Hydrogen Clusters in the UAE

Six (6) clusters emerge as prospective priority clusters, each serving a unique regional role.

Cluster 1: Ruwais Cluster

Location	Ruwais Industrial City
Emirate	Abu Dhabi
Demand (MT)	0.5 (2031), 0.7 (2040), 1.2 (2050)
Potential Cluster Offtakers	• ADNOC • Fertil
Sector Mix (%)	~100% industry

Cluster 2: Abu Dhabi Cluster

Location	Abu Dhabi City
Emirate	Abu Dhabi
Demand (MT)	0.6 (2031), 1.1 (2040), 1.5 (2050)
Potential Cluster Offtakers	• Emirates Steel • Etihad / AD Airports • AD Ports
Sector Mix (%)	~65% industry ~35% transport

Cluster 3: KEZAD Cluster

Location	KEZAD
Emirate	Abu Dhabi
Demand (MT)	0.4 (2031), 0.9 (2040), 1.7 (2050)
Potential Cluster Offtakers	• EGA • AD Ports
Sector Mix (%)	~60% industry ~40% transport

Cluster 4: Jebel Ali Cluster

Location	Jebel Ali
Emirate	Dubai
Demand (MT)	0.5 (2031), 1.5 (2040), 2.9 (2050)
Potential Cluster Offtakers	• DP World • EGA • Dubai Airports • ENOC
Sector Mix (%)	~25% industry ~75% transport

Cluster 5: Dubai-Sharjah Cluster

Location	North Dubai & Sharjah
Emirate	Dubai, Sharjah
Demand (MT)	0.1 (2031), 0.3 (2040), 1.0 (2050)
Potential Cluster Offtakers	• Dubai Airports • Emirates • Sharjah Airport • DP World
Sector Mix (%)	~100% transport

Cluster 6: East Coast Cluster

Location	Khor Fakkan & Fujairah
Emirate	Sharjah, Fujairah
Demand (MT)	0.1 (2031), 0.2 (2040), 0.4 (2050)
Potential Cluster Offtakers	• AD Ports (Fujairah) • VTTI
Sector Mix (%)	~10% industry ~90% transport

- Aluminum, Iron & Steel
- Chemicals & Refining
- Shipping & Aviation

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Hydrogen Clusters in the UAE

Three (3) clusters develop in **Abu Dhabi**, primarily driven by demand from **industry**, and another **three (3) clusters** in **Dubai** and the **Northern Emirates**, largely driven by the **transport** sector.

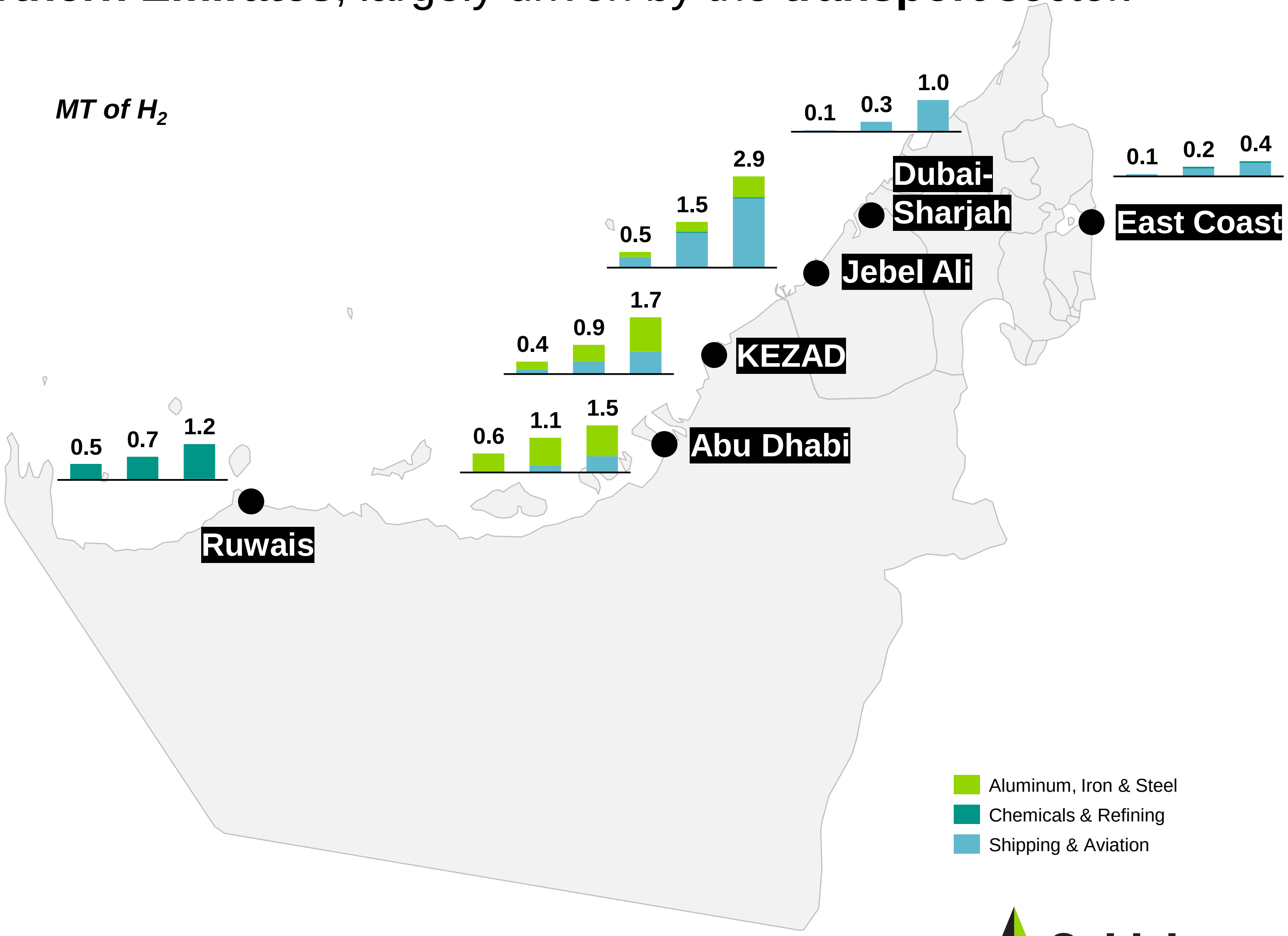
Major Cluster Highlights

Ruwais: Almost exclusively an **industrial cluster**, composed of demand from **ADNOC's Ruwais refinery** – the UAE's largest oil refinery – and **Fertil's petrochemical complex**.

Abu Dhabi: Composed of demand from **Emirates Steel's Mussafah operations**, Abu Dhabi's **AUH Airport** – Etihad Airways' main hub – and the **Zayed and Mussafah Ports**.

KEZAD: Composed of **EGA's Al Taweelah facility**, the largest aluminium production facility in the Middle East, and the **Khalifa Port**, the UAE's second largest port.

Jebel Ali: The **UAE's largest cluster** and composed of **DP World's Jebel Ali Port** (the Middle East's largest port), **EGA's Jebel Ali operations**, **Dubai's DWC Airport**, and **ENOC's oil refinery**.



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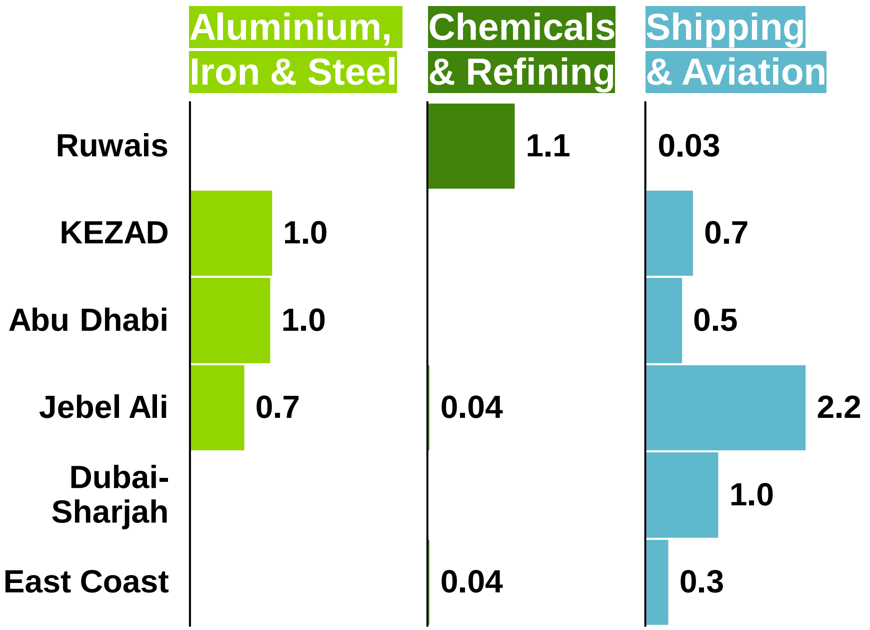
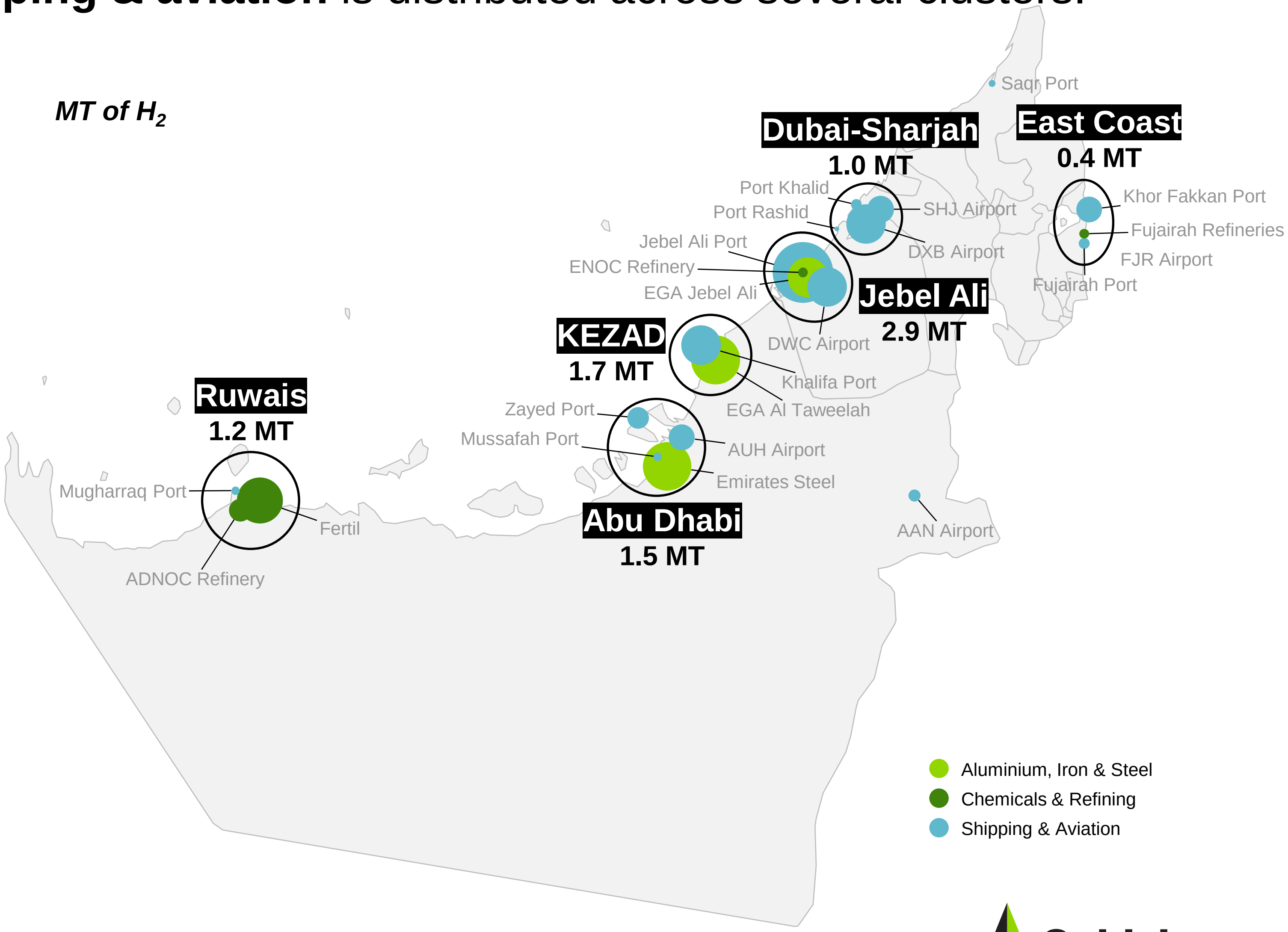
Hydrogen Demand by Cluster in 2050

Hydrogen demand from **chemicals & refining** is largely concentrated in Ruwais, whereas demand from **aluminium, iron & steel** and **shipping & aviation** is distributed across several clusters.

Sector Highlights

- Demand from **aluminium, iron & steel** is well distributed across **KEZAD, Abu Dhabi** and **Jebel Ali**, while demand from **chemicals & refining** is almost exclusively concentrated in **Ruwais**.
- Demand from **shipping & aviation** is distributed across most clusters.





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Major Cluster Considerations

Cluster development is **highly complex** and faces a **range of challenges**, including stakeholder coordination, high upfront costs and infrastructure availability.

European Experience

Experience from **early cluster-development activities** across Europe shows that cluster projects face a range of challenges, including:

1. **Offtaker coordination** on future hydrogen needs and ramp-up timelines.
2. **Inconsistent decarbonization timelines** across offtakers.
3. **Commercial risks** due to policy, regulatory, and market uncertainties.
4. **Early hydrogen production costs** due to high CAPEX and OPEX; and
5. **Availability of transmission and storage infrastructure**, whether new or repurposed.

UAE Next Steps

Near-Term Objective: The UAE’s most immediate next-step and objective will be the **identification and selection** of its near-term **priority clusters**.

Enabling Activities: Several activities can support the identification and selection of priority clusters, including:

1. **Bottom-up hydrogen demand assessment**.
2. **High-level technical assessment** of hydrogen supply routes and related transmission and storage options.
3. **Economic analysis** of hydrogen supply routes.
4. **Engagement with market players** across the entire value chain (e.g., supply, transport, demand); and
5. **Demand offtaker coordination**.

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