The strategic importance of chloralkali and sustainable aviation fuel for the EU & Saudi Arabia

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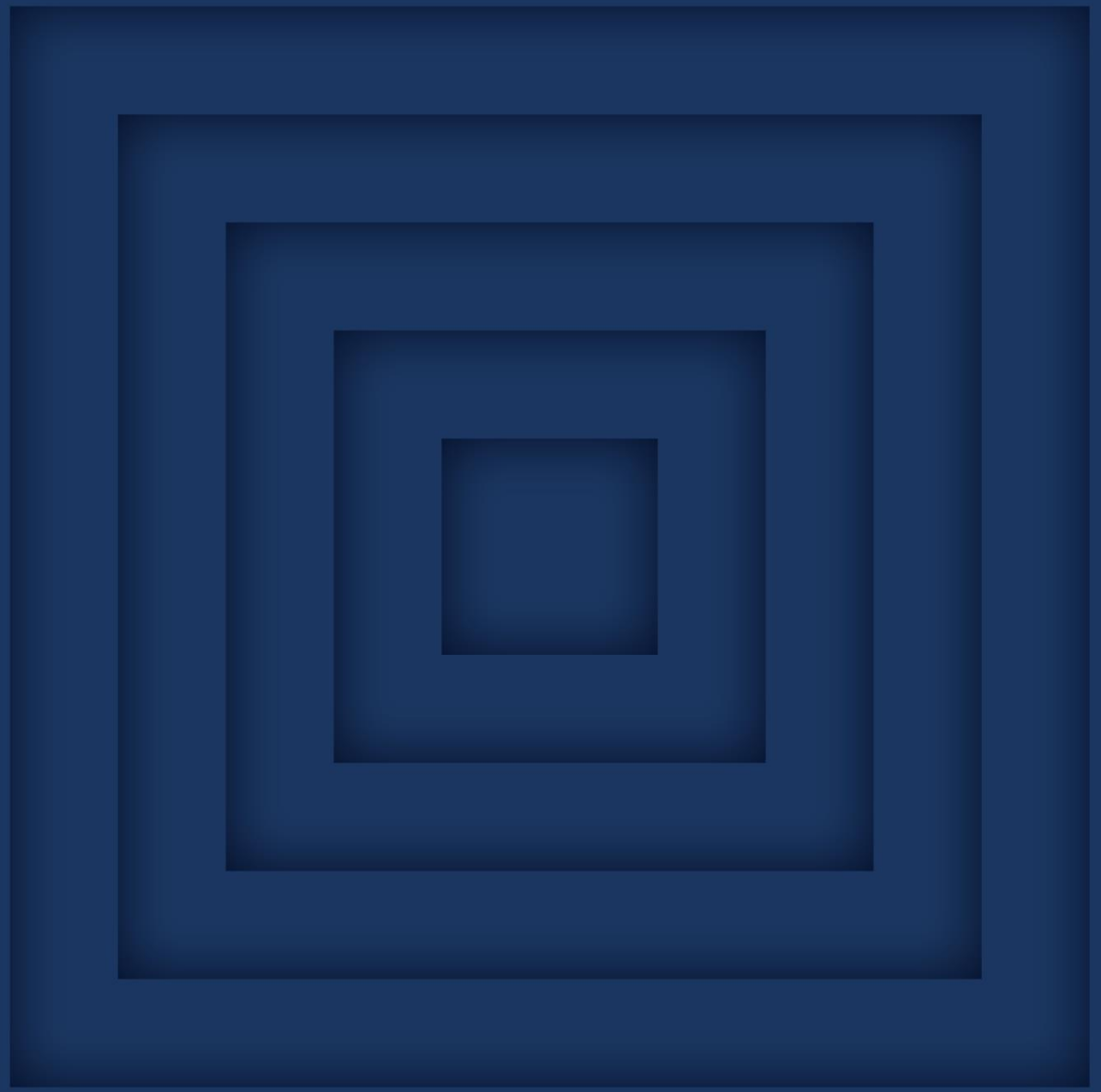
Background of this slide deck

- This slide deck is part of the broader project '**The long-term competitive position of energy intensive industries'** conducted in February 2025 by Roland Berger, TNO and HCSS.

- **The project assesses and compares the competitive position and strategic importance of two energy intensive industries** – chloralkali and sustainable aviation fuels – **in two regions** – North-Western Europe (NWE, represented by the port and industrial cluster in Rotterdam) and the Middle East (represented by the port and industrial cluster in Yanbu).

- The project consists of two parts:
  - **The technical-economic perspective**, assessing the competitive position of the industries in the two regions (this is **not** part of this slide deck)
  - **The strategic perspective**, assessing the strategic importance of the two industries for the two regions and the interventions that the two governments are undertaking to support domestic industry (this **is** part of this slide deck)

Summary



A geopolitical shift with massive consequences for the global order

The US-based liberal order is undergoing profound changes due to the rise of China as a major player with different political economic principles than the 'West'. This has notable implications for the behaviour of governments and their involvement in the market.

- **Geopolitical bloc forming and selective multilateralism:** Countries are increasingly split into blocs and alliances based on similar geopolitical, ideological and economic principles. A key common goal of BRICS and 'non-aligned' states in Latin America, Africa or the Middle East is the contestation of the Western-led world.
- **Economic statecraft:** Countries are increasingly using “economic tools to influence the behaviour of foreign actors” (Baldwin, 2020), like trade barriers and investment restrictions. Economic statecraft has been used before (e.g., during the First and Second World Wars), but has re-surged over the last decade. This makes private companies vulnerable to geopolitical tensions.
- **High-tech competition:** Countries are actively trying to develop their relative advantage in high-tech sectors and prevent intelligence-gathering and espionage by placing trade restrictions on advanced technology exports.
- **Security tensions:** Power politics has led to an expansion in hybrid threats to (among others) critical infrastructure and strategic industries but has also increased the risk of conflict escalation involving the EU and NATO.

The geopolitical shift and resulting tensions are leading to a more offensive approach to asymmetric dependencies. Governments use dependencies in sectors of vital and strategic importance, like energy, high-tech and healthcare, to apply pressure and coerce others into changing their behaviours and/or their policies. In turn, this is creating a shift toward reduced dependencies in strategic sectors and an increased investment in domestic resilience and self-sufficiency.

The European Union's & Saudi Arabia's responses to the geopolitical shift & industrial strategies

The European Union (EU)

- **The EU strives for reduced dependency on foreign actors**, a competitive decarbonized economy, and stronger technological and defence capabilities. Yet the EU has been **struggling to compete economically** with other regions, including East Asia, the Middle East and the United States. With a weaker domestic industry, the EU will become more import dependent and will be **unable to achieve strategic autonomy**.
- Several new EU **policies are being introduced to support industry,** including the Green Deal Industrial Plan, Clean Industrial Deal and the Carbon Border Adjustment Mechanism, generally targeted towards regulatory reform rather than direct financial support. **Member states are allocating limited funds**, though concrete financial incentives **differ in size** across Germany, Belgium and the Netherlands.

Saudi Arabia

- Saudi Arabia strives to be an **independent and non-aligned middle power**, maintaining flexibility to cooperate with countries on an issue-basis rather than in a formalized institutional set-up. The **Vision 2030** strategy drives Saudi policy on domestic development. The Saudi government is moving towards a **competitive diversified economy and an increase in the quality of life of its residents.**
- Saudi Arabia is focused on **domestic economic development through localization** by offering generous incentives to businesses that aim to localize within its borders. At the same time, **most incentives come with stipulations for businesses** such as tech transfers, local hiring requirements and joint venture obligations for foreign companies.

The strategic importance of **chloralkali** for the EU and Saudi Arabia

	Strategic uses of chloralkali	Contribution to EU ambitions	Contribution to Saudi ambitions
Geopolitical importance: Contribution to strategic autonomy	**Outputs:** ○ Chlorine: Medicine, sanitation, defence (solid rocket propellants, missile fuels) ○ Caustic soda: Clean tech **End-products:** ○ PVC: A light-weight and durable plastic used in making medical devices, wind turbine blades, cables, and insulation for military applications ○ Epoxy: Due to its strength and lightness, epoxy is used in the guidance section of missiles, while composites are used in airframes and on-board electronics of fighter jets; Epoxy resins and fibers are also used in wind turbine manufacturing ○ Polyurethanes: Often used in defence apparel and other military applications **Technology:** ○ The chloralkali industry is researching salt batteries, a less geopolitically sensitive alternative to lithium-ion	**The EU aims to become more strategically autonomous in critical sectors that use chloralkali.** Outputs, end-products and technologies of the chloralkali industry are necessary for clean tech, defence, healthcare and clean water. These sectors are on the Critical Entities Resilience Directive list as they are of vital importance to the Union. The EU has strategies in place to reduce import dependencies and become more self-sufficient in all these sectors, which makes a domestic chloralkali industry a key part of achieving geopolitical ambitions.	**Saudi Arabia is investing in its position as a non-aligned middle power, which is served by reducing dependencies in vital sectors like defence and healthcare, which partly depend on chloralkali.** Being resilient to economic coercion by other states requires the Saudi government to not only diversify its economy but also ensure self-sufficiency in strategic sectors. Saudi Arabia is expanding its chloralkali sector, but it is still (partly) reliant on European capabilities (Thyssenkrupp) for this.
Economic importance: Contribution to the competitiveness of downstream industries	**Outputs:** ○ Caustic soda: Electric vehicle batteries, aluminium components, book pages, detergent ○ Chlorine chemistry: Car manufacturing (antifreeze, brake fluid, sealants), glass, cement **End-products:** ○ PVC: Construction (flooring, roofing, window frames, cable wiring, pipes) ○ Polyurethane: Construction (thermal insulation) **Technology:** ○ The chloralkali industry is a large investor in research and development and technological innovation	**The von der Leyen II Commission has set a key priority to increase EU competitiveness, which depends on the continued operation of base industries like chloralkali and the downstream sectors that depend on them.** The automotive and construction sectors are struggling to maintain competitiveness due to a variety of reasons, but having secure supplies of basic inputs could be an additional hurdle for them to overcome. Moreover, the chloralkali industry is relatively patent-intense on Climate Change Mitigation Technologies, contributing to an innovative ecosystem.	**To successfully reduce its economic dependence on revenues from fossil fuels, Saudi Arabia is diversifying its economy, and a chloralkali industry could be the basis for several downstream sectors.** 'A Thriving Economy' is one of the three goals of Saudi's Vision 2030, and that includes the localisation of promising manufacturing industries and non-fossil fuels sectors. Several chloralkali plants are already under expansion, notably SACHLO doubling capacity and BCI.
Societal importance: Contribution to a resilient society	**Outputs:** ○ Chlorine is essential for public health and sanitation **End-products:** ○ Chloralkali end-products contribute to a wide range of products used on a daily basis, like cosmetics, apparel, cleaning products, etc **Technology**: ○ The employees of chloralkali industries possess significant know-how and specialized expertise, especially in areas where production plants have been present for a long time. This social capital can be an asset for the future of clean competitive industries, including in hydrogen storage, water electrolysis, as well as electrochemistry ○ Expertise on electrolysis and chloride can be used in the sustainable conversion of lithium chloride into lithium hydroxide	**In producing a wide range of essential and non-essential goods, the chloralkali industry can be an asset not only in the provision of daily consumer goods but also in decarbonisation.** Know-how based on a long-term legacy of this industry is a societal capability. A loss of industry means a loss of (future) capabilities for industrial decarbonisation.	**Saudi Arabia is investing in revitalizing its social systems to improve wellbeing, notably healthcare, which is strongly dependent on inputs from the chloralkali industry.** Vision 2030 includes strategic objectives around increasing the value and ease of access to healthcare services. As 85% of pharmaceutical drugs are dependent on chlorine, the chloralkali industry could be a strategic asset.

The strategic importance of **sustainable aviation fuels (SAF)** for the EU and Saudi Arabia

	Strategic uses of SAF	Contribution to EU ambitions	Contribution to Saudi ambitions
Geopolitical importance: Contribution to strategic autonomy	**Outputs** ○ Synthetic fuel (Syncrude) **End-products** ○ Sustainable aviation fuel (SAF, focus of this study) ○ Others: renewable diesel, naphtha, gasoline, renewable wax **Technology** ○ Municipal solid waste through gasification, Fischer-Tropsch synthesis and hydro-cracking to produce 3rd generation bio-based SAF ○ Green hydrogen and CO2 through gasification, Fischer-Tropsch synthesis and hydro-cracking to produce Power-to-Liquid e-SAF	**Building a strong domestic SAF industry is essential for the security of energy supply of the aviation sector, as the EU is has decided to reduce reliance on foreign actors for energy imports since the invasion of Ukraine**. The REPower EU Plan was introduced in 2022 to mandate the need for energy security in response to geopolitical tensions. The EU has the resources to become strategically autonomous in aviation fuel production while staying committed to its climate targets. The targets for blending SAF into conventional jet fuel are progressively growing as a result of EU climate regulations. This brings an opportunity for the EU to become more self-sufficient in its energy supply, replacing the imports of fossil-based jet fuel with domestically produced SAF.	**As Saudi Arabia is moving away from fossil fuels both due to global climate goals and need for economic diversification, it needs to develop SAF as an alternative to remain self-sufficient.** Strengthening the prosperity of its economy and diversifying are key goals of the Vision 2030 strategy. As one of the largest fossil fuel producers in the world, the Saudi government will want to preserve the same level of flexibility and security of supply in a decarbonized world as well. Domestic SAF production is essential for that.
Economic importance: Contribution to the competitiveness of downstream industries		**A domestic SAF industry can contribute to the aviation sector's future competitiveness by ensuring wide availability of SAF and reducing transportation costs and the greenhouse gas emissions associated with shipping it from outside of Europe.** The ReFuel EU Aviation regulation mandates the aviation sector to progressively increase its blend of SAF into jet fuel. As of 2024, only 2% of aviation fuel within the EU is sustainable (SAF). The Refuel EU sets out an ambitious goal of increasing the share of SAF to 70% of fuel used for aviation by 2050. The EU Aviation Safety Agency (EASA) has projected the Fischer-Tropsch process as well as Power-to-Liquid fuel to take a 93% stake in global production by 2040. Establishing a domestic SAF industry is economically viable in Europe considering the wide availability of carbon feedstock like municipal solid waste, about 15 times more than that of Saudi Arabia on an annual basis.	**Saudi Arabia is aiming to become a major SAF producer moving forward to support its aviation industry and promote itself as a global hub.** The country's current focus is on hydroprocessed fuels (HEFA) and alcohol-to-jet methods of producing SAF rather than Fischer-Tropsch due to its relatively low amounts of municipal solid waste. Still, multiple partnerships are being set up between the Royal commisions of Jubail and Yanbu for the creation of SAF facilities in Saudi Arabia. A recent example is the partnership between Aramco and Total Energies.
Societal importance: Contribution to a resilient society		**A local SAF industry contributes to achieving a circular economy and society as Fischer-Tropsch using waste is an inherently circular process.** Waste management and recycling are key priorities of European governments under the Waste Framework Directive (2008) and the Circular Economy Action Plan (2020). The targets for recycling municipal waste are progressively increasing from 55% in 2025 to 65% in 2035. The Fischer-Tropsch synthesis would not only support industrial decarbonization by producing sustainable fuels but also circularity.	**Saudi Arabia's goals to improve the wellbeing of its society by decreasing soil, air and water pollution could be supported by the production of synthetic fuels and a circular economy.** Saudi Arabia has one of the largest chemical industries in the world, which could benefit from replacing conventional fuels with synthetic ones like naphtha. At the same time, recycling waste (even if the quantities are much lower than in Europe) would reduce pollution

Conclusions

1. **The US-based liberal world order is under severe pressure.** Geopolitics is dominated by new alliances that challenge the 'Western bloc' as well as growing tensions between the US and partners, especially in Europe. Economic coercion is increasingly used as a part of foreign policy, high-tech competition is in full swing, and there is a heightened security risk for (critical) infrastructure and strategic industries.

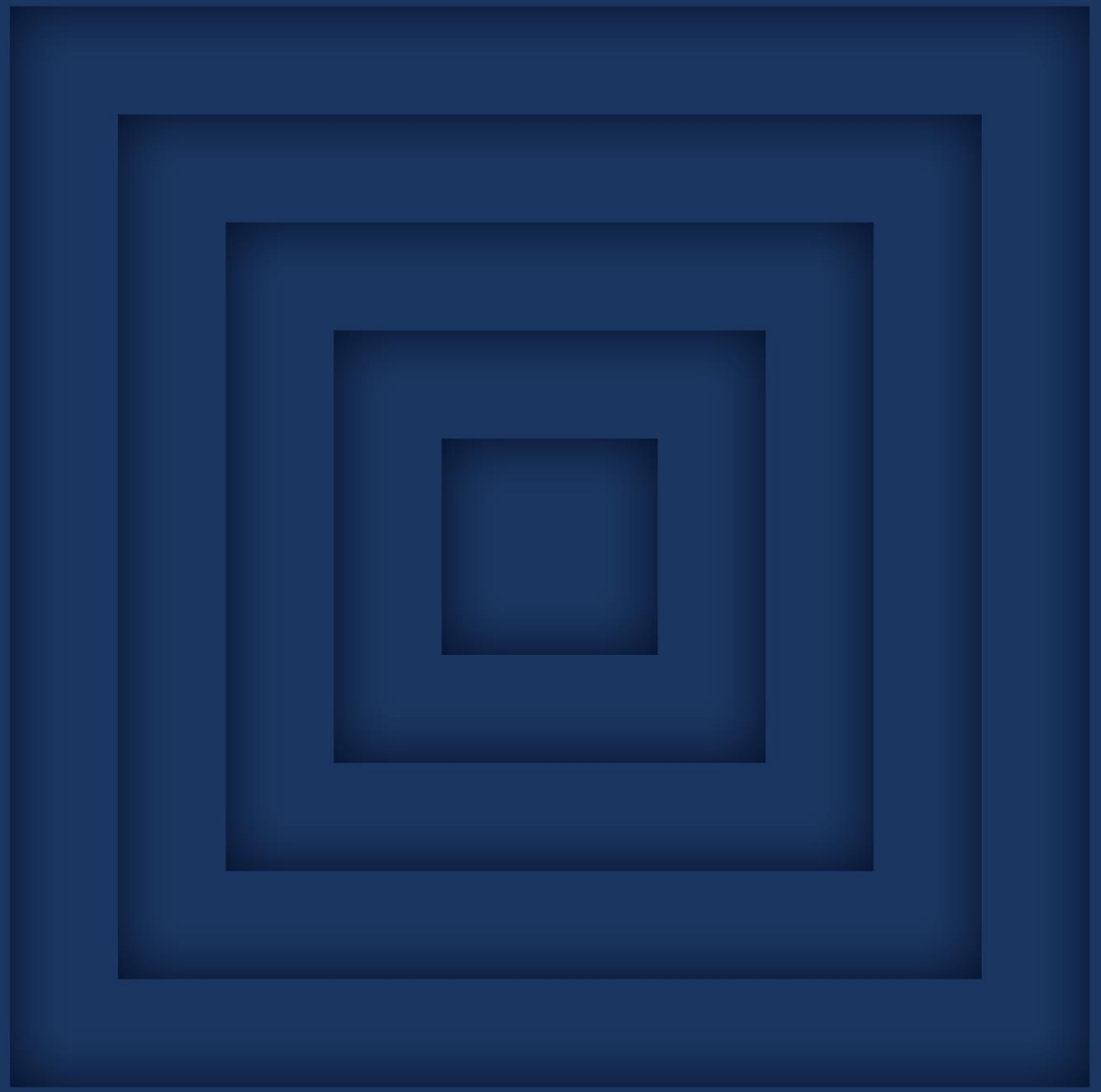
2. **In this complex world, both the NWE/EU and Saudi Arabia aim to become more strategically autonomous.** They seek economic prosperity and globally competitive industries and pursue societal wellbeing.

3. **Strong domestic chloralkali and SAF industries are strategically important for these ambitions.**
   - **Geopolitically**, chloralkali provides essential inputs for a wide range of industries, including defence, healthcare, and clean tech. Domestic SAF production is central to ensure energy security for the emerging low-carbon aviation sector.
   - **Economically**, chloralkali is part of a highly integrated and efficient industrial cluster, while SAF is promising as an emerging clean industry and necessary to achieve net zero aviation goals.
   - **Societally,** chloralkali companies hold valuable industrial know-how and are patent-intensive in innovative climate technologies. The production of SAF could stimulate the circular economy by reusing waste streams and capturing carbon.

4. **A decrease in the domestic capacity for chloralkali and a failure to support the emerging SAF industry will create import dependencies that are geopolitically and economically problematic and that can have negative effects on societal resilience.** European companies and governments should consider their geopolitical business case, in addition to their economic business case. Local production of chloralkali and SAF serves strategic sectors (defence, energy transition, healthcare etc.) and makes the EU more resilient to coercive action by global players. It contributes to societal resilience through security of supply and affordability in vital sectors.

5. **The decision to locate a European company in a different region should not just be based on techno-economic considerations, but also on geopolitical due diligence.** Geopolitical tensions between the EU and other countries may negatively affect European companies active in those areas. More and more governments are influencing (foreign) companies to achieve their foreign policy goals through e.g., hostile takeovers, trade restrictions or new licensing requirements, which can be avoided through geopolitical due diligence. This is especially the case in vital sectors like energy, healthcare or defence.

Structure



Structure

1. **The geopolitical and geo-economic landscape**

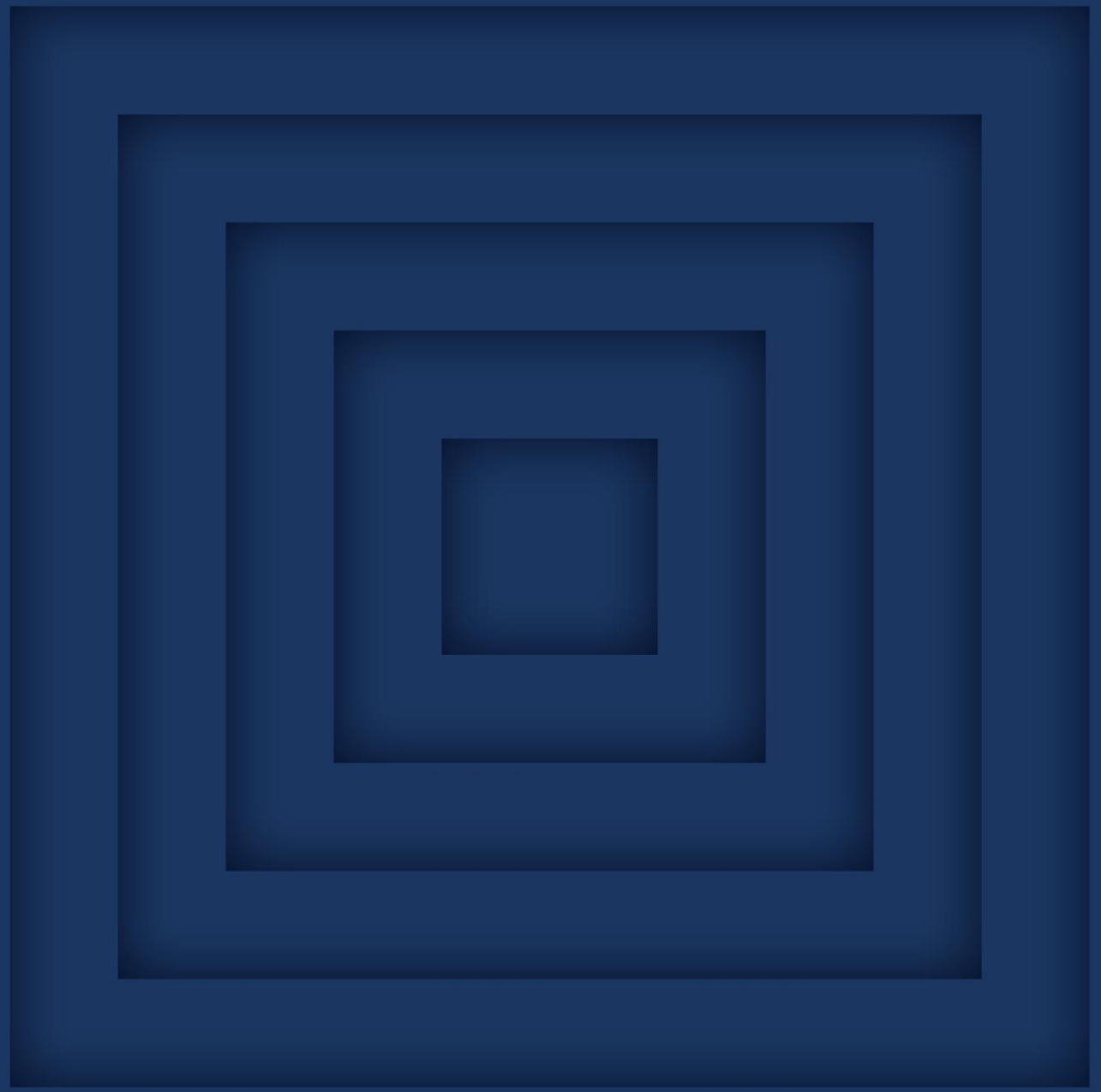
2. **The EU's and Saudi Arabia's responses to the geopolitical shift**
    1. EU response & interventions: strategic autonomy and net-zero secure energy system
    2. Saudi response & interventions: self-interested and industrial hub

3. **Chloralkali**
    1. Strategic uses and contribution to EU and Saudi goals
    2. Deep-dive into geopolitical, economic and societal importance

4. **Sustainable Aviation Fuels (SAF)**
    1. Strategic uses and contribution to EU and Saudi goals
    2. Deep-dive into geopolitical, economic and societal importance

5. **Conclusion**

1. The geopolitical and geo-economic landscape



The changing global order

The liberal market-based order is undergoing profound changes due to the rise of China as a major player with different political economic principles

- Geopolitical change in the form of power transition occurs when the hegemonic power is challenged by an emerging great power. **Periods of power transition lead to instability due to various reasons:** erosion of international order; contenders' demand new roles while leading powers try to protect their position; increased interstate competition, including military, and higher risk of escalation of conflict.
- **China's rise** as a global manufacturing and technological powerhouse in the last 15 years **has challenged the geopolitical order** that emerged after the Cold War, led by the United States. The geopolitical change is causing **notable competition for political, economic and technological dominance** between China and the US, both of which aiming to shift the balance in their favour.
- An international order that is led by China will function based on **profoundly different political economic principles** from those that dominated since the Cold War. China is an autocratic state-capitalist system in which the government and the market are closely interlinked. This heavy centralisation of decision-making power impacts their behaviour in global affairs:
  - There are laws and measures in place ensuring compliance of company activity with Chinese national interests on the long term and making sure that the companies will obey national orders if need be.
  - Not every economic action is necessarily a part of Chinese political goals and the degree of control between the central government and the companies varies. However, at times, the economic business case may be sacrificed at the expense of the broader national interest and strategy.
- The **Trump II Administration** is bringing additional uncertainty for the future of global politics and causing fragmentation in the 'Western' bloc.

Political effects of the geopolitical shift

The multilateral rules-based order is becoming more fragmented, with emerging coalitions and a growing number of countries that seek a new geopolitical order

- **Countries are increasingly split into blocs** based on similar geopolitical, ideological and economic principles, in order to **protect their interests or exert influence together.**
- **The Western bloc** consists of initiatives like NATO, the EU and G7. It is unclear how the second Trump Administration will impact the cohesion of this bloc.
- **Other alliances are emerging with the common goal of reducing the role of Western countries in the world order.** For instance, China has been getting closer to the countries in the Belt and Road Initiative. Another example is BRICS and its recent initiatives to expand into 'Friends of BRICS' (incl. Iran, Saudi Arabia, the United Arab Emirates, Cuba, Democratic Republic of Congo, Comoros, Gabon, and Kazakhstan, Egypt, Argentina, Bangladesh, Guinea-Bissau and Indonesia).
- The growing formation of blocs and alliances is **weakening the effectiveness of multilateral institutions** like the UN Security Council, World Trade Organisation, G20. Parallel institutions are being established that mirror and aim to provide an alternative to the historically Western-led ones.
- Still, apart from the Western bloc, **alliances are rarely formalized and they remain vulnerable to internal tensions given that their interests do not fully align.** The challengers to the liberal world order have so far been unable to organize themselves as cohesive blocs based on a clear ideology and shared interests.
- **Most countries remain 'non-aligned' and work together on a case-by-case basis (selective multilateralism)**, depending on their own self-interests. India is slowly emerging as the leader of the non-aligned world ('Global South'), which consists of African and Latin American states. The Middle East is also largely non-aligned.

Economic effects of the geopolitical shift

Governments are using economic tools to change the behaviour of foreign actors, making private companies vulnerable to geopolitical tensions

- **Countries are increasingly using "economic tools to influence the behaviour of foreign actors"** (Baldwin, 2020), like trade barriers and investment restrictions . Economic statecraft has been used before (e.g., during the First and Second World Wars), but has resurged over the last decade. The unprecedented interconnectedness of supply chains resulting from hyper-globalisation makes economic statecraft a popular tool today.
- **Economic statecraft is especially employed when countries possess an asymmetric advantage relative to their 'opponents'.** The main sectors where this has played out so far are critical raw materials, clean technologies and advanced digital technologies. Apart from bilateral dynamics, economic statecraft can lead to escalation through tit-for-tat spirals with negative consequences for the parties involved the global economy.
  - **China possesses an expansive economic statecraft toolkit**. Beijing has not shied away from employing these tools against countries that they perceive as threatening to the achievement of Chinese foreign policy objectives (e.g., against Korea, Japan, Australia, the US, EU)
  - **The US has also repeatedly imposed extra-territorial economic sanctions** to reach its foreign policy objectives, (e.g., in relation to the Iran Nuclear Deal and Nord Stream 2)
- **This is increasing the level of government intervention in the market, which can negatively affect private companies.** Apart from economic considerations, companies have to increasingly consider the relationship between their 'home' country (where headquarters are established) and the country where their operations are located.

Technological effects of the geopolitical shift

The global competition for technology dominance has resulted in more trade restrictions as well as clandestine activities such as espionage

- The technological competition is largely focused on **the '4th Industrial Revolution'**, which consists of the emergence of artificial intelligence (AI), 5/6G technologies, quantum computing. Countries are more active developing their relative advantage while also trying to prevent intelligence-gathering and espionage by placing trade restrictions on advanced technology exports.
- Globally active Chinese companies may be involved in **industrial espionage** given that technological leadership in digital, energy and military sectors is one of the key priorities of the Chinese government. China's National Security Law obliges companies to cooperate with the state intelligence services. Mergers and acquisitions as well as procurement and tender processes can be used as methods for espionage. This is not just a risk for the competitiveness of companies, but also for the national security interests.
- **The trade conflict** between the US and China since 2022 in which the Netherlands and Japan have also played a role is fuelled by concerns of **technological leakage of chips and chip-making technology.**
- Policies like the US Chips and Science Act or the EU's Chips Act aim to **incentivise** the development of **the domestic semiconductor sector** at the expense of other countries.

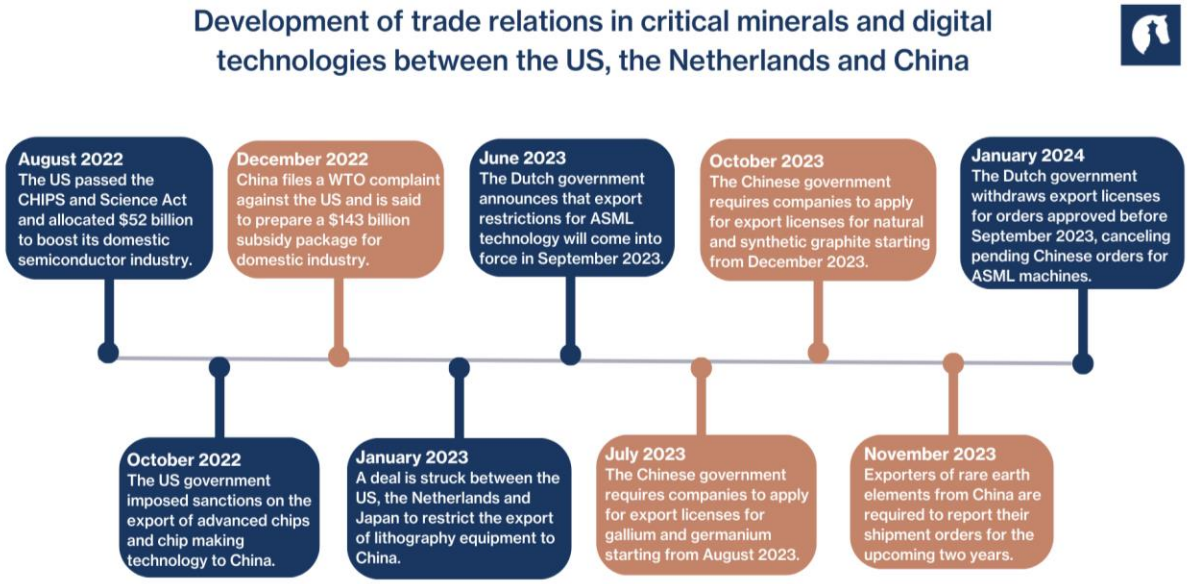


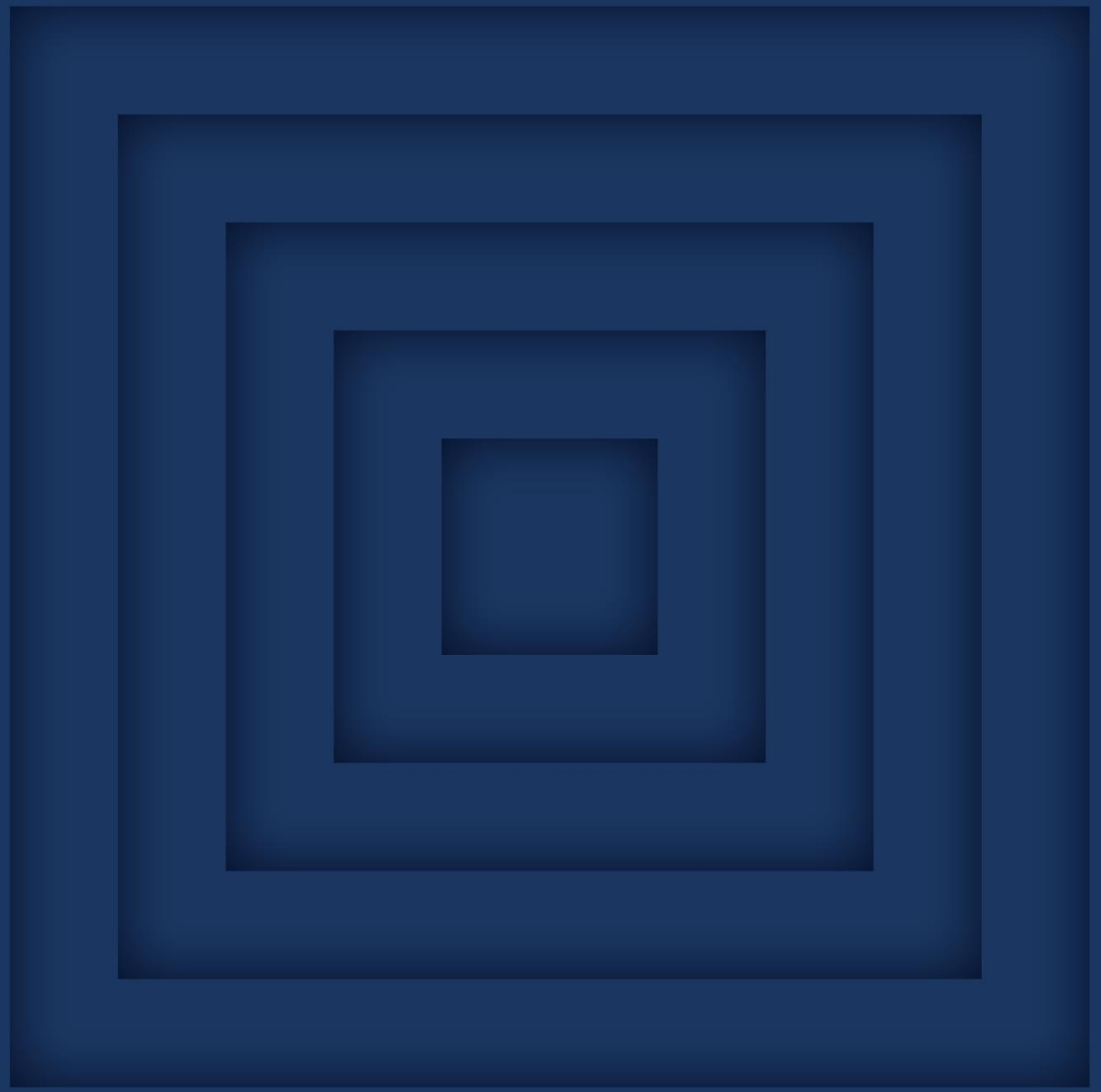
Figure from HCSS, 2024

Security effects of the geopolitical shift

Hybrid operations such as sabotage and cyberattacks are increasing in intensity, in addition to an increasing risk of military conflict in Europe and beyond

- **Power politics** has led to an expansion of hybrid threats to (among others) critical infrastructure and strategic industries, but also the risk of conflict escalation.
- There is an increase in escalation under the threshold of military conflict. **Hybrid activities** affect critical infrastructure in different regions, including **sabotage of submarine communication and internet cables and offshore (energy) infrastructure** and **cyberattacks** on hospitals, banking systems and large-scale companies.
- The mounting tensions in the South and East China Sea as well as the Russian war in Ukraine are increasing the **risk of military conflict** between NATO and China, Russia and their allies. This is also increasing the risk of escalation to nuclear warfare.
- Globally, the more the West weakens in relative terms at the expense of China and Russia, other autocracies will also become more assertive, further empowering them to rely on military means to reach their goals.

2. The EU's and Saudi Arabia's responses to the geopolitical shift



The EU's response to the geopolitical shift

The EU strives for reduced dependency on foreign actors, a competitive decarbonized economy, and stronger technological and defence capabilities

- **Politically**, the EU is pursuing **open strategic autonomy** across different sectors to reduce dependencies on foreign actors and increase its freedom of action in foreign policy. The new European Commission 2024-2029 aims to establish a renewed Common Foreign and Security Policy that takes into account the changing geopolitical landscape.
- **Economically**, the EU is **'de-risking' and increasing economic security** to reduce vulnerability to other states' involvement in areas of vital importance to the European economy and society like health, clean tech, defence, raw materials and dual-use technologies such as quantum, AI and biotechnology.
    - This also includes a significant push towards a **net-zero competitive energy system** to achieve climate goals and increase energy security, preventing a similar situation to the 2020-2022 energy price crisis.
- **Technologically,** the EU is aiming to **bolster its own capabilities in the high-tech industry**, by investing in artificial intelligence (AI), quantum technologies and semiconductor sector, as well as to **protect domestic players** by regulating digital markets and services.
- **Militarily**, the EU & European NATO members have **increased defence spending** in order to renew readiness for a potential conflict by upgrading and/or procuring equipment and technologies as well as investing in human capital.

Industrial competitiveness: Challenges & opportunities in the EU

The EU is struggling to compete economically with other regions, but a decarbonized competitive economy would allow it to achieve its strategic autonomy goals

Industrial actors, especially energy intensive industries (EII), across the EU have been ringing alarm bells for a long time that the global uneven playing field is making it challenging to remain competitive, naming issues like high energy prices, slow licensing processes, over-regulation and net congestion. **With a weaker domestic industry, the EU becomes more import dependent and cannot achieve strategic autonomy goals.**

- **Uneven playing field with East Asia**: Over the last two decades, industries in East Asia have brought significant competition for European industry through governmental subsidies (financial, input, energy), less stringent environmental regulation, lower wages, less stringent labour laws.
- **Uneven playing field with the Middle East:** Given that energy prices are the main factor affecting European EII competitiveness, the wide availability of fossil fuels at low prices in Middle Eastern countries (Saudi Arabia, United Arab Emirates, etc) makes energy-intensive processes much more affordable in the region compared to the EU.
- **Uneven playing field with the US**: The US has set aside significant budgets to support its domestic manufacturing industries and the decarbonization of its economy. The series of policies since 2020 including the Bipartisan Infrastructure Act and the Inflation Reduction Act (IRA), followed by sector specific policies for critical minerals or green hydrogen, have made the US a more attractive business environment than the EU.

As shown in the technical-economic perspective of this study, a decarbonized energy system could improve the competitiveness of EIIs like chloralkali and sustainable fuels in the EU.

In addition, there are opportunities especially in North-Western Europe for companies to maintain and/or establish operations. This depends for each industry, but general characteristics include a favourable and well-connected geographical area that allows it to be an integral part of global supply chains, as well as an integrated industrial cluster that shares resources like heat and infrastructure, increasing productivity and effectiveness.

Interventions taken in EU/NWE to support energy intensive industries

In the EU and NWE, several new legislative pieces are being introduced to support industry

The EU focuses on providing a broad framework for relaxed state-aid rules and funding for members

- Competitiveness Compass
  - Clean Industrial Deal (a competitiveness-driven approach to decarbonization & mobilization of funding)
  - Affordable Energy Action Plan (lowering energy prices)
  - Industrial Decarbonisation Accelerator Act (speeding up permitting)
  - State Aid Framework (building on previous Temporary Crisis and Transition Framework)
  - Bespoke solutions for steel, metals and chemicals
  - Focus on reduced import dependencies and security
- Carbon Border Adjustment Mechanism: CO2-import tax to protect domestic industries against 'dirty' (chemical) imports
- European Investment Bank's venture capital for sustainable investments (500 million euro)

Belgium is increasing state aid, mainly on transmission costs

- Discount on electricity transmission costs for large energy users
- Scheme to support energy-intensive industries (150 million)

Germany spends large amounts in state aid for EIIs

- Discount on electricity transmission costs (€5.5 billion in 2024)
- €2.2 billion German scheme to support investments in the decarbonisation of industrial production processes (with renewable targets)
- €4 billion German State aid scheme for decarbonization
- Financial grant of up to €310 million for BASF under German climate protection contract scheme

The Netherlands has been abolishing several discounts/rebates, with partial reinstation in 2024

- Discount on transmission costs abolished in 2024
- Tax rebate for energy-intensive companies was abolished in 2023
- Scrapping (2023) and reinstating (2024) of the indirect cost compensation for ETS sectors
- A new plastic tax could come into force in 2028 with the goal of promoting circular plastics but with potential negative impacts for existing EIIs
- EUR 750 million Dutch financial grant scheme to support investments in the decarbonisation of industrial production processes (with decarbonization targets)

Saudi Arabia's response to the geopolitical shift

Saudi Arabia strives to be a non-aligned middle power, moving towards a diversified economy and supporting its companies to be globally competitive

Saudi Arabia: A non-aligned middle power in a changing world

- Saudi Arabia is positioning itself as an independent, non-aligned geopolitical player
- The historical defence alignment with the US still exists but has become weaker
- Foreign policy of 'opportunistic actionism', which focuses on temporary alliances to further national political and economic interests

Economic diversification away from fossil fuels

- The Saudi Arabia economy is still heavily reliant on fossil fuels (62% of government revenues from fossil fuels in 2022)
- The government is trying to move away from fossil-fuel only revenues through diversification into sectors such as tourism, financial services, digital economy and manufacturing

Saudi Arabia Vision 2030: National economic growth with domestic and foreign capital

The Saudi Arabia Vision 2030 centers around the concepts of

- Economic diversification (away from primarily petrochemical)
- Local industry and knowledge buildup (through foreign investment and tech transfer)
- Supporting national industries (developing national champions that can compete globally)

Saudi industrial strategies

Saudi Arabia is focused on localization via tech transfers, local hiring requirements and joint ventures.

Saudi Arabia wants to attract and retain knowledge and technology within its borders

Localization, tech transfer policies

- Policies instated by the Local Content and Government Procurement Authority
- Focus on tech transfers, local content requirements, regular updating of sectoral requirements.

Saudi Arabia mandates a minimum of Saudi employees and prioritizes local production and tech transfers

Saudization: Minimum requirement of Saudi employees in Saudi-based company.

- For large companies (+100 employees) minimum Saudization rate is 30%
- Saudization requirements vary per sector (consulting has a 40% Saudization requirement).

For instance, large chemical operations in Saudi Arabia are joint ventures with a Saudi majority stake

Common practice in (petro)chemical: Saudi-majority owned joint ventures

Sadara	Aramco (65%) / DOW Chemicals (35%)
Petro Rabigh	Aramco (60%) / Sumimoto Chemicals (15%)
SATORP	Aramco (62.5%) / Total (37.5%)

Interventions taken in Saudi Arabia to support industry

Saudi Arabia provides generous incentives to businesses that aim to localize within its border, but these tend to come with requirements for businesses

Saudi Arabia is providing direct incentives as well as fiscal support for foreign companies

<u>"Standard Incentives Program for the Industrial Sector": SAR 10 billion (2.6 billion dollar)</u>

- Focus of Chemicals, Automotive, Machinery
- Coverage of up to 35% of the initial project investment, capped at 50 million SAR

<u>Regional Headquarters policy</u>

Entities that establish regional HQ receive 30-year tax incentive of

- 0% corporate income tax (CIT)
- 0% withholding tax (WHT)

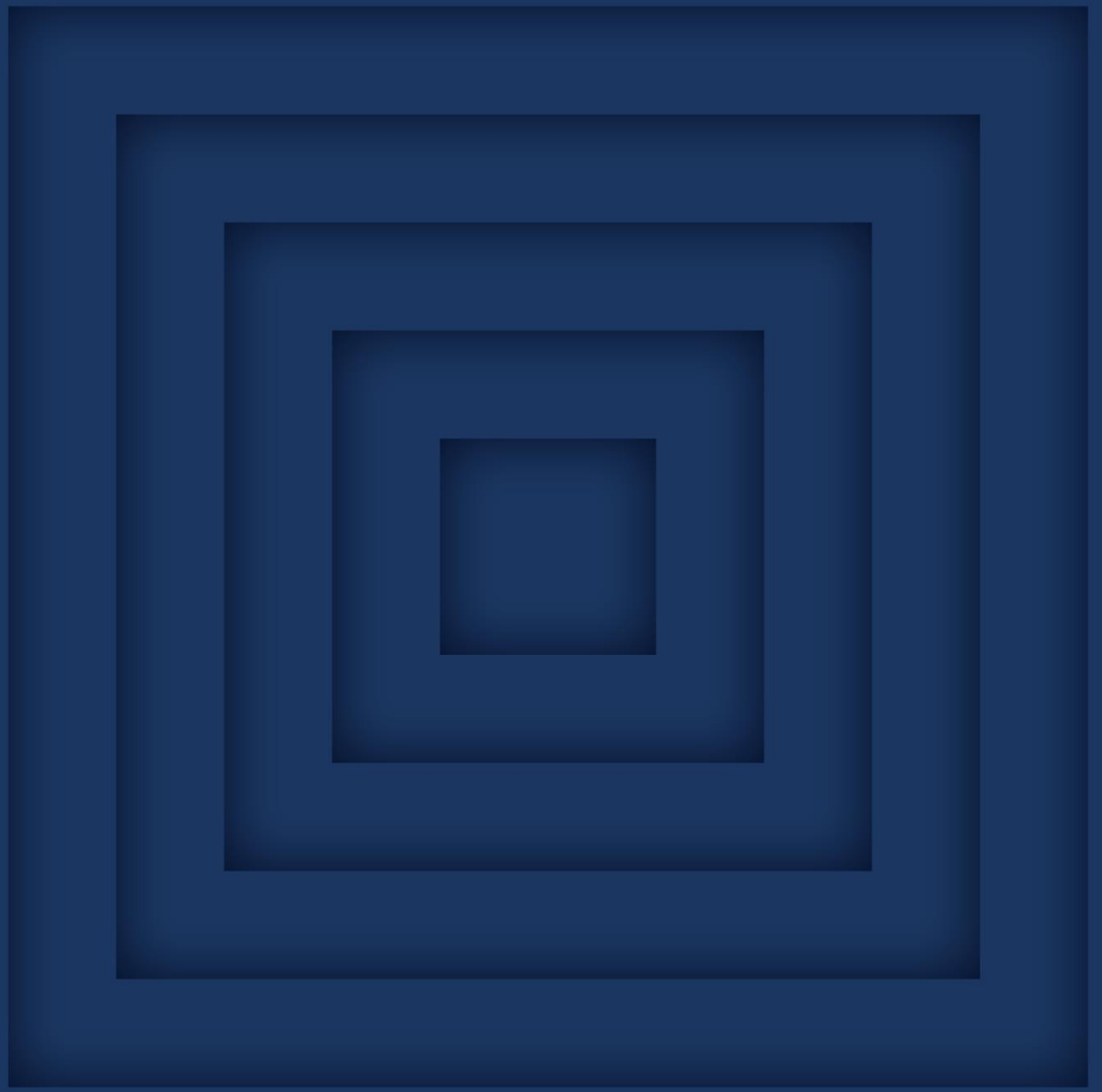
<u>Public Investment Fund</u>

- Sovereign Wealth Fund of Saudi Arabia: takes equity stakes in local and global companies.
- Example: PIF has an equity stake in steel company ArcelorMittal Jubail location as a JV

<u>Special economic zones</u>

- Five Special Economic Zones (SEZ) in Saudi Arabia that offer several incentives such as
  - lower taxes
  - lower regulatory burden

3. Chloralkali



The strategic importance of **chloralkali** for the EU and Saudi Arabia

	Strategic uses of chloralkali	Contribution to EU ambitions	Contribution to Saudi ambitions
Geopolitical importance: Contribution to strategic autonomy	**Outputs:** ○ Chlorine: Medicine, sanitation, defence (solid rocket propellants, missile fuels) ○ Caustic soda: Clean tech **End-products:** ○ PVC: A light-weight and durable plastic used in making medical devices, wind turbine blades, cables, and insulation for military applications ○ Epoxy: Due to its strength and lightness, epoxy is used in the guidance section of missiles, while composites are used in airframes and on-board electronics of fighter jets; Epoxy resins and fibers are also used in wind turbine manufacturing ○ Polyurethanes: Often used in defence apparel and other military applications **Technology:** ○ The chloralkali industry is researching salt batteries, a less geopolitically sensitive alternative to lithium-ion.	**The EU aims to become more strategically autonomous in critical sectors that use chloralkali.** Outputs, end-products and technologies of the chloralkali industry are necessary for clean tech, defence, healthcare and clean water. These sectors are on the Critical Entities Resilience Directive list as they are of vital importance to the Union. The EU has strategies in place to reduce import dependencies and become more self-sufficient in all these sectors, which makes a domestic chloralkali industry a key part of achieving geopolitical ambitions.	**Saudi Arabia is investing in its position as a non-aligned middle power, which is served by reducing dependencies in vital sectors like defence and healthcare, which partly depend on chloralkali.** Being resilient to economic coercion by other states requires the Saudi government to not only diversify its economy but also ensure self-sufficiency in strategic sectors. Saudi Arabia is expanding its chloralkali sector, but it is still (partly) reliant on European capabilities (Thyssenkrupp) for this.
Economic importance: Contribution to the competitiveness of downstream industries	**Outputs:** ○ Caustic soda: Electric vehicle batteries, aluminium components, book pages, detergent ○ Chlorine chemistry: Car manufacturing (antifreeze, brake fluid, sealants), glass, cement **End-products:** ○ PVC: Construction (flooring, roofing, window frames, cable wiring, pipes) ○ Polyurethane: Construction (thermal insulation) **Technology:** ○ The chloralkali industry is a large investor in research and development and technological innovation	**The von der Leyen II Commission has set a key priority to increase EU competitiveness, which depends on the continued operation of base industries like chloralkali and the downstream sectors that depend on them.** The automotive and construction sectors are struggling to maintain competitiveness due to a variety of reasons, but having secure supplies of basic inputs could be an additional hurdle for them to overcome. Moreover, the chloralkali industry is relatively patent-intense on Climate Change Mitigation Technologies, contributing to an innovative ecosystem.	**To successfully reduce its economic dependence on revenues from fossil fuels, Saudi Arabia is diversifying its economy, and a chloralkali industry could be the basis for several downstream sectors.** 'A Thriving Economy' is one of the three goals of Saudi's Vision 2030, and that includes the localisation of promising manufacturing industries and non-fossil fuels sectors. Several chloralkali plants are already under expansion, notably SACHLO doubling capacity and BCI.
Societal importance: Contribution to a resilient society	**Outputs:** ○ Chlorine is essential for public health and sanitation **End-products:** ○ Chloralkali end-products contribute to a wide range of products used on a daily basis, like cosmetics, apparel, cleaning products, etc **Technology**: ○ The employees of chloralkali industries possess significant know-how and specialized expertise, especially in areas where production plants have been present for a long time. This social capital can be an asset for the future of clean competitive industries, including in hydrogen storage, water electrolysis, as well as electrochemistry. ○ Expertise on electrolysis and chloride can be used in the sustainable conversion of lithium chloride into lithium hydroxide.	**In producing a wide range of essential and non-essential goods, the chloralkali industry can be an asset not only in the provision of daily consumer goods but also in decarbonisation.** Know-how based on a long-term legacy of this industry is a societal capability. A loss of industry means a loss of (future) capabilities for industrial decarbonisation.	**Saudi Arabia is investing in revitalizing its social systems to improve wellbeing, notably healthcare, which is strongly dependent on inputs from the chloralkali industry.** Vision 2030 includes strategic objectives around increasing the value and ease of access to healthcare services. As 85% of pharmaceutical drugs are dependent on chlorine, the chloralkali industry could be a strategic asset.

The strategic importance of chloralkali for the EU

As of 2025, most chloralkali outputs and end-products are produced and traded locally. They are essential inputs for a wide range of geopolitically and economically important sectors, like energy and defence on the one hand, and automotives and construction on the other. The shrinkage of the chloralkali industry in the EU would increase import dependencies on foreign actors, making the EU's geopolitical position and economy more vulnerable to coercive action. This would also negatively affect societal resilience by putting security of supply and affordability at risk.

Most of NWE's trade in chloralkali products happens within the region (see table below). This sector's market is strongly concentrated locally, with limited exports to non-European states.

Product	Imports to NWE 2022	Largest suppliers	Exports from NWE 2022	Largest buyers
Chlorine (HS280110)	$16,5 million	Belgium (41,2%), France (19%), Poland (11,6%)	$14,9 million	Netherlands (39,7%), Belgium (15,8%), Germany (8,52%)
Polyurethanes (HS390950)	$860 million	Belgium (17,5%), Germany (14,6%), Italy (11,6%)	$2,8 billion	Italy (10,6%), China (8,95%), USA (7,38%)
PVC (HS3904)	$3,15 billion	France (20,5%), Netherlands (18,5%), Belgium (11,8%)	$5,06 billion	Germany (14%), Italy (10%), France (9,2%)
Caustic soda (HS281512 & HS281511)	$985 million	Germany (32,9%), Belgium (16,2%), Netherlands (13,7%)	$1,85 billion	Netherlands (16,7%), France (12,4%), Sweden (11,2%)
Epoxy resins (HS390730)	$1,01 billion	Switzerland (17%), Germany (13,3%), Czechia (11,3%)	$1,64 billion	Italy (9,08%), UK (8,3%), USA (7,83%)

Globally, the largest **non-European exporters** in chloralkali products are:

- **Caustic soda**: The U.S., China, Japan.
- **PVC**: The U.S., China, and Other Asia.
- **Epoxy**: South Korea, Other Asia, Japan.
- **Polyurethanes**: The U.S., China, and Other Asia.
- ***Chlorine is very difficult to transport.*** *Insignificant numbers flow out of Canada, the U.S., and Colombia.*

Outside of Europe, exporters are concentrated in the U.S. and East Asian countries. Without a local market, NWE countries risk becoming **dependent on imports** from these producers. Especially for a product like chlorine, which is difficult to transport, this creates problems.

Outputs for PVC production (EDC added to chlorine) and polyurethane production (MDI/TDI added to chlorine) are **expensive to ship**, heavily relying the local cluster.

The output used to produce epoxy (epichlorohydrin), used in **defence,** *can be* cheaply shipped, especially from China who has significant production capacity. This would increase Europe's **import dependence on China.**

Chloralkali market developments

In Europe there are problems with the profitability of chloralkali operations, while a recent expansion has been announced in Saudi Arabia

The chloralkali sector in Europa is facing profitability issues

- In 2023 Kem One closed its chloralkali plant in France temporarily due to persistent profitability issues. This reflects a broader trend in which chemical companies in Europe downsize or halt production due to high energy prices and lack of profitability.
- Apart from profitability issues, chloralkali production also depends on high volumes of affordable and quality salt as well. For instance, Arkema's chloralkali cluster in France shut down in 2025 after having lost their main salt supplier and not being able to replace it in the short term.

In Saudi Arabia chloralkali production is expanding

- German company Thyssenkrupp has signed an agreement to expand the existing chloralkali plant in Jubail.

Deep-dive: The geopolitical importance of chloralkali for the EU (1/3)

Sector	Application	EU Ambition	Relevance of chloralkali industry
Energy	**Batteries**	Batteries are essential to support the net-zero electricity system of EU and the increasing electrification of e.g. transport. The European battery sector is currently facing competitiveness and scaling issues despite the various legislative efforts of the EU over the last few years (European Battery Alliance, Battery Regulation 2023, Net Zero Industry Act (NZIA) 2024).	**Technology: Salt batteries** (sodium-ion) are suitable for large-scale storage (grid storage and load levelling). The largest global project involving sodium-ion batteries has been installed in China in 2024. The research is under development. If pursued in NWE, they would reduce dependencies on insecure critical raw materials given that they rely on locally sourced and produced salt. They reduce the use of hazardous materials and their design allows for easy recycling.
	Solar panels	Solar panels are a cornerstone of the European energy transition. According to the NZIA, the EU aims to achieve at least "30 gigawatt of operational PV manufacturing capacity by 2030 across the full PV value chain".	**Output: Chlorine** chemistry is used to purify the silicon found in grains of sand that is used to make solar panel chips.
	Wind turbines	Under RED III (October 2023), the EU aims for 42.5% renewable energy by 2030, requiring 425 GW of wind capacity, while the NZIA (June 2024) sets a non-binding target of 36 GW annual wind turbine production by 2030. The EU needs to install 33 GW annually to meet its target.	**End-product: Epoxy** resins and fibres are used in the manufacturing of wind turbine blades, providing the necessary structural integrity. **End-product: PVC** (foam) is used to make composites for wind turbine blades manufacturing. Moreover, coating the towers of the wind turbines with PVC films makes them last longer.
	Cables/ Wiring	Cables and wiring are essential in the construction, maintenance, and upscaling of the European energy grid, which is the backbone of electrification and of the energy transition.	**End-product: PVC** has electrical insulation properties as well as mechanical durability, and is resistant against water, chemicals, and UV radiation. Thereby, it is used for insulation, sheathing, and outer protection in cable manufacturing, to avoid unintended flows of current. It enhances the durability of cables in all kinds of conditions.

Note: This is not a comprehensive list but serves to illustrate the wide applicability of the chloralkali industry across technologies and sectors.

Deep-dive: The geopolitical importance of chloralkali for the EU (2/3)

Sector	Application	EU Ambition	Relevance of chloralkali industry
Defence	**Aircraft**	European NATO members have increased their defence spending with the goal of improving military readiness but also developing the European defence industry. There are two consortia involving European countries that are developing sixth generation air platforms, TEMPEST and FCAS (Airbus Future Combat Air System). The current 'state-of-the-art' is the fifth-generation American-manufactured jet fighter, but the EU is developing its own technology, which can benefit from domestic epoxy manufacturing.	**End-product: Epoxy** is essential for the high-performance carbon-epoxy used in the airframe of currently used fighter jets (body, wings, tail, nose) as well as the radar in on-board electronics. While in the sixth-generation fighters this may be supplemented by newer advanced materials, carbon epoxy is still likely to be used.
	Missile guidance hardware	Under the first-ever European Defence Industrial Strategy (EDIS), the EU sets a long-term vision to enhance its defence industrial readiness. The EDIS aims for 40% collaborative procurement, 35% intra-EU defence trade, and 50% of defence budgets spent within the EU by 2030 (rising to 60% by 2035). The European Defence Industry Programme (EDIP) will mobilize €1.5 billion (2025-2027) to strengthen the European Defence Technological and Industrial Base (EDTIB), boost production capacity, ensure supply chain security, and enhance cooperation with Ukraine.	**End-product: PVC** is used in the electrical work in missile guidance systems, as well as hardware applications. Chlorinated product are used in rubbers, glass and optics, and coatings in these systems.
	Apparel		**Output: Chlorine chemistry** is used in the production of lightweight and water-resistant garments, bullet-resistant vests and helmets. **End-product: PVC** is used in boot soles, as it is able to endure high stress levels and is a durable material. **End-product: Polyurethane**, often in foam form, are used in a broad range of defence apparel applications (e.g. padding, shoes, rifle recoil buffers, communication devices).
	Bulletproof glass products		**Output: Chlorine chemistry** is used in a wide array of bulletproof glass applications, such as night-vision goggles, fighter jet canopies, bulletproof glass, riot shields, and protective visors,.
	Infrared stealth		**Output: Chlorine chemistry** is used in the production of Kevlar. From this, a lightweight, flexible cloak is created that hides objects from thermal cameras.
	Cables/ Wiring		**End-product: PVC** has electrical insulation properties as well as mechanical durability, and is resistant against water, chemicals, and UV radiation. Thereby, it is used for insulation, sheathing, and outer protection in cable manufacturing, to avoid unintended flows of current. Enhancing cable durability.
	Insulation		**End-product: PVC** is the material of choice for military applications for insulating and fire-resistant applications due to its low flammability.
	Other manufacturing		**Output: Chlorine chemistry** is used to produce fuel cells, rocket propellants, carbon-reinforced polymers, airbags, surveillance cameras, and unmanned aerial vehicles. **End-product: Epoxy & polyurethanes** provide strength and reliability to products from prototypes and production parts to gaskets, wheels, and casings, due to their durability and resistance qualities.

Note: This is not a comprehensive list but serves to illustrate the wide applicability of the chloralkali industry across technologies and sectors.

Deep-dive: Geopolitical importance of chloralkali for the EU (3/3)

Sector	Application	EU Ambition	Relevance of chloralkali industry
Medical	Disinfecting	Under the 2020 Pharmaceutical Strategy for Europe, the European Commission has set the goal to support competitiveness, innovation and sustainability of its pharmaceutical industry, as well as the development of high quality and greener medicines. The Critical Entities List for Enhancing EU Resilience aims to strengthen the resilience of healthcare and pharmaceutical services. It aims to do so by ensuring stable distribution, manufacturing, and provision of medical care, requiring Member States to identify critical entities by July 2026 and enforce protective measures for these suppliers.	**Output: Chlorine** is used as a disinfectant in the medical industry.
	Medicine		**Output: Chlorine** or chlorinated compounds are used in manufacturing around 85% of pharmaceutical drugs. It is used in drugs to treat e.g. asthma, seizures, high blood pressure, depression, cancer, diabetes.
	Devices		**End-product: PVC** is used in 40% of disposable, plastic-based devices with medical purposes used in hospitals. Examples are oxygen masks, gloves, blood vessels for artificial kidneys, tubing, catheters, mattress covers, overshoes, “artificial skin” in burn treatment.
	Prosthetics		**End-product: PVC** is widely used in prosthetics due to its durability, flexibility, affordability, and recyclability, making it a reliable and cost-effective choice for patients and manufacturers. Its advancements in sustainability, including bio-circular PVC and recycling initiatives, further enhance its environmental benefits while maintaining high performance and longevity.
Nutrition	Water sanitation	The Critical Entities List for Enhancing EU Resilience seeks to ensure the stability of drinking water supply as well as distribution, while reinforcing proper wastewater management. This requires Member States to identify critical entities by July 2026 and aim to enhance their resilience.	**Output: Chlorine** is used in processing water at purification and waste management plants. It is effective against water born disease.
	Disinfecting		**Output: Chlorine** is used as a disinfectant in the food industry.

Note: This is not a comprehensive list but serves to illustrate the wide applicability of the chloralkali industry across technologies and sectors.

Deep dive: Economic importance of chloralkali (1/3)

Chloralkali outputs and end-products are used in a wide array of downstream industries in North-Western Europe

- **Automotives**
  - **Electric car batteries** rely on chlor-alkali chemicals such as caustic soda to help carry the charge.
  - Additionally, chlor-alkali chemicals are used in various **car components**, including polyurethane seats, armrests, and headrests, PVC dashboards, and polyurethane bumpers and headlight lenses. Chlorine chemistry is used for brake fluid and antifreeze liquids.
  - Caustic soda products are used for **aluminum car components** such as the frame.

- **Construction**
  - Chlorine products are used in construction, in applications such as **draining pipes, flooring, roofing, window frames and insulation, as well as cable wiring**.
  - Polyurethane is widely used in the **thermal insulation of buildings**.
  - PVC contributes to the **quality of construction materials**, as well as to **safety and cost-effectiveness**. Due to its durability, PVC contributes to lower environmental impacts of completed projects.
  - Caustic soda products are used in **aluminum framing, polyurethane sealants, glass, and cement**.

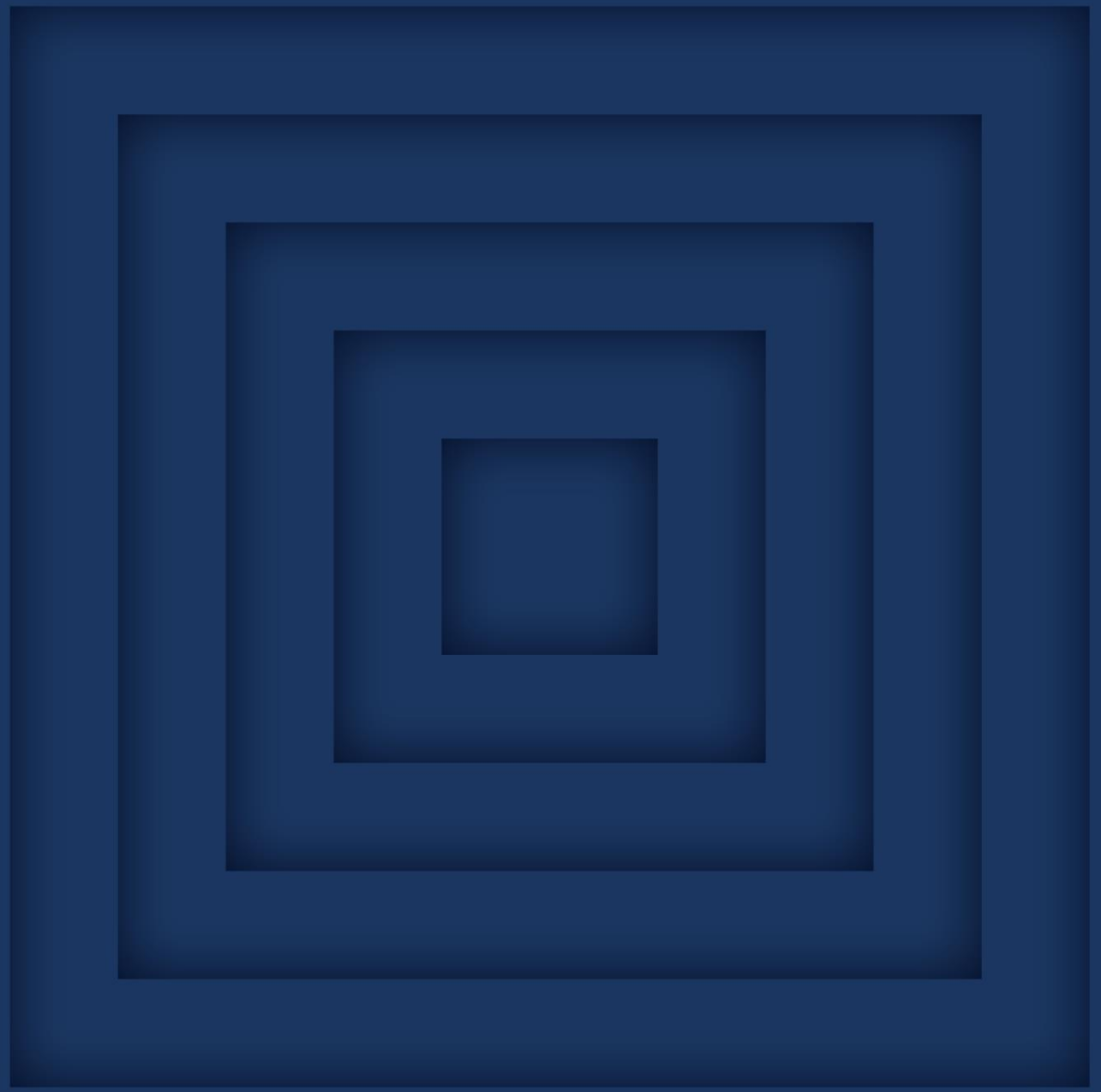
- **Consumer goods**
  - Chlorine (chemistry) is used in **footwear, chair cushioning, contact lenses, deodorant, disinfectants**.
  - Caustic soda is used to produce **book pages, detergents, cotton fabric**.

Deep-dive: Societal importance of chloralkali for the EU

In producing a wide range of essential and non-essential goods,
the chloralkali industry can be an asset in decarbonisation efforts for the EU

- Chloralkali (under the European Patent Office's NACE 20.13) is considered a **patent-heavy and trademark-intensive industry** when it comes to Climate Change Mitigation Technologies (0.49 CCMT-patents per 1,000 employees). This is relatively high for chemical industries. This shows there is **significant R&D spending** allocated to green solutions. According to EuroChlor, 2023 saw a **17.6% decrease in carbon footprint** from 2022. This is **higher than the EU's average emissions reduction** in power and industrial installations under the Emissions Trading System (ETS), which achieved a "record 16.5% decrease" in the same period.
- The patent intensity also showcases **European know-how** in this industry. For the EU's climate goals and ambitions to support net-zero competitive industries, know-how based on a long-term legacy of this industry is a societal capability. A loss of industry means a loss of (future) capabilities for industrial decarbonisation.
- **Lithium hydroxide for lithium-ion batteries** can be produced from lithium chloride, using expertise in electrolysis and chloride embedded in chloralkali producers. This provides an alternative way of extracting lithium in a more sustainable way in the EU, avoiding the use of fossil fuels.

4. Sustainable Aviation Fuels



The strategic importance of **sustainable aviation fuels (SAF)** for the EU and Saudi Arabia

	Strategic uses of SAF	Contribution to EU ambitions	Contribution to Saudi ambitions
Geopolitical importance: Contribution to strategic autonomy	**Outputs** ○ Synthetic fuel (Syncrude) **End-products** ○ Sustainable aviation fuel (SAF, focus of this study) ○ Others: renewable diesel, naphtha, gasoline, renewable wax **Technology** ○ Municipal solid waste through gasification, Fischer-Tropsch synthesis and hydro-cracking to produce 3rd generation bio-based SAF ○ Green hydrogen and CO2 through gasification, Fischer-Tropsch synthesis and hydro-cracking to produce Power-to-Liquid e-SAF	**Building a strong domestic SAF industry is essential for the security of energy supply of the aviation sector, as the EU is has decided to reduce reliance on foreign actors for energy imports since the invasion of Ukraine**. The REPower EU Plan was introduced in 2022 to mandate the need for energy security in response to geopolitical tensions. The EU has the resources to become strategically autonomous in aviation fuel production while staying committed to its climate targets. The targets for blending SAF into conventional jet fuel are progressively growing as a result of EU climate regulations. This brings an opportunity for the EU to become more self-sufficient in its energy supply, replacing the imports of fossil-based jet fuel with domestically produced SAF.	**As Saudi Arabia is moving away from fossil fuels both due to global climate goals and need for economic diversification, it needs to develop SAF as an alternative to remain self-sufficient.** Strengthening the prosperity of its economy and diversifying are key goals of the Vision 2030 strategy. As one of the largest fossil fuel producers in the world, the Saudi government will want to preserve the same level of flexibility and security of supply in a decarbonized world as well. Domestic SAF production is essential for that.
Economic importance: Contribution to the competitiveness of downstream industries		**A domestic SAF industry can contribute to the aviation sector's future competitiveness by ensuring wide availability of SAF and reducing transportation costs and the greenhouse gas emissions associated with shipping it from outside of Europe.** The ReFuel EU Aviation regulation mandates the aviation sector to progressively increase its blend of SAF into jet fuel. As of 2024, only 2% of aviation fuel within the EU is sustainable (SAF). The Refuel EU sets out an ambitious goal of increasing the share of SAF to 70% of fuel used for aviation by 2050. The EU Aviation Safety Agency (EASA) has projected the Fischer-Tropsch process as well as Power-to-Liquid fuel to take a 93% stake in global production by 2040. Establishing a domestic SAF industry is economically viable in Europe considering the wide availability of carbon feedstock like municipal solid waste, about 15 times more than that of Saudi Arabia on an annual basis.	**Saudi Arabia is aiming to become a major SAF producer moving forward to support its aviation industry and promote itself as a global hub.** The country's current focus is on hydroprocessed fuels (HEFA) and alcohol-to-jet methods of producing SAF rather than Fischer-Tropsch due to its relatively low amounts of municipal solid waste. Still, multiple partnerships are being set up between the Royal commisions of Jubail and Yanbu for the creation of SAF facilities in Saudi Arabia. A recent example is the partnership between Aramco and Total Energies.
Societal importance: Contribution to a resilient society		**A local SAF industry contributes to achieving a circular economy and society as Fischer-Tropsch using waste is an inherently circular process.** Waste management and recycling are key priorities of European governments under the Waste Framework Directive (2008) and the Circular Economy Action Plan (2020). The targets for recycling municipal waste are progressively increasing from 55% in 2025 to 65% in 2035. The Fischer-Tropsch synthesis would not only support industrial decarbonization by producing sustainable fuels but also circularity.	**Saudi Arabia's goals to improve the wellbeing of its society by decreasing soil, air and water pollution could be supported by the production of synthetic fuels and a circular economy.** Saudi Arabia has one of the largest chemical industries in the world, which could benefit from replacing conventional fuels with synthetic ones like naphtha. At the same time, recycling waste (even if the quantities are much lower than in Europe) would reduce pollution

Deep-dive: Geopolitical importance of SAF for the EU

A domestic SAF industry can contribute to energy security in a net-zero economy

- **A reliable and steady stream of SAF will become crucial to ensure energy security and prevent the creation of new import dependencies in the coming decades**. This brings an opportunity for the EU to become more self-sufficient in its energy supply, replacing the imports of fossil-based jet fuel with domestically produced SAF.

- **Globally, the EU is well positioned to become more strategically autonomous in the aviation sector (see figure)**. Given the aviation industry's significant role in Europe, ensuring its independence from external suppliers is crucial to safeguarding its long-term resilience and competitiveness.

- **SAF capabilities could also be relevant for the decarbonization of militaries in the long term**. For instance, in January 2023, Liège Airport, the fifth-largest cargo airport in the EU, announced its readiness to supply SAF via truck or through the NATO pipeline system.

Figure from E-fuel Alliance, 2024

Deep-dive: Economic importance of SAF for the EU

As the market is still emerging and is projected to grow significantly, there is notable economic potential for Europe to establish itself as a leading SAF producer

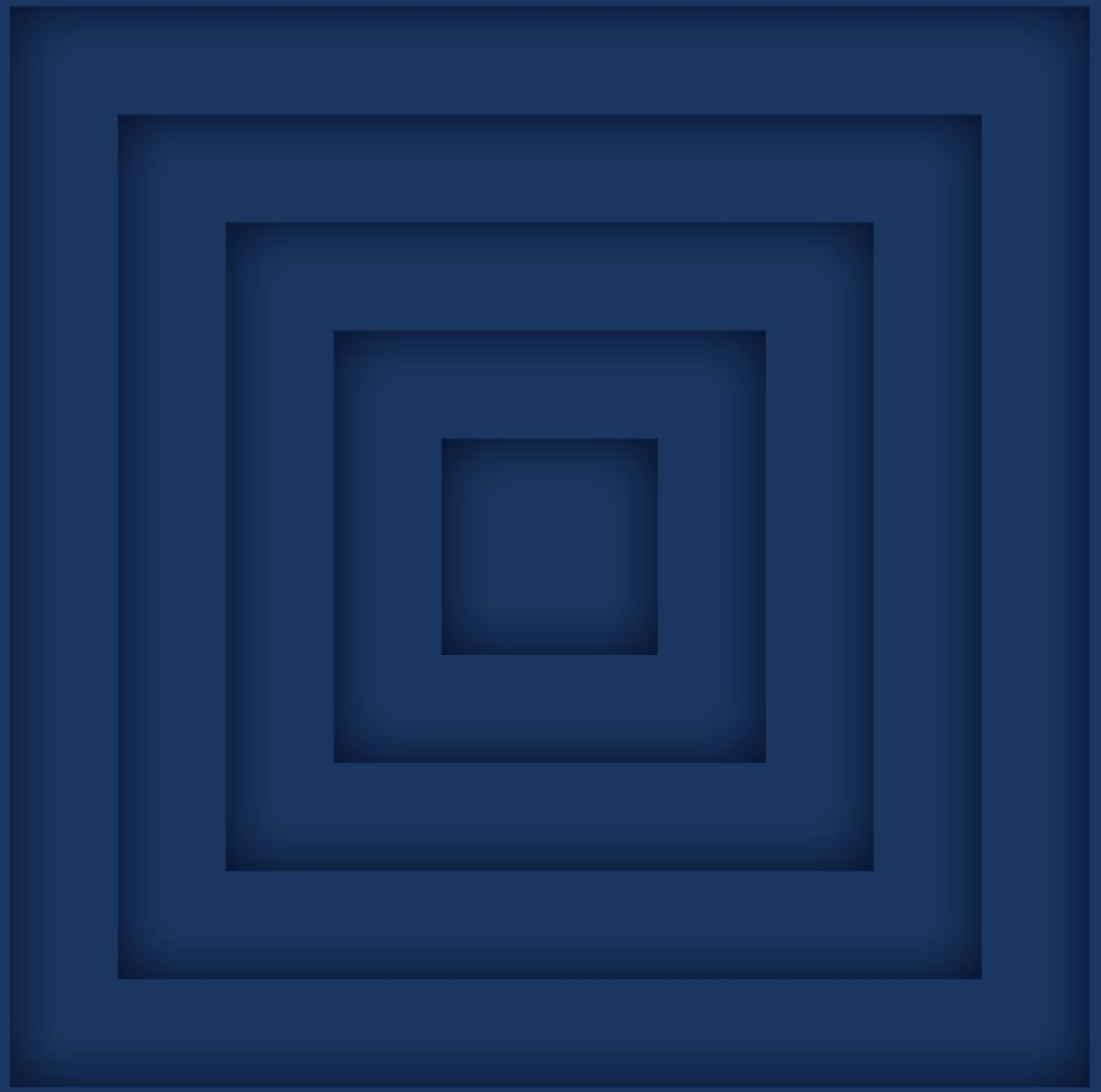
- **Market growth:** According to Global Market Insights the current market value is estimated at 1.7 Billion. This will rise in 2034 to a projected value of 74.6 Billion USD.
- **Anticipated demand in 2030**: According to the ReFuelEU Aviation Regulation, the demand for aviation fuel at EU airports is projected to be around 46 million tonnes by 2030. To align with the goal of a 5% SAF blend for all flights departing from EU airports, approximately 2.3 million tonnes of SAF will be required.
- **2040 and 2050 targets**: The ReFuelEU Aviation Regulation proposal sets forth that 32% and 63% of jet fuel consumed by flights departing from EU airports should be SAF by 2040 and 2050, respectively. This translates to an annual requirement of approximately 14.8 million tonnes of SAF by 2040, and 28.6 million tonnes by 2050.
- **EU's potential as a market leader**: The Fischer-Tropsch process enables the conversion of various waste products into fuel, reducing the strain on resource inputs. With abundant municipal waste and biomass available within the EU, the necessary resources to establish this industry are already in place. This brings the EU to a highly favourable position to play a significant role in the market.

Deep-dive: Societal importance of SAF for the EU

A developing SAF industry is an important step in a more sustainable economy and environment

- **Building a local SAF sector is relevant for future resilience of the EU energy supply in aviation as well as for reaching climate goals.** There is a valuable base level of **European know-how** in the existing chemical industry. These should be leveraged and enhanced to support industrial decarbonisation and a green aviation industry.
- **In building a local SAF industry, the EU is also supporting its circularity goals, which is an important improvement in societal wellbeing.**
  - For SAF production, carbon inputs are a significant differentiator. Adequate supply of carbon sources is essential for the business case in SAF production.
  - Europe has large amounts of municipal solid waste (MSW) and agricultural waste, which can function as a feedstock to SAF production. Waste treatment in Europe focuses on recycling and composting, moving away from landfills. Gasification only covers a small portion but has potential to increase its importance. Europe has a current baselevel capacity of approximately 141 biomass and waste gasification installations. It has 54 more projects under development, showing significant growth. Germany is the biggest producer, with 61 installations.
  - In addition, Europe has an ecosystem for carbon recycling and processing in place, increasing the access for SAF producers to these materials.

5. Conclusions



Conclusions

1. **The US-based liberal world order is under severe pressure.** Geopolitics is dominated by new alliances that challenge the 'Western bloc', economic coercion is increasingly used as a part of foreign policy, high-tech competition is in full swing, and there is a heightened security risk for (critical) infrastructure and strategic industries.
2. **In this complex world, both the NWE/EU and Saudi Arabia aim to become more strategically autonomous.** They seek economic prosperity and globally competitive industries and pursue societal wellbeing.
3. **Strong domestic chloralkali and SAF industries are strategically important for these ambitions.**
    - **Geopolitically**, chloralkali provides essential inputs for a wide range of industries, including defence, healthcare, and clean tech. Domestic SAF production is central to ensure energy security for the emerging low-carbon aviation sector.
    - **Economically**, chloralkali is part of a highly integrated and efficient industrial cluster, while SAF is promising as an emerging clean industry and necessary to achieve net zero aviation goals.
    - **Societally,** chloralkali companies hold valuable industrial know-how and are patent-intensive in innovative climate technologies. The production of SAF could stimulate the circular economy by reusing waste streams and capturing carbon.
4. **A decrease in the domestic capacity for chloralkali and a failure to support the emerging SAF industry will create import dependencies that are geopolitically and economically problematic and that can have negative effects on societal resilience.** European companies and governments should consider their geopolitical business case, in addition to their economic business case. Local production of chloralkali and SAF serves strategic sectors (defence, energy transition, healthcare etc.) and makes the EU more resilient to coercive action by global players. It ensures security of supply and affordability in vital sectors.
5. **The decision to locate a European company in a different region should not just be based on techno-economic considerations, but also on geopolitical due diligence.** Geopolitical tensions between the EU and other countries may negatively affect European companies active in those areas. More and more governments are influencing (foreign) companies to achieve their foreign policy goals through e.g., hostile takeovers, trade restrictions or new licensing requirements, which can be avoided through geopolitical due diligence.