

# Eastern Mediterranean Sustainable Natural Gas Utilization with Hydrogen

## Conversion: 2026–2050

### Mathematical Forecasting of Gas Producibility and Bridge Fuel Potential Outlook

August 2025

#### Abstract

This outlook presents the outcomes of a comprehensive mathematical modeling study assessing natural gas producibility and hydrogen potential in the Eastern Mediterranean region from 2026 to 2050. Using an innovative Gaussian bell curve approach an adaptive model is developed to predict sustainable utilization of natural gas as a bridge fuel during the energy transition. Through detailed examination of two strategic case studies, Cyprus' natural gas reserves (411bcm) and the broader Eastern Mediterranean reserves (2,399bcm), the research reveals transformational economic opportunities that fundamentally depend on regional cooperation for successful implementation. Depending on regional cooperation level, our latest modeling reveals:

- **18–247US\$B revenue potential** over 25–year period
- **4–41 billion kg hydrogen production** capacity through steam methane reforming
- **17%–53% reserves remain post–2050** enabling extended utilization beyond modeling period
- **25% hydrogen share achievable** by 2050 alongside **60% renewable energy sources** integration
- Regional synergies unlock 10x greater potential compared to individual country development

#### Mathematical Model Overview

The optimization modeling introduces a novel forecasting approach combining:

- Natural gas production profiles: Sophisticated allocation algorithms with Gaussian bell curves peaking in 2035
- Hydrogen production pathways: Steam methane reforming technology modeling
- Integrated energy systems: Natural gas allocation between domestic use, exports and hydrogen production
- Energy transition dynamics: Renewable energy targets and hydrogen transition goals by 2050
- Economic optimization: Revenue maximization considering extraction costs, carbon taxation and hydrogen market dynamics

#### East Med major natural gas reserves

Year	Discovery	Country	Estimated reserves (bcm)
2010	Leviathan	Israel	623
2011	Aphrodite	Cyprus	128
2011	Tanin	Israel	25
2013	Tamar	Israel	305
2013	Karish	Israel	72
2015	Zohr	Egypt	850
2015	Nooros	Egypt	113
2018	Calypso	Cyprus	28–56
2019	Glaucus	Cyprus	85–114
2022	Zeus	Cyprus	56–85
2022	Cronos	Cyprus	71

#### Key Results

##### Cyprus: Controlled–Scale Implementation

Cyprus represents a manageable scale for hydrogen transition demonstration:

- Initial natural gas reserves of 411bcm, supporting sustained production through 2050
- Natural gas production capacity grows from 6bcm in 2026 to peak at 10bcm in 2035
- Total production of 4,072 million kg of hydrogen by 2050 through steam methane reforming processes
- Strategic advantages including simplified regulatory coordination within a single jurisdiction and controlled in-

frastructure requirements that enable faster deployment timelines

- 80% of natural gas production must be allocated for exports to achieve economic viability, creating dependence on international market conditions

#### East Med: Regional Hub Development

The broader East Mediterranean region presents massive scale opportunities for regional hydrogen hub development:

- Initial natural gas reserves of 2,399bcm, supporting sustained production through 2050
- Natural gas production capacity grows from 61bcm in 2026 to peak at 100bcm in 2035
- Total production of 40,728 million kg of hydrogen by 2050 through steam methane reforming processes
- Peak hydrogen production reaches 2,405 million kg/year by 2041, positioning the region as a potential major supplier to European markets

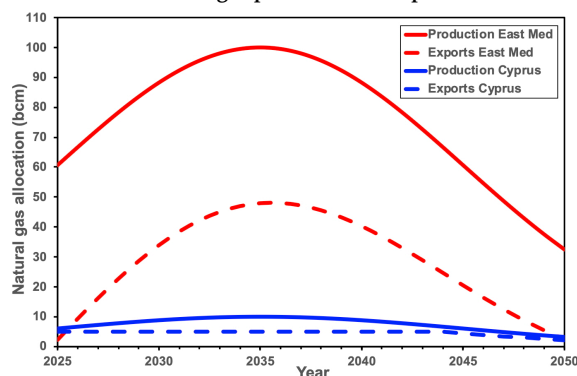
#### Hydrogen Economy Development

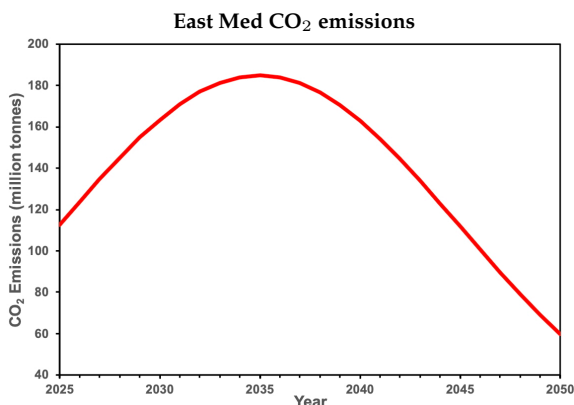
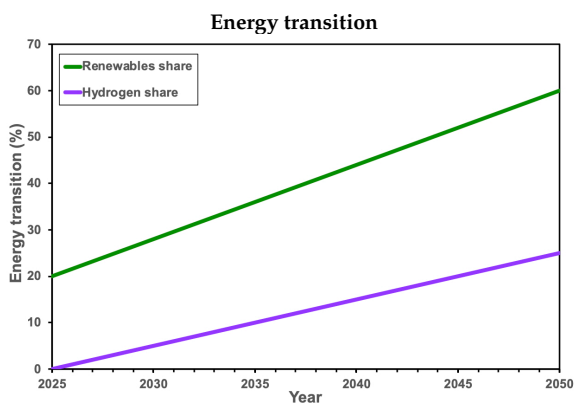
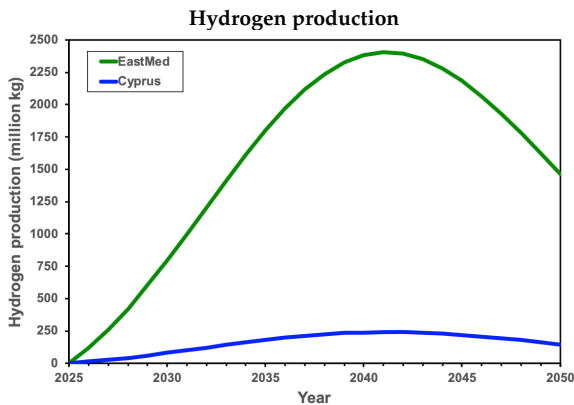
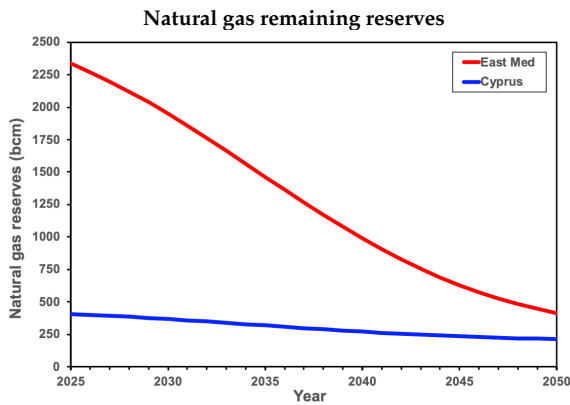
Key hydrogen production trajectories show:

- Conversion efficiency, 0.18kg<sub>H<sub>2</sub></sub>/m<sup>3</sup><sub>NG</sub> via steam methane reforming
- Environmental impact, 10.5kgCO<sub>2</sub>/kg<sub>H<sub>2</sub></sub> (grey hydrogen)
- 25% of natural gas allocated to hydrogen by 2050

#### Detailed Results

Natural gas production & exports





### Economic Implications

East Med region presents significant economic opportunities through strategic natural gas utilization and hydrogen production. The analysis reveals substantial revenue potential while highlighting critical infrastructure investment requirements for realizing the regions energy potential:

- **Massive Infrastructure Investment:** Total infrastructure costs range from 15–25US\$B for comprehensive regional development, including LNG terminals, offshore

platforms, hydrogen production facilities, and subsea pipelines, with development timelines spanning 3–7 years

- **Substantial Long-Term Resource Sustainability:** Both Cyprus and East Med region maintain significant reserve longevity, with Cyprus retaining 212bcm (53% of initial reserves) and Eastern Mediterranean maintaining 412bcm (17% of initial reserves) by 2050, ensuring continued production potential beyond the modeling period
- **Regional Scale Offers Superior Economics:** The East Med approach delivers 40.73 billion kg total hydrogen production versus Cyprus 4.07 billion kg, while achieving better economies of scale
- **Significant Employment and Economic Multiplier Effects:** Projects will generate 25,000–40,000 construction jobs and 8,000–12,000 permanent positions, contributing 3–5% annual GDP growth during peak development periods, with 15–35US\$B annual export revenue potential at full regional capacity

### Policy Recommendations

Based on our modeling, we recommend:

1. **Hydrogen infrastructure development:** Early investment in steam methane reforming facilities and distribution networks to capture optimal production windows
2. **Carbon pricing integration:** Implementation of robust carbon taxation frameworks to incentivize clean hydrogen production
3. **Regional cooperation frameworks:** Development of hydrogen export partnerships to maximize economic benefits
4. **Resource optimization strategies:** Coordinated natural gas extraction profiles to balance current revenue needs with long-term hydrogen production potential
5. **Technology advancement priorities:** Investment in advanced steam methane reforming technologies and eventual transition to green hydrogen production methods

### Conclusion

Eastern Mediterranean natural gas resources represent a significant opportunity for sustainable energy transition through 2050 and beyond. The modeling demonstrates that:

- **East Med natural gas resources** can effectively serve as a bridge fuel, particularly when coupled with hydrogen production and renewable energy integration
- **Natural gas-to-hydrogen transition** represents a viable pathway for both regional energy security and economic development
- **Regional cooperation** amplifies benefits across all metrics, suggesting that coordinated East Med development represents the optimal pathway for maximizing economic returns while supporting global decarbonization objectives
- **High revenue potential** provide strong economic incentives for early infrastructure investment
- **Careful resource management and coordinated policy frameworks** will be essential to optimize the balance between immediate natural gas revenues and long-term hydrogen economy benefits