



WINTER  
IS COMING

PLASTIC  
HAS TO GO



A case for decreasing plastic production to reduce the European Union's dependence on fossil fuels and Russia

SEPTEMBER 2022

#breakfreefromplastic

 **CIEL** CENTER for INTERNATIONAL  
ENVIRONMENTAL LAW

## About BREAK FREE FROM PLASTIC

Break Free From Plastic is a global movement envisioning a future free from plastic pollution. Since its launch in September 2016, over 1,900 non-governmental organisations and individuals from across the world have joined the movement to demand massive reductions in single-use plastics and to push for lasting solutions to the plastic pollution crisis. These organisations share the common values of environmental protection and social justice, which guide their work at the community level and represent a global, unified vision.

In Europe, Break Free From Plastic has more than 100 core member organisations covering all European subregions and with expertise all along the plastics value chain.

For more information, visit [www.breakfreefromplastic.org](http://www.breakfreefromplastic.org)

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## Acknowledgements

This report was authored by Amadeo Ghiotto and Delphine Lévi Alvarès, with support from Andy Gheorghiu (Andy Gheorghiu Consulting), and reviewed by Lili Fuhr (CIEL), Tom Harrison (GGON), Carroll Muffett (CIEL), Joan Marc Simon (Zero Waste Europe), Sarah Baulch (The Pew Charitable Trusts), and Jozef Vandermeulen (FairFin). Project management was provided by Delphine Lévi Alvarès. The data sets in this report were produced by Amadeo Ghiotto based on Eurostat data, under the supervision of Andy Gheorghiu, and reviewed by Ana Maria Jaller-Makarewicz (IEEFA). This report was edited by Bethany Spendlove Keeley and Cate Bonacini.

This report was made possible with the generous support of the Global Gas Hub and the Plastic Solutions Fund.

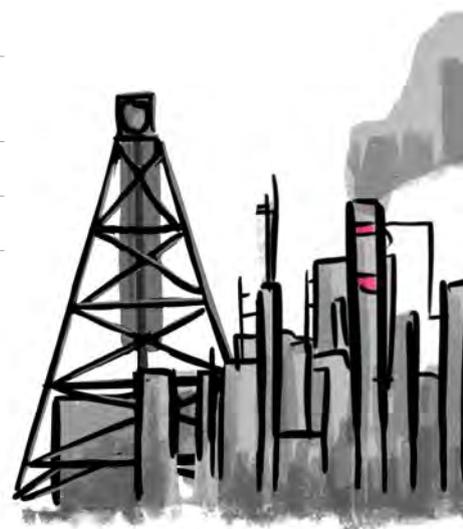
**Design & Layout:** [Blush Design Agency](#)

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# EXECUTIVE SUMMARY

## Russia's invasion of Ukraine has revealed, in a brutal way, Europe's dependence on fossil fuels, particularly Russian oil and gas.

In August 2022, as the European Union (EU) faced the harsh reality of having reduced access to Russian fossil fuels, EU Member States committed to reducing gas consumption by at least 15% by 31 March 2023. While in Member States like Germany, the general public is being told that they should take cold showers and use less heat to reduce the overall fossil fuel consumption, the EU is concluding or exploring new trade deals to secure supply for the colder months of the year, in particular with the United States (US),<sup>1</sup> and African countries like Senegal.<sup>2</sup> Not only do EU governments demand far more action - and adaptation - from individual citizens than from industry sectors that consume the lion's share of fossil feedstock and energy, they also completely overlook the huge potential to reduce fossil fuel consumption by tackling unnecessary use.

The case of petrochemicals and plastics is emblematic of this problem. If the global petrochemical producers were a country, they would be the third-largest oil consumer in the world<sup>3</sup> and the fourth-largest gas consumer.<sup>4</sup> Today, the industry is the largest driver of the increased demand for oil and gas globally,<sup>5</sup> fuelling the climate crisis and its disastrous impacts on the most vulnerable populations and ecosystems. Yet, this extremely high fossil fuel-consuming industry remains a complete oversight in the EU public energy and climate debates, even as Europe confront a violent war within its borders as well as an unprecedented energy crisis and catastrophic climate impacts. This is despite clear and feasible pathways to reduce consumption of one of its main products: plastic.

Meanwhile, since the publication of its Plastics Strategy<sup>6</sup> in 2018 and the adoption of the groundbreaking Single-Use Plastics (SUP) Directive in 2019, the EU and several of its Member States have been a leading voice in the global fight against plastic pollution. This leadership was particularly evident during the United Nations Environment Assembly (UNEA) process that led to the March 2022 adoption of a historic resolution to advance negotiations on a binding global agreement to end plastic pollution along the full life cycle of plastic.<sup>7</sup> Yet, of all the measures that the EU has taken to tackle plastic pollution at its source, none address plastic production directly. Plastic production was responsible for nearly 9% and 8% of the EU's final consumption of fossil gas and oil in 2020, respectively. Taking ambitious reduction measures across all sectors could contribute to reducing the demand for fossil fuels within the EU and from countries importing into it. Simultaneously, such measures would contribute to tackling the plastic pollution, energy, and climate crises. Since the biggest share of plastics produced and consumed in the EU is packaging, boosting the pace and ambition of implementing the SUP Directive - as well as advancing transformative measures through the revision of the Packaging and Packaging Waste Directive (PPWD) - constitutes a critical first step.



## MAJOR FINDINGS

- Plastic production is by far the largest industrial oil, gas, and electricity user in the EU, overshadowing other energy-intensive industries such as steel, automobile manufacturing, machinery, and food and beverages. It was responsible for nearly 9% and 8% of the EU's final consumption of fossil gas and oil, respectively, in 2020. This is about as much as the final gas consumption of the Netherlands and almost as much as the final oil consumption of Italy in 2020.<sup>8</sup>
- Plastic production is also the most energy- and feedstock-intensive of all the processes of the petrochemicals industry. It accounts for a fifth (21.98%) of industrial gas and two-fifths (37.58%) of oil consumption in the EU. The largest part of this energy was used to produce plastic packaging, which accounts for 40% of the end market for plastic products in the EU. This represents about 10 billion cubic metres (bcm) of fossil gas and 14 million tonnes (mt) of oil. This is about as much as Hungary's final gas consumption in 2020, and Sweden and Denmark's combined oil consumption in 2020.
- Nearly 15% of the final gas consumption and 14% of the final oil consumption in 2020 in the EU 27 was used to manufacture petrochemicals.
- In the EU in 2020, 38% of the gas and 22% of the oil came from Russia, making the energy-intensive petrochemical industry significantly reliant on Russian fossil fuels.
- Together, Belgium, Germany, Spain, France, Italy, the Netherlands, and Poland are responsible for 77% of all plastic packaging waste in the EU. Achieving reductions of 50% in plastic packaging and 90% in recycling would lead to a reduction of 6.2 bcm of fossil gas and 8.7 million tonnes of oil at the EU level compared to 2020. These figures are the equivalent to the Czech Republic's final oil and gas consumption in 2020.<sup>9,10</sup>

A business-as-usual scenario, where the plastic production industry plans on doubling its gas- and oil-based production is incompatible with achieving the goals of the Green Deal, binding climate targets to keep global warming under 1.5°C, and addressing our urgent need to reduce our oil and gas consumption and dependency. The EU cannot buy its way out of the multiple current crises by simply replacing Russian fossil fuels with imports from other regions. Every barrel of oil or cubic metre of fossil gas that goes towards plastics is a major roadblock towards the goals of tackling the climate and plastics crises and breaking free from the fossil dependency that foments instability and fuels wars. To regain international leadership in fighting the climate and plastic pollution crises and to protect its citizens from escalating prices and resulting conflicts, the EU needs to confront the petro-elephant in the room: plastics.

# 9%

In 2020 plastic production was responsible for 9% of the EU's fossil gas consumption and 8% of its oil consumption.

## POLICY RECOMMENDATIONS

- A first and easy step in achieving a drastic reduction of virgin plastic production is for the EU Member States to accelerate and expand the implementation of the Waste Framework and Single-Use Plastics Directives, increasing the level of ambition, notably by adopting prevention and reuse targets. Such action will also reduce oil and gas consumption.
- The EU and its Member States need to seize the opportunity of the revision of the PPWD, to adopt ambitious measures on packaging reduction. These should include a cap on overall packaging put on the EU market that would decrease over time, and the development of reuse systems, powered by ambitious and binding reuse targets. The EU should, in particular, consider using the PPWD vehicle to ban further unnecessary packaging such as single-serving sachets and wrapping of fruits and vegetables, and to prohibit overpackaging.
- The EU cannot afford to wait another three decades to reduce by 40% its virgin plastic use in the packaging and household goods, automotive, and building sectors, as put forward even in industry-sponsored proposals by Plastics Europe and SYSTEMIQ.<sup>11</sup> Reducing production from 50 to 29 megatonnes (Mt) should be achieved by 2030.
- Reacting to the threat of a supply cut from Russia, EU Member States have agreed to reduce gas consumption by at least 15% by 31 March 2023. But this measure falls far short of what is needed. For the immediate future and in light of expected gas shortages over the coming months, the EU and its Member States need to ensure that emergency measures restrict non-essential industry oil and gas use, for example, the share that would typically go to producing unnecessary single-use plastics and packaging. The scope of such restrictions needs to mirror the scale of the crisis and be implemented in a way that protects workers and low-income households.
- The EU and its Member States need to push for ambition on upstream measures within the negotiations of the Global Treaty to End Plastic Pollution, including the following: recognition of sourcing and feedstocks in defining the full plastics life cycle, a global cap on overall plastics production, and recommendations to begin phasing down plastics production with initial limitations on the production of particularly problematic or unnecessary plastics.
- The EU and its Member States must stop building new fossil fuel infrastructure, including petrochemical facilities, starting with a moratorium or freeze on permitting of new virgin plastic production facilities (such as crackers).
- EU and Member State attempts to secure oil and gas from Africa, the US, and elsewhere, offer only a short-term fix for a long-term problem, while deepening the climate crisis and imposing significant environmental and health costs on the countries and communities where extraction occurs. Attempts to address the crisis must be rooted in lowering all fossil fuels consumption while laying the foundation for a just transition, not enabling the building out of new infrastructure. Thus, the EU's climate and energy diplomacy should be based on securing climate-friendlier energy access and climate justice, and be used to fulfil its commitments, including financial ones, under the EU Green Deal, the United Nations Framework Convention on Climate Change (UNFCCC), and the Paris Agreement.
- The EU and its Member States must engage with the European petrochemical industry to set up decarbonisation plans and a fossil-free future pathway, and a needed just transition for this sector.

**Considering that the EU's seven biggest oil- and gas-consuming countries for plastics production are also responsible for 77% of all plastic packaging waste in the EU, these measures should be implemented in priority in Belgium, Germany, Spain, France, Italy, the Netherlands, and Poland.**



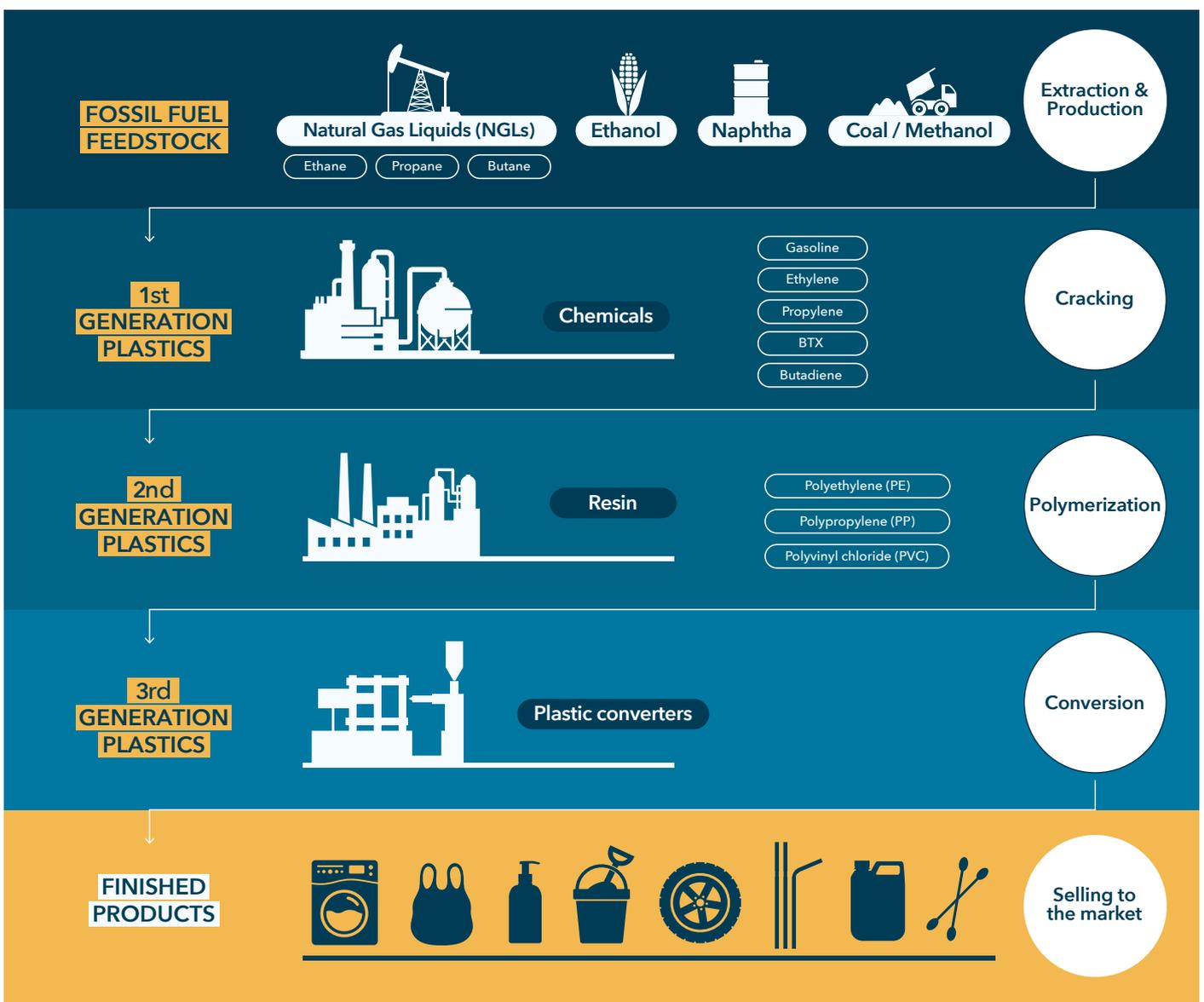
# INTRODUCTION

## BACKGROUND: FROM THE OIL AND GAS WELL TO PLASTIC POLLUTION AND ENERGY, IT'S ALL CONNECTED

While many people think that plastic was born on the shelves of supermarkets, others see it primarily as a 'turtle-with-a-straw-in-the-nose' problem. Academics, activists, decision-makers, and influencers warn against the unfolding disastrous impacts of global warming, yet very few link plastics and the climate crisis.

Plastic is the biggest market of the EU petrochemicals industry. And as the name implies, petrochemicals, and therefore plastics, are made primarily from oil and gas: put simply, they are fossil fuels in another form. The most important feedstocks for plastics and petrochemicals are naphtha derived from crude oil and natural gas liquids derived from fossil gas (e.g., ethane, propane, and butane).

[Figure 0.1] From fossil fuels to plastic



Unsurprisingly, given their fossil fuel origin, plastics and petrochemicals are extraordinarily energy- and feedstock-intensive. They consume massive amounts of fossil fuels both to power their processes and as raw materials, resulting not only in increased fuel demand but also pollution of air, water, human bodies, and the earth's atmosphere.<sup>12</sup> The Intergovernmental Panel on Climate Change (IPCC) has warned<sup>13</sup> that the agreed-upon targets of lowering global warming by 1.5 degrees Celsius are rapidly becoming unachievable and that the effects of rising global warming will be increasingly irreversible. The integrity of our planet's ecosystems is in danger due to chemical pollution, including pollution caused by plastic. According to 2022 research<sup>14</sup> by Linn Persson et al., scientists have observed the hazardous consequences of chemical pollution, which harms the biological and physical processes that are the basis of all life. They note that a 'planetary boundary' has been exceeded, pushing us beyond a 'safe operating space for humanity.'

Last year, the influential International Energy Agency (IEA) officially stated that no new oil and gas sources should be

exploited<sup>15</sup> to adhere to the 1.5-degree warming objective set at the Paris climate conference. To a significant degree, the solutions to Europe's current energy security and climate change crises are the same as the much-needed measures to tackle plastic pollution at its source – i.e., reducing oil and gas extraction and consumption.

There are opportunities for Europe to cut its fossil fuel consumption, starting with challenging unnecessary uses for fossil fuels, such as plastic packaging items for which reusable options or alternative delivery systems exist. A drastic reduction in non-essential items (such as single-use plastic products<sup>16</sup> and packaging) and a quick switch to renewable energy are the only feasible options if the goals of the Paris Agreement, the EU Green Deal, and the ambition of the yet-to-be-negotiated global plastics treaty are to be achieved. Critically addressing the energy and fossil feedstock going into plastic production, the most energy-intensive industry will have to be part of that effort. Yet, this opportunity has been notably absent from the current EU energy crisis debate.

## THE PROBLEM: HOW RUSSIA'S INVASION OF UKRAINE REVEALED THE EU'S WEAK SPOTS AND CLIMATE CONTRADICTIONS

**Russia's invasion of Ukraine has revealed, in a brutal way, Europe's dependence on fossil fuels, particularly Russian oil and gas. In August 2022, faced with the harsh reality of having reduced access to Russian fossil fuels, the EU adopted a regulation calling on EU Member States commits to reduce gas by at least 15% by 31 March 2023. In Germany, the EU's biggest gas-consuming country, the general public is being told that they should shower cold and heat less.**

Yet, even as governments demand action – and adaptation – from individual citizens, they are asking for far less from industry sectors that consume the lion's share of fossil feedstock and energy and have the greatest potential to reduce both. The case of petrochemicals and plastics is emblematic of this problem. The petrochemical industry is one of the largest consumers of oil and gas in the EU, with plastic production being one of its most important subsectors in production value.<sup>17</sup>

Since Russia invaded Ukraine, Europe has continued to undermine its global climate leadership by pursuing a number of controversial deals to secure gas from many parts of the world, despite the harm oil and gas production has on the broader climate and local communities' security, health, and economics. In addition to existing Liquefied Natural Gas (LNG) imports from Norway, Azerbaijan, Egypt, Israel, and Algeria, the block seeks to explore the fossil gas export potential of other African countries like Nigeria, Senegal, and Angola.<sup>18</sup> This challenges the IEA's recommendation that no new oil and gas sources should be exploited to achieve net zero by 2050 and give the planet a chance to stay under 1.5°C of global warming. Instead, it fosters new fossil fuel

exploration and construction of export infrastructure in vulnerable communities<sup>19</sup> and drives major price spikes for those same fuels in the Global South. At the same time, the EU is fast-tracking new agreements with Norway to explore and invest in securing oil and gas for the European market.<sup>20</sup>

According to IEA's Africa Energy Outlook 2022,<sup>21</sup> Africa could potentially supply an extra 30 bcm of gas to Europe by 2030. Yet, in 2020, the EU's gas consumption for plastic production alone amounted to approximately 25 bcm. Therefore, rather than pursuing an unsustainable, neo-colonial, unpopular scramble for gas in Africa, Europe should focus on reducing its demand for oil and gas by taking measures that include phasing out unnecessary plastic packaging and products at home. And it should invest in accelerating and expanding renewable energy access across Africa.

The EU has also compromised its global climate leadership by seeking increased gas imports from fracking in the US. This is despite this technique being heavily criticised and banned in most EU countries due to its disastrous environmental and health impacts.<sup>22</sup> While the so-called Trump-Juncker deal<sup>23</sup> of July 2018 had already led to US LNG imports into the EU increasing by 2418% (as of February 2022),<sup>24</sup> in the aftermath of Russia's invasion of Ukraine, the US agreed<sup>25</sup> to deliver an additional 15 bcm into the EU by the end of 2022 – which is about as much as Poland's annual gas consumption – and up to 50 bcm/annum until at least 2030. This methane-emissions-intensive US LNG<sup>26</sup> and increase in fracked gas trade risks jeopardising the EU's climate targets. Allowing access to cheap fracked gas has not only encouraged investments for new petrochemical facilities in the US but has also spurred plans for new virgin plastic facilities<sup>27</sup> in Europe. Ineos, the EU's largest producer of virgin plastic (i.e., ethylene),<sup>28</sup> has already established a supply chain of fracked gas from the US for plastic production in the UK, Norway, and the EU.

# THE OPPORTUNITY: REDUCING PLASTIC AND PETROCHEMICAL USE

**In March 2022, two weeks after 'Russia's unprovoked and unjustified war against Ukraine' started,<sup>29</sup> the EU Heads of State met to agree on the need to phase out Europe's reliance on Russian energy imports as soon as possible, concretising this consensus in the 2022 Versailles Declaration.<sup>30</sup> The REPowerEU Plan,<sup>31</sup> published in May 2022, sought to offer an operational reaction to the weaponisation of Putin's oil and gas and the climate crisis. The main focus of this plan would be diversification, accelerating renewables, energy efficiency, and electrification in order to reduce the EU's reliance on Russian fossil fuels.**

The window of opportunity for the reduction of oil and gas consumption, expansion of energy efficiency measures, and rapid development of renewables quickly closed when it became apparent that the EU governments were keener on pursuing new fossil-fuelled trade agreements.<sup>32</sup>

After it became clear that the EU would face an energy shortage this winter if immediate action were not taken, this proved to be an ineffective response to the crisis. In the middle of an intensely hot summer, where hydropower was down due to droughts<sup>33</sup> and nuclear power stations were down in France<sup>34</sup> due to the heat, the European Commission presented the Save Gas for a Safe Winter plan<sup>35</sup> asking EU Member States to cut gas use by at least 15% between 1 August 2022 and 31 March 2023.

This plan reveals a massive discrepancy between the attention and measures taken against the consumption of fossil gas in households and the lack of attention to the enormous energy and fossil feedstock use of the different industries of the EU Member States. This is despite the fact that, in almost every Member State, the industry's fossil gas consumption exceeds that of the fossil gas consumption of European households.<sup>36</sup>

Of the large industrial consumers of fossil gas and oil, one notable energy and fossil fuel-intensive industry is absent from the public debate: the petrochemical industry. According to the IEA, the petrochemical sector has become the largest driver of increased global oil demand and is predicted to be responsible for over a third of the growth in oil demand by 2030 and nearly half by 2050, ahead of industrial road transportation, aviation, and shipping.<sup>37</sup> The petrochemical industry is also expected to consume an additional 56 bcm of fossil gas by 2030 globally, equivalent to more than half of Germany's total gas consumption this year. If the global petrochemical producers were a country, they would be the third-largest oil consumer in the world<sup>38</sup> (13 million barrels of oil per day<sup>39</sup>) and the fourth-largest gas consumer<sup>40</sup> (300 bcm per year).<sup>41</sup> The petrochemical sector is already the largest European industrial energy consumer, accounting for 15% of the EU's total final fossil gas consumption (Figure 1.1) and 13% of the EU's final oil consumption (Figure 1.5) in 2020, with numbers rising substantially in the seven biggest petrochemicals-producing countries of the EU: the Netherlands, Belgium, Germany,

France, Spain, Italy, and Poland (see 1.1). Yet, despite being the most energy-intensive industry in the EU, accounting for a fifth and two-fifths of industrial gas and oil consumption (Figures 1.4 and 1.8), petrochemicals accounts for just 7% of the industrial production value and just 6% of industrial employment in the EU in 2020.<sup>42</sup> So while it should be recognised that plastic production in Europe directly and indirectly employs many people, it is an unsustainable business model compared to its share of industrial energy use in the EU. According to the EU, a transition to a more circular economy will provide many new jobs.<sup>43</sup>

Yet, this extremely high fossil fuel-consuming industry remains a complete oversight in the EU public energy and climate debates, even amid the momentous challenges facing Europe in 2022, and despite clear and feasible pathways to reduce consumption of one of its main products: plastic. In 2020, the EU produced 55 Mt of plastic, using 9% of the EU's total final gas consumption and 8% of the final oil consumption (see 1.1). With 40% of this production being packaging,<sup>44</sup> this represents over 22 million tonnes of plastic packaging alone (see 2.). These numbers are at odds with the EU's global leadership against plastic pollution.

Since the publication of its Plastics Strategy<sup>45</sup> in 2018 and the adoption of the groundbreaking SUP Directive in 2019, the EU and several of its Member States have been leading voices in the global discussion on plastic pollution, sharing their policy best practices in multiple multilateral fora.<sup>46</sup> This has been particularly the case within the United Nations Environment Assembly (UNEA) process that led to adopting a historic resolution to advance negotiations on a global plastics treaty in March 2022.<sup>47</sup> This resolution created an Intergovernmental Negotiating Committee (INC) mandated with negotiating a binding global agreement to end plastic pollution along the full life cycle of plastic – a life cycle that begins with sourcing oil, gas, and other feedstocks from which plastics are made. Of all measures taken by the EU to tackle plastic pollution at its source, none address plastics production directly. Measures range from bans (prohibition of the placing on the market) to simple labelling, with prevention, reuse, and recycling targets and increased producer responsibility obligations.<sup>48</sup> The necessity to turn off the tap at the source – i.e., at the plastic production level – is still vastly ignored by decision-makers charged with confronting the plastic pollution crisis at both national and EU levels.

This is a conspicuous and unsustainable oversight. Since the 1960s, the world's plastic manufacturing has grown twenty-fold,<sup>49</sup> reaching 322 million tonnes in 2015, and is predicted to double once again over the following 20 years. In the EU, plastic production increased from 0.35 to 55 million tonnes<sup>50</sup> between 1950 and 2020.

There won't be any real reduction in plastic pollution without a real and mandatory reduction in plastic production. And considering that plastic production is the most energy- and fossil feedstock-intensive industry in Europe, implementing measures to phase it down would address the need to reduce fossil fuel consumption and to turn the plastic pollution tap off at the source. Besides the full and ambitious implementation of existing legislations tackling plastic

pollution – e.g., the SUP Directive, the Waste Framework Directive, and the Plastic Bags Directive – there are further opportunities to speed up the EU’s transition to a

resource-efficient, truly circular and zero waste economy, in particular with the revised PPWD and the Sustainable Product Initiative (SPI).

This report takes a deep dive into the data of the EU to find out how much oil and gas goes into petrochemicals and plastics and – in the current context – how much of it is actually Russian oil and gas. It examines the potential for reducing plastic consumption and, therefore, production, by accelerating the implementation of existing policies and adopting new and urgent

measures. The two-fold approach is a way to tackle the climate, energy, and plastics crises at the same time. Moving away from plastics and petrochemicals – and from fossil fuels altogether – would not only help to prevent war and armed conflict, but it would also help to protect citizens from escalating energy and food prices, in Europe and beyond.

## METHODOLOGY: A QUICK INTRODUCTION TO THE ENERGY BALANCE AND THE DATA

### Production

This analysis – and the calculations that underlie it – draw directly on the annual Energy Balances<sup>51</sup> reported by the EU, including data from 2020 (the most recent statistical year at the time of writing). The energy balance lists all statistically significant energy products (fuels) produced in a nation, as well as how they are produced, transformed, and used by various economic players (industry, transport, etc.). These data provide a clear and well-founded starting point for determining how much energy and feedstock each EU Member State consumes in its petrochemical and plastics sector. Using the below-referenced sources, it has been possible to approximate the amount of fossil gas, oil, and electricity used in the EU for petrochemical and plastic production as a share of the final consumption and in comparison to the industrial consumption of oil and gas.

To define plastics in the energy balance, this analysis utilises the standard EU Statistical Classification of Economic Activities in the European Community (NACE) classification<sup>52</sup> for different activities in the economy. Just as the petrochemical industry includes more than just plastics, the plastic production process extends across different processes in the industry. In this research, the calculations take into account the share of the following:

- energy used in the refining process attributable to plastics (NACE 19), where crude oil is refined into petrochemical feedstock;
- energy and feedstock used in the petrochemical industry (NACE 20), where the refined petroleum product or gas is turned into plastics as primary form;<sup>53</sup> and
- rubber and plastics industry (NACE 22), where the plastic products as we know them are produced from these petrochemical building blocks.

In the energy used during the oil refining process, a share was taken for the amount of oil that could be attributed to plastics production. In the petrochemical industry, a closer look was taken at the energy and feedstocks used during the energy-intensive cracking of hydrocarbons, the manufacture of primary plastics, and the manufacture of synthetic textiles. And in the rubber and plastics industry, the energy used in the plastics industry was taken into account. Due to a lack of data in the Eurostat Energy Balance, the energy used for the manufacturing of recycled plastics and waste management is not included in these results. By far, the largest energy consumer of the plastic production process is the manufacturing of fossil fuels-based plastics due to the large amount of energy needed to crack the fossil fuels into the building blocks of plastic – i.e., ethylene and propylene.

The analysis utilises EU ProdCom data<sup>54</sup> to calculate how much energy these sub-activities use in each Member State and to adjust the broader defined energy balance data. So while the Energy Balance data of “Chemicals” also includes pharmaceuticals, petrochemicals account for the overwhelming majority of energy use in chemical production in the EU (90% of the 2020 EU level).

After establishing the amount of fossil fuels going to the petrochemical industry, the Russian connection was calculated using the EU Energy trade tool.<sup>55</sup> Using this tool makes the amount of imports and exports, by Member State and by fuel, readily observable.

Calculations for fossil gas were done with data in terajoules as provided by the Eurostat Energy Balance. Recognising that methods differ for converting terajoules to billion cubic metres of gas, this analysis applies the conversion factors published by BP in its most recent statistical review of world energy.<sup>56</sup>

## Waste

All data was drawn from Eurostat unless otherwise specified. Data on EU virgin plastic production numbers was taken directly from industry data published by Plastics Europe.<sup>57</sup> For the data on waste collection, the Eurostat packaging waste by waste management operations statistics<sup>58</sup> was used, for which the most recent data is from 2019. It should be noted that in 2020, the production of plastic did not slow down due to the COVID-19 pandemic,<sup>59</sup> and therefore an assumption is made that 2020 data for waste will not be much different.

## Knowledge gaps

Certain knowledge gaps should be acknowledged. The below-mentioned knowledge gaps should be addressed in the coming months and years to continue to build the full picture of the energy and CO<sub>2</sub> intensity of our plastic production and consumption. But the limited time available for this research - with winter just around the corner - means that certain limitations have been accepted to approximate the energy going to plastic production, to inspire bold and rapid policy action.

This research takes into account plastic production in a broader sense than just petrochemicals, but it remains a conservative approximation of the energy and fossil feedstock going to plastic in the EU. Important energy-intensive sectors have not been taken into account in this research, such as waste management, transport of the products in the long stretched supply chains, etc.

At the same time, by using the EU Energy Balance, this research relies on the accuracy of Member State reporting,

which also means countrywide data is used to calculate the energy going to the petrochemical- and plastic-producing sectors, and not company-specific data. This research should therefore be interpreted as approximations and not exhaustive results.

And while the European plastics industry has promised some changes and decarbonisation plans,<sup>60</sup> most of these rely on risky and unproven technologies, with time frames between 2030 and 2050 - far later than the EU and the climate could handle. Among these proposed solutions are Carbon Capture, Utilisation, and Storage (CCUS) to collect the emitted carbon dioxide while continuing to produce it in the fossil-fuelled industry, which has been widely criticised as a dangerous and costly false solution.<sup>61</sup>

It must also be stressed that this research takes a look at the energy used for the 55 million tonnes of plastic production in the EU but not at the imported plastics from around the world, leaving the full picture of energy used for plastic consumption in Europe underestimated.

In Eurostat's end-of-life plastic statistics, another data gap should be noted: namely, the gap between the larger annual production of plastic packaging and the smaller annual collection of plastic packaging waste. A share of this will be in mixed waste streams ending as unclassified materials going to landfills or incineration, another will be exported in finished goods, and another will enter a growing stock of products not entering waste streams in their production year, while a share will not end up in any official waste collection. While this study used Eurostat data on waste management, it should be acknowledged that the total consumption of plastic packaging will be higher.





# 1. ADDRESSING THE PETRO-ELEPHANT IN THE ROOM: THE PETROCHEMICALS AND PLASTICS OVERSIGHT IN THE EU ENERGY DEBATE

**The petrochemical sector, which includes energy-intensive processes such as the manufacturing of basic chemicals, plastics, fertilisers, textiles, paints, etc., is already the largest European industrial energy and fossil feedstock consumer. In 2020, it accounted for 15% of the EU's total final fossil gas consumption (Figure 1.1) and 13% of the EU's total oil consumption (Figure 1.5), with numbers increasing to 35% for gas and a staggering 59% for oil when considering only the industrial energy and feedstock consumption.<sup>62</sup>**

Out of all the processes of the petrochemicals industry, plastic production is the most energy-intensive. In 2020, almost 9% of the EU's total consumption of fossil gas and 8% of the total oil consumption were attributable to plastic production. When looking at industrial consumption alone, the sector was responsible for 18% of the fossil gas consumption and 30% of the oil consumption (1.1.). A significant part of this feedstock came from Russia (1.2.).

# 1.1. THE MASSIVE AMOUNT OF FOSSIL FUELS AND ENERGY FEEDING THE PETROCHEMICALS AND PLASTICS INDUSTRY BETWEEN 2014 AND 2020: FINDINGS

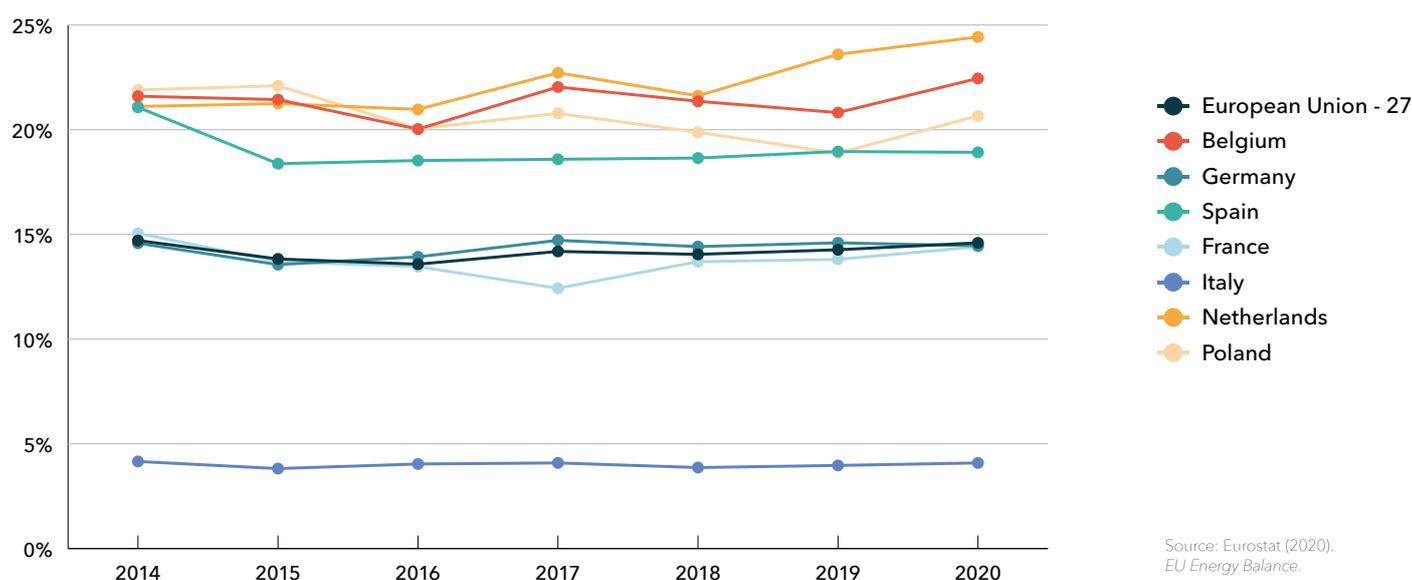
The EU and its large industry are dependent on fossil fuels. As detailed below, the present analysis shows that a significant proportion of the EU's gas, oil, and electricity supplies are directly going to the petrochemical industry generally and to plastic production specifically. Just seven Member States (Belgium, Germany, Spain, France, Italy, the Netherlands, and Poland) account for the majority

of this throwaway energy. Together, these countries account for 81% of the EU's final gas consumption and 75% of its oil consumption. As the largest producers of petrochemicals in Europe, these seven states account for 85% of the gas used for plastic production in the EU and 87% of the oil.

## 1.1.1. PETROCHEMICALS AND PLASTICS INDUSTRY FOSSIL GAS USE 2014-2020

Nearly 15% of all the fossil gas consumed in 2020 in the EU was used to manufacture petrochemicals, with one of its biggest markets being plastics (Figure 1.1).

[Figure 1.1] Share of final gas consumption for petrochemical production in the EU 2014-2020



More than 9.3% of the EU's final consumption of fossil gas in 2020 went to plastic production, compared to 9.79% in 2014 when Russia annexed the Crimean Peninsula.

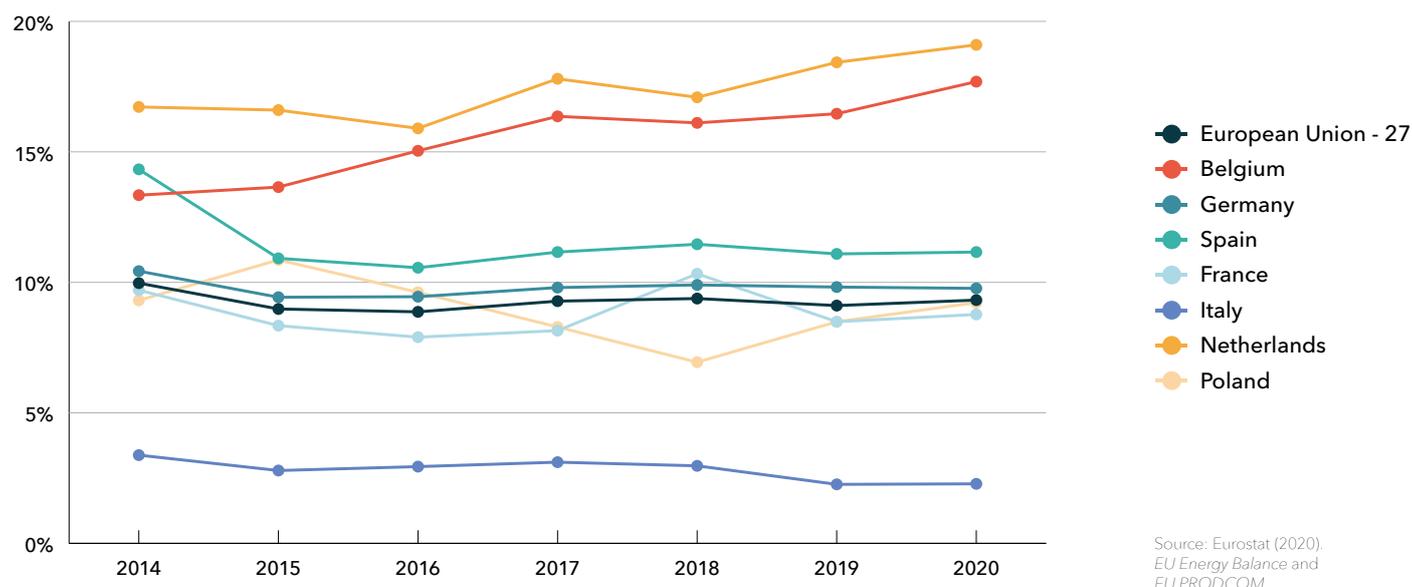
However, when taking a closer look at the big seven petrochemical-producing countries in the EU, the numbers rise substantially to 19% of the final consumption of fossil

gas in 2020 in the Netherlands, 18% in Belgium, and 10% in Germany (Figure 1.2). This means substantial parts of the energy consumption of these countries are going directly to plastic production. Only Italy is below the EU's 9%, and that could be attributed to their smaller plastics industry and larger share of fossil gas in the consumption of private households.

# 15%

Nearly 15% of all the fossil gas consumed in 2020 in the EU was used to manufacture petrochemicals, with one of its biggest markets being plastics.

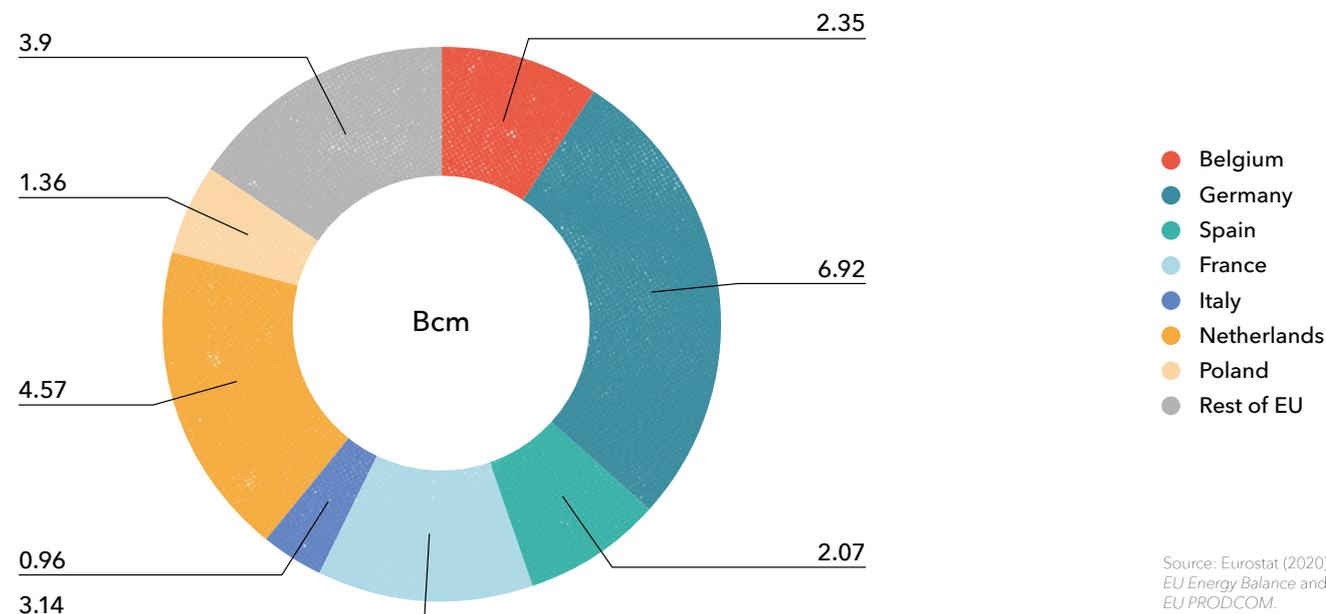
[Figure 1.2] Share of final gas consumption for plastic production in the EU 2014-2020



These large percentages for the Netherlands and Belgium can be attributed to their large petrochemical industries, coupled with their relatively smaller populations, as a result of which industry-related fuel and feedstock demands comprise a larger share of the final consumption.

In absolute numbers, the EU's consumption of fossil gas for plastic production equates to 25 bcm in 2020, of which approximately a quarter (approximately 7 bcm) can be attributed to Germany and a fifth (approximately 4.5 bcm) to the Netherlands alone (Figure 1.3).

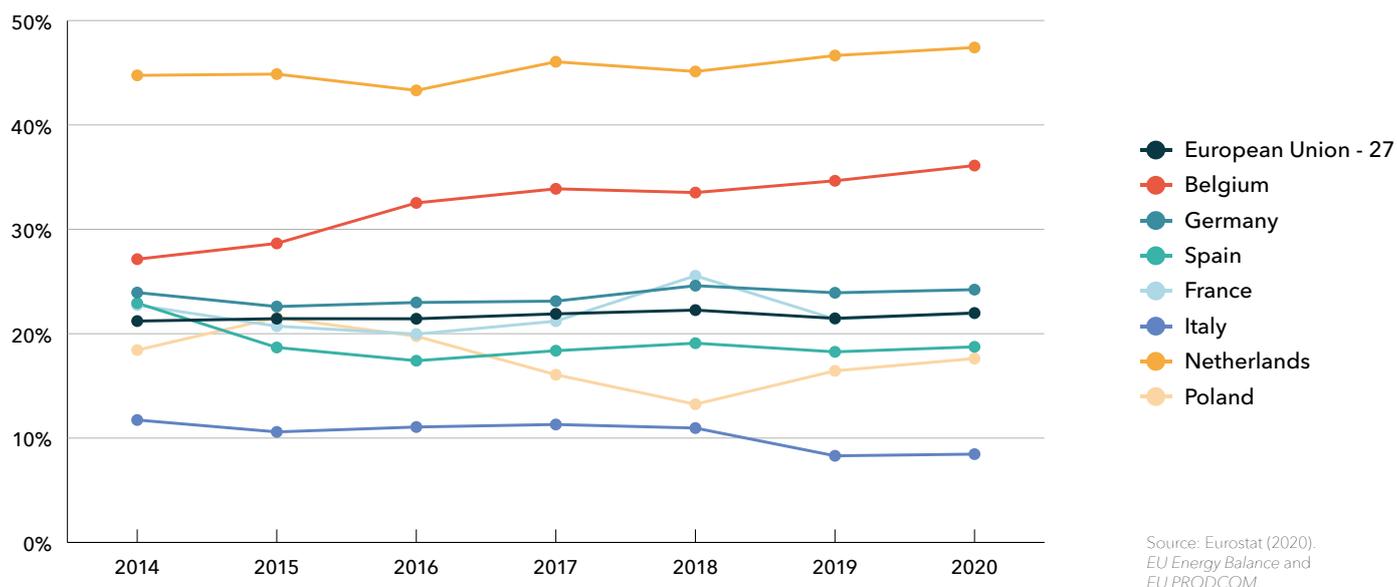
[Figure 1.3] Final gas consumption for plastic production in the EU in 2020 (in bcm)



The fossil gas demands of the plastics industry become more apparent when the analysis focuses specifically on industrial sector gas consumption (Figure 1.4). More than one-fifth (22%) of all fossil gas consumed in the European industry<sup>63</sup> is used to produce plastics, an amount three times greater than gas consumption by the EU steel industry.<sup>64</sup> In Germany and

Belgium, the plastics industry accounts for nearly a quarter (24.22%) and more than a third (36.11%) of the industrial sector's gas consumption respectively. Even more strikingly, nearly half of all fossil gas consumed in the Netherlands' industrial sectors goes into plastic production.

[Figure 1.4] Share of industrial gas consumption for plastic production in the EU 2014-2020

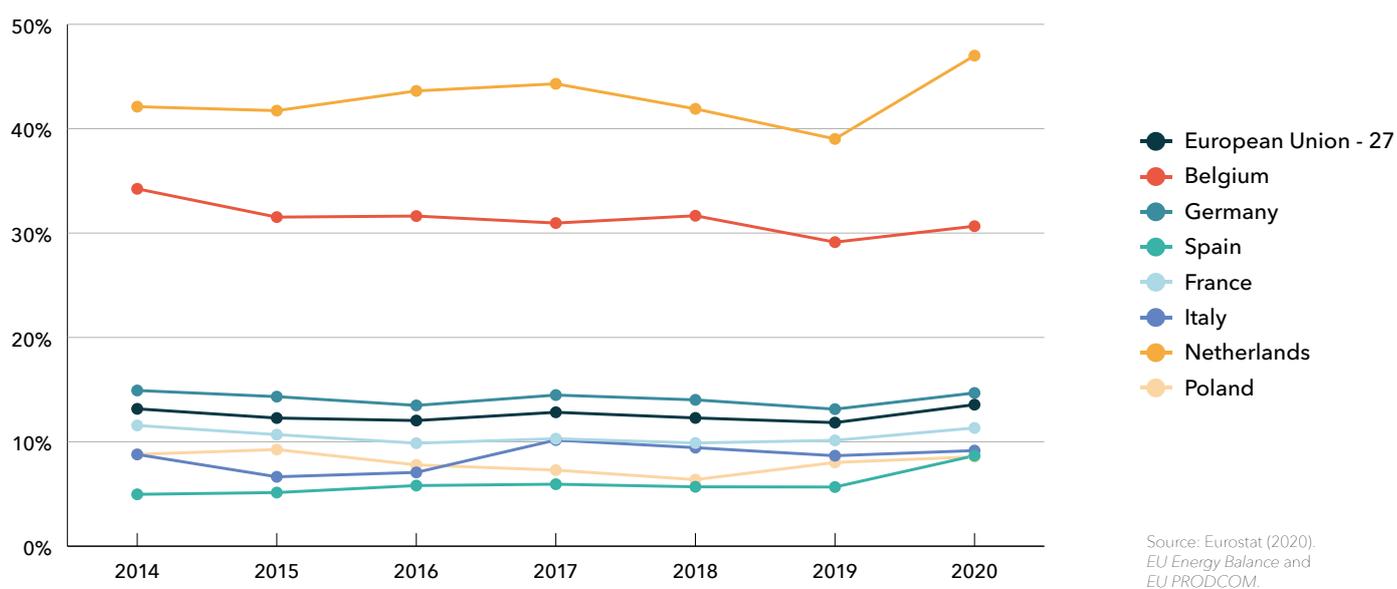


### 1.1.2. PETROCHEMICALS AND PLASTICS INDUSTRY OIL USE 2014-2020

The broader petrochemical industry consumed nearly 14% of the EU's oil in 2020 (Figure 1.5). The ratio in Germany is slightly higher still, with nearly 15% of that country's total final consumption of oil and petroleum products going to the petrochemical industry. Given the enormous size of Germany's economy and its fossil fuel use - relative to the EU and to the world as a whole - the scale of oil and

petroleum flowing to plastics and petrochemicals production is staggering. As with fossil gas, the petrochemical industry's share of final oil consumption in petrochemicals-intensive Belgium (31%) and the Netherlands (47%) is even greater (Figure 1.5). The ports of Antwerp and Rotterdam both have some of the largest petrochemical complexes in the world.

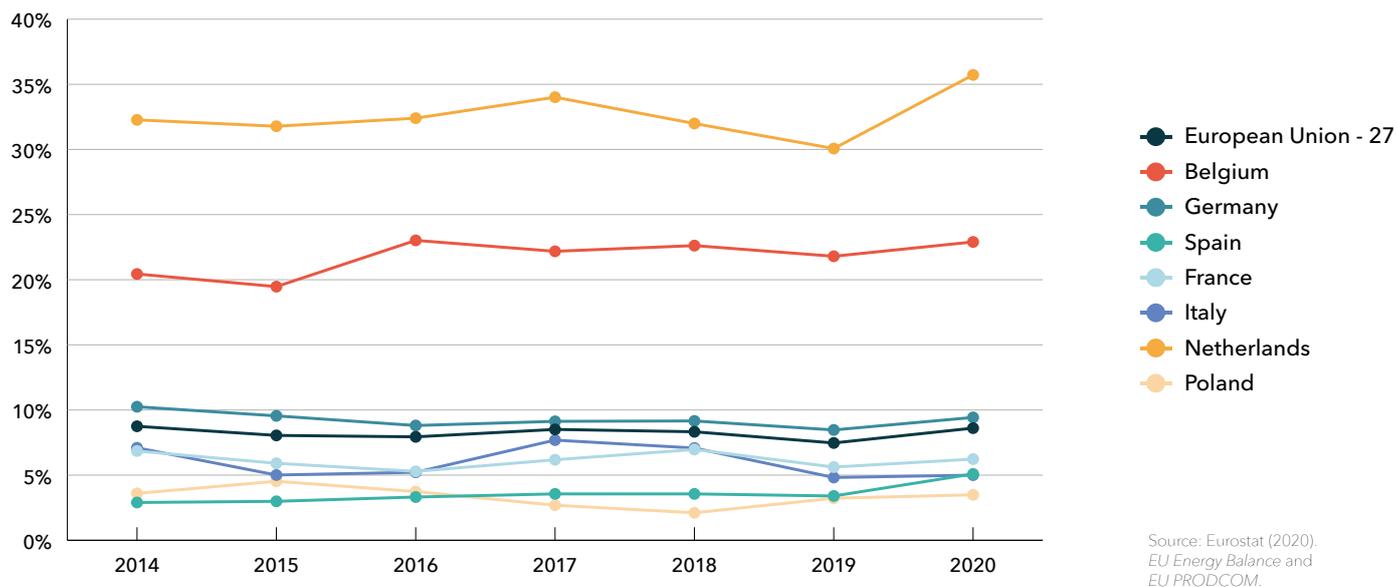
[Figure 1.5] Share of final oil consumption for petrochemical production in the EU 2014-2020



In 2020, plastic production accounted for nearly 9% of total final oil consumption for the entire EU. The impact of plastic production is even greater when one considers that oil is used primarily as a feedstock, and natural gas is used mostly for fuel. Thus, plastic production does not consume simply one or the other - it consumes both. Consistent

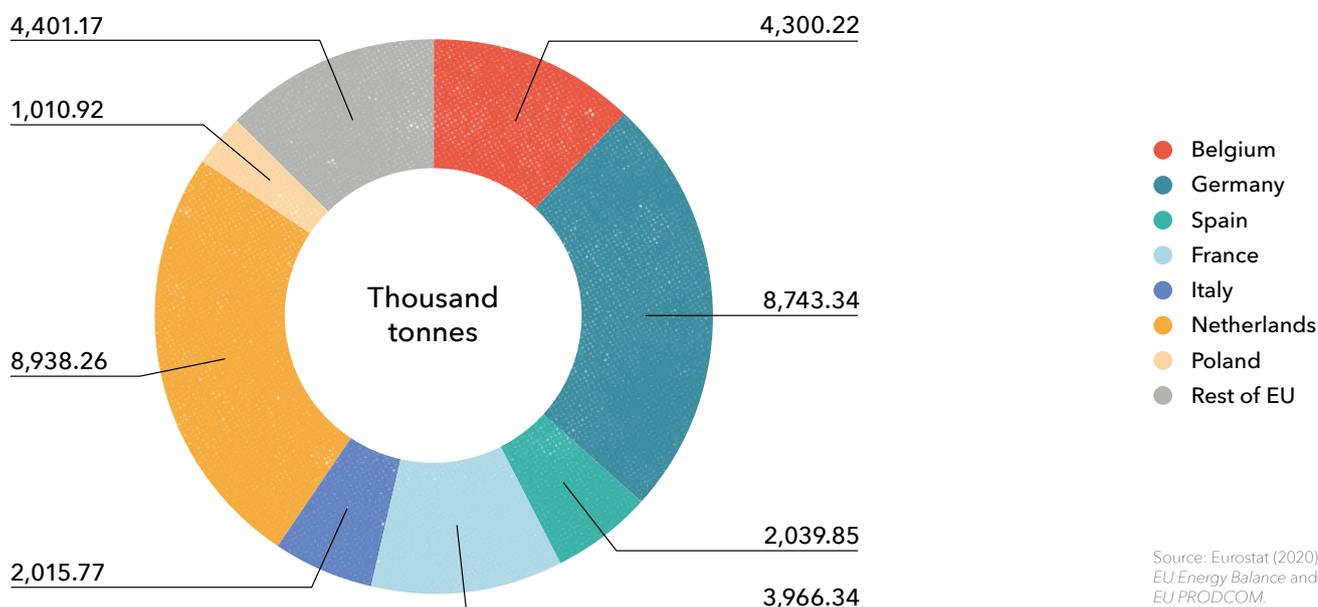
with earlier findings herein, the share of oil consumption going specifically to plastics in Germany, Belgium, and the Netherlands is comparably greater, with plastic production alone accounting for well over a third (35.72%) of the total final oil and petroleum consumption in the latter.

[Figure 1.6] Share of final oil consumption for plastic production in the EU 2014-2020



In absolute numbers, in 2020, the EU consumed 35 million tonnes of oil and petroleum products to fuel its dependency on plastic. This is almost as much as the final oil consumption of Italy the same year.<sup>65</sup>

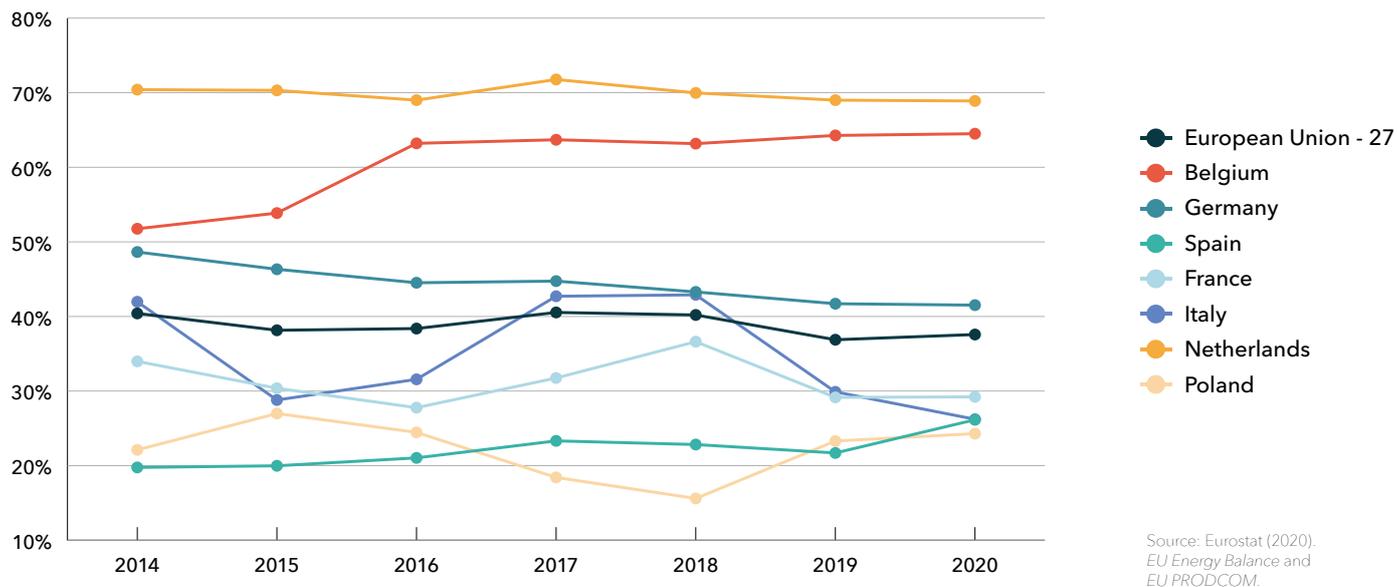
[Figure 1.7] Final oil consumption for plastic production in the EU in 2020 (in thousand tonnes)



When the oil used for transport and households is taken away, and only the industrial consumption of oil and petroleum products is taken into account, we can observe the true scale of the plastic appetite for oil. Nearly 38% of industrial consumption of oil is going towards plastic production, with German plastic production consuming 41.5%, Belgium 64.5%, and the Netherlands 69% of their industrial oil consumption.

As the European public faces growing and well-justified demands to curtail oil and gas use, the massive share of these resources being used to produce plastic products with useful lifetimes of mere minutes to a few months demands serious scrutiny.

[Figure 1.8] Share of industrial oil consumption for plastic production in the EU 2014-2020



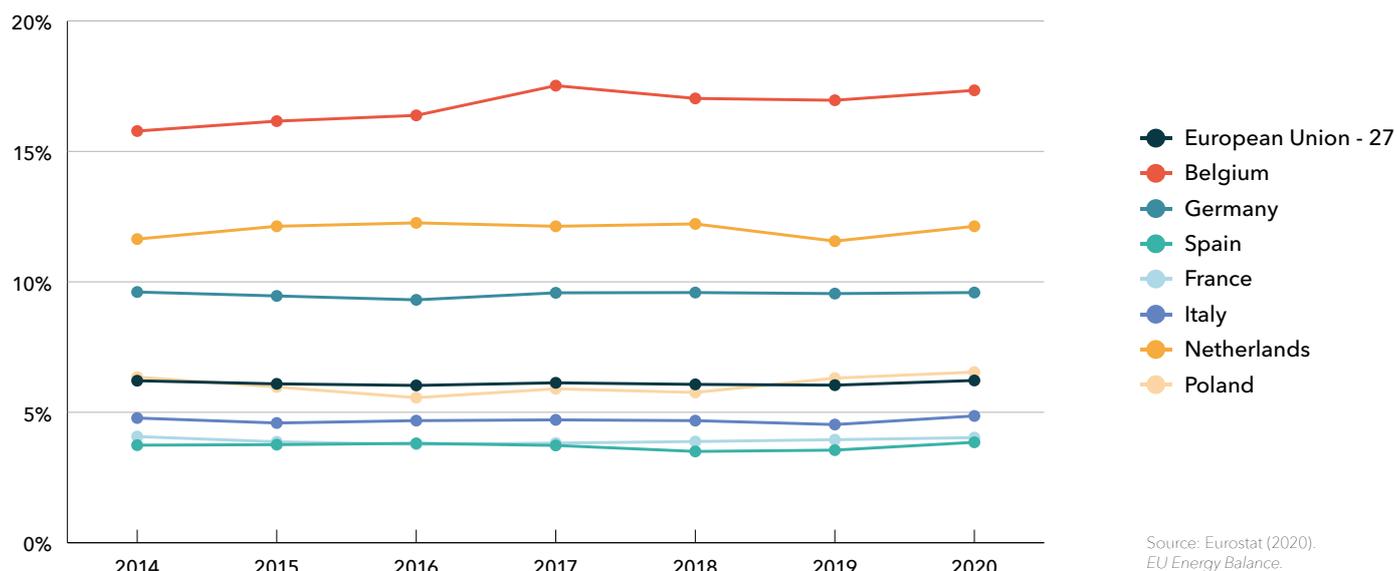
### 1.1.3. PETROCHEMICALS AND PLASTICS INDUSTRY ELECTRICITY USE 2014 - 2020

Compared to gas and oil as sources of energy in petrochemicals and plastics production, electricity takes up the lowest amount of energy, mainly because oil and gas are also used as feedstocks to manufacture their products, whereas electricity is not.

Examining the broader petrochemical industry (Figure 1.9)

reveals that this sector alone accounts for 6% of the total final overall electricity consumption for the entire EU. This rises to 17%, 12%, and 9.5% of the final electricity consumption in Belgium, the Netherlands, and Germany respectively - far surpassing the demands of other energy-intensive industries such as iron and steel, mining, machinery, food, and beverages.

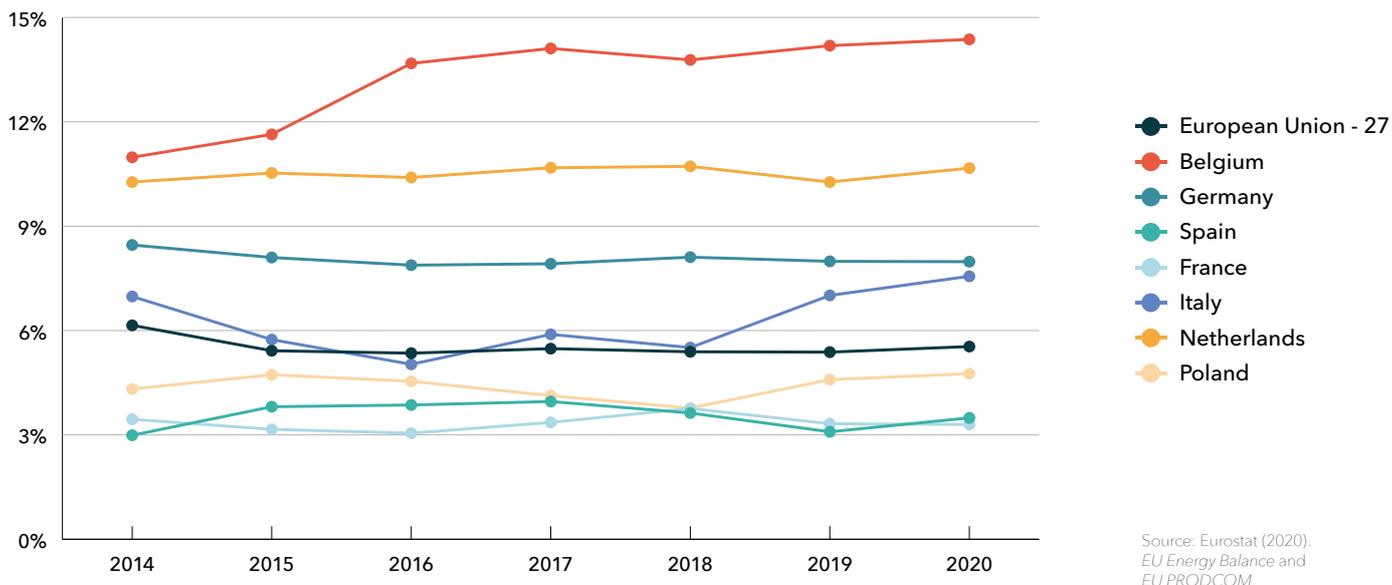
[Figure 1.9] Share of electricity consumption for petrochemical production in the EU 2014-2020



Similarly and relatedly, more than one out of every twenty (5.54%) kilowatt hours of electricity consumed in the entire EU in 2020 was used to make plastics. And here again, the energy demands for plastic are even starker when viewed at a national level. Belgian plastics and petrochemicals producers are taking more than one out of seven (14.47%)

kilowatt hours of electricity consumed in that country. Plastic production eats up more than a tenth (11%) of all electricity used annually in the Netherlands, with marginally smaller but still sizable shares of total consumption in Germany (8%) and Italy (7.5%).

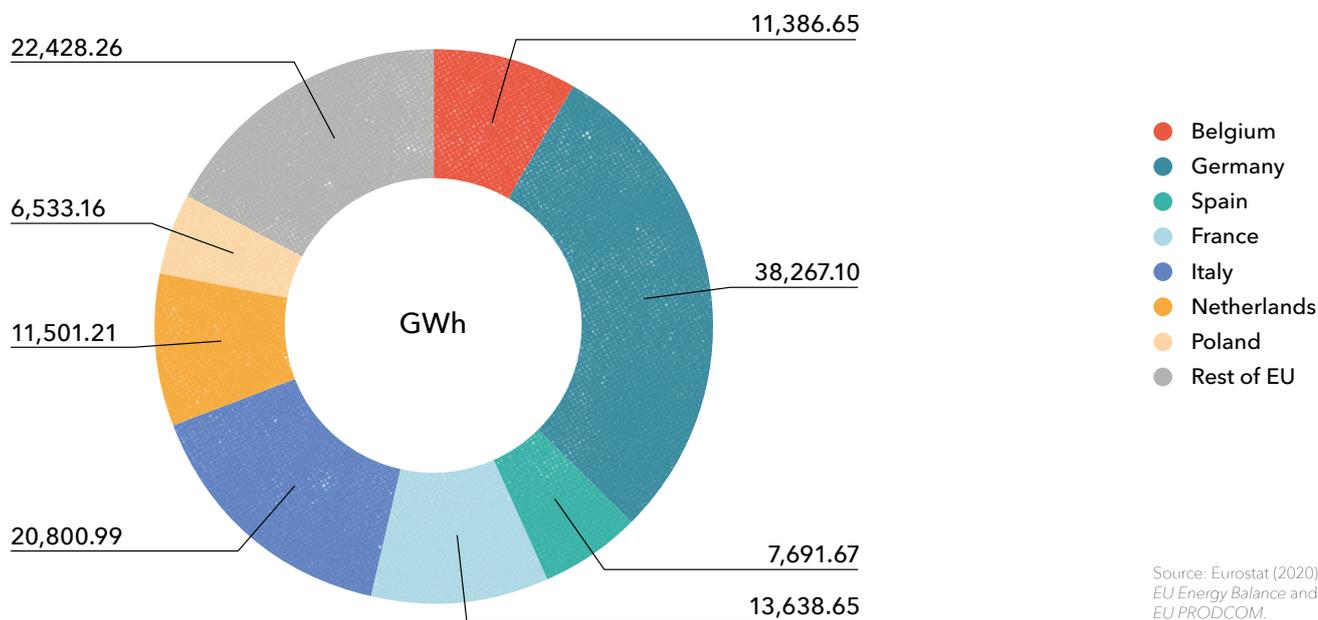
[Figure 1.10] Share of electricity consumption for plastic production in the EU 2014-2020



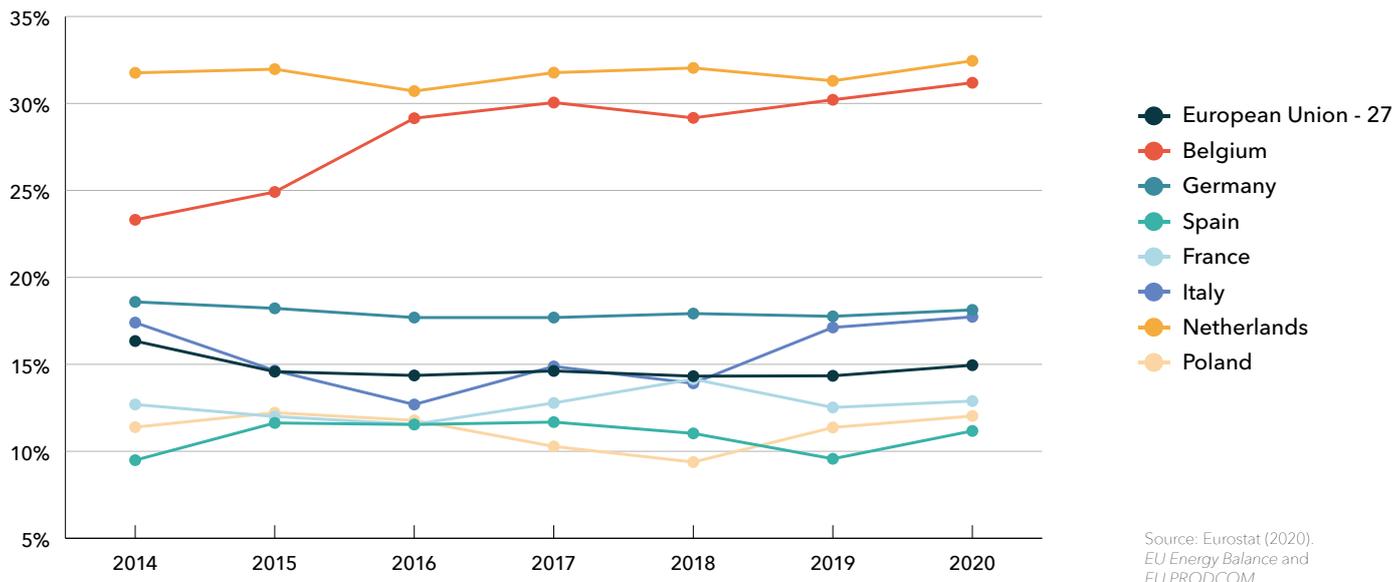
As previously noted, plastics comprise the greater majority of petrochemicals. Accordingly, the share of total final energy consumption used specifically for plastics (Figure 1.10) is equally significant and comparable in scale. With 6% of the final EU electricity consumption in 2020 used for plastic production alone, it is the most electricity-intensive industry,

accounting for 15% of European industrial consumption of electricity in 2020 (Figure 1.12). Combined, plastic producers in the EU Member States consumed an extraordinary 132,000 Gigawatt hours (GWh) of electricity in 2020 (Figure 1.11).

[Figure 1.11] Electricity consumption for plastic production in the EU in 2020 (in GWh)



[Figure 1.12] Share of industrial electricity consumption for plastic production in the EU 2014-2020



Considering the geopolitical context and the looming energy crisis that could worsen this winter, with skyrocketing prices preventing poorer households from affording heating or fuel, and potential shortages should Russia decide to reduce or cut supply or should EU governments apply strict sanctions and reduce or

stop trade, it is critical to assess the share of Russian oil and gas consumed by the EU's petrochemicals and plastics industry - and to evaluate how reducing the overproduction of plastics and petrochemicals could help narrow near-term supply gaps without locking in still more fossil fuel infrastructure.

22%

22% of all fossil gas consumed in the EU industry is used to produce plastics.

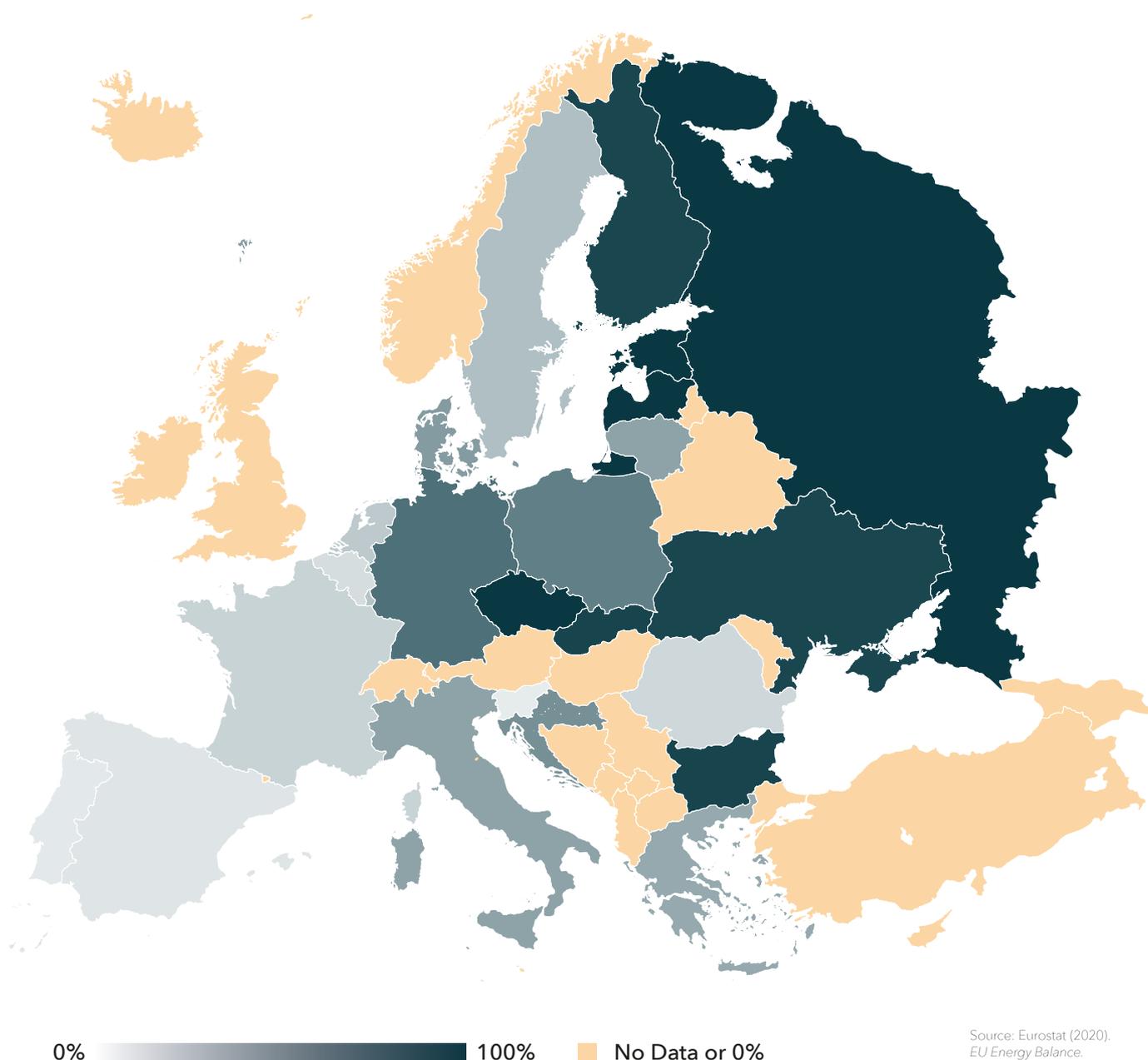
## 1.2. UNPACKAGING OUR DEPENDENCE ON RUSSIAN OIL AND GAS

### 1.2.1. THE EU'S PETROCHEMICALS GIANTS' DEPENDENCE ON RUSSIAN OIL AND GAS

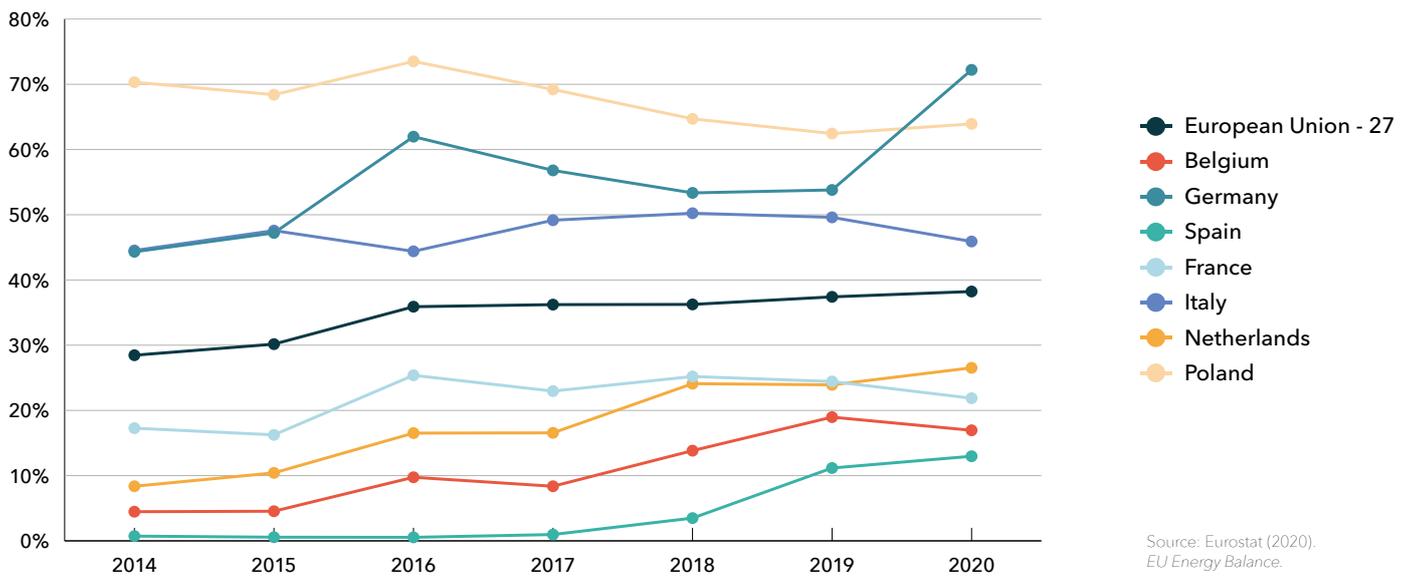
Russia has been by far the EU's largest supplier of oil and gas. While in 2020, the EU had other suppliers such as Algeria, Azerbaijan, Iran, Libya, Qatar, and the US, it still depended on Russia for 38% of its fossil gas and 22% of its oil and petroleum products (see Figure 1.14 and Figure 1.15). Despite early warning signs from a dispute between Russia

and Ukraine in 2009, and Russia's unlawful annexation of Crimea in 2014, the EU (and, in particular, Europe's biggest gas consumer, Germany) did not reduce but rather deepened its fossil fuel dependence on Russia. As the data below shows, the EU's Russian gas dependency increased post-2014 from 28% to 38%.

[Figure 1.13] Dependence of the EU Member States on Russian fossil gas in 2020

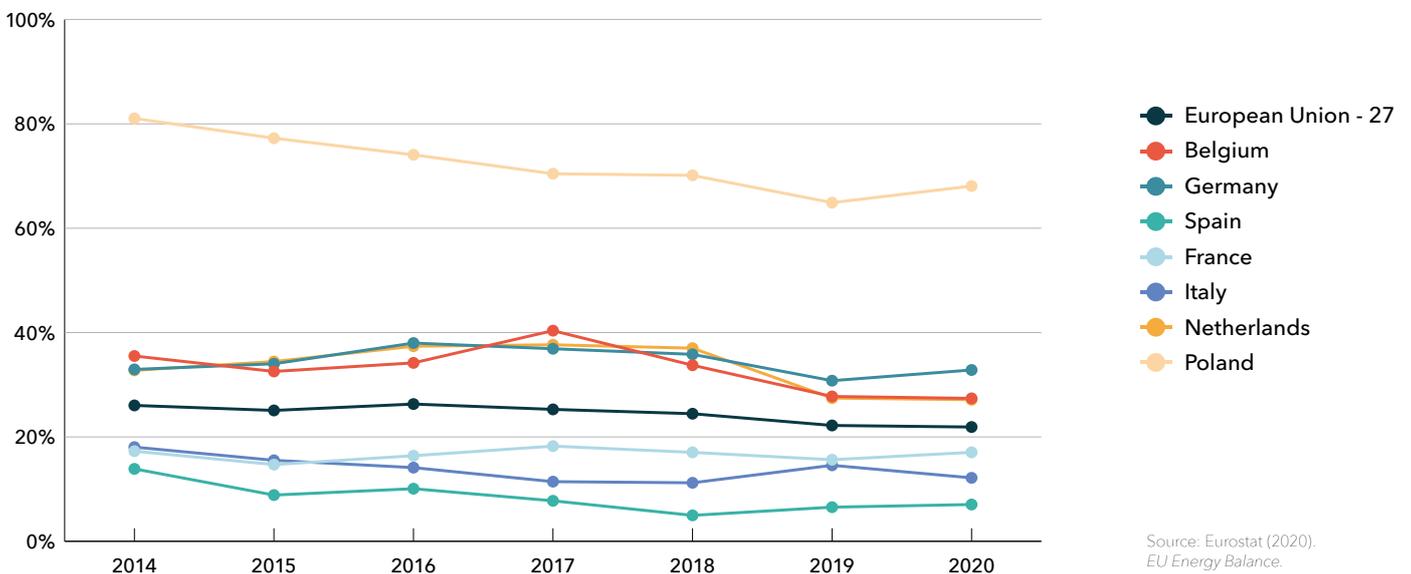


[Figure 1.14] Dependence of the EU and its seven biggest petrochemical-producing countries on Russian fossil gas as a share of the total gas influx in the EU 2014-2020



As a contrary development, the dependence on Russian oil has slightly decreased since 2014 in almost every Member State, and EU-wide from 26% to 22%.

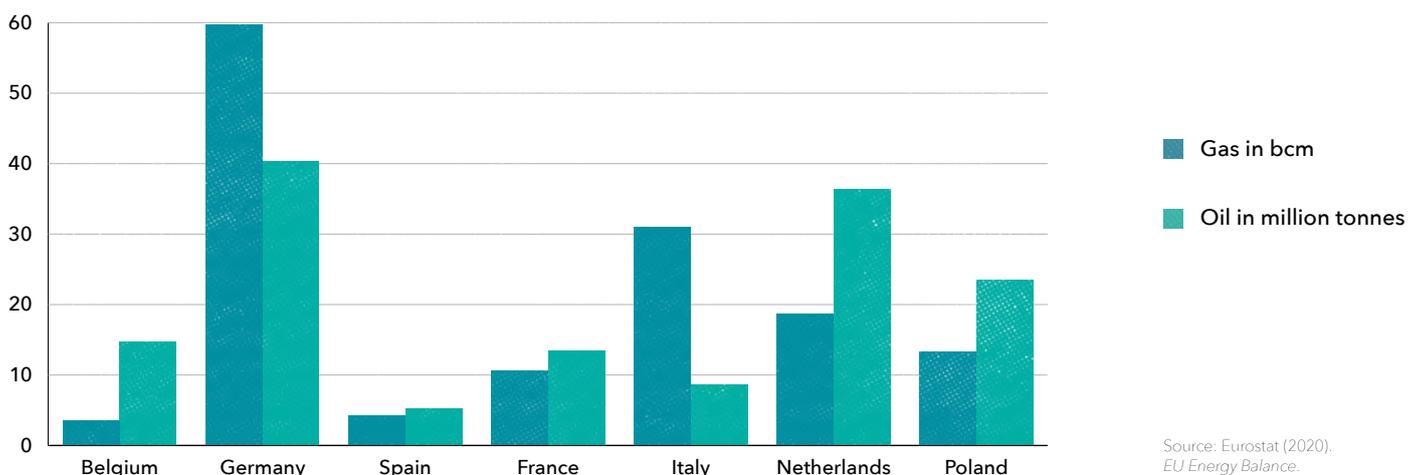
[Figure 1.15] Dependence of the EU's seven biggest petrochemical-producing countries on Russian oil as a share of the total oil influx in the EU 2014-2020



For this research, all indirect imports through other EU Member States have been taken into account, not only direct Russian imports, while taking care to avoid cases of double counting. Meaning that, for example, Russian crude

oil imported into Belgium, which is then refined into naphtha or other petroleum products and exported to France or Germany, is included in this data set as Russian oil and petroleum products for each country.<sup>66</sup>

[Figure 1.16] Dependence of the EU's seven biggest petrochemical-producing countries on Russian fossil gas and oil in bcm and million tonnes in the EU in 2020



Taking a closer look at the different EU Member States, it should be noted that in general, Eastern EU countries have decreased their reliance on Russian fossil gas, and Western EU countries - in particular, Germany - have significantly increased Russian imports. Coincidentally, these are also some of the biggest petrochemicals producers in Europe. The reasons why Western Europe has overlooked the dangers of depending on Russian imports, even after Russian aggression in Crimea and East Ukraine in 2014, are manifold. First of

all, the output of domestic production in Europe began to fall quickly<sup>67</sup> in the last decade. Second, alternative supply to Russian gas (both via pipeline and as LNG) has proven insufficient to reduce the demand for Russian fossil gas. And thirdly, geopolitics, lobbying, and propaganda on gas have prevented a proper debate on the much-needed phaseout of fossil gas in Europe and a decarbonisation of the energy- and feedstock-intensive petrochemical industry, starting with its biggest market: plastic.<sup>68</sup>

## 1.2.2. HOW RUSSIA IS FUELLING THE EU'S PLASTIC PRODUCTION

When considering the looming shortages of gas this winter due to a possible cutoff of Russian gas, it's worth seeing how much of the EU's plastic production is made from Russian oil and gas.

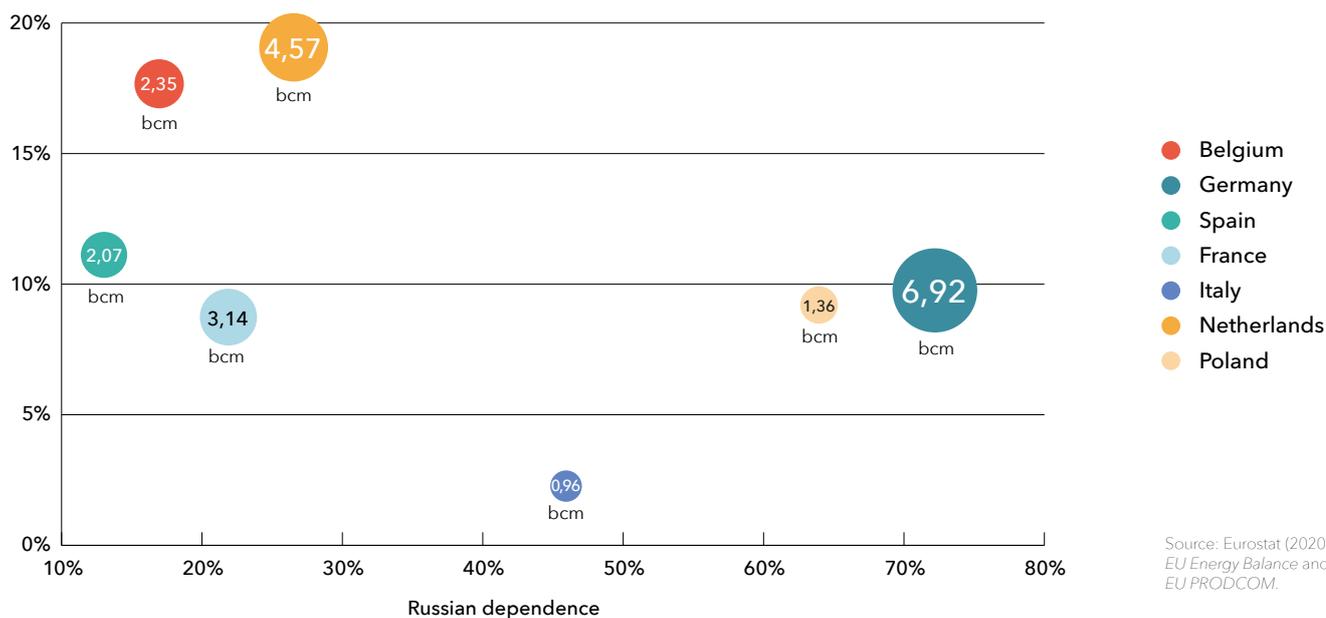
In the EU, 9% of the final consumption of fossil gas is attributable to plastic production, with almost 40% of that consumed gas being sourced from Russia in 2020 (Figure 1.14). Looking at the consumption of the EU's big seven petrochemical-producing countries for their plastic

production in 2020, the Netherlands and Belgium have the largest percentage of the total final consumption of fossil gas going to plastic consumption, with nearly a fifth of their final consumption of gas going to plastic production. Of this gas, 17% could be attributed to Russia for Belgium in 2020, and 26% for the Netherlands. In absolute numbers, Germany has the largest amount of gas going to plastic production - of which about 72% came from Russian sources.

# 40%

In the EU, 9% of the final consumption of fossil gas is attributable to plastic production. In 2020 almost 40% of this gas was sourced from Russia.

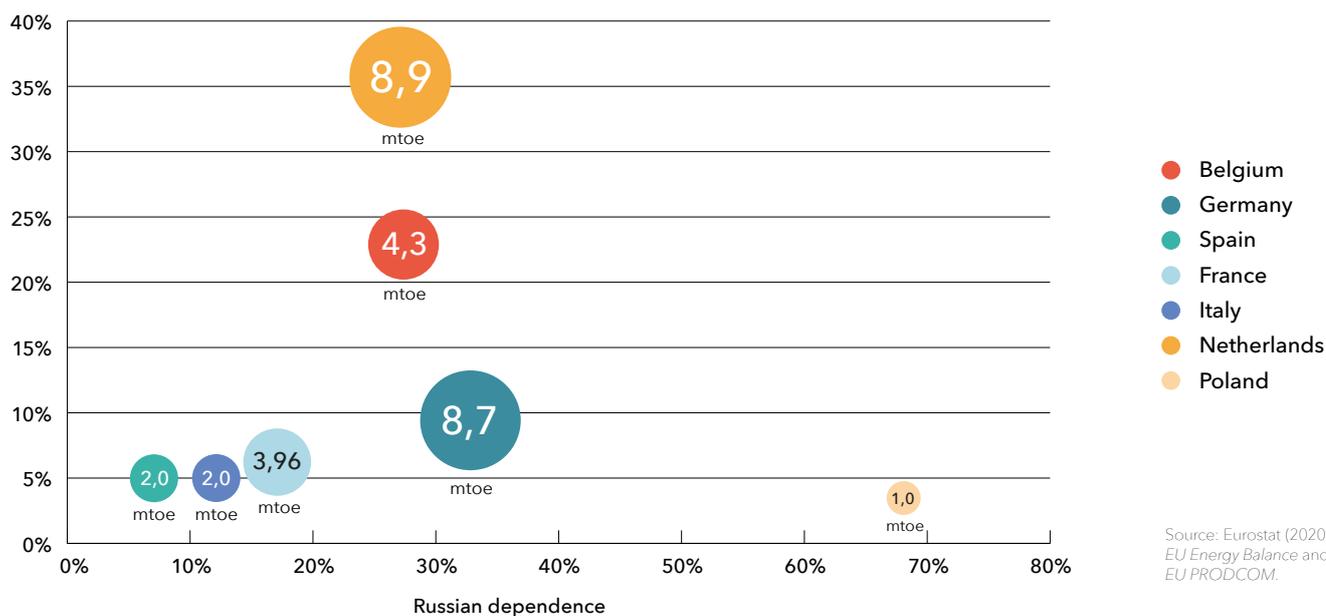
[Figure 1.17] The EU's seven biggest petrochemical-producing countries' share of final gas consumption for plastic production compared to their Russian gas imports in 2020



While there is currently a much more intensive public debate about fossil gas consumption and reduction, one must remain vigilant about the EU oil and petroleum consumption too. In an EU petrochemicals industry where most plastics are still made of naphtha, Russian imports remain relevant for the European plastics producers. The vertical axis of Figure 1.18 shows the percentage of oil going to plastic production of

the big seven, and the horizontal axis shows the percentage of the total available oil of Russian origin as a percentage of the total oil imported in Europe. Note that this includes indirect Russian imports too. This data includes not only the imports of crude oil but also of refined petroleum products.<sup>69</sup> These include naphtha for plastic production, gasoline for transport, LPG, etc.

[Figure 1.18] The EU's seven biggest petrochemical-producing countries' share of final oil consumption for plastic production compared to their Russian oil imports in 2020

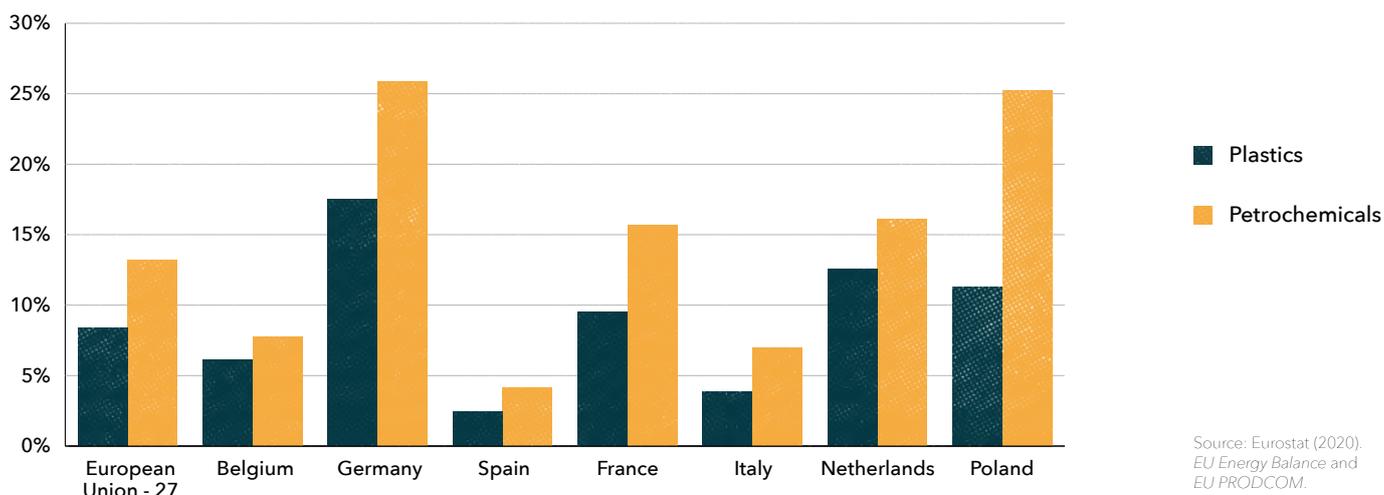


In the EU, 8% of the final consumption of oil and petroleum products is attributable to plastic production, of which more than a fifth was sourced from Russia in 2020 (Figure 1.15). This rises in some of the seven biggest petrochemical-producing countries. Thirty-six percent of the Netherlands' final oil consumption, 23% in Belgium, and 9% in Germany is used for plastic production (Figure 1.18, y-axis). Since a quarter of Dutch and Belgian oil and a third of German oil was sourced from Russia in 2020, it appears that a significant amount of Russian oil was used for this plastic production. Poland is the most dependent on Russian oil, with two-thirds of its oil

coming from Russia (Figure 1.18, x-axis). In absolute numbers, the Netherlands is the largest oil-to-plastic producer, with Germany coming in a close second place.

When comparing the Russian imports used for plastic production to the industrial gas consumption, it can be seen that more than 8% of the EU's industrial gas consumption is used for plastic production made of Russian gas (energy or feedstock) (Figure 1.19). For the petrochemicals industry, this climbs to 13%, showcasing the EU's industrial dependence on Russian gas.

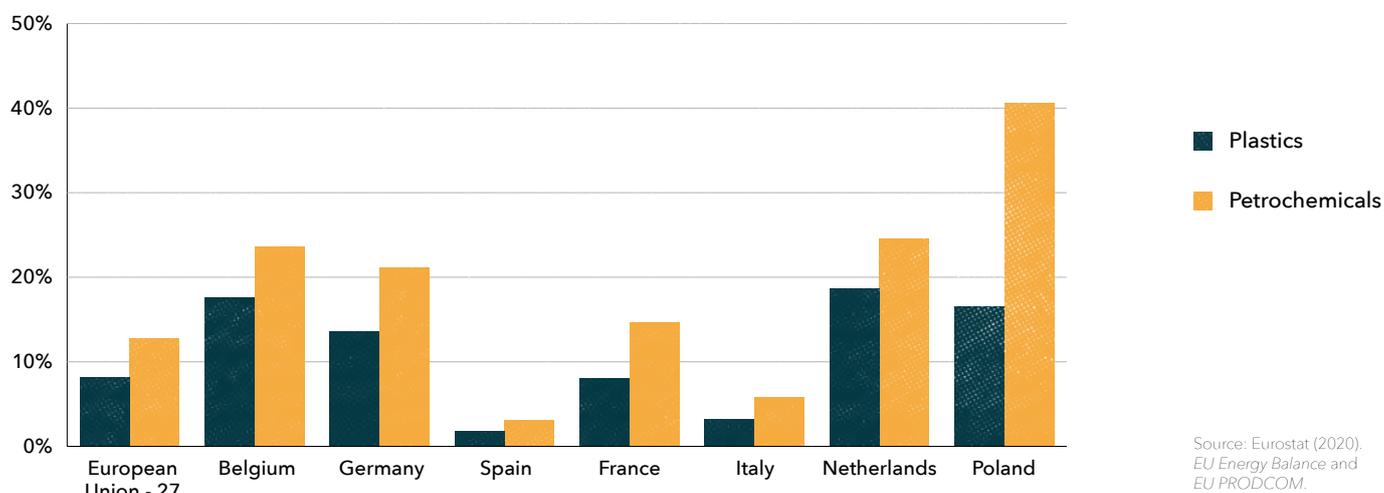
[Figure 1.19] Share of the industrial gas consumption for petrochemical and plastic production coming from Russia in 2020



In 2020, 8% of the EU industrial consumption of oil was attributable to plastics made from Russian oil (Figure 1.20). In recent decades, these big petrochemical-producing countries have built a plastic empire, for which Russian fossil fuels have been a cornerstone. This reliance shows still more

starkly at the national level, with two-fifths of all industrial oil consumption in Poland, a quarter in the Netherlands and Belgium, and a fifth in Germany being Russian-powered petrochemicals.

[Figure 1.20] Share of the industrial oil consumption for petrochemical and plastic production coming from Russia in 2020



With Russia's aggressive and unlawful war against Ukraine severely interrupting the global energy infrastructure, the world is experiencing an unprecedented energy crisis, posing even greater challenges than the oil shocks of the 1970s.<sup>70</sup> Decades-long lack of ambition with regard to the energy transition and high energy and fuel costs, now exacerbated by the war, have made life difficult for countries everywhere and sparked concern about energy security, highlighting the EU's excessive reliance on gas, oil, and coal - particularly from Russia. Having to choose between keeping the heating on at home, covering the higher costs of transport, or even buying food will be a financial and social dilemma for many European households and small businesses this winter. And this energy crisis could potentially become worse in the coming months. Research by Bruegel<sup>71</sup> shows that, in the case of a Russian gas supply cut, even with record-high non-Russian imports, there would not be enough to fully close the gap left by Russian gas. This is due to lack of capacity and infrastructure such as pipelines and LNG

terminals (infrastructure to retransform liquid shipped gas into a gaseous state). With over half of the Member States already experiencing lower deliveries, the EU is at imminent risk of seeing significant further reductions in gas supplies from Russia. As this report demonstrates, however, prioritising the construction of additional fossil fuel infrastructure while ignoring the existing and massive potential to reduce the wasteful consumption of oil and gas in the plastics and petrochemicals sector is a serious strategic error.

The only answer to the triple energy, climate, and plastic pollution crises that the world is facing lies in a substantial reduction of fossil fuels usage - including non-essential items made of oil and gas, such as a large share of our plastic products and packaging. To complete some of these goals, the European Commission has started a big demand reduction initiative in the EU for gas but is still ignoring one of its biggest untapped potentials: petrochemicals and plastics production.



8%

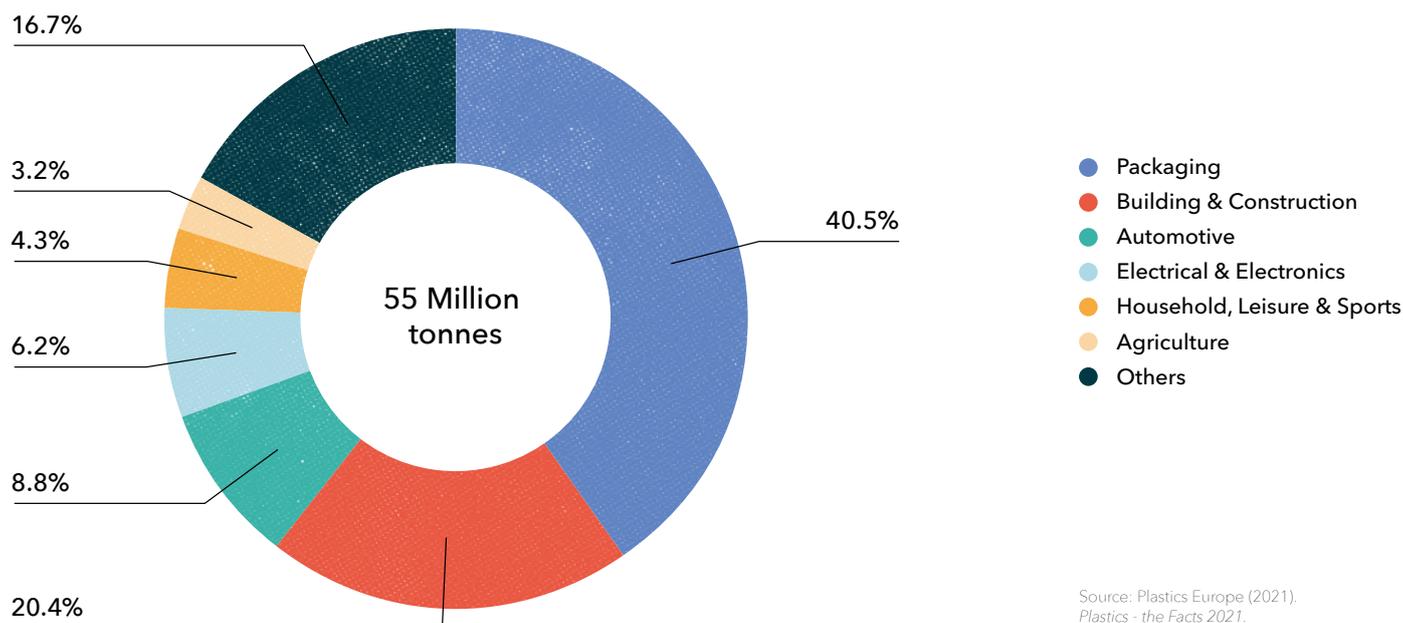
In the EU, 8% of the final consumption of oil and petroleum products is attributable to plastic production, of which more than a fifth was sourced from Russia in 2020.



## 2. A WIN-WIN SITUATION: HOW TACKLING PLASTIC POLLUTION CAN HELP ADDRESS OUR ENERGY AND CLIMATE EMERGENCIES

Plastic production is by far the largest industrial oil, gas, and electricity user in the EU, overshadowing other energy-intensive industries such as steel, automotive, machinery, and food and beverages. The largest part of this energy was used to produce packaging, which accounts for 40% of the end market for plastic products in Europe (Figure 2.1).<sup>72</sup>

[Figure 2.1] EU plastics demand by segments in 2020



While the EU has paved the way for a moderate reduction in plastic consumption, and therefore production, notably through its SUP Directive,<sup>73</sup> no overall binding prevention target has been set. As the latest report commissioned by industry trade group Plastics Europe points out, “while prevention is at the top of the waste hierarchy, so far this has not been an explicit key priority of most policy or industry actions.”<sup>74</sup> With the energy and climate crises worsening by the day, compounded and accelerated by Russia’s invasion

of Ukraine, the EU needs to immediately use every lever it has to reduce fossil fuel consumption, with a particular focus on rapidly reducing non-essential and wasteful uses. Accelerating and raising the ambition for plastic production reduction, starting with single-use plastics and packaging, is a concrete action that decision-makers could implement to contribute to the overall effort to reduce fossil fuel consumption.

## 2.1. WHEN OIL AND GAS GO TO WASTE IN A RECORD TIME

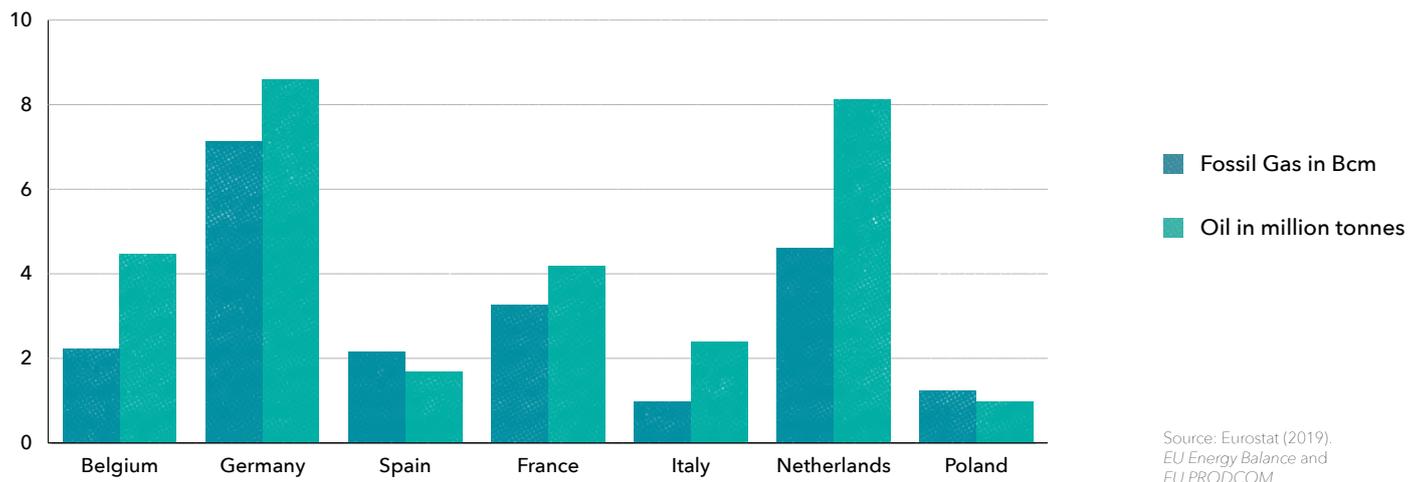
In 2019, the EU produced 57.9 Mt of plastic,<sup>75</sup> including over 22 million tonnes of plastic packaging. The approximately 10 bcm of gas and 14 Mt of oil used for this packaging production represent more than the 2019 final gas consumption of Hungary and the 2019 final oil consumption of Austria.<sup>76</sup> In the same period, the EU generated 15 Mt of plastic packaging waste.<sup>77</sup> For every 100 kg of plastic packaging produced in the EU, it produced 65 kg of plastic

packaging waste, two-thirds of which was then landfilled or incinerated.<sup>78</sup> In 2019, the EU’s seven biggest petrochemical-producing countries used a combined 21.62 bcm of gas and 30.4 million tonnes of oil to produce plastic (Figure 2.2).<sup>79,80</sup> For reference, this roughly equals the yearly final gas consumption of the Netherlands and the final oil consumption of Poland, the EU’s fifth- and seventh-largest economies, respectively.

30.4mt

In 2019, the EU’s seven biggest petrochemical-producing countries used a combined 21.62 bcm of gas and 30.4 mt of oil to produce plastic. That’s the equivalent of the yearly final gas consumption of the Netherlands and the final oil consumption of Poland.

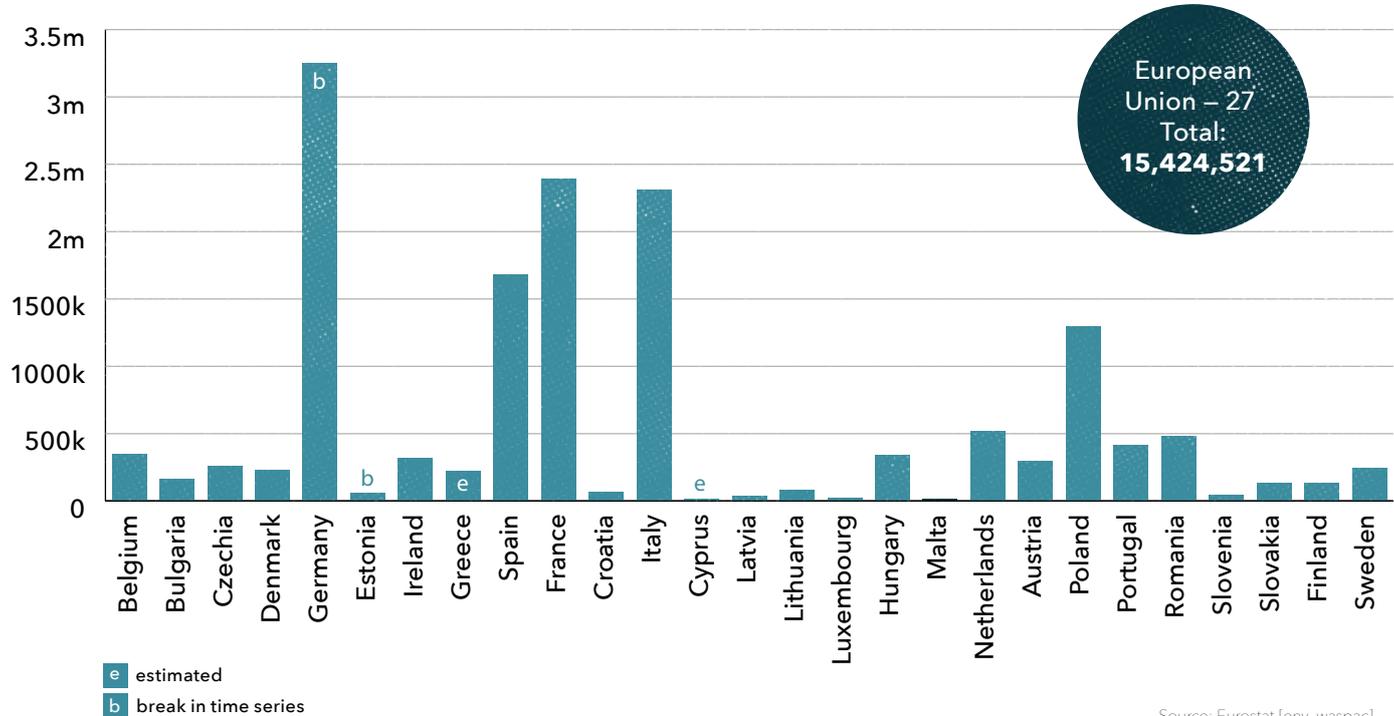
[Figure 2.2] Fossil gas and oil going to plastics in the EU's big seven petrochemical-producing countries in 2019



The Netherlands, Germany, Belgium, France, Spain, Italy, and Poland are not only the seven biggest consumers of oil, gas, and electricity for petrochemicals production. They are also among the top 10 generators of plastic packaging waste in the EU (Figure 2.3) - generating an average of 35 kg of plastic packaging waste per capita each year.<sup>81</sup> In 2019, in total, these seven countries produced a reported 11.8 million

tonnes of plastic packaging waste, with Germany alone producing 3.2 million tonnes, followed by Italy and France with 2.3 million tonnes (Figure 2.3). Together, the biggest plastic producers in the EU are responsible for 77% of all plastic packaging waste in the EU. Not only do they consume the most energy for plastic production, they also generate the most waste.

[Figure 2.3] Plastic packaging waste collected in the EU in 2019 (in tonnes)



From 2014 to 2019, the amount of plastic packaging waste rose by 16% in the EU, and is showing no signs of slowing down.<sup>82</sup> The latest industry forecast on plastic packaging and

household plastics goods waste in the EU suggests that it will steadily increase by 1% per year until 2050, a number that can be considered conservative.

[Figure 2.4] Growth in plastic packaging waste generated from 2014 to 2019

	European Union - 27	Belgium	Germany	Spain	France	Italy	Netherlands	Poland
Plastics	16.03%	4.12%	7.53%	17.14%	14.28%	13.14%	7.26%	44.87%

Source: Eurostat [env\_waspac].

Reusable and refillable packaging represents only a very marginal portion of the market share in EU countries (usually not more than 2-3%) and most of the few existing refillable systems in Europe have been developed with glass bottles or containers.<sup>83</sup> Therefore, the present report assumes that virtually all plastic packaging produced and put on the EU market becomes waste after a single use, usually in a very short time period ranging from a few days to a few weeks. Considering that it took 25 bcm of gas, 35 million tonnes

of oil, and 132 Terawatt hours (TWh) to produce 55 million tonnes of plastic in 2020, this is an enormous amount of fossil fuel wasted in a very short amount of time. And the future doesn't look brighter. Indeed, according to the latest industry-commissioned report, "on the current trajectory, more than half of packaging and household goods waste will end up in incinerators in 2050, representing a linear system that will produce approximately 1.2 GtCO<sub>2</sub>e of [greenhouse gas] GHG emissions between 2022-2050."<sup>84</sup>

With the climate, energy, and plastic pollution crises worsening, it is key to look at how to reduce plastic production. And since the EU's top plastic-producing countries are also the ones who waste the most, they present the biggest potential to reduce demand and plastic use in absolute numbers.

## 2.2. TACKLING PLASTIC POLLUTION AND OIL AND GAS CONSUMPTION AT SOURCE: THE ROLE OF PREVENTION AND REUSE

The key policy and industrial actions to take in order to reduce the massive amount of fossil gas and oil going to plastic production each year are at the top of the EU waste hierarchy: prevention and reuse.

In April 2022, SYSTEMIQ published a report on pathways to decarbonise and improve the circularity of the plastics system in Europe, providing data-driven scenarios on how the EU could decrease its plastics use.<sup>85</sup> Considering that this report was commissioned by Plastics Europe, the plastics industry's own trade group, and informed by a steering group composed of representatives from the industry, academic world, and civil society,<sup>86</sup> the data therein can be considered a conservative scenario on which to build the present analysis. The reduction and substitution scenario produced by SYSTEMIQ envisions a substantial elimination of plastic consumption, significant deployment of reuse and alternative distribution methods, and plastic replacements when appropriate. In this scenario, SYSTEMIQ estimates that virgin fossil plastic demand would decrease from approximately 50 Mt to 29 Mt by 2050. Reductions at this scale would entail a 40% reduction of virgin fossil plastic, with an attendant reduction in fossil gas and oil used for plastic production. Using this scenario commissioned by the plastics industry and incorporating industry data, the EU could save 10 bcm of gas and 14 million tonnes of oil, which is more than the 2020 final gas consumption of Hungary or Romania<sup>87</sup> and is

roughly equivalent to the final oil consumption of Denmark and Sweden combined.<sup>88</sup> Faced not only with the current energy challenges, however, but also with the urgent realities of both the climate and plastic pollution crises, the EU cannot afford to wait another three decades to see the effects of such a scenario. The policies and measures that will lead to this cut should be considered as priority crisis measures, to enable a quick transition and allow this reduction to be fully effective at the latest by 2030, beginning with accelerating the implementation of the SUP Directive and undertaking a rapid and ambitious revision of the PPWD.

Amongst the many solutions that exist and are already being implemented to reduce the overall amount of plastic, many are low-hanging fruits for the packaging sector. Considering that it constitutes 40% of the total EU production, this sector needs to act quickly and ambitiously to directly eliminate unnecessary packaging through redesign (e.g., secondary plastic wrappings (overwraps), unnecessary tear-offs, excess headspace, and unnecessary films) and packaging-free solutions (e.g., no veggie wrapping, bulk dispensers).<sup>89</sup> On top of that, redesigning packaging and the logistics chain to foster reuse, widely developing deposit return systems (DRS), and new delivery models at home and in-store could lead, at minimum, to a "net reduction of 13% (2.3 Mt) of packaging demand by 2030."<sup>90</sup>

Were the EU to adopt (and implement) a 50% prevention target of plastic packaging put on the market by 2030<sup>91</sup> in the revision of the PPWD, it could potentially reduce the fossil fuels going to plastic production by one-fifth.<sup>92</sup> This alone would mean a reduction of 4% of the industrial consumption of fossil gas in the EU compared to consumption in 2020. This 4% corresponds to 5 bcm, roughly equivalent to the 2020 final gas consumption of the Czech Republic or Slovakia.<sup>93</sup>

In the big plastic-producing countries, this would be an industrial consumption of fossil gas reduction equivalent to 7% in Belgium, 5% in Germany, and 9% in the Netherlands. This number rises for the industrial consumption of oil and petroleum products, with a potential reduction of 6% in the EU compared to consumption in 2020, 13% in Belgium, 8% in Germany, and 14% in the Netherlands.

The EU-wide reduction potential of 6% corresponds to 6 million tonnes of oil, which is comparable to the 2020 final oil consumption of Ireland or Denmark.<sup>94</sup>

Packaging waste prevention can have 0% energy use (i.e., packaging-free initiatives), and while reuse systems don't have 0% energy use, this analysis assumes they have a much lower energy use than single-use (when implemented taking into consideration the key parameters for effective reuse systems<sup>95</sup>) to approximate a reduction potential for fossil gas and oil use in the plastic production. For instance, according to a recent study<sup>96</sup> a packaging's production phase was found to have the biggest impacts of a product's life cycle. Nevertheless, for the majority of reusable packaging, the production impacts become less relevant, since the overall environmental impact is divided throughout the number of cycles (re-uses) of the packaging. Given the urgency and the uncertainty related to fossil gas supply for heating of households in particular for the upcoming winters, a high prevention target of plastic packaging earlier than 2030 should be aimed for.

[Figure 2.5] Industrial gas and oil consumption reduction potential if plastic packaging production is reduced by half by 2030 in comparison to 2020

	European Union - 27	Belgium	Germany	Spain	France	Italy	Netherlands	Poland
Gas	4.40%	7.22%	4.84%	3.75%	4.39%	1.69%	9.48%	3.52%
Oil	7.52%	12.90%	8.30%	5.23%	5.84%	5.24%	13.78%	4.86%

Source: Eurostat (2019). EU Energy Balance and EU PRODCOM.

While the world cannot recycle its way out of plastic pollution, in a scenario where it is possible to achieve a high rate of prevention and reuse first and foremost, mechanical recycling could play a complementary role.

# 50%

Were the EU to adopt a 50% prevention target of plastic packaging put on the market by 2030 in the revision of the PPWD, this could reduce the amount of fossil fuels going to plastic production by one-fifth, the equivalent of the Czech Republic's 2020 final gas consumption.

## 2.3. THE COMPLEMENTARY ROLE OF MECHANICAL RECYCLING

The energy going towards the production of virgin plastics is by far the most energy-intensive way to produce plastics. While prevention and reuse are the priority, mechanical recycling of plastic waste can also play a role in reducing the amount of oil and gas going to virgin plastics production.

However, in the EU, only a third of plastic waste is currently recycled.<sup>97</sup> For most plastics, recycling is either technologically impractical or too costly, largely because plastic products and packaging have not been designed to be recycled and contain hazardous chemicals hindering recycling. Mechanical recycling is facing three main challenges at the moment to truly play a role in preventing plastic pollution and fossil fuel consumption.

**First**, the current recycling system is actually downcycling, where plastic packaging is recycled into items (e.g., fleece, pipes, benches) that won't likely be recycled afterward. Currently, only 1% of plastic is recycled more than once,<sup>98</sup> and only between 2 and 5% of recycled plastic is used to replace virgin plastic in new products.<sup>99</sup> Due to material loss in the recycling process, virgin plastic is needed to maintain the same level of production, making it an uncircular mode of production. Improvements in packaging design, collection systems, and elimination at source and traceability of harmful chemicals in products could enable product-to-product recycling systems for plastic materials like polyethylene terephthalate (PET). However, it is unlikely that this closed-loop recycling can be replicated for the majority of polymers.

**Second**, the EU is dependent on offshoring a significant amount of the plastic packaging waste it generates. Such offshored waste is in reality often not recycled at all, and when it is, rarely in an environmentally sound manner. Yet the EU still exports more than 1.1 million kg of plastic waste per year,<sup>100</sup> including plastic packaging, outside of its borders for 'recycling', which, given the hard-to-recycle nature of this waste stream, makes it more vulnerable to mismanagement and illegality. This is further compounded by the current opacity of the plastic waste trade, rendering the traceability of its fate incredibly difficult, further exacerbating the issue. This feeds a vicious cycle that subsequently results in ever-increasing and extensively documented evidence of environmental, social, and human health harms in recipient countries, in addition to displacing domestic recycling capacity.

**Lastly**, for recycling to safely play a role against plastic pollution, toxic additives that are added to plastic to give it certain properties need to be eliminated at the source, and traceability mechanisms need to be put in place for legacy chemicals. While the European plastics industry acknowledged that one of the challenges that the plastics

system is facing "relates to the toxicity of the materials and their impacts on human health (especially as plastic breaks down into micro- and nano-plastics),"<sup>101</sup> the industry chose to completely ignore this critical element in its 2050 scenario. As long as these issues are not tackled, mechanical recycling cannot be a sustainable solution, but it is not an excuse to not do our best to repurpose plastic waste that is already circulating.

### THE RISK OF BETTING ON CHEMICAL RECYCLING

Aware of the shortcomings of mechanical recycling, the European plastics industry is now betting heavily on chemical 'recycling,' arguing that it could not only eliminate toxic additives from the process but also treat plastics that are hard to recycle mechanically. However, research has proven that not only is this process extremely energy-intensive, it is also not yet mature and would require clean and mono-material plastic waste streams to be viable, which defies its displayed purpose.<sup>102</sup> Furthermore, the last report from the European Chemicals Agency underlines the fragmented knowledge on the fate of substances of concern in different chemical recycling processes, therefore calling for a precautionary approach and more investigations at commercial scale.<sup>103</sup>

According to the single-use-plastics-friendly US Plastics Industry Association, making products from recycled plastics uses 66% less energy than virgin plastics.<sup>104</sup> This number is conservative, since it assumes only one cycle, while it is likely that if designed for recycling, plastic products could sustain multiple recycling cycles. In its current version (revision forthcoming), the EU PPWD features a target of 50% recyclable plastic packaging by 2025,<sup>105</sup> while the Circular Economy Action Plan<sup>106</sup> wants all packaging on the EU market reusable or recyclable in an economically viable way by 2030. In its Plastics Strategy,<sup>107</sup> the EU committed to having all plastic packaging recyclable by 2030. This does not mean that it could all be effectively recycled, but the current crisis is calling for ambition. If, by 2030, 90% of plastic packaging (40% of the total EU plastic production) is to be safely mechanically recycled into new packaging, more than 6 bcm of gas and almost 9 million tonnes of oil could be saved compared to 2020. This is nearly a fifth of the total 2020 EU plastic production,<sup>108</sup> and a quarter of the oil and gas going into plastic production annually.

[Figure 2.6] Industrial gas and oil consumption reduction potential if 90% of plastic packaging waste is recycled by 2030 in comparison to 2020<sup>109</sup>

	European Union - 27	Belgium	Germany	Spain	France	Italy	Netherlands	Poland
Gas	5.44%	8.94%	5.99%	4.64%	5.44%	2.09%	11.74%	4.36%
Oil	9.30%	15.97%	10.28%	6.47%	7.23%	6.49%	17.05%	6.01%

Source: Eurostat (2019). EU Energy Balance and EU PRODCOM.

When comparing this reduction potential to the total amount of Russian oil and gas imported into the EU and the seven biggest plastic-producing countries, the reduction potential of just Russian fossil fuels can be measured. Countries with a relatively low amount of Russian imports and large petrochemical industries have the most potential to decrease their dependence on Russian imports by reducing their

plastic packaging production and use (Figure 2.7). Notably, Belgium and Spain could significantly reduce their Russian gas and oil imports. But major plastic and petrochemical producers like Germany have still larger fossil fuel gaps to close and, accordingly, much to gain by rapidly and dramatically reducing wasteful plastic production.

[Figure 2.7] Russian oil and gas reduction potential if 90% of plastic packaging waste is recycled by 2030 in comparison to 2020

	European Union - 27	Belgium	Germany	Spain	France	Italy	Netherlands	Poland
Gas	3.77%	37.45%	2.99%	13.35%	8.54%	0.78%	6.69%	3.26%
Oil	5.14%	9.09%	6.20%	12.33%	9.66%	6.10%	8.12%	1.13%

Source: Eurostat (2019). EU Energy Balance and EU PRODCOM.

The European plastics industry agrees that *“the next three to five years are a critical window for action.”*<sup>110</sup> Considering their plastic pollution prevention and fossil fuels consumption reduction potential, the priority should be given to policy measures and industrial strategies focusing on eliminating all unnecessary plastic use through the redesign of products and upscaling of reuse systems. As a baseline, the pathways to a more circular plastics system in the industry-commissioned SYSTEMIQ report include a reduction and substitution scenario which could

be quickly implemented and could lower the EU’s total plastic production by 40%. This could give a potential reduction of 10 bcm of gas and 14 million tonnes of oil. Looking at only packaging, a 50% plastic packaging prevention target together with a 90% recycling rate would save 6.2 bcm of gas, and 8.7 million tonnes of oil in 2030 compared to the 2020 final consumption, the equivalent to the Czech Republic’s final oil and gas consumption in 2020.<sup>111,112</sup> This would decrease climate impacts and increase the EU’s energy security.

# CONCLUSION AND RECOMMENDATIONS

This report sheds light on the staggering consumption of oil, gas, and electricity of the EU's petrochemicals and plastics industry – and its substantial dependency on Russian imports. The threats to the EU's energy security just ahead of the colder months of the year, combined with escalating climate impacts, are calling for drastic measures to phase out consumption of fossil fuels for non-essential use. In this context, looking at ways to reduce virgin plastic production constitutes a unique opportunity for the EU to address plastic pollution at the same time as the climate and energy crises. The reduction potentials calculated in this report should demonstrate the pressing need, the clear opportunity, and the urgent responsibility for EU decision-makers to implement the bold and ambitious response measures required to address the current crisis. Below are some recommendations as to where to start.

- A first and easy step in achieving a drastic reduction of virgin plastic production is for the EU Member States to accelerate and expand the implementation of the Waste Framework and Single-Use Plastics Directives, increasing the level of ambition, notably by adopting prevention and reuse targets. Such action will also reduce oil and gas consumption.
- The EU and its Member States need to seize the opportunity of the revision of the PPWD to adopt ambitious measures on packaging reduction and the development of reuse systems. These measures should include the following:
  - Ambitious and binding prevention and reuse targets (50% by 2030 and 80% by 2040). These targets should be accompanied by requirements for transparent monitoring and reporting and should ensure reusable packaging systems are accessible to all.
  - Bans on an additional number of single-use plastics, such as monodose plastic packaging, as well unnecessary packaging such as single-serving sachets and wrapping of fruits and vegetables, and prohibiting overpackaging (e.g., plastic wrapping of cardboard packaging, an excessive amount of packaging for the product/content).
  - A cap on overall packaging put on the EU market, reducing over time.
  - Economic incentives for reusable packaging and accompanying systems (e.g., deposit return schemes and reverse logistics).
  - Requirements to prioritise reusable packaging in the context of public procurement.
- The EU cannot afford to wait another three decades to reduce by 40% its virgin plastic use in the packaging and household goods, automotive, and building sectors, as put forward in proposals by Plastics Europe and SYSTEMIQ.<sup>113</sup>

Reducing production from 50 to 29 megatonnes (Mt) should be achieved by 2030.

- Reacting to the threat of a supply cut from Russia, EU Member States have agreed to reduce gas consumption by 15% by 31 March 2023. But this measure falls far short of what is needed. For the immediate future and in light of expected gas shortages over the coming months, the EU and its Member States need to ensure that emergency measures restrict non-essential industry oil and gas use – for example, the share that would typically go to producing unnecessary single-use plastics and packaging. The scope of such restrictions needs to mirror the scale of the crisis and be implemented in a way that protects workers and low-income households.
- The EU and its Member States need to push for ambition on upstream measures within the negotiations of the Global Treaty to End Plastic Pollution, including recognition of sourcing and feedstocks in defining the full plastics life cycle, a global cap on overall plastics production, and recommendations to begin phasing down plastics production, with initial limitations on the production of particularly problematic or unnecessary plastics.
- The EU and its Member States must stop building new fossil fuel infrastructure, including petrochemical facilities, starting with a moratorium or freeze on permitting of new virgin plastic production facilities (such as crackers).
- EU and Member State attempts to secure oil and gas from African countries, the US, and elsewhere offer a short-term fix for a long-term problem, even as they accelerate the climate crisis and increase harm to communities and countries where extraction occurs. Attempts to address the crisis must be rooted in lowering all fossil fuels consumption while laying the foundation for a just transition, not enabling the building out of new infrastructure. Thus, the EU's climate and energy diplomacy should be based on securing climate-friendlier energy access and climate justice and be used to fulfill its commitments, including financial ones, under the EU Green Deal, the United Nations Framework Convention on Climate Change (UNFCCC), and the Paris Agreement.
- The EU and its Member States must engage with the European petrochemical industry to set up decarbonisation plans and a fossil-free future pathway, and a needed just transition for this sector.

Considering that the EU's seven biggest oil- and gas-consuming countries for plastics production are also responsible for 77% of all plastic packaging waste in the EU, these measures should be implemented in priority in Belgium, Germany, Spain, France, Italy, the Netherlands, and Poland.

# ANNEX 1

## EXTRA DATA

[Figure A.1] Percentage of production value and direct employment of plastics, as share of the total industrial sector in 2019

	European Union - 27	Belgium	Germany	Spain	France	Italy	Netherlands	Poland
Production value	7,36%	11,47%	7,25%	6,36%	5,50%	7,09%	13,03%	7,44%
Employment	5,73%	8,25%	6,81%	4,90%	5,15%	4,45%	7,11%	7,03%

Source: Eurostat (2019). EU Energy Balance and EU PRODCOM.

[Figure A.2] Percentage of final consumption of gas for households vs. industry in 2020

	European Union - 27	Belgium	Germany	Spain	France	Italy	Netherlands	Poland
Industry	38,16%	44,23%	36,32%	53,60%	35,94%	24,22%	36,26%	47,12%
Households	33,97%	27,11%	36,02%	21,93%	35,19%	44,17%	30,96%	30,63%

Source: Eurostat (2020). EU Energy Balance.

[Figure A.3] Percentage of the total industrial consumption of fossil gas and oil going to the petrochemical industry in 2020 (for top seven petrochemical-producing countries in the EU)

	European Union - 27	Belgium	Germany	Spain	France	Italy	Netherlands	Poland
Gas	34,46%	45,84%	35,84%	31,77%	36,09%	15,20%	60,65%	39,46%
Oil	58,51%	86,35%	64,62%	44,60%	53,08%	48,07%	90,65%	59,70%

Source: Eurostat (2020). EU Energy Balance.

# ANNEX 2

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