

P3 **RESEARCH, INNOVATION & TALENT: BUILDING THE FUTURE OF CHEMISTRY IN MOROCCO**

PANEL 1: SUMMARY - DAY 2

MOROCCO'S PORT PLATFORM: BACKBONE OF THE GLOBAL CHEMICAL SUPPLY CHAIN

A Strategic Lever for Industrial Sovereignty

The first panel of Day 2 at the International Chemistry Forum highlighted the strategic importance of Moroccan ports in reshaping global chemical supply chains. Positioned at the intersection of geopolitical shifts, energy transition, and digital transformation, these port platforms are becoming key catalysts in the Kingdom's industrial transformation.

Discussions focused on several key areas:

- **Strategic integration of ports within the chemical value chain**
- **Accelerated digitalization as a driver of competitiveness**
- **Energy transition of port infrastructures**
- **Morocco's attractiveness for international investment**
- **Development of specialized human capital**

The panel emphasized three strategic priorities:

1. Expanding the industrial-port network to prevent congestion (Jorf Lasfar is expected to reach full capacity by 2027).
2. Accelerating key infrastructure projects, such as the Nigeria-Morocco gas pipeline and the expansion of Dakhla Atlantique (budget: $2.3 billion).
3. Positioning Morocco as a green standards-setter in the chemical industry, building on ISO 45001 and ISO 14001 certifications.

A shared ambition emerged from the discussions: to transform Moroccan ports into «logistical factories»—integrating production, storage, and export of strategic chemical molecules. This vision is backed by strong figures: 8.5 million tons of chemical products handled annually, and a stated ambition to rival traditional global hubs such as Antwerp.

Mohamed Benchekroun
–> Moderator
Vice President, Moroccan Federation of Chemistry & Parachemistry (FCP) – CEO, Dyechem

Elected FCP Vice President in 2020, he combines industrial leadership with strategic vision. As CEO of Dyechem—specialized in dyes and chemical additives—he champions process optimization and the shift toward sustainable chemistry. His career bridges technical innovation with sector-wide transformation.

Abdelaziz Mantrach
President – Moroccan Association of Ship Agents, Chartering Brokers and Maritime Consignees (APRAM)

A graduate in international trade and maritime transport, he launched his career in major European ports such as Antwerp and Rotterdam. With 40 years of experience in shipping, global freight forwarding, and logistics, he is a recognized expert and active member of international bodies including FONASBA (London).

Meryem Bortali
Director, Jorf Lasfar Port – National Ports Agency (ANP)

A civil engineering graduate from the Hassania School of Public Works, she also holds a PhD in engineering and an MBA from Sorbonne Business School. With 17 years of experience in Morocco's port sector, she has led major projects in operations, infrastructure development, and strategic port management.

Youssef Ahouzi
CEO – PORTNET

An engineering graduate from the Mohammedia School of Engineers (EMI) with an Executive MBA from École des Ponts Business School, he has led Morocco's port and foreign trade digital transformation since 2015. As an active member of the International Port Community Systems Association (IPCSA), he champions innovation to boost Morocco's logistical competitiveness.

Mohamed Abid
Deputy Director – Ports and Maritime Public Domain, ANP

With over two decades of expertise in port infrastructure, he has overseen major development projects including the construction of Boujdour Port, the expansion of Dakhla, and the new Safi Port. A seasoned planner, he contributes to Morocco's national maritime development strategy.

Rachid Abinouh
Operations Director – Mohammedia Port (Marsa Maroc)

Trained in metallurgy and materials science, he has previously managed operations at the Jorf Lasfar and Safi ports. His expertise includes process optimization and strategic infrastructure management in port logistics.

PANEL1

MOROCCAN PORTS: CATALYSTS FOR CHEMICAL COMPETITIVENESS

From molecule transport to integrated industrial value chains, Morocco's ports are evolving into strategic logistics platforms serving the global chemical industry.

Amid a reconfiguration of global trade flows, Morocco is positioning its ports as key enablers for the future of the chemical sector. The first panel of Day 2 of the International Chemistry Forum titled "Morocco's Port Platforms Serving the Global Chemical Supply Chain" brought together five high-level experts who converged around a common vision: to build a port ecosystem that is integrated, competitive, and sustainable, capable of supporting the rise of green chemistry and next-generation energy technologies.

A Strengthened Strategic Position

Opening the session, Mohamed Benchekroun highlighted the disruptions currently reshaping global supply chains: geopolitical tensions, the U.S.-China trade war, accelerated regionalization of trade, and decarbonization pressures stemming from the European Green Deal. In this context, Morocco holds a unique card to play—as a chemical logistics hub, in the same vein as Antwerp or Rotterdam during the 20th century.

"The Strait of Gibraltar has once again become a strategic junction. Morocco, through its ports, industrial zones, and infrastructure, now has the capacity to receive, process, and export the molecules of tomorrow—green hydrogen, ammonia, bio-based methanol," the moderator emphasized.

> Morocco, through its ports, industrial zones, and infrastructure, now has the capacity to receive, process, and export the molecules of tomorrow

A Flexible and Evolving Ecosystem

Mohamed Abid, Deputy Director of Ports and Public Maritime Domain at ANP (National Ports Agency), outlined Morocco's port strategy through 2030. Anchored in an integrated approach, it aligns with national sectoral strategies such as Halieutis (fisheries), the Green Morocco Plan (agriculture), and renewable energy initiatives. "Our infrastructures are designed to be modular and adaptable, enabling us to capture future opportunities," he noted.

Chemistry sits at the heart of this vision, with three major specialized ports—Jorf Lasfar, Mohammedia, and Safi—serving as key pillars. "Ports are expected to play three strategic roles in the energy transition:

> Our infrastructures are designed to be modular and adaptable, enabling us to capture future opportunities

serve as gateways for exporting green molecules, reduce their own carbon footprint, and support maritime decarbonization," he explained.

Several large-scale projects are already underway, including new infrastructure in the Guelmim-Oued Noun region for green ammonia and hydrogen, and a World Bank-supported study on building a complete ammonia logistics corridor from Tan-Tan to Tanger Med.

Jorf Lasfar: The Backbone of Morocco's Chemical Industry

Meryem Bortali, Director of the Jorf Lasfar Port, offered a concrete look into the port's pivotal role in the chemical supply chain. "Ports are the vital arteries of chemical logistics. At Jorf, we handle over 70% of the country's chemical flows—about 4.8 million tons per year. Expansion studies are already complete, with new berths planned for emerging sectors like green hydrogen," she explained.

The port is directly connected to a dense industrial ecosystem, including the OCP chemical complex, the Mzinda industrial zone, and soon, the battery manufacturing sector. Jorf handles large volumes of ammonia, phosphoric acid, and sulfuric acid.

> Expansion studies are already complete, with new berths planned for emerging sectors like green hydrogen

"Our facilities are tailored for handling hazardous materials, with robust safety systems, strict environmental protocols, and strong partnerships with industrial operators," she said.

Bortali also emphasized the port's diversification beyond fertilizers: "Jorf is no longer limited to fertilizers. We now handle potassium chloride, detergents, and we're already assessing future needs for battery-related materials."

Planned expansion projects include infrastructure for electric batteries and advanced materials, aligned with ISO 45001 (Occupational Health and Safety) and ISO 14001 (Environmental Management) standards. OCP, already a global leader in fertilizers, is piloting innovative technologies such as alkaline electrolysis and PEM membranes to produce green ammonia on-site.

Digitalization and Streamlined Logistics

Youssef Ahouzi, CEO of Portnet, emphasized the critical role of digitalization in boosting logistics performance—especially within the chemical sector. "We've digitalized 90% of port procedures. Our integrated platform connects all stakeholders in the logistics chain—customs, operators, ports—and enables the automation of formalities, the tracking of sensitive cargo, and a reduction in turnaround times," he explained. "It also ensures full traceability and regulatory compliance for sensitive chemical products."

He announced a pilot project with the port of Jorf Lasfar, supported by the Global Alliance for Trade Facilitation, aiming to fully digitize the chemical logistics chain. "Our goal is to orchestrate port operations intelligently, with real-time tracking, digital dashboards, and decision-support tools to enhance global competitiveness," he added.

In parallel, Portnet is experimenting with disruptive technologies: IoT sensors to secure hazardous flows, and blockchain to certify end-to-end traceability. Partnerships with the International Port Community Systems Association (IPCSA) also allow for data synchronization with global standards.

> Our goal is to orchestrate port operations intelligently, with real-time tracking, digital dashboards, and decision-support tools to enhance global competitiveness

Mohammedia: A Port in Transition

Rachid Abinouh, Director of the Port of Mohammedia, retraced the century-long legacy of this historically petroleum-focused hub. Today, plans are underway to repurpose part of its infrastructure for new chemical and energy applications. "We currently have underutilized capacities for liquid and gaseous bulk. We must adapt quickly to emerging needs—LNG, hydrogen, methanol... With the future Nigeria-Morocco gas pipeline and underground salt cavern storage, Mohammedia is poised to become a key player in the decarbonized energy landscape," he stated.

He also highlighted the port's role as a strategic regulator. "Mohammedia could serve as a support base, a relay port, or even a cabotage zone for potash or battery-related raw materials."

> With the future Nigeria-Morocco gas pipeline and underground salt cavern storage, Mohammedia is poised to become a key player in the decarbonized energy landscape

Abinouh praised the agility of Morocco's port sector in the face of rapid transformations: "Technological disruptions are constant. A port's role is to reconcile the needs of both industry and logistics while treating environmental performance as a competitive advantage."

Already powered 100% by green energy, the port is investing in digitalization to optimize logistics costs and reduce emissions, while also preparing to accommodate hydrogen- or methanol-powered vessels and meet future needs for sustainable mobility.

Global Benchmarks and Lessons

Abdelaziz Mantrach, President of APRAM and maritime logistics expert, provided a valuable comparative perspective based on his knowledge of ports like Rotterdam and Singapore. "To become a global chemical hub, you need to build on six pillars: safety, integrated logistics, digitalization, environmental commitment, an attractive economic model, and collaborative governance," he summarized.

He applauded Morocco's advances in port security and environmental standards but stressed the need to develop specialized infrastructure—pipelines, tanks, dedicated terminals—and a clear co-investment strategy between the state and private sector. "In Botlek, 40 pipelines link factories to the terminal. In Singapore, industrial zones were designed alongside the ports. Morocco should draw inspiration from such models," he urged.

Mantrach also emphasized the need to elevate skills within the logistics sector. "Shipping agents are no longer just administrative intermediaries. They have become orchestrators of a safe, traceable, and connected chemical logistics ecosystem."

Toward a Global-Scale Chemical Hub

In conclusion, the panel reached a strong consensus around a common objective: positioning Morocco as an integrated port platform serving the global chemical industry. The country has all the key assets: a strategic geographic location, a dense port network, proven logistics expertise, strong industrial ambition, and growing institutional support.

"The question is no longer whether we can become a regional or global hub," said Meryem Bortali. "The real question is how fast, how effectively, and how collaboratively we can make it happen."

Despite solid foundations, significant challenges remain. Rachid Abinouh warned of infrastructure saturation risks—especially at Jorf Lasfar—and called for "greater operational agility and better anticipation of disruptive technologies, especially those linked to green hydrogen."

To turn this ambition into action, several speakers advocated for the creation of a joint task force bringing together industrial players, logistics operators, port authorities, and financial institutions. Its mission: to draft a common roadmap, align standards, pool infrastructure, and create long-term investment appeal.

"It's No Longer If, But How Fast"

Mohamed Benchekroun summed up this shared ambition with conviction: "The question is no longer whether we will become a global chemical hub, but how we can get there faster, farther, and together."

A similar tone came from Abdelaziz Mantrach, who pointed to the inspiring example of Tanger Med: "We dared to dream beyond domestic trade flows—and we built a global success story. Let's do the same for the chemical sector."

With 8.5 million tonnes of chemical products handled annually across its ports, and with large-scale projects such as the Nigeria–Morocco gas pipeline and OCP's "Future is Mine" platform, Morocco holds the cards to compete with global giants like Antwerp and Rotterdam.

But beyond the numbers, a new vision for the port sector is emerging. As Meryem Bortali put it: "A port is no longer just an infrastructure manager. It is becoming a strategic partner—a growth catalyst for Morocco's chemical industry."

The roadmap is clear: industrial integration, digital and logistical innovation, ecological transition, and, above all, active coordination across the entire value chain. At the crossroads of industrial ambition and logistics sovereignty, Moroccan ports are poised to become the lifeblood of the chemistry of tomorrow.

Key Levers for a Port-Based Chemical Hub

- **Logistics integration** between ports, manufacturers, and production zones to streamline flows and capture value.
- **Energy transition infrastructure,** adapted to green hydrogen, methanol, or low-carbon ammonia.
- **Advanced digitalization** to automate, trace, and secure operations involving sensitive materials.
- **Industrial innovation,** aligned with the emerging needs of sectors such as batteries, fertilizers, and advanced materials.
- **Collaborative governance,** through the creation of a joint commission bringing together institutions, port operators, and industry players.
- **Territorial agility,** through the repurposing of existing sites like Mohammedia and the development of new dedicated hubs.

PANEL 2 : SUMMARY - DAY 2

SEAWATER DESALINATION

A Technological Pillar for Morocco's Water Sovereignty

The second panel of the Forum's second day explored the strategic potential of desalination in strengthening the country's water sovereignty. At the crossroads of energy transition, industrial innovation, and applied chemistry, the discussions framed desalination as a key lever for Morocco's water resilience.

The exchanges focused on five major themes:

- The central role of chemistry at every stage of desalination;
- Local industrial integration as a competitiveness factor;
- Modular solutions tailored for remote areas;
- Energy optimization through renewable sources;
- Valorization of brine within a circular economy framework.

Three key directions emerged:

1. To build a Moroccan desalination sector, spanning from R&D to equipment manufacturing.
2. To accelerate the adoption of green solutions and local production of chemical reagents.
3. To promote an exportable technological model adapted to regional constraints.

This panel confirmed a clear ambition: to position Morocco as a leading player in sustainable desalination — competitive, sovereign, and innovative.

Morad Fethy
–> *Panelists*
Vice-President, Federation of Chemistry and Parachemistry (FCP)

CEO of SCE Chemicals, Morad Fethy leads a company specializing in the production of chemical raw materials for agriculture, detergents, paints, and water treatment. He also drives SCE's industrial diversification through capital increases and expanding production capacities.

Mohamed Sebbane
Engineer, Acciona

A graduate of the Escuela Técnica Superior de Ingenieros de Caminos, Canales y Puertos (ETSI Caminos) in Granada, he built his career at Acciona across Europe and the Middle East. He gained solid expertise in designing, managing, and operating large desalination plants in Saudi Arabia and the UAE. He now participates in structuring Moroccan projects, particularly in energy integration and sustainability.

Ahmed Znibar
CEO, OCP Green Water

He directs the OCP Group's water strategy, focused on desalination and treated wastewater. He orchestrated a 6-billion-dirham fundraising effort to strengthen the group's capacities. This strategic funding supports water autonomy objectives and reflects a commitment to structuring a national sustainable water sector.

Mohamed Amine
CEO, Watek

A chemical engineer trained in Belgium, he is the founder and CEO of Watek, a Moroccan pioneer in membrane technologies. Since 1987, he has designed and locally manufactured reverse osmosis units, especially for wastewater reuse. He actively advocates for national technological sovereignty and the development of a Moroccan industrial water treatment sector.

Hicham Grari
Operations Director, Schiele Morocco

With over 20 years of experience in industrial project management, he oversees national strategic desalination programs. An expert in operational engineering, he develops turnkey modular solutions adapted to rural areas and contributes to strengthening Morocco's industrial integration in the water sector.

Mohamed Chaker Necibi
Professor, Mohammed VI Polytechnic University (UM6P)

Specializing in advanced water treatment, green chemistry, and circular economy, he conducts applied research at the International Water Research Institute (IWRI) and collaborates on innovative projects such as solar desalination. His approach combines research, innovation, and environmental sustainability.

PANEL2

SEAWATER DESALINATION: CHEMISTRY AS A STRATEGIC LEVER FOR WATER SOVEREIGNTY

Industrial Innovation and Technological Breakthroughs Paving the Way for an Ambitious Moroccan Model

In the face of increasing water scarcity, Morocco is making a decisive commitment to seawater desalination, relying on chemistry to make it a cornerstone of national water sovereignty. During the second panel of the International Chemistry Forum, industry leaders, scientists, and engineers shared their solutions, experiences, and visions for a more resilient future.

Morocco's Strategic Approach

Morad Fethy, moderator of the panel, opened the discussion with a strong sense of urgency. "Seawater desalination is no longer an option—it is now a strategic necessity," he declared in the opening minutes. He pointed to recurring droughts, mounting pressure on groundwater resources, the demands of agriculture, and rapid urban growth as key factors requiring a bold shift in strategy. Within this context, Morocco is betting on disruptive solutions—placing at the center a long-overlooked player: chemistry.

Fethy emphasized that chemistry plays a role at every stage of the desalination process. "From membrane design to brine management, anticorrosion treatment, disinfection, and even energy recovery—chemistry is everywhere," he noted. He reiterated Morocco's ambition to develop an innovative, sustainable desalination model tailored to its local realities. This model is grounded not only in technological excellence but also in harnessing the full potential of Morocco's scientific and industrial ecosystem.

As he introduced the panelists, Fethy set the tone for an interdisciplinary collaboration. "Today, we have brought together industrial experts, scientists, and institutional actors, all united in building a Moroccan model of desalination," he stated. He framed the discussion within a national perspective—aiming to align technological innovation, applied research, and political will in pursuit of genuine water sovereignty.

> From membrane design to brine management, anticorrosion treatment, disinfection, and even energy recovery chemistry is everywhere

A Sustainable Industrial Strategy

Ahmed Znibar, CEO of OCP Green Water, presented an ambitious roadmap that is both industrial and ecological. Founded in 2022, his subsidiary is fully dedicated to the production of non-conventional water through desalination and wastewater reuse—powered entirely by green energy. "Our goal is to reach 600 million cubic meters per year by 2027," Znibar announced. This ambition addresses three key challenges: securing OCP Group's water autonomy, supplying potable water to the cities where it operates, and supporting high-value agricultural projects.

> Physico-chemical water treatment requires anticorrosion agents, disinfectants, antiscalants, pH regulators, and remineralizing additives

Znibar underscored the central role of chemistry in these operations. "Physico-chemical water treatment requires anticorrosion agents, disinfectants, antiscalants, pH regulators, and remineralizing additives," he explained. In partnership with UM6P and other institutions, OCP Green Water is developing new, more efficient and environmentally friendly chemical products. This synergy between chemistry, innovation, and sustainability is a key driver in lowering costs and enhancing operational performance.

A circular approach also underpins the water management system. Seawater used to cool equipment is reused in desalination units, and brine is diluted to mitigate its environmental impact. "This model gives us a competitive edge—both in cost and in the responsible management of marine resources," Znibar noted. He concluded by emphasizing that half of the 2027 targets have already been met, with 300 million cubic meters currently being produced annually.

A Structuring Scientific Expertise

Professor Mohamed Chaker Necibi, a faculty member at UM6P and an expert in advanced water treatment, enriched the discussion by highlighting the scientific challenges related to chemistry in desalination. He emphasized that membranes are the technological heart of reverse osmosis—but also its most fragile and costly component. "All water preparation efforts are aimed at protecting them, as their lifespan determines the economic viability of the installation," he explained. This calls for a complex pre-treatment process involving coagulation, flocculation, filtration, chlorination, and subsequent dechlorination.

This sequence of treatments requires a precise command of chemical reactions in a saline environment. Professor Necibi underlined the importance of the partnership with OCP Green Water, which enables real-world testing of various pre-treatment technologies and industrial-scale trials. "This organic link between research and industry allows us to develop solutions that are tailored to our context—efficient, cost-effective, and environmentally responsible," he stressed.

> In Morocco, we are exploring methods to recover lithium and magnesium using technologies such as temperature-sensitive liquid-liquid solvent extraction

But Necibi went even further, drawing attention to the management of brine—a liquid waste highly concentrated in salts—which could become a strategic asset. "In Morocco, we are exploring methods to recover lithium and magnesium using technologies such as temperature-sensitive liquid-liquid solvent extraction." This approach seeks to turn a costly by-product into a resource, contributing to the overall profitability of desalination and to a fully integrated circular economy model.

An Integrated Energy Model

Mohamed Sebbane, an engineer at Acciona, offered a strategic perspective focused on optimizing the energy performance of desalination projects. He pointed out that reverse osmosis remains energy-intensive, even though technological advances have brought consumption down to around 3 kWh per cubic meter. "The real challenge lies in combining energy stability, controlled costs, and environmental sustainability," he said.

Sebbane cited the Casablanca desalination project, which is set to become the largest in Africa. This innovative initiative combines connection to the national grid with a power purchase agreement (PPA) tied to a wind farm under development in Dakhla. "This setup allows us to optimize energy costs while ensuring a continuous power supply—critical for a facility operating 24/7 at this scale," he explained. The integration of renewable energy is central to the project, anchored by a reliable infrastructure.

Looking ahead, Sebbane described the desalination plant of the future as one that must include three essential pillars: 100% green energy autonomy, on-site production of the chemicals required for operation, and brine valorization. "Only under these conditions can we achieve a truly sustainable model," he asserted. However, he expressed regret that current tender specifications still fail to adequately reward these sustainability criteria—despite their long-term importance.

> The real challenge lies in combining energy stability, controlled costs, and environmental sustainability

Innovative On-the-Ground Engineering

Hicham Grari, Operations Director at Schiele Morocco, brought crucial operational insight into the technical challenges of desalination. Highlighting the need for agility, he explained how his company has developed containerized stations that can be rapidly deployed in emergency contexts and remote rural areas. "These are turnkey solutions that enable fast commissioning, unlike conventional stations that require extensive civil engineering and long timelines," he noted.

From the earliest project phases, chemical analysis of the water is indispensable. Grari insisted on this crucial step: "Physico-chemical characterization of raw water determines the appropriate treatment approach—this process is deeply rooted in chemistry." Water sources, often drawn from coastal or underground wells, show varying levels of mineralization, which guide the choice of membranes and reagents. The ability to customize solutions in this way is a clear competitive advantage.

Grari also emphasized Morocco's growing expertise across the value chain. Design, automation, equipment integration, commissioning, and maintenance are now all handled locally. "We ensure a high degree of national integration while delivering performance and durability," he affirmed. This grounded engineering demonstrates the country's capacity to produce desalination solutions that are robust, flexible, and competitive.

> Design, automation, equipment integration, commissioning, and maintenance are now all handled locally

Assertive Sovereignty

Mohamed Amine, CEO of the Moroccan company Watec Water Technologies, strikes a determined and critical tone. A pioneer of desalination in the Kingdom since the 1980s, he traces the evolution of membrane technologies, from distillation to the first imported spiral membranes. "We understood very early on that technological independence required mastering the know-how ourselves," he asserts with conviction.

Watec Water Technologies designs and manufactures modular desalination units locally, tailored to a wide range of environments. "We've delivered plants in remote areas like Tarfaya in less than four months," he notes, highlighting his team's adaptability. He calls for greater trust in Moroccan expertise, criticizing the systematic preference for foreign contractors. "It's time for decision-makers to acknowledge the quality of domestic solutions," he insists.

> We've delivered plants in remote areas like Tarfaya in less than four months. It's time for decision-makers to acknowledge the quality of domestic solutions,

Amine also looks ahead to the sector's industrial future: local production of filter cartridges, assembly of spiral membranes, and development of compact, energy-efficient stations. "We need to build a full-fledged industrial ecosystem, from basic chemistry to advanced engineering," he concludes. For him, water sovereignty depends as much on resource control as on the consolidation of a national desalination industry.

Toward a Moroccan Model

As the panel drew to a close, moderator Morad Fethy underscored the depth and richness of the discussions. "What we've witnessed today is the emergence of a true Moroccan desalination model — built on local expertise, strategic vision, and smart application of chemistry," he declared. The continuous dialogue among industry leaders, researchers, and engineers highlighted promising synergies and concrete pathways to strengthen the country's autonomy in water management.

One of the key points of convergence was industrial integration. Ahmed Znibar noted that OCP's projects already reach an integration rate of 60 to 70%, with a medium-term target of 80%. Mohamed Amine supported this ambition, urging, "We must stop importing what we are perfectly capable of producing ourselves," especially in the area of chemical components and standard equipment. Hicham Grari also emphasized domestic know-how, reminding that "engineering, automation, prototyping, and commissioning are now entirely handled by Moroccan teams" — clear evidence of a growing industrial capacity.

All the panelists ultimately aligned around the same vision: innovation as a driver of sustainability. Whether it's about making water more accessible, valorizing brine, optimizing energy use, or reinforcing system resilience, each contributor advocated for an integrated and cross-cutting approach. As Morad Fethy summed up in his closing remarks, "Water sovereignty will inevitably depend on industrial and scientific sovereignty. This forum is a powerful testament to that."

The Central Role of Chemistry in Desalination

Chemistry is involved in every stage of the desalination cycle:

- **Pre-treatment:** flocculants, coagulants, disinfectants, and dechlorinators to protect membranes.
- **Reverse osmosis:** pH stabilizers, antiscalants to prevent mineral deposits.
- **Post-treatment:** remineralization of desalinated water to make it potable.
- **Maintenance:** chemical cleaning products for membranes (acids, alkaline agents).
- **Valorization:** extraction of resources such as lithium or magnesium from brine.

Thanks to applied research and industry partnerships, new reagents are emerging — more efficient, less polluting, and locally produced — enhancing the competitiveness and sustainability of the Moroccan model.

PANEL 3 : SUMMARY - DAY 2

RESEARCH, INNOVATION & TALENT

A National Strategy for Industrial Sovereignty in the Chemical Sector

The third panel of Day 2 at the International Chemistry Forum focused on the foundations of industrial sovereignty through investment in research, innovation, and talent development. In a rich dialogue between university leaders, internationally renowned researchers, and institutional stakeholders, the discussion brought forward the levers of a high-performing scientific and technological ecosystem.

The panel centered on several key structural priorities:

- The need for national governance of industrial research;
- The pivotal role of universities in driving chemical innovation;
- The valorization of Moroccan talent, both at home and abroad;
- The integration of students into real-world industrial projects;
- Breaking down silos between laboratories, businesses, and public policy.

Three main recommendations emerged from the exchanges:

1. Establish joint university–industry platforms for co-innovation and technology transfer;
2. Activate a dedicated fund to support applied research and strengthen university-based incubators;
3. Promote a culture of innovation aligned with the needs of the local economic fabric.

This panel confirmed a shared ambition: to make Morocco's scientific youth, its universities, and its global intellectual diaspora key drivers of industrial transformation. It's a dynamic that positions chemistry at the heart of the country's broader innovation strategy.

Abderrahmane Zaghrary
–> *Moderator*
Secretary General of the Federation of Chemistry and Parachemistry

Zaghrary also sits on the board of Vilion and leads a cosmetics company based in Casablanca. An active figure within the Federation, he works closely with fellow board members to structure a competitive ecosystem, elevate national expertise, and support the emergence of Morocco as an international chemical hub.

Rachid Yazami
Moroccan Physicist and Electrochemist

Inventor of the graphite anode used in lithium-ion batteries, Yazami is the founder and CTO of KVI Holdings. He holds more than 150 patents and has authored over 200 scientific papers. A recipient of the Draper Prize and the Légion d'Honneur, he is committed to positioning Morocco as a center for technological innovation in electrochemistry and advanced materials.

Mohamed Laabi Kerkeb
President of Ibn Tofail University, Kenitra

A former director of the IT Resources Center at Abdelmalek Essaâdi University, Kerkeb is an expert in electronics and materials science. He serves on the Scientific Council of the Agence Universitaire de la Francophonie (AUF). His leadership advocates for a university model that is closely aligned with industrial needs and open to innovation and scientific entrepreneurship.

Hassan Qjidaa
Head of Research and Development, Université Privée de Fès (UPF)

Specializing in computer vision, artificial intelligence, and image processing, Qjidaa champions applied research rooted in industrial realities. He advocates for deep integration between academia and the economic sector, especially through immersing students in hands-on innovation projects.

PANEL 3

RESEARCH, INNOVATION, AND TALENT

The Scientific Ecosystem at the Core of Morocco's Industrial Future in Chemistry

In an era marked by energy, digital, and ecological transitions, Morocco's chemical industry cannot move forward without a large-scale, structured investment in research, innovation, and human capital. The third panel of the Forum's second day focused on the key drivers of this transformation, highlighting the complementarity between world-class researchers, Moroccan universities, and industrial federations.

Laying the Foundations of a National Ecosystem

Abderrahmane Zaghrary, panel moderator and Secretary General of the Moroccan Federation of Chemistry and Parachemistry (FCP), opened the discussion with a call for a national alliance between industry, academia, and government. "The triptych of research, innovation, and talent must lie at the heart of our industrial sovereignty," he stated. According to him, this foundation remains fragmented, despite the emergence of promising centers of excellence. "We need a framework that connects human and scientific resources—from the lab to the factory," he emphasized.

Zaghrary also highlighted the role of the FCP in driving this momentum. The federation aims to become a catalyst for strategic projects by building strong partnerships with universities, tech start-ups, and Moroccan talent worldwide. "We must think both locally and globally. Moroccan brainpower shines internationally—we need to reconnect it with the national ecosystem," he urged. He advocated for building bridges between high-level researchers, technical centers, and industrial players, with a focus on co-innovation and technology transfer.

He also stressed the need to restore the university to a central role in Morocco's industrial strategy. "We won't be able to build a competitive chemical industry without a solid academic foundation—without well-funded labs and training aligned with market needs," he concluded. The message was clear: research and innovation must become engines of industrial development—not isolated silos.

The Vision of a Global Pioneer

Professor Rachid Yazami, founder of KVI Holdings and inventor of the graphite anode used in lithium-ion batteries, contributed as an international expert. From the outset, he emphasized the importance of placing innovation at the heart of economic development. "A country without advanced science is a dependent country," he declared. His personal journey—from Fez to Singapore, via Caltech and the CNRS—speaks volumes about the potential of Moroccan talent when provided with the right environment.

However, he lamented the absence of incentives for industrial research in Morocco: "I've never received a single call from a Moroccan industrialist to collaborate on an innovative chemical solution." Yazami insisted that Moroccan researchers—whether based in Morocco or abroad—must be approached by the private sector, not just universities. He called

> 'La science doit sortir du laboratoire et entrer dans l'usine, et inversement.

for a cultural shift and the breaking down of barriers: "Science must leave the lab and enter the factory—and vice versa."

He also proposed the creation of innovation centers inspired by the Singaporean model, bringing together companies, researchers, and students under one roof. "We need to build living ecosystems—not compartmentalized institutions," he explained. In his view, Morocco has the potential to become a hub for innovation in materials science, electrochemistry, and green chemistry—but only if it rethinks its scientific governance and fosters strong public-private synergies.

Universities and Reindustrialization

Mohamed Laabi Kerkeb, President of Ibn Tofail University in Kenitra, shared insights from the academic world, emphasizing the university's role in regional development. For him, applied research and innovation must address real-world challenges embedded in the local economy. "We have structured our labs around national priorities: water, energy, agriculture, and materials," he noted.

He stressed that universities can no longer remain passive stakeholders: "We must reach out to industry, understand its needs, and co-develop solutions."

He cited several successful collaborations with the private sector, particularly in clean technologies and water treatment. Still, he acknowledged that funding mechanisms for research remain inadequate and called for a national fund dedicated to industrial R&D.

Kerkeb also advocated for an overhaul of university training. "We need to break down disciplinary silos, foster interdisciplinary learning, and integrate soft skills such as entrepreneurship and project management," he said. His university has launched incubators, partnerships with start-ups, and a professional PhD program focused on industry. He concluded: "The university of tomorrow must not just produce graduates—but drivers of innovation."

> We must reach out to industry, understand its needs, and co-develop solutions

A Continuum from Training to Research to Industry

Hassan Qjidaa, Vice President for Research and Development at the Université Privée de Fès, called for establishing a seamless continuum between education, scientific research, and the needs of the industrial fabric. "The separation between academia and the economic world is one of the main obstacles to the emergence of an innovative chemical industry in Morocco," he stated.

He advocates for an integrated vision in which students become co-actors in innovation from the very start of their academic journey. Qjidaa emphasized the importance of introducing industrial challenges early on in education programs. "Our students work on real industrial projects as early as the undergraduate level, in collaboration with partner companies," he explained.

> We must invent our own innovation model rooted in our realities but open to the world

This immersion not only enhances employability but also fosters a hands-on innovation culture. He also stressed the importance of applied research carried out in partnership with industry—particularly in areas such as waste recovery, green processes, and chemical formulation.

Finally, he called for drawing inspiration from international models while building a uniquely Moroccan framework. "We must invent our own innovation model—rooted in our realities but open to the world," he concluded. For him, Moroccan youth represent a rich reservoir of innovation—provided they are equipped with the right tools, funding, and trust.

A Conclusion Oriented Toward Action

In closing, Abderrahmane Zaghrary praised the clarity of the diagnostics shared by the panelists and the convergence of their visions.

"There is a shared will to act, to break down silos, and to create a coherent ecosystem linking research, innovation, and industry," he affirmed.

He called for the rapid implementation of funding mechanisms, collaborative platforms, and hybrid structures bringing together businesses, researchers, and students.

All panelists highlighted the need to create an integrated knowledge value chain—from training to prototype, from idea to market. They also advocated for a cultural shift in university-industry relations, centered on mutual trust, listening, and co-creation.

"Industrial sovereignty will be achieved through investment in brains," summarized Rachid Yazami—a conviction widely echoed throughout the panel, where science, industry, and youth were placed at the heart of Morocco's chemical future.

Research, Innovation, and Talent in Chemistry

5 Levers for a High-Performing Ecosystem

1. **Applied Research :** Align laboratories with national priorities: water, energy, materials, waste recovery.
2. **Territorially Anchored Universities :** Promote industry-oriented programs, incubators, and university-business partnerships.
3. **Public-Private Synergies :** Establish hybrid platforms bringing together industry professionals, researchers, and students around real-world projects.
4. **Global Moroccan Talent :** Engage the scientific diaspora and reconnect international experts to the national ecosystem.
5. **Governance and Funding :** Create a dedicated industrial research fund and build cross-sector governance for innovation.

"Industrial sovereignty will be achieved through investment in brains." — Prof. Rachid Yazami

CLOSING REMARKS

M. Abed CHAGAR,
President of the Federation of Chemistry and Parachemistry (FCP)

Ladies and Gentlemen,

Thank you all for staying with us until the very end of this third edition of the International Chemistry Forum. I am especially pleased that the final panel focused on education, skills development, and human resources—an area that the Federation has always regarded as a top priority and which must remain at the heart of our collective efforts.

What I heard today during this panel was both rich and inspiring. It encourages me to respond spontaneously, even though more in-depth discussions will take place with our partners, notably the universities of Fès, Kénitra, Ben Guérir, and Casablanca.

The Federation has always been committed to building concrete bridges with academia. I want to highlight the exemplary collaboration we have established with the National Higher School of Chemistry in Kénitra. Through this partnership, we have been able to co-design training modules and specializations with the teaching team, ensuring a perfect match between the skills developed and industry needs. We do not want universities to bear alone the burden of «making space» for businesses: mutual commitment and a willingness to understand each other's constraints are essential.

I want to stress a fundamental point: companies operate on a logic of profitability. They do not train out of benevolence but because they have a need—and this need drives the resources. We require operational talents capable of contributing immediately to

> companies operate on a logic of profitability. They do not train out of benevolence but because they have a need and this need drives the resources. We require operational talents capable of contributing immediately to industrial performance

industrial performance. It is therefore up to the university to adapt to this reality, not the other way around. I know this may sound blunt, but it is sincere.

Our partnership with the Kénitra chemistry school has given birth to two key specializations for us: formulation and process engineering. The entire first graduating class of 2024 is already fully employed—before even receiving their diplomas! This is a strong indicator of the relevance of our collaboration. We have even co-developed a third specialization in QSE (Quality, Safety, Environment) at the sector's request.

I would like to remind everyone that in the chemical industry, there is no factory without a laboratory. Whether we are talking about paints, cosmetics, plastics, or heavier processes, R&D is inseparable from production. This requires well-trained, pragmatic profiles up to date with real industrial demands.

Our vision at the Federation relies on two indispensable levers:

- Apprenticeships, which bring young people closer to the real professional environment.
- The involvement of companies in the governance of educational institutions, to ensure the relevance of training programs.

Broadening this reflection, I would like to mention a still little-known tool: the Innovation Support Fund. It enables companies, alone or in consortium with universities, to benefit from funding covering up to 60% of applied project costs, amounting to several million dirhams. This is a concrete lever that must be more widely mobilized to support industry-oriented research.

I am convinced that applied research must take precedence over fundamental research, except in specific cases such as natural resources. Our industrial fabric is mainly made up of SMEs that need concrete, fast, and applicable solutions. The university must be an accelerator, not just a space for theorization.

I cannot conclude without recalling that this forum, just three years ago, was still merely an ambition. Today, it is a tangible reality.

Yesterday, we spoke about batteries. GOTION announced a projected turnover exceeding one billion dollars in the first phase of its establishment, 3,000 jobs created from the outset, and a second phase already under negotiation. MERA, BTR, COBCO—all are moving forward, the momentum is real.

Today, we saw that seawater desalination has become a lever for water sovereignty. The south of Casablanca is already drinking desalinated water, and soon the entire region will. What seemed improbable fifteen years ago has become reality.

Finally, green hydrogen. A bold bet, but one already backed by concrete projects, real investments, and emerging technologies. Behind all of this lies chemistry—lots of chemistry.

These projects require funding, expertise, but above all, human skills. We can train these skills in Morocco or attract them from elsewhere. I advocate for continuing to build these future sectors with universities through apprenticeship schemes, internships, and active industrial participation on educational boards.

> For three years, this forum expressed ambitions. Today, those ambitions have become realities: projects have been signed, factories are being established, and skills are being developed.

Throughout the panels, I have also noted two urgent priorities:

- Updating the regulations, which are obsolete and hinder innovation. We have repeatedly signaled this—it's time to act.
- Port and logistics coordination, which is essential for making Morocco a true industrial and logistics hub, akin to Antwerp or Singapore. The idea of a joint commission bringing together industrialists, logisticians, and public decision-makers should be activated without delay.

In conclusion, I warmly thank all participants, experts, academic partners, institutional representatives, and guests. The success of this forum is the result of your commitment.

And of course, I look forward to seeing you at the 4th edition of the Forum, with even more projects, more partners, and—hopefully—Professor Yazami as our national and international scientific icon.

A heartfelt thank you to all speakers, partners, participants, academics, and industry professionals whose active presence and rich exchanges have helped make this 3rd edition of the International Chemistry Forum a true space for dialogue, innovation, and convergence toward a more competitive, sustainable, and sovereign Moroccan chemistry.

برقية ولاء وإخلاص

إلى المقـام العالـي بالله

مولانا الملك محمد السادس نصره الله و أيده

نعم سيدي أعزكم الله،

بعد تقديم فروض الطاعة والولاء، يتشرف خادم الأعتاب الشريفة رئيس الفيدرالية المغربية للكيمياء وشبه الكيمياء، أصالة عن نفسه ونيابة عن السيدات والسادة المشاركين في أشغال الدورة الثالثة للمنتدى الدولي للكيمياء، المنعقدة في يومي 21 و22 من ماي 2025 بمدينة الرباط، و المنظمة تحت شعار «الصناعة الكيميائية المغربية في قلب التحول الطاقي و الرهانات الاستراتيجية، أن يرفع إلى السدة العالية بالله أسمى عبارات الولاء و الإخلاص، مشفوعة بصادق مشاعر الوفاء و التعلق المتين بأهداب العرش العلوي المجيد.

و قد شكل هذا المنتدى، المنظم تحت الرعاية السامية لجلالتكم، مناسبة رفيعة المستوى لتجديد التأكيد على التوجهات النيرة لجلالتكم، في مجال السيادة الصناعية و التنمية المستدامة و توطين التكنولوجيا و الصناعات الجديدة، لاسيما ما يتعلق بصناعة البطاريات الكهربائية و الهيدروجين الأخضر و تثمين الثروات المعدنية الوطنية، تماشيا مع رؤيتكم الملكية السديدة، كما عبر المشاركون عن إعتزازهم الكبير بالتقدم الذي حققه المغرب تحت قيادتكم الرشيدة في مجالات صناعية رائدة، كصناعة السيارات و الطائرات، مما مكن المملكة من تعزيز مكانتها على الصعيدين الإقليمي و الدولي، كمركز تنافسي صناعي في خدمة القارة الإفريقية و العالم. و تثمينا لتوجيهاتكم المولوية السامية، حرصت الفيديرالية على دعوة و تمكين نفوذ إقتصادية من بلدان إفريقيا الشرقية ،للمشاركة في هذه التظاهرة الكبرى بهدف توطيد أواصل تعاون جنوب جنوب، و فتح آفاق جديدة للشراكة الصناعة بين الفاعلين الأفارقة.

حفظكم الله يا مولاي بما حفظ به الذكر الحكيم، وأبقاكم ذخرا وملاذا لهذه الأمة ، وأدام عليكم وفرة الصحة و العافية وأقر عينكم بولي عهدكم المحبوب صاحب السمو الملكي الأمير الجليل مولاي الحسن و شد عضدكم بصاحب السمو الملكي الأمير الجليل مولاي رشيد وسائر أفراد الأسرة الملكية الشريفة، إنه سميع مجيب .

والسلام على المقام العالي بالله ورحمته تعالى وبركاته

وحرر بالرباط في 22 مايو 2025

خادم الأعتاب الشريفة

خادم الأعتاب الشريفة عابد شكار

رئيس الفيدرالية المغربية للكيمياء وشبه الكيمياء

Message de vœux, de fidélité et de loyalisme à SM le Roi Mohamed VI que Dieu l'Assiste.


Abed CHAGAR
Président de la Fédération de la Chimie et de la Parachimie


تحت الرعاية السامية لصاحب الجلالة الملك محمد السادس
SOUS LE HAUT PATRONAGE DE SA MAJESTÉ LE ROI MOHAMMED VI
AMDIE


SOUS LE HAUT PATRONAGE DE SA M
forvis mazars
OCP


AMDIE
L'INDUSTRIE DES BATTERIES À HAUTES PERFORMANCES
UN SECTEUR EN ÉMERGENCE AU MAROC

Responsible Care
FEDERATION DE LA CHIMIE ET DE LA PARACHIMIE

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ⵜⴰⵎⴰⵡⴰⵙⵜ ⵏ ⵜⵣⵔⴼⵜ ⴰⴷ ⵜⵣⵡⵉⵔⴰ
المملكة المغربية
وزارة الصناعة والتجارة
ROYAUME DU MAROC
MINISTÈRE DE L'INDUSTRIE ET DU COMMERCE

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