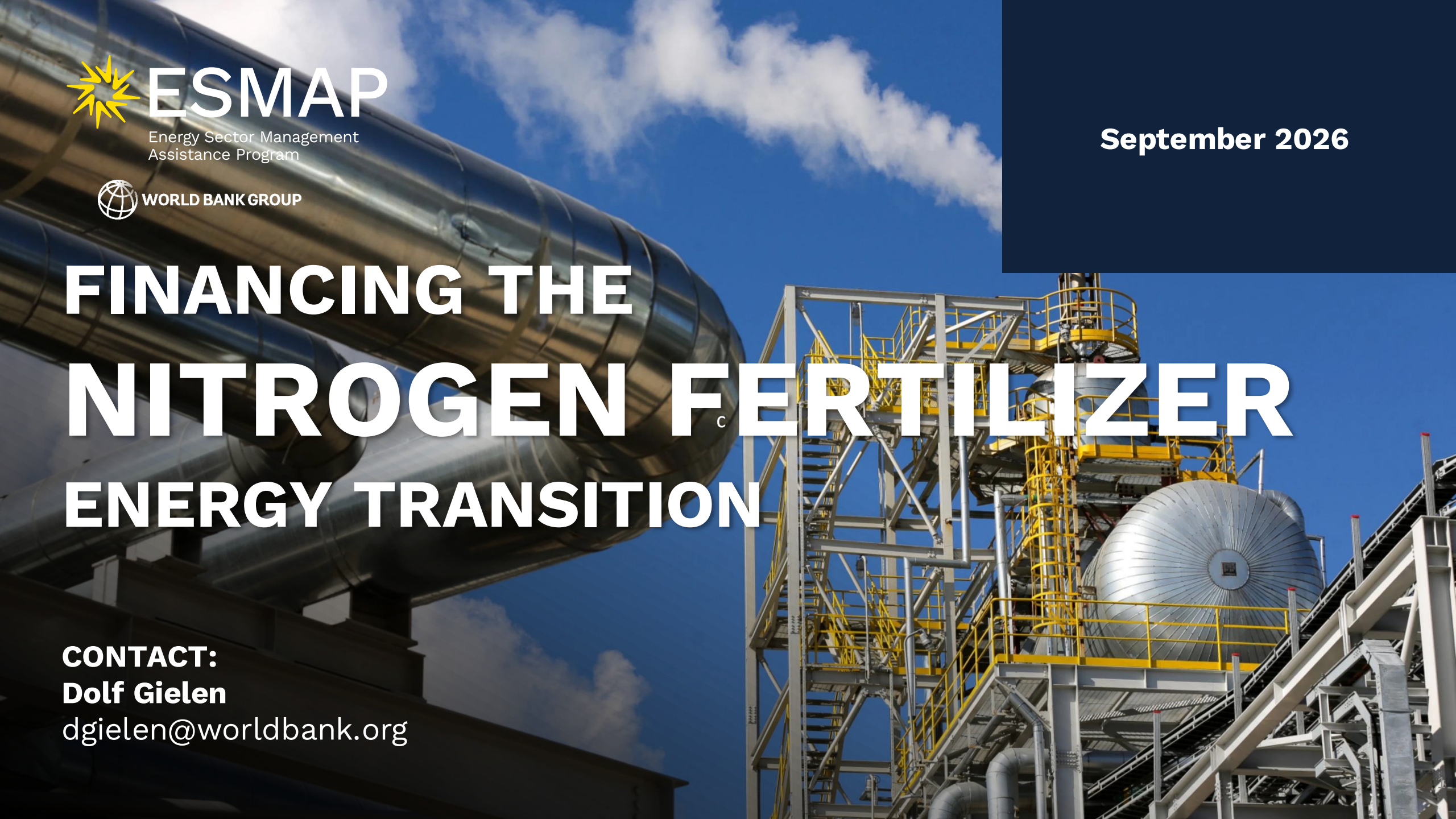

ESMAP
Energy Sector Management Assistance Program

WORLD BANK GROUP

September 2026

FINANCING THE NITROGEN FERTILIZER ENERGY TRANSITION

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THE URGENCY OF TARGETED INTERVENTION NOW

- **Synthetic nitrogen fertilizers** are critical for **global food production.**
- In recent years various disruptions to **ammonia and nitrogen fertilizer supply** have driven up prices and resulted in **supply shortfalls**, threatening **food supply security**.
- A more secure supply alternative is emerging. Innovation continues to reduce the cost of r**enewable hydrogen, green ammonia and renewable nitrogen fertilizers** thus creating an increasingly viable business case.
- While the business case for renewable nitrogen fertilizers is improving initial projects still need **financial support** (e.g., investment subsidies, concessional financing, offtake support).
- Production of **hydrogen** and its derivative **ammonia** is the **costliest part** of synthetic nitrogen fertilizer production
- Production and use of nitrogen fertilizers is a major source of **global GHG emissions.** Technically viable solutions have been developed to reduce these emissions substantially.
- **Nitrogen fertilizers** constitute a **key early opportunity** to roll out **renewable hydrogen** for national use, as international **clean ammonia trade** is lagging.

PRELIMINARY – NOT FOR DISTRIBUTION

MARKET OVERVIEW

200 Mt

Around **200 Mt ammonia** is produced every year, **85%** is used for production of **nitrogen fertilizers**. **244 Mt/yr production capacity**.

750 NH3

Production plants

Over **750 ammonia production plants** in operation worldwide.

6.3 Mt

Operational

6.3 Mt clean production is already operational, including **4.3 Mt low-carbon ammonia**, the remainder renewable ammonia

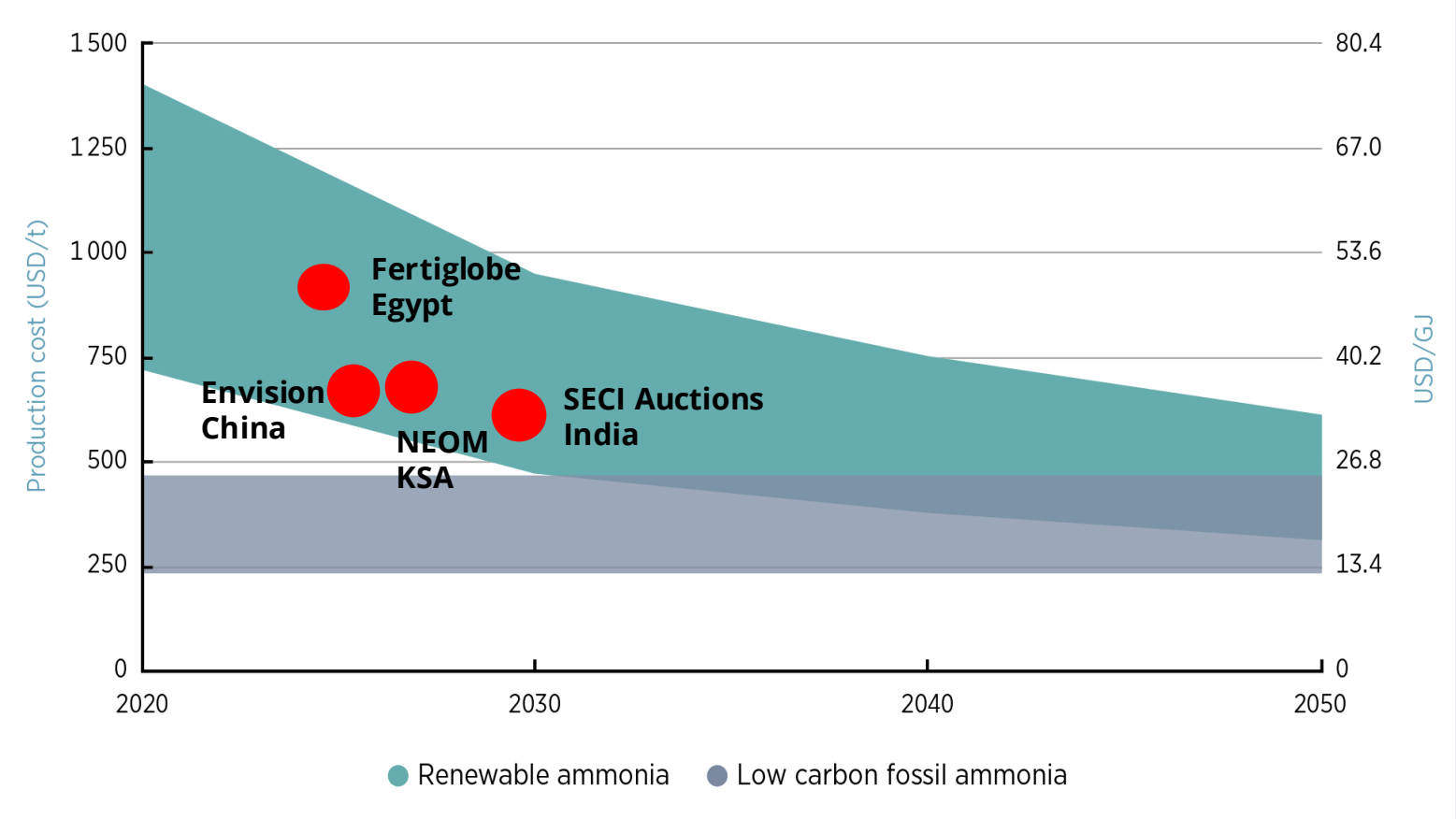
China is the **largest ammonia producer**, followed by **India**.

- The **net low-emission ammonia capacity pipeline** (low carbon consisting of conventional + CCS retrofit and new build as well as renewable ammonia) stands at **501.8 Mt (November 2025)**. Less than **a tenth** of that capacity is expected to be online by **2030 (12–20 Mt)**.
- As of **December 2025**, the global **renewable and low-carbon ammonia pipeline** for **2030** reached **114 Mt (88 Mt renewable ammonia** and **26 Mt low-carbon ammonia**), spanning **330 projects worldwide**.
- Expectation is that **renewable ammonia** will grow faster than **low-carbon ammonia**.
- Nearly **75%** of the **Operational, Firm, and Mature projects** is **Newbuild capacity by 2030 (35.5 Mt)**, with only **25%** representing **revamps (12.3 Mt)**.
- **Fertilizer substitution**, **efficiency of fertilizer use**, and **fertilizer-induced soil carbon storage** offer **decarbonization potential** that is not discussed here.
- Other conventional ammonia and N-fertilizer production is concentrated in countries with **low-cost natural gas resources**.
- Significant amounts of **ammonia** and **nitrogen fertilizers** are **traded globally**.

EXAMPLE: ONGOING COST REDUCTIONS FOR RENEWABLE AMMONIA

NITROGEN FERTILIZER

Current and future production costs of renewable ammonia



- Ammonia spot price 350-400 USD/t
- Green ammonia production cost in good locations twice spot price level
- Hydrogen cost dominate renewable ammonia production cost (approx. 185 kg hydrogen/t ammonia)
- Technology innovation and lower cost financing can reduce supply cost
- Today significant subsidies for clean hydrogen production
- Low carbon "blue" ammonia is today cheaper than renewable ammonia
- This is changing best-in-class renewable ammonia projects 600 USD/t
- Low carbon ammonia CCS adds 100-200 USD/t to the cost of grey ammonia
- Significant project development worldwide

Note: Compared with production cost range for low-carbon fossil ammonia (USD 2-10/GJ)

INVESTMENTS AND FINANCING NEEDS
AND WORLD BANK ENGAGEMENT

NITROGEN FERTILIZER

- USD 600 bln – 1400 bln investment needs to replace existing ammonia production capacity, depending on chosen production route.
- This excludes Common User Infrastructure
- Ammonium nitrate fertilizer decarbonization is straightforward
- Urea decarbonization requires innovative solutions
    - Biomethane use
    - Shift to ammonium nitrate fertilizer
    - Capture and use biogenic CO2
- Some opportunity to enhance the energy efficiency of existing plant
- Need for innovation funds for emerging solutions eg small scale production units

Potential World Bank Engagement

- A price guarantee fund for low carbon fertilizers
- Identify economically viable business cases and projects
- Invest in enabling infrastructure
- Deploy investment risk mitigation instruments