



Petrochemical Industry in Eurasia: Opportunities for Deeper Processing

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PETROCHEMICAL INDUSTRY IN EURASIA: OPPORTUNITIES FOR DEEPER PROCESSING

KEY FINDINGS

ANALYTICAL REPORT'24

PETROCHEMICAL INDUSTRY CONTRIBUTES SIGNIFICANT ECONOMIC BENEFITS

Cumulative GDP growth

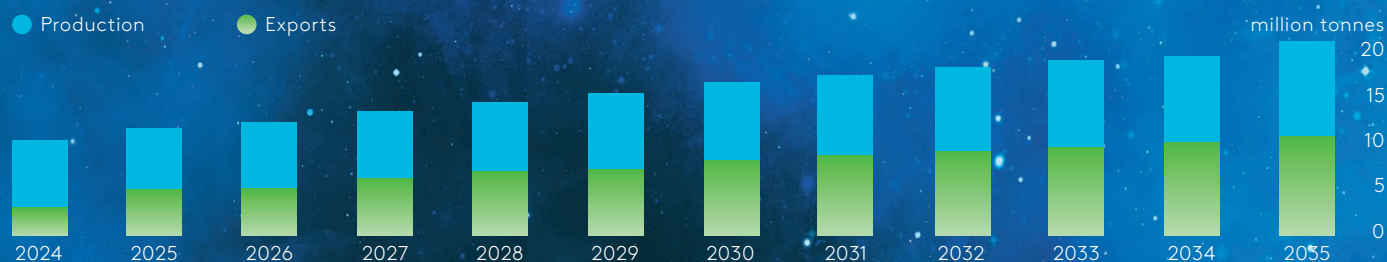
of **\$153** billion
in the region

3.2-fold
increase in polymer
exports

\$12 billion
annual growth in polymer
production

5.8%
annual industry
growth

Target forecast for polymers in the region



PETROCHEMICAL INDUSTRY – ONE OF THE TOOLS TO OVERCOME THE INERTIAL DEVELOPMENT RUT

Promotes
qualitative
diversification

\$2.62

increase in gross
economic output per
\$1 of petrochemical
production

Stimulates the creation
of knowledge-intensive
related industries

2–7 jobs

in the economy for
every 1 job in the
petrochemical industry

Localisation
of value
added

20x

price difference
between feedstock
and finished
products

Finished product
(PE pipes)
\$2,500–3,700 per tonne

Polyethylene (Stage III)
\$1,600–1,800 per tonne

Ethylene (Stage II)
\$600 per tonne

Ethane (Stage I)
\$80–90 per tonne

PRIORITY ACTIONS TO UNLOCK THE POTENTIAL OF THE EURASIAN PETROCHEMICAL INDUSTRY



Create modern
petrochemical
clusters in
natural centres of
strong economic
attraction
as the main
development
route



Focus project
implementation
on innovative
low-tonnage
petrochemicals



Introduce
circular
economy
mechanisms



Provide
transport
and logistics
solutions
for export



Using the
international status
of MDBs to attract
investment capital
to the industry



Eurasian Development Bank

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Abstract

The petrochemical industry is an important sector of the global economy. Today it is undergoing a major structural change. There is an ongoing energy transition that is closely linked to a deeper transformation of petrochemical products. Demand is shifting to developing countries, particularly the Asia-Pacific region and India. The Eurasian region's geographical proximity to the large emerging Asian markets offers great opportunities. If these opportunities are properly exploited, production and exports of commodity polymers could more than triple by 2035. However, our diagnostic has identified certain challenges and constraints. Addressing these will require an integrated approach. The main ways to unlock the potential of the petrochemical industry include the following: (1) creating petrochemical clusters in attractive centres; (2) focusing on innovative and low-tonnage production; (3) using circular economy mechanisms; (4) designing transport and logistics solutions to deliver polymer products to emerging markets; and (5) using the international status of multilateral development banks to attract investment capital to the industry. If the region's existing potential is fully harnessed, the petrochemical industry can become a powerful tool for breaking out of the inertial development rut.

Keywords: petrochemical industry, polymer products, Eurasian region, Central Asia, production potential, industrial co-operation, development of process stages, transition from raw materials to finished products, export potential.

JEL: F15, L65, N65, O14, Q32, Q35

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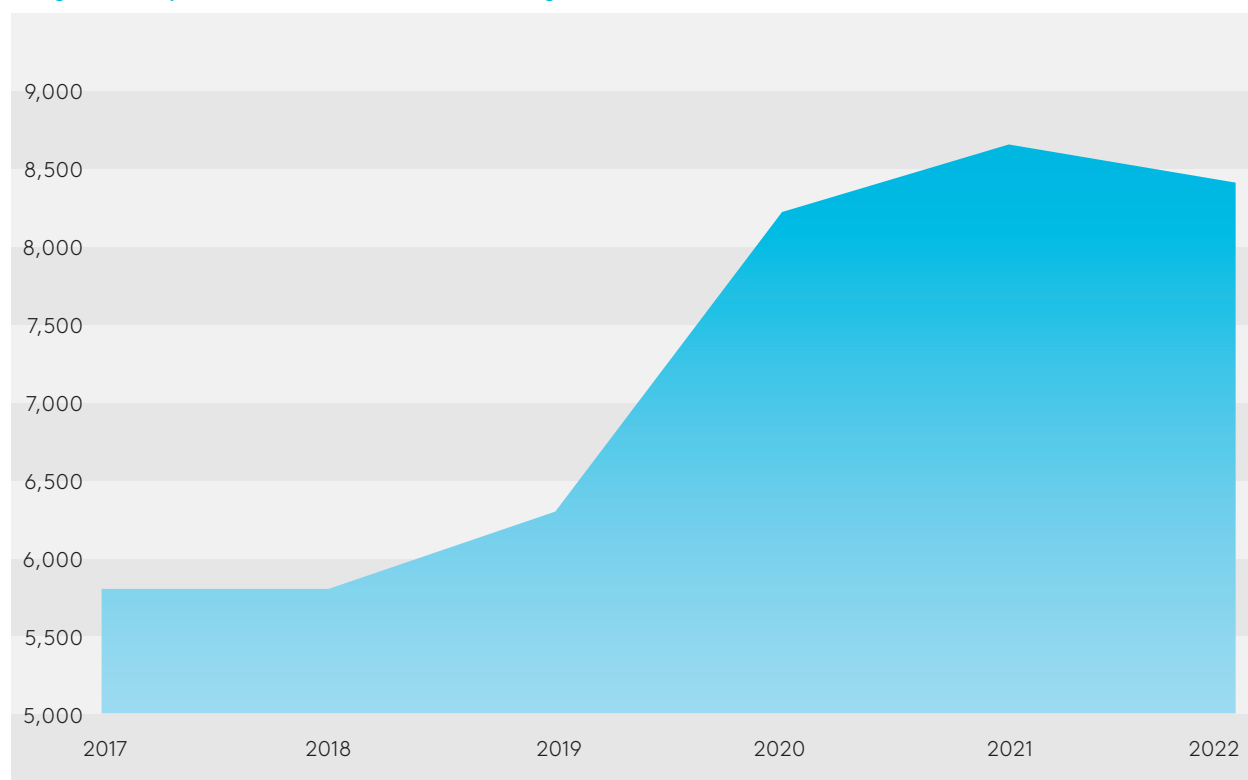
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SUMMARY

The petrochemical industry in the Eurasian region (Armenia, Belarus, Kazakhstan, Kyrgyzstan, Russia, Tajikistan, Turkmenistan, Uzbekistan) is developing rapidly. Over the last six years, the total production of basic polymers (*polyethylene, polypropylene, polyvinyl chloride, polystyrene, polyethylene terephthalate, synthetic rubber*) has increased by a factor of 1.5, from 5.8 million tonnes in 2017 to 8.4 million tonnes in 2022. The production of polyethylene, polyethylene terephthalate and polypropylene in Russia is accelerating. There is one active player in the market — the national petrochemical company SIBUR — which has implemented a number of large-scale projects and is planning to expand its production capacity in the next few years (*Amur Gas Chemical Complex in the east of the country*). Kazakhstan is actively pursuing an industrial policy that includes rapid expansion of petrochemical production. A polypropylene production project has recently been completed in the Atyrau region (*KPI LLP*). Uzbekistan and Turkmenistan, together with their foreign partners, have commissioned the Ustyurt Gas Chemical Complex (*Uz-Kor Gas Chemical*) and the Kiyanly Gas Chemical Complex, respectively.

↓ **Figure A. Polymer Production in the Eurasian Region, KT**



Source: national statistical agencies.

Unlocking the petrochemical production and export potential can offer the Eurasian region significant economic benefits. Going forward, by 2035 the industry may secure:

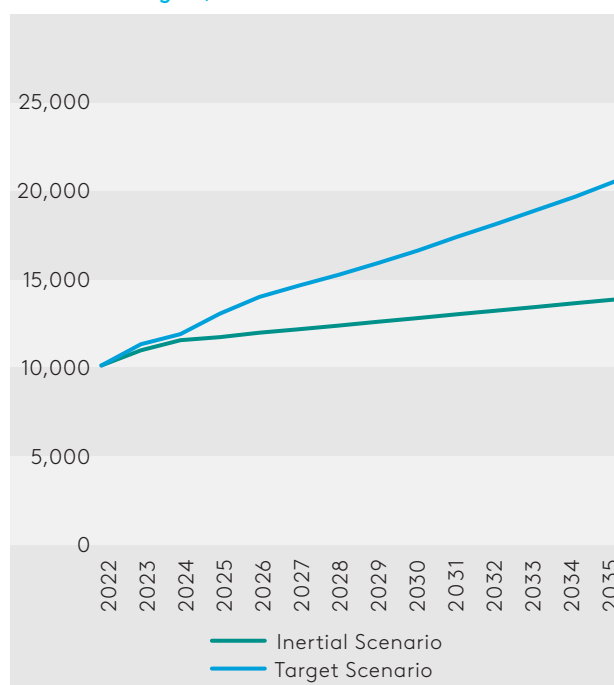
- **an annual increase in the output of base polymers and synthetic rubber of up to 5.8%.** In total, the volume of polymer production may increase by 10.8 MT ([Figure B](#)) to more than 20 MT, with the current output more than doubling. The total value of supplementary output in the manufacturing industry may be as high as \$138.1 billion;
- **an annual increase in the Eurasian region's GDP of up to 0.44 pp** (*ratio of the average annual total investment and output growth effect on GDP to GDP volume in 2022*). The

indicator for the Russian Federation is 0.32 p.p., and for the Republic of Kazakhstan — 1.38 p.p. In total, by 2035, the region's GDP may receive an additional \$153.5 billion;

- **a 3.2-fold increase in petrochemical exports** (by 7.2 MT to 10.4 MT) (Figure C). There are several base polymers that have significant export potential. By 2035, net exports may increase to 4.7 MT (*annual average growth in 2017–2022: 536.9 KT*).

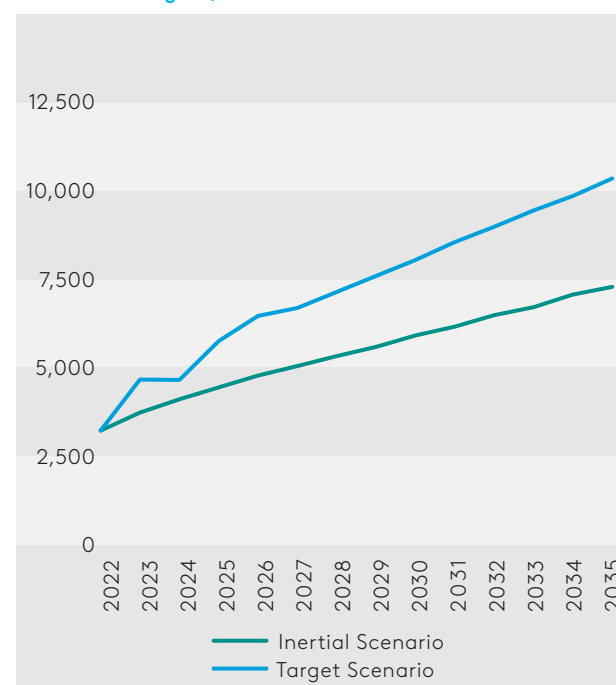
The petrochemical industry has a **high multiplier effect, and is capable of supporting a transition from the commodity-based to the innovative economic development model** (*the multiplier effect is estimated at \$2.62 per \$1 of industry output*). It is capital-intensive, and has the highest capital-expenditure-per-worker ratio among the manufacturing industries, generating the second-highest added value after the pharmaceutical industry (Oil and Capital, 2023). Moreover, the UNIDO classifies the petrochemical industry as a high-tech industry alongside the manufacture of computers, mechanical engineering, and the pharmaceutical industry. Each job in the petrochemical industry creates 2–7 new high-productivity jobs in related sectors of the economy (Braginsky, 2015).

↓ Figure B. Projected Petrochemical Output in the Eurasian Region, KT



Source: authors' calculations.

↓ Figure C. Projected Petrochemical Exports from the Eurasian Region, KT

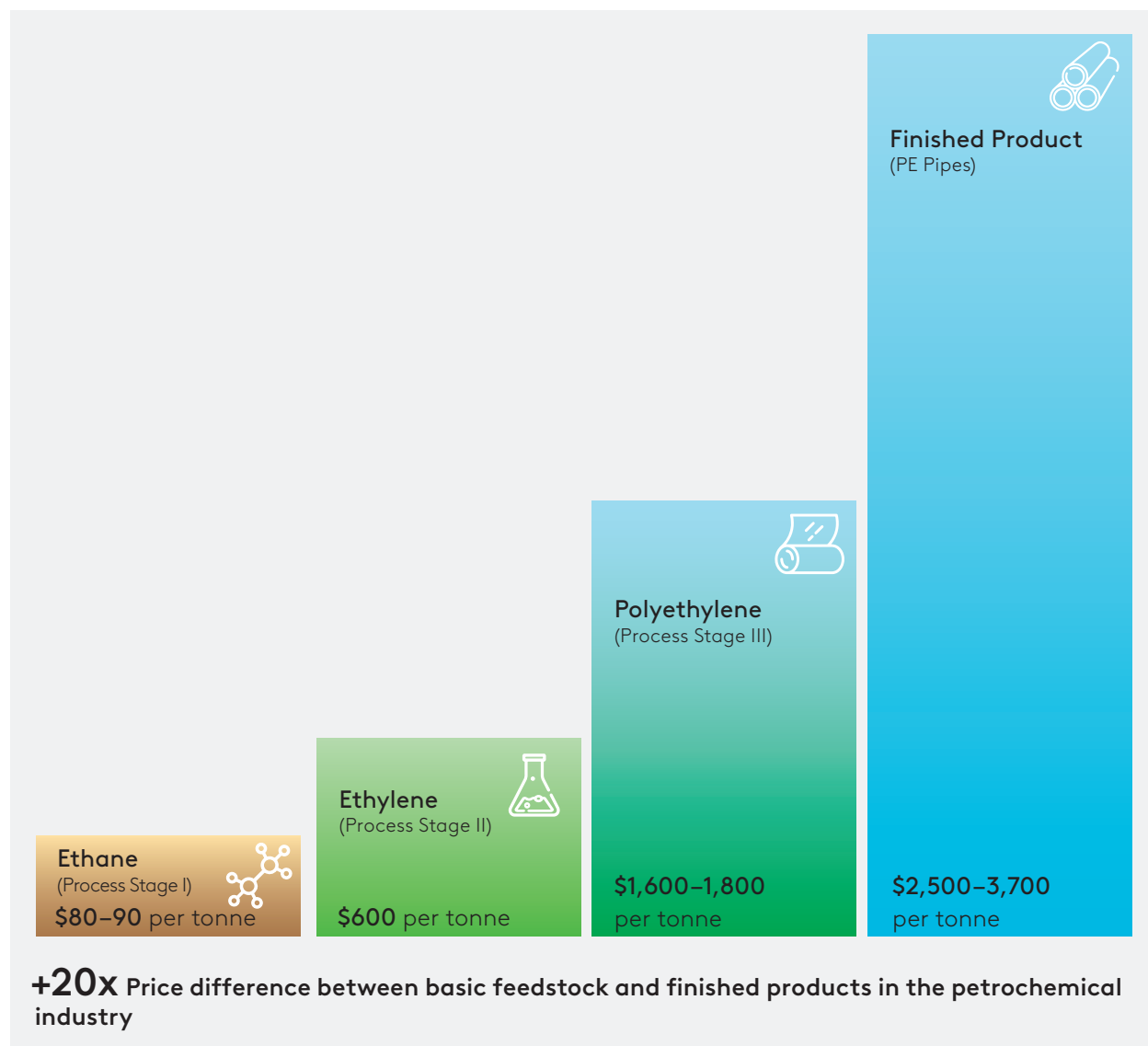


Source: authors' calculations.

The industry is characterised by a rapid added value increase along the process chain (Figure D). As production moves along from one process stage to another, newly — generated added value grows exponentially. The prices for base raw materials and final polymer products may differ more than 20-fold (Ivanov, 2016). Both mining and processing companies are attracted to deep hydrocarbon conversion process stages, not only because they are highly profitable, but also because they make their business more resilient.

On the other hand, development of the petrochemical industry in the Eurasian region creates **not only economic benefits, but also an additional environmental load**. In particular, continued growth of industrial output will be accompanied by an increase in greenhouse gas emissions (*annual average: 6.7–17.8 mln tCO₂e*) and polymer waste (*annual average: 1.4–2.2 MT*). However, that impact needs to be viewed in the context of the possible benefits associated with using plastics as opposed to other materials (*use case: significant advantages of using plastic pipes vs cast-iron pipes in the Housing and Utilities sector*).

↓ Figure D. Product Value per Tonne at Different Process Stages from Raw Materials to Finished Products



Source: Ivanov, 2016.

Further strengthening of the petrochemical industry is a natural economic policy priority for the countries of the Eurasian region. All conditions for that are in place:

- The region has a **huge resource potential**. Total proven oil reserves (as of 2022) are 115 MMbbl (more than 7% of world reserves), while total proven gas reserves are 62.8 TCM (about 30% of world reserves). The region is one of the world's largest producers and exporters of raw hydrocarbons, which aligns its petrochemical industry development goals with those of the other oil and gas exporting countries.
- Just like industrially developed countries, the region has a **long-standing tradition of petrochemical industry development**, including both production per se and creation of the related scientific and technological basis (for example, Russia is one of the world's leaders in the invention and commercialisation of ground-breaking synthetic rubber production technologies), and a successful track record of implementation of large-scale chemicalisation programmes.
- The countries of the region are already proactively pursuing **government policies aimed at advancement of petrochemical projects**. There are more than 20 ongoing large-scale petrochemical projects with a total value of more than \$200 billion.

- The **region is geographically close** to the emerging Asian markets. By 2035, the Asia-Pacific Region (APAC) and India will account for more than 40% of the global petrochemical market. Their immense growth potential can be attributed to their relatively modest current per capita polymer consumption levels relative to developed economies. The Eurasian region is putting considerable effort into maintaining **logistical connectivity with those markets**.

The structural transformation of the global petrochemical industry is creating long-term advantages for the countries of the Eurasian region. The global economy is going through a new energy transition, which is closely linked to deeper conversion of petrochemical products. A qualitative technological breakthrough requires polymer raw materials (*for example, ethylene is used in the production of photovoltaic elements for solar power stations*). The global petrochemical market will be growing at a compound annual growth rate (CAGR) of **3–6% until 2035** (IEA, 2022). By 2050, 50% of incremental global demand for crude oil will be generated by the evolving petrochemical industry. Accordingly, petrochemical regions with a substantial resource potential will be playing an increasingly important role.

The Eurasian region can potentially improve its position in the global division of labour. It currently accounts for merely 2.1% of total global petrochemical output, and positions itself as a supplier of primary products (*particularly oil and gas*). However, everything is in place for the region to transform itself into the world's largest polymer production centre. Taking into consideration the technological intensity of the petrochemical industry and the considerable multiplier effect it produces, it may be instrumental in escaping from the “rut” of previous development (overcoming “path dependence”).

Box A. Successful Escape from the “Rut” of Previous Development: South Korea

It took South Korea only a few decades to turn from one of the world's poorest agrarian countries into an industrially developed country with a high per capita income. In the beginning of the transformation journey, the government of South Korea created important points of economic attraction in the country's agrarian economy by pursuing a selective industrialisation policy that prioritised heavy and chemical industries (Jwa, 2023). It also set out to develop shipbuilding and mechanical engineering, two industries that were virtually non-existent in the country's economy. Emergence of capital-intensive industries triggered a new “economic miracle” process that encompassed development not only of production capacity, but also of all collateral sectors of the economy, including education, science, engineering, logistics, and services. Today South Korea's export product basket is extremely diversified. The country has a strong competitive position in trade in electronic, mechanical engineering, and chemical products. These, in turn, have a strong “connection” to the traded products that can be described as “contiguous” in terms of complexity. According to Harvard Growth Lab, the “cost of switching” to such contiguous products necessitated by industrial production expansion exigencies is rather low. The more such connections, the more opportunities for the diversification of the economy.

The petrochemical industry may become a point of economic attraction for the Eurasian region. It has already scored some successes in building up its scientific potential and creating engineering and manufacturing complexes with their own R&D. The region has sufficient scientific potential to expand domestic production of polymers needed by local companies. For example, there are several ongoing polymer import substitution R&D projects, including

the testing of cold catalysis technologies for plastic waste processing (TNK company), work on polyarylates, polysulfones, and polyethersulfones ("Digital Materials Engineering: New Materials and Substances" National Technical Initiative, Bauman Moscow State Technical University), launch of seven proprietary polyethylene brands, development of 28 new polymer materials, 18 new low-tonnage localisation projects and 10 catalyst development projects (Polylab Research Centre, Skolkovo, Sibur company), pilot testing at a Voronezhsintezkauchuk facility of the new reagent Macromer SP-9 to replace the adhesion-reducing powders Sokalan AC CP 9 (BASF company) and Geroon T/36-DF (Solvay company) previously used for rubber production, and others.

In many successful countries, the state plays a critical role in developing the petrochemical industry. In the Eurasian region, comprehensive government support could be structured so as to ensure coordinated decision-making by the key industry players, forge stable research–production and production–demand links, enhance human resources, and create specialised infrastructure facilities. The following three principles should be observed: an emphasis on locally procured raw materials and local talent; a commitment to promoting innovation, creating high-tech production facilities at initial process stages, and making end products with high added value; and a focus on boosting the investment appeal of the petrochemical industry.

Based on our review of an extensive body of international best practices, we have identified **five blocks of priority measures** designed to unlock the existing production and export potential:

1. **Creation and accelerated development of modern petrochemical clusters in natural centres of attraction** within the Eurasian region close to major sources of hydrocarbon materials (oil and gas). A cluster is defined as the full value chain from developing proprietary production technologies and manufacturing of required equipment to production of ready-to-use end products. Special attention should be paid to creating deep-conversion value chains that yield end products with high added value, and establishing close links between petrochemical facilities and consumers, both within such clusters and at their "exit points". This needs to be done, primarily in industrial clusters, to achieve economies of scale, facilitate comprehensive utilisation of hydrocarbon materials, pipelines, and infrastructure facilities, and create technoparks and technopolises for the implementation of relatively small high-tech and innovative production projects. Global clustering success stories include petrochemical clusters at Jurong Lake (*Singapore*), in the cities of Al Jubail and Yanbu (*Saudi Arabia*), and at the Texas Petrochemical Cluster (*USA*).
2. **Innovative and low-tonnage petrochemical production** is likely to be the most promising growth area in the Eurasian region. The segment is facing very tough import substitution challenges. Accordingly, there is a significant market potential for expanding domestic production. It also concentrates the bulk of added value in the process chain. For that reason, the share of low-tonnage facilities in total chemical production is 40% in developed countries, and only 15% in developing countries. The segment accounts for 70% of total end-product value in the petrochemical industry. Low-tonnage petrochemistry is the cornerstone of knowledge-intensive, waste-free production, and it may become one of the pillars of transition to a new technological paradigm. Importantly, the cost of potential projects is much lower than capital-intensive, large-scale projects. Notably, it is low-tonnage chemical production that is the key driver of large-tonnage chemical production.
3. Subject to the environmental aspects of evolution of the petrochemical industry in the Eurasian region, it is **advisable to take into consideration global circular production and rational consumption trends**, primarily in connection with the deployment of circular

economy mechanisms. To do that, it is necessary to support recycling of by-products of oil and gas extraction (especially plastics); use polymer waste in chemical recycling processes; minimise release of plastic particles into the environment; procure and deploy the best available petrochemical technologies which minimise emissions and streamline the use of natural resources. Recycling can be rather profitable in terms of utilisation of resources. It requires merely 10% of the energy consumed during primary polymer production, but yields a product with almost identical physical properties and quality parameters.

4. It is necessary to **come up with transport and logistical solutions to enable effective delivery of polymer products to the emerging markets** in the Middle East and the Asia-Pacific region. The countries of the Eurasian region can easily increase domestic and export freight traffic of polymer products using the **Eurasian transport corridors**. Development of alternative logistical corridors and export routes should reduce the adverse impact of the existing constraints on freight traffic. In the new geopolitical reality, the new transport channel — the International North–South Transport Corridor (INSTC) — has become particularly significant. Its development will open new routes for business co-operation with India, Iran, Pakistan, and the countries of the Middle East. The Northern Sea Route, a potentially stable logistical option, also warrants attention due to the importance of maritime routes to Southeast Asia.
5. **Using the international status of multilateral development banks (MDBs) to attract investment capital to the industry.** To carry out the steps listed above, it will be necessary to secure long-term investments from a consortium of oil, gas, and petrochemical companies, states, and diverse financial institutions. Over the last ten years, the MDBs have invested about \$7.5 billion in the petrochemical industry. Those financial institutions offer the same financial instruments as bilateral development banks in developing countries. However, the MDBs are less prone to the influence of national political or industrial stakeholders. They can structure financing programmes, enrol private capitalists in loan syndications, attract investment resources from other MDBs and commercial banks, issue bonds, acquire equity stakes, etc. MDBs can also offer umbrella programmes for international investment partners, use their access to international financial markets, and facilitate development of the petrochemical industry by employing a broad range of financial instruments (*including trade finance support, funded participation, and soft export loans*).