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Closing the Loop: Circular Economy as part of Jordan's Resource Security Strategy

Reducing Import Dependency, Strengthening Supply Chain
Resilience, and Building a Resource-Efficient Economy





Dr. Dureid Mahasneh

Chairman, EDAMA Association for Energy,
Water and Environment

On behalf of EDAMA Association for Energy, Water and Environment, I am pleased to endorse this policy note as a timely and important contribution to Jordan's green economy agenda. The circular economy strategies outlined here speak directly to the structural challenges our country faces, and reflect the kind of evidence-based thinking that EDAMA Association has championed alongside its members and partners since 2009. We hope this work will inform policy, inspire investment, and strengthen the collaboration between Jordan's public and private sectors on the path toward greater sustainability and resilience. This paper makes a compelling case that Jordan's vulnerabilities in energy, water, food, and industrial materials can be meaningfully addressed not by replacing imports entirely, but by maximising the value of every resource within our economy. Across a range of sectors, the opportunities are concrete, scalable, and within reach. Jordan already possesses the policy foundations to act; what is needed now is the collective will to connect them into a unified national strategy. I invite you to read this paper and join us in that effort.

Amman, Jordan – 2026



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Registered offices
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Address

Mohamed Baseem Al-Khammash
St.13, Sweifieh
11190 Amman
Jordan

E info@giz.de
I www.giz.de/en

Project description:

Green Action in Enterprises (GAIN) Project

Author:

Dr. Jürgen Hannak, adelphi Global gGmbH
Shada El-Sharif, SustainMENA
Ameer Mubaslat, insider. ltd

Project Responsible:

David Musleh

Design:

Basil Tahboub

Location:

Jordan

Executive Summary

Jordan faces profound structural vulnerabilities arising from its heavy dependence on imported raw materials. Approximately 74% of the country's energy supply is imported¹, 90% of essential food commodities are imported, and the country is one of the most water-scarce nations on Earth. These dependencies expose Jordan to price volatility, geopolitical disruption, and cascading systemic risks—a vulnerability nexus that the COVID-19 pandemic, the Ukraine crisis, and ongoing regional instability have repeatedly underscored.

This policy note argues that circular economy (CE) strategies offer Jordan a powerful, complementary pathway to reduce these vulnerabilities—not by replacing imports entirely, but by lowering demand for virgin resources, creating secondary material streams, recovering energy and nutrients from waste, emphasizing water circularity, and extending the useful life of products and infrastructure. Grounded in evidence from Jordan's own emerging CE initiatives and international best practice, this note maps specific circular interventions to each vulnerability domain and proposes a set of actionable policy recommendations.

Key Messages

1. Jordan's triple resource vulnerability nexus (energy, food, water) is structurally reinforced by a linear economic model. Circular economy (CE) interventions address all three simultaneously.
2. The highest-impact CE opportunities lie in organic waste valorisation (biogas + compost), wastewater reuse for agriculture, and secondary material recovery from construction and mining waste streams.
3. Jordan's phosphate mining industry generates phosphogypsum—a by-product that can serve as a secondary source of rare earth elements and construction materials, turning an environmental liability into a strategic asset.
4. CE strategies can reduce Jordan's import bill by an estimated 5–15% across key commodity categories over a 10-year horizon, while generating up to 25,000 new jobs in waste management, recycling, and remanufacturing.
5. Jordan already has important policy foundations (Economic Modernisation Vision (EMV), Industrial Policy, National Climate Change Policy, National Solid Waste Management Strategy (NSWMS), Green Growth National Action Plans (GG-NAPs), Extended Producer Responsibility (EPR) instructions) that can be leveraged and integrated into a comprehensive National Circular Economy Strategy (see ongoing effort on CE roadmap development led by MoEnv and MoITS, with support from RSS and GIZ GAIN).

¹ Ministry of Energy and Mineral Resources (Jordan), Facts and Figures, 2024, https://www.memr.gov.jo/ebv4.0/root_storage/ar/eb_list_page/memr_facts_&_numbers_2024_-_14.8.2025.pdf

1. Context: Jordan's Raw Material Vulnerabilities

Jordan is a lower-middle-income, service-dominated economy with a population of approximately 11.55 million and a nominal GDP of around USD 53 billion (2024). Despite steady GDP growth of around 2.5% in recent years, the economy faces persistent structural challenges: an unemployment rate of approximately 16.5%², a chronic trade deficit (with an export-to-import coverage ratio of just 52% in 2025), and extreme resource scarcity. Jordan's total imports amounted to JD 20.5 billion in 2025, while total exports reached only JD 10.6 billion, reflecting the country's deep structural dependence on imported commodities.³

1.1 Energy

Jordan imports approximately 74% of its total energy supply. By the end of 2024, natural gas constituted about 58% of electricity generation, with domestic production accounting for around 26%. The majority of Jordan's total energy production comes from imported sources, primarily crude oil (40.8% of energy imports), diesel (21.2%), gasoline (20.9%), and LPG (8.7%). Mineral fuels and oils constitute the single largest import category at approximately USD 6.7 billion annually. The Arab Gas Pipeline, a critical supply route, has suffered multiple attacks (2011–2014), demonstrating the fragility of energy supply corridors. This dependence makes Jordan acutely vulnerable to price fluctuations and political coercion (MERIP 2025; EIA 2024).

1.2 Food and Agricultural Commodities

Jordan is a net food-importing country, relying on imports for approximately 90% of essential food commodities. Import dependency reaches 100% for sugar and rice, 96–97% for cereals, 86% for vegetable oils, and 74% for red meat. Jordan produces only about 3% of its wheat needs domestically. This extreme reliance creates acute exposure to global market shocks a vulnerability amplified by demographic pressures from hosting a substantial refugee population (nearly 7% of the population) and by regional geopolitical instability that regularly disrupts critical trade routes (Wiley/Global Policy 2025; DOS 2024).

1.3 Water

Jordan is one of the most water-scarce countries in the world, with renewable water resources estimated at less than 61 cubic meters per capita annually far below the water poverty threshold⁴. Groundwater overextraction runs at approximately three times the rate of actual recharge. Water scarcity acts as a vulnerability multiplier across agriculture, industry, and mining constraining domestic food production and limiting the viability of water-intensive mineral extraction (MDPI 2023).

1.4 Industrial Materials and Critical Minerals

Jordan imported approximately USD 428 million in iron and steel in 2024⁵, with near-total import dependency for metals used in construction and manufacturing. Jordan imports approximately USD 199 million of inorganic chemicals million serving as essential feedstocks for the fertilizer and pharmaceutical industries⁶. As Jordan expands its renewable energy infrastructure (currently ~27% of the electricity grid⁷, targeting 40% by 2035)⁸, it faces growing dependency on imported silicon, lithium, cobalt, copper, and rare earth elements for solar panels, batteries, and grid technology (SFA Oxford 2024; Trade.gov 2024).

² World Bank, Jordan Country Data, 2025, <https://data.worldbank.org/country/jordan>

³ Petra News Agency, Jordan News Article, 2025, https://www.petra.gov.jo/Include/InnerPage.jsp?ID=81901&lang=en&name=en_news

⁴ U.S. Department of Commerce – International Trade Administration, Jordan Country Commercial Guide: Environment and Water Sector, 2024, <https://www.trade.gov/country-commercial-guides/jordan-environment-and-water-sector>

⁵ Observatory of Economic Complexity (OEC), Jordan Trade Profile: Iron and Steel, 2024, <https://oec.world/en/profile/bilateral-product/iron-and-steel/reporter/jor>

⁶ Observatory of Economic Complexity (OEC), Jordan Trade Profile: Inorganic Chemicals, 2024, https://oec.world/en/profile/bilateral-product/inorganic-chemicals/reporter/jor?selector2787id=trade_i_baci_a_17

⁷ Petra News Agency, Jordan News Article, 2024, https://petra.gov.jo/Include/InnerPage.jsp?ID=76672&lang=en&name=en_news

⁸ Petra News Agency, Jordan News Article, 2026, [https://org.petra.gov.jo/Include/InnerPage.jsp?ID=84157&lang=en&name=en_news#:~:text=Amman%2C%20May%20%20\(Petra\),and%20growth%20across%20productive%20sectors.](https://org.petra.gov.jo/Include/InnerPage.jsp?ID=84157&lang=en&name=en_news#:~:text=Amman%2C%20May%20%20(Petra),and%20growth%20across%20productive%20sectors.)

Table 1: Summary of Jordan's Critical Raw Material Vulnerabilities

Raw Material	Import Dep.	Risk Level	Key Risk Factors
 Crude oil & petroleum	~76%	Very High	Price volatility, geopolitical disruption, pipeline sabotage
 Natural gas	~95%	Very High	Single-source risk (Israel/Egypt), infrastructure vulnerability
 Wheat / cereals	~96–97%	Very High	Global food price shocks, climate events, export bans
 Sugar, rice	100%	Very High	Global supply disruptions, shipping route instability
 Vegetable oils	~86%	High	Concentration of supply (SE Asia palm oil)
 Iron & steel	Near-total	High	Construction sector dependency, global price spikes
 Inorganic chemicals	~USD 199 million/yr	High	Fertilizer & pharma production chain disruption
 Water	Structural scarcity	High	Climate change, groundwater depletion, regional politics
 RE transition minerals	Emerging	Moderate (rising)	Global competition for lithium, copper, rare earths

2. The Circular Economy Rationale for Jordan

A circular economy based on the principles of eliminating waste and pollution, circulating products and materials at their highest value, and regenerating nature (Ellen MacArthur Foundation) directly addresses import dependency through three interlocking mechanisms:

- » Demand reduction: Extending product lifetimes, improving resource efficiency, and substituting virgin materials with secondary ones reduces the volume of raw materials that must be imported.
- » Supply diversification and Resource Security: Recovering materials from local waste streams (urban mining, industrial by-products, end-of-life products) creates domestic secondary supply, reducing reliance on volatile international markets.
- » Systemic resilience: Closing material loops locally shortens supply chains, buffers against external shocks, and creates economic value and employment from resources already within the national boundary.
- » Improved competitiveness: reduction of operation costs -particularly energy - linked to the import of costly resources and materials.

For Jordan, the CE rationale is particularly compelling because the country's vulnerabilities are deeply interconnected: energy imports power the water pumps that irrigate the food crops that feed a growing population under increasing climate stress. A disruption in any one domain cascades through the others. CE strategies that address the water energy food environment (WEFE) nexus rather than isolated commodities for example, converting organic waste into biogas (energy), compost (food/agriculture), and reclaimed water (water) simultaneously offer multiplicative returns on investment. This is also in line with the EMV's priority on advancing WEFE nexus governance and planning in Jordan.

Internationally, the EU's Critical Raw Materials Act (2024) explicitly identifies circular economy strategies including recycling targets, eco-design requirements, and product passports as essential instruments for reducing raw material supply risks. The World Economic Forum (WEF) notes that circular practices in developing countries can create jobs in repair, parts recovery, and recycling while reducing dependency on volatile raw material imports, boosting economic resilience (WEF 2025).

3. Sector-by-Sector Circular Economy Interventions

3.1 Energy: From Linear Consumption to Circular Energy Systems

Jordan generates approximately 4.24 million tonnes of municipal solid waste (MSW) annually, of which roughly 50% is organic/food waste.⁹ Currently, only about 12.5% of generated solid waste is recycled. The organic fraction represents a vast, untapped energy resource.

Intervention 1: **Waste-to-energy through anaerobic digestion**

Anaerobic digestion of the organic fraction of MSW, agricultural residues, and sewage sludge can produce biogas for electricity generation and heating. Jordan's waste sector offers the highest cumulative greenhouse gas reduction potential (4,600.8 Gg CO₂-eq/year by 2050 via landfill gas capture and biogas), while simultaneously displacing fossil fuel imports.¹⁰ The Al Ghabawi landfill near Amman already operates a gas collection system the first municipal carbon finance

partnership in the Middle East. Scaling this model across Jordan's 19 operational landfills could meaningfully offset natural gas imports for electricity generation.

⁹ MDPI (Sustainability Journal), Sustainability, 2026, <https://www.mdpi.com/2071-1050/18/3/1230>

¹⁰ ResearchGate, Mitigating Methane in Jordan: National Inventory, Emission Projections and Policy Pathways, 2025, https://www.researchgate.net/publication/392648924_Mitigating_Methane_in_Jordan_National_Inventory_Emission_Projections_and_Policy_Pathways



Intervention 2: Industrial energy recovery

Wastewater treatment through anaerobic sludge digestion can produce electricity offsetting 0.11–0.53 kWh/m³, which can also have application in the industrial sector. Waste heat recovery from Jordan's cement, fertiliser, and potash industries can reduce industrial energy demand. Jordan's concentrated industrial zones (Aqaba, Zarqa, Sahab) are well-suited for industrial symbiosis networks where waste energy from one facility becomes an input for another.



Intervention 3: End-of-life solar panel and battery recovery

As Jordan's ~2 GW solar fleet ages (panels have a 25–30 year lifespan), end-of-life panels will contain recoverable silver, copper, silicon, and aluminium. Establishing domestic recycling infrastructure now will create a secondary supply of critical materials in the 2040s. Jordan already has 8 battery recycling facilities and 12 oil recycling facilities that can serve as a foundation for scaling. Planning for this circularity at the point of deployment rather than waiting for end-of-life is essential.¹¹

3.2 Food and Agriculture: Closing Nutrient and Water Loops

While CE cannot substitute for Jordan's need to import cereals, sugar, and rice, it can significantly reduce the effective import bill by minimizing food loss, recovering nutrients, and expanding domestic agricultural capacity through water reuse.



Intervention 4: Food loss and waste reduction

Significant proportions of Jordan's domestically produced vegetables and fruits (where the country is self-sufficient or near-self-sufficient vegetables at 127.7%, eggs at 105%, olive oil at 111%) are lost post-harvest due to inadequate cold chain, storage, and distribution infrastructure.¹² CE approaches to cold chain optimization, improved packaging design, and redistribution networks can extend the effective supply of domestically produced food without increasing imports.



Intervention 6: Treated wastewater for irrigation

Jordan already operates 31 wastewater treatment plants that provide 16% of total water supply, with treated wastewater accounting for about 31.3% of total irrigation water¹³. Scaling and upgrading this infrastructure treating wastewater as a circular water-nutrient resource rather than waste could significantly expand domestic agricultural capacity. The UN recommends expanding decentralized wastewater treatment systems (DWATS) in smaller communities and reviewing standards to enable higher-value reuse applications.



Intervention 5: Composting for soil health and reduced fertilizer imports

With ~60% of MSW being organic, large-scale composting produces soil amendments that reduce dependency on imported chemical fertilizers while improving domestic agricultural yields and soil carbon content. Jordan's National Solid Waste Management Strategy (NSWMS) targets diverting 75% of organic waste from landfills by 2034 an ambitious but achievable target that would generate substantial quantities of compost for agricultural use.

¹¹ Zawya, Jordan Charts Bold Course Toward Circular Economy in Major Economic Shift, 2024, <https://www.zawya.com/en/economy/levant/jordan-charts-bold-course-toward-circular-economy-in-major-economic-shift-wnhqm6wf>

¹² Wiley Online Library, Global Policy Journal Article, 2024, <https://onlinelibrary.wiley.com/doi/10.1111/1758-5899.70092>

¹³ U.S. Department of Commerce – International Trade Administration, Jordan Country Commercial Guide: Environment and Water Sector, 2024, <https://www.trade.gov/country-commercial-guides/jordan-environment-and-water-sector>

3.3 Construction Materials and Metals: Urban Mining

Intervention 7: **Construction and demolition waste recovery**

Construction and demolition (C&D) waste is a major waste stream in Jordan's growing urban areas. Systematic collection, sorting, and recycling of steel scrap, concrete aggregate, and other materials from demolition, end-of-life vehicles, and industrial waste can substitute a significant portion of virgin steel and aggregate imports. Research on concrete recycling in Jordan has demonstrated that recycled aggregates can achieve satisfactory performance in non-structural and selected structural applications.¹⁴ Introducing design-for-disassembly principles and material passports in new construction would create a growing domestic secondary materials stock.

Intervention 8: **Phosphogypsum valorisation in construction**

Jordan's phosphate mining industry the country is the world's 5th-largest producer generates millions of tonnes of phosphogypsum as a by-product. Only about 15% of global phosphogypsum is recycled¹⁵; the rest is stored in environmentally damaging stockpiles. This material can be valorised as a substitute for natural gypsum in cement and plasterboard manufacturing, reducing imports of construction inputs while addressing a significant waste challenge. Jordanian researchers have already studied P₂O₅ reduction processes for beneficiating phosphogypsum, demonstrating technical feasibility.

3.4 Industrial Chemicals: Symbiosis and Efficiency

Intervention 9: **Industrial symbiosis networks**

Creating inter-firm partnerships where the waste or by-product of one industry becomes the input for another can significantly reduce imported chemical feedstocks. Examples include spent acids from metal processing repurposed in phosphate beneficiation; waste heat from cement kilns powering adjacent manufacturing; and CO₂ captured from fertilizer production used in greenhouse agriculture. Jordan's concentrated industrial zones are well-suited for such clustering, for example, through the establishment of eco-industrial parks. This approach aligns with the Economic Modernization Vision's emphasis on industrial competitiveness.

Intervention 10: **Chemical leasing models**

Shifting from selling chemicals as products to selling chemical services (paying for function, not volume) incentivises suppliers and users to minimise chemical consumption while maintaining performance. UNIDO has piloted chemical leasing models in the MENA region with demonstrated reductions in chemical use of 20–50%.¹⁶ Applied to Jordan's manufacturing and cleaning sectors, this could materially reduce chemical import volumes.

3.5 Water: The Quintessential Circular Resource

Water is arguably the resource where circular economy logic applies most urgently in Jordan.

Intervention 11: **Comprehensive wastewater reuse strategy**

Expanding Jordan's 31 existing wastewater treatment plants and improving treatment quality to enable reuse in higher-value applications (industry, aquifer recharge, other non-potable reuse applications) is the single

most impactful CE measure for Jordan. A circular water economy treats every drop as a resource to be recovered. The Ministry of Water and Irrigation's target of increasing non-conventional water sources is fully aligned with this approach.

¹⁴ Front. Sustain., (18 July 2024 Sec. Waste Management, Volume 5 - 2024 From waste to wealth: a study of concrete recycling in Jordan, <https://doi.org/10.3389/frsus.2024.1398918> <https://www.frontiersin.org/journals/sustainability/articles/10.3389/frsus.2024.1398918/full>

¹⁵ ResearchGate, By-product Phosphogypsum Valorisation Possibilities in the Context of Circular Economy of Building Materials, 2023, https://www.researchgate.net/publication/376306546_By-product_Phosphogypsum_Valorisation_Possibilities_in_the_Context_of_Circular_Economy_of_Building_Materials

¹⁶ UNIDO (Chemical Leasing) <https://chemicalleasing.com/success-stories/>



Intervention 12: Industrial water recirculation

Mandating closed-loop water systems in manufacturing, mining, and cooling processes can dramatically reduce freshwater withdrawal. This is especially critical if Jordan proceeds with expanded mining of copper and lithium processes that conventionally require 2.2 million litres of water per tonne of lithium produced¹⁷. Requiring best-available-technology water recirculation as a condition of mining licences would ensure that resource extraction does not exacerbate water scarcity.



Intervention 13: Household greywater reuse

Domestic greywater from sinks, showers, and laundry can be treated and reused for garden irrigation and toilet flushing. Incentivising greywater systems through building codes and subsidies could reduce per-capita freshwater demand by an estimated 20–30% in new residential developments.¹⁸

3.6 Critical Minerals for the Energy Transition



Intervention 14: Rare earth elements from phosphogypsum

This is potentially Jordan's most distinctive circular economy opportunity. The country's phosphate industry generates enormous volumes of phosphogypsum which can serve as a secondary source of rare earth elements (REEs). Research suggests that recovering REEs from phosphogypsum can offer economic and environmental advantages over conventional mining, though outcomes are process-dependent.¹⁹ If developed, this pathway could position Jordan as a supplier rather than merely a consumer of critical minerals for the energy transition, leveraging an existing waste stream rather than opening new extraction sites.



Intervention 15: Product life extension and remanufacturing

Repair, refurbishment, and remanufacturing of electronics, electric vehicle batteries (second-life applications for stationary storage), and industrial equipment reduces the throughput of critical minerals and delays import needs. The Ellen MacArthur Foundation estimates that circular strategies could reduce demand for critical minerals by 25–30% in key technology sectors. Jordan could foster a regional hub for battery second-life and remanufacturing, serving both domestic and MENA markets²⁰.

¹⁷ World Economic Forum, Lithium and the Energy Transition in Latin America, 2023, <https://www.weforum.org/stories/2023/01/lithium-latin-america-energy-transition/>

¹⁸ Springer (Nature Links, Environmental Chemistry Letters) Benefits and limitations of recycled water systems in the building sector: a review, <https://link.springer.com/article/10.1007/s10311-023-01683-2>

¹⁹ MDPI (Minerals), Rare Earths' Recovery from Phosphogypsum: An Overview on Direct and Indirect Leaching Techniques <https://www.mdpi.com/2075-163X/11/10/1051>

²⁰ Ellen MacArthur Foundation, Critical Minerals and the Circular Economy: Overview, 2023, <https://www.ellenmacarthurfoundation.org/critical-minerals/overview>

4. Existing Policy Foundations and Institutional Landscape

Jordan is not starting from zero. A number of important policies, initiatives and institutional building blocks are already in place that can be leveraged and integrated into a comprehensive circular economy framework:

Table 2: Existing CE-Relevant Policies and Initiatives in Jordan

Policy / Initiative	Status & Relevance
Economic Modernisation Vision (EMV) 2033	Includes mining as high-value priority; aims to triple mining exports to JD 3.4 billion and increase sector employment to 27,500. Also promotes a circular economy.
Industrial Policy	Includes circular economy as a strategic direction for Jordan.
National Solid Waste Management Strategy (NSWMS)	Targets incorporation of CE solutions including 50% recyclable waste diversion and 75% organic waste diversion from landfills by 2034.
Green Growth National Action Plans 2021–2025	Sector-specific action plans for waste, energy, agriculture, water, tourism, and transport mainstreaming green growth and climate objectives. Currently being updated.
Extended Producer Responsibility (EPR) Instructions	Under this instructions, companies are obliged to pay fees for packaging materials placed on the market, funding separate waste collection and recycling.
National Mining Strategy	Recently approved by the Council of Ministers; aims to make Jordan 'a mining country' by 2033 with JD 2.9 billion GDP contribution.
GIZ Climate & Resource Protection Project (until 2022) and Solid Waste Management in Jordan (SoWas, since 2021)	Supports separation/treatment of recyclables and organic material; technical assistance for EPR implementation.
UNDP/EU Circular Economy Programme	Inaugurated plastic recycling plant in Deir Alla (Jordan Valley); 7,000 tonnes segregated for recycling in 2024.
SwitchMed / Sustainable Consumption and Production (SCP) National Action Plan	Addresses sustainable consumption and production in agriculture/food, transport, and waste management.
Existing waste management infrastructure	183 waste management facilities including 8 for battery recycling, 12 for oil recycling, and 12 for tyre recycling.

5. Summary: CE Impact Potential by Vulnerability Domain

Table 3 summarizes the estimated impact potential of circular economy strategies across Jordan's key vulnerability domains, together with indicative timeframes and priority interventions.

Table 3: CE Impact Potential by Vulnerability Domain

Domain	CE Reduction Potential	Timeframe	Priority CE Strategies
Energy imports	Moderate (10–20% offset)	Medium (5–10 yrs)	Biogas from organic waste, waste-to-energy, industrial heat recovery, end-of-life solar/battery recovery
Food imports	Moderate (indirect)	Medium (5–10 yrs)	Food loss reduction, compost → better yields, wastewater irrigation expansion
Water scarcity	High	Short-med (3–7 yrs)	Wastewater reuse, industrial recirculation, greywater systems, DWATS expansion
Iron & steel	Moderate	Medium (5–10 yrs)	Scrap metal recycling, C&D waste recovery, phosphogypsum in construction
Chemicals	Moderate	Medium (5–10 yrs)	Industrial symbiosis, chemical leasing, by-product valorisation
Critical minerals	High (long-term)	Long (10–20 yrs)	REE from phosphogypsum, solar/battery recycling, product life extension, remanufacturing
Packaging / textiles	Enabling	Short (1–3 yrs)	EPR scheme implementation, textile waste plan, secondary material markets

6. Policy Recommendations

Based on the analysis above, this note proposes the following policy recommendations, organised by priority level and timeframe:

Immediate Priorities (1–3 years)

- **Develop a National Circular Economy Strategy (NCES)** as part of the ongoing CE Roadmap development process currently underway, that integrates and supersedes fragmented sectoral initiatives. The NCES should explicitly frame circularity as a supply chain resilience and economic security instrument not merely an environmental policy. It will be anchored in the Economic Modernisation Vision and its Executive Program 2026–2029 and aligned with the upcoming update of the Green Growth National Action Plans.
- **Accelerate EPR implementation beyond packaging** to cover electronic waste, end-of-life vehicles, tyres, and construction materials. The EPR Instructions of 2024 provides a regulatory template that can be extended to other high-impact waste streams.
- **Establish a National Industrial Symbiosis Programme** in Jordan's key industrial zones (Aqaba, Irbid, Zarqa, Sahab), facilitating waste-as-resource

exchanges between co-located firms. This can build on existing initiatives, such as the waste-to-worth platform developed by ACI. International experience (e.g., the UK's National Industrial Symbiosis Programme) demonstrates benefit-to-cost ratios of 5:1 or higher.

- **Scale organic waste diversion** by mandating source separation of food waste in municipalities, hotels, and restaurants, channelling it to anaerobic digestion and composting facilities. Prioritise Amman, Zarqa, and Irbid, which generate the largest waste volumes (noting efforts underway by Greater Amman Municipality (GAM) to partner with the private sector through Amman Vision Treatment and Recycling (AVTR)),
- **Integrate CE criteria into public procurement:** Require minimum recycled content in construction materials, prioritise remanufactured equipment, and include life-cycle costing in tender evaluations.

Medium-Term Priorities (3–7 years)

- **Invest in wastewater treatment upgrading** to enable higher-value reuse (industrial process water, aquifer recharge). Expand DWATS in smaller communities and develop economic incentive models that make treated wastewater financially attractive for farmers and industry.
- **Commission a phosphogypsum valorisation roadmap** to assess the technical and economic feasibility of (a) rare earth element extraction and (b) construction material substitution from Jordan's phosphogypsum stockpiles (c) Sodium chloride as a byproduct (NaCl). This should be developed jointly by the Ministry of Energy and Mineral Resources, the Jordan Phosphate Mines Company (JPMC), and research institutions.

- **Mandate water recirculation requirements** for new mining licences, particularly for the exploration of copper and lithium in Wadi Araba and the Dead Sea region. Require closed-loop water systems and best-available-technology as licence conditions.
- **Develop secondary material quality standards** for recycled aggregates, compost, reclaimed metals, and treated wastewater. Without clear quality standards, markets for secondary materials cannot develop.
- **Establish a CE skills and training programme** targeting the informal waste sector (formalisation and upskilling), engineering graduates (design for circularity), and SMEs (resource efficiency audits). Given Jordan's 16.5% unemployment rate, the job creation potential of the CE transition is a significant co-benefit.

Long-Term Priorities (7–15 years)

- **Build domestic solar panel and battery recycling capacity** in anticipation of the first wave of end-of-life renewable energy infrastructure (expected from the late 2030s onwards). Jordan can position itself as a regional recycling hub for the MENA region.
- **Explore Jordan as a critical mineral processing hub**, leveraging its phosphogypsum-derived REEs, its free trade agreements (particularly with the US and EU), and its geographic position. The US

Inflation Reduction Act provides up to USD 7,500 in tax breaks for electric vehicles with battery minerals sourced from US trading partners. Jordan's FTA with the US places it in an advantaged position.²¹

- **Embed CE principles in urban planning:** Mandate design-for-disassembly, material passports, and minimum recycled content in all new public construction as Jordan's cities expand.

7. Challenges and Limitations

Any analysis of CE potential must be transparent about the constraints and limitations:

- » **CE cannot fully substitute for imports** in a country as resource-constrained as Jordan. It can reduce and buffer, but not eliminate, import dependency for energy and food. Circular economy is a complement to – not a replacement for – trade diversification, strategic stockpiling, and diplomatic supply agreements.
- » **Infrastructure investment requirements are significant.** Recycling facilities, treatment plants, collection systems, sorting infrastructure, and regulatory enforcement all require capital. International climate finance and development cooperation can play an important role, but domestic fiscal commitment is also essential.
- » **Informal waste sector:** Much of Jordan's current recycling occurs through an informal sector of waste pickers and small traders. Formalising this sector requires sensitivity to livelihoods, social protection, and gradual transition pathways – not abrupt displacement.
- » **Water constraint as a fundamental bottleneck:** Even CE-oriented mining (e.g., lithium or copper extraction from domestic reserves) remains water-intensive. There is a fundamental tension between expanding mining, preserving the country's natural capital, and managing water scarcity that CE alone cannot fully resolve.
- » **Market development for secondary materials:** Establishing demand for recycled materials, compost, and reclaimed water requires quality standards, procurement incentives, consumer confidence, and – in some cases – overcoming cultural reluctance (particularly for wastewater reuse).
- » **Regulatory fragmentation:** CE policies currently span multiple ministries (Environment, Energy & Mineral Resources, Water & Irrigation, Industry, Trade and Supply, and Planning and International Cooperation) without a single coordinating entity. An inter-ministerial CE coordination mechanism is needed and/or integration into existing mechanisms such as those developed under the National Green Growth Plan.

²¹ MDPI (Sustainability Journal), Sustainability, 2025, <https://www.mdpi.com/2071-1050/17/2/653>

8. Conclusion

Jordan's extreme import dependency on energy, food, water, and industrial materials constitutes a structural economic vulnerability that geopolitical shocks, climate change, and demographic pressures are intensifying. The circular economy offers a **systemic, cross-sectoral strategy** that can meaningfully reduce these vulnerabilities – not by autarky, but by maximising the value extracted from every resource that enters or exists within the national economy.

The most promising opportunities for Jordan lie in:

- » **Organic waste valorisation** – simultaneously producing energy (biogas), agricultural inputs (compost), and reducing landfill methane emissions.
- » **Wastewater reuse** – the quintessential circular strategy for a water-scarce country, with immediate impact on agricultural capacity and industrial efficiency.
- » **Phosphogypsum-derived rare earth elements** – a potentially transformative pathway that turns a mining waste liability into a strategic asset, positioning Jordan in global critical mineral supply chains.
- » **Construction waste recovery and secondary materials** – reducing the import bill for steel, aggregate, and gypsum while creating employment.

Jordan already possesses important policy foundations – the EMV, Industrial Policy, NSWMS, the Green Growth NAPs, and the EPR instructions – that provide a platform for CE integration. What is needed now is a unified National Circular Economy Strategy (aligned with the ongoing CE Roadmap) that connects these initiatives, frames circularity explicitly as an economic security and resilience instrument, and mobilises the investment needed to scale from pilot projects to systemic transformation.

The transition will not happen overnight, and CE alone cannot resolve all of Jordan's import dependencies. But as a strategic complement to trade diversification, renewable energy expansion, and diplomatic engagement, the circular economy represents one of the most cost-effective and co-benefit-rich pathways available to strengthen Jordan's economic resilience in an era of increasing resource competition and geopolitical uncertainty.

References

- » Abu-Qdais, H. et al., *From Waste to Wealth: A Study of Concrete Recycling in Jordan*, 2024, <https://www.frontiersin.org>
- » Al-Nawaiseh, A. et al., *Composting of Organic Waste: A Sustainable Alternative Solution for Solid Waste Management in Jordan*, 2021, <https://www.researchgate.net>
- » Arab Potash Company, *Annual Report 2020*, 2021, <https://www.arabpotash.com>
- » Central Bank of Jordan, *Annual Report 2023*, 2024, <https://www.cbj.gov.jo>
- » Department of Statistics (Jordan), *External Trade Statistics – December 2024*, 2024, <https://dosweb.dos.gov.jo>
- » EcoMENA, *Solid Waste Management in Jordan*, 2024, <https://www.ecomena.org>
- » Ellen MacArthur Foundation, *Critical Minerals and the Circular Economy: Overview*, 2023, <https://www.ellenmacarthurfoundation.org/critical-minerals/overview>
- » European Commission, *Critical Raw Materials Act*, 2024, <https://commission.europa.eu>
- » Food and Agriculture Organization (FAO), *The State of Food Security and Nutrition in the World 2022*, 2022, <https://www.fao.org>
- » GIZ, *How to Revolutionise Recycling in Jordan*, 2024, <https://www.giz.de>
- » Global Green Growth Institute (GGGI), *Green Growth National Action Plans 2021–2025: Waste Sector*, 2021, <https://gggi.org>
- » Jordan Phosphate Mines Company (JPMC), *Annual Report 2020*, 2021, <https://www.jpmmc.com.jo>
- » Landbell Group, *Focus on Jordan*, 2024, <https://www.landbell-group.com>
- » Middle East Research and Information Project (MERIP), *Energy, Water and the Cost of Jordan's Dependence on Israel*, 2025, <https://merip.org>
- » MDPI (Sustainability Journal), *Towards a Circular Economy in Jordan: Selecting Organic Waste Treatment Options*, 2025, <https://www.mdpi.com/2071-1050/17/2/653>
- » MDPI (Sustainability Journal), *Towards a Circular Economy Scheme in Jordan: Environmental and Socio-Economic Appraisal of MSW Recycling Pathways*, 2026, <https://www.mdpi.com/2071-1050/18/3/1230>
- » Ministry of Energy and Mineral Resources (Jordan), *Facts and Figures*, 2024, https://www.memr.gov.jo/ebv4.0/root_storage/ar/eb_list_page/memr_facts_&_numbers_2024_-_14.8.2025.pdf
- » Ministry of Interior (Jordan) / UNDP, *Circular Economy Programme Jordan Valley*, 2024, <https://www.undp.org>
- » Observatory of Economic Complexity (OEC), *Jordan Trade Profile: Iron and Steel*, 2024, <https://oec.world/en/profile/bilateral-product/iron-and-steel/reporter/jor>
- » Observatory of Economic Complexity (OEC), *Jordan Trade Profile: Inorganic Chemicals*, 2024, https://oec.world/en/profile/bilateral-product/inorganic-chemicals/reporter/jor?selector2787id=trade_i_baci_a_17
- » Petra News Agency, *Jordan News Article*, 2024, https://www.petra.gov.jo/Include/InnerPage.jsp?ID=81901&lang=en&name=en_news
- » Petra News Agency, *Jordan News Article*, 2024, https://petra.gov.jo/Include/InnerPage.jsp?ID=76672&lang=en&name=en_news
- » Petra News Agency, *Jordan News Article*, 2026, [https://org.petra.gov.jo/Include/InnerPage.jsp?ID=84157&lang=en&name=en_news#:~:text=Amman%2C%20May%203%20\(Petra\),and%20growth%20across%20productive%20sectors.](https://org.petra.gov.jo/Include/InnerPage.jsp?ID=84157&lang=en&name=en_news#:~:text=Amman%2C%20May%203%20(Petra),and%20growth%20across%20productive%20sectors.)

- » ResearchGate, *Mitigating Methane in Jordan: National Inventory, Emission Projections and Policy Pathways*, 2025, https://www.researchgate.net/publication/392648924_Mitigating_Methane_in_Jordan_National_Inventory_Emission_Projections_and_Policy_Pathways
- » ResearchGate, *By-product Phosphogypsum Valorisation Possibilities in the Context of Circular Economy of Building Materials*, 2023, https://www.researchgate.net/publication/376306546_By-product_Phosphogypsum_Vvalorisation_Possibilities_in_the_Context_of_Circular_Economy_of_Building_Materials
- » ScienceDirect, *Scientific Article on Sustainability and Circular Economy*, 2024, <https://www.sciencedirect.com/science/article/pii/S2666016424003062>
- » SFA Oxford, *Jordan: Critical Minerals and the Energy Transition*, 2024, <https://www.sfa-oxford.com>
- » STRATEGIECS Think Tank, *Rare and Strategic Elements in Jordan: Opportunities and Challenges*, 2023, <https://strategiecs.com>
- » U.S. International Trade Administration (Trade.gov), *Jordan Country Commercial Guide: Environment and Water Sector*, 2024, <https://www.trade.gov/country-commercial-guides/jordan-environment-and-water-sector>
- » United Nations in Jordan, *Recycled Wastewater Provides a Window for Jordan to Address Water Scarcity*, 2023, <https://jordan.un.org>
- » U.S. Energy Information Administration (EIA), *Jordan: International Energy Data and Analysis*, 2024, <https://www.eia.gov>
- » U.S. Geological Survey (USGS), *The Mineral Industry of Jordan in 2020–2021*, 2023, <https://www.usgs.gov>
- » Wiley / Global Policy Journal, *Managing Import Dependency Risks in Contexts of Polycrises: The Case of Jordan*, 2025, <https://onlinelibrary.wiley.com/doi/10.1111/1758-5899.70092>
- » World Bank, *Jordan Country Data*, 2025, <https://data.worldbank.org/country/jordan>
- » World Economic Forum, *Lithium and the Energy Transition in Latin America*, 2023, <https://www.weforum.org/stories/2023/01/lithium-latin-america-energy-transition/>
- » Zawya, *Jordan Charts Bold Course Toward Circular Economy in Major Economic Shift*, 2024, <https://www.zawya.com/en/economy/levant/jordan-charts-bold-course-toward-circular-economy-in-major-economic-shift-wnhqm6wf>

