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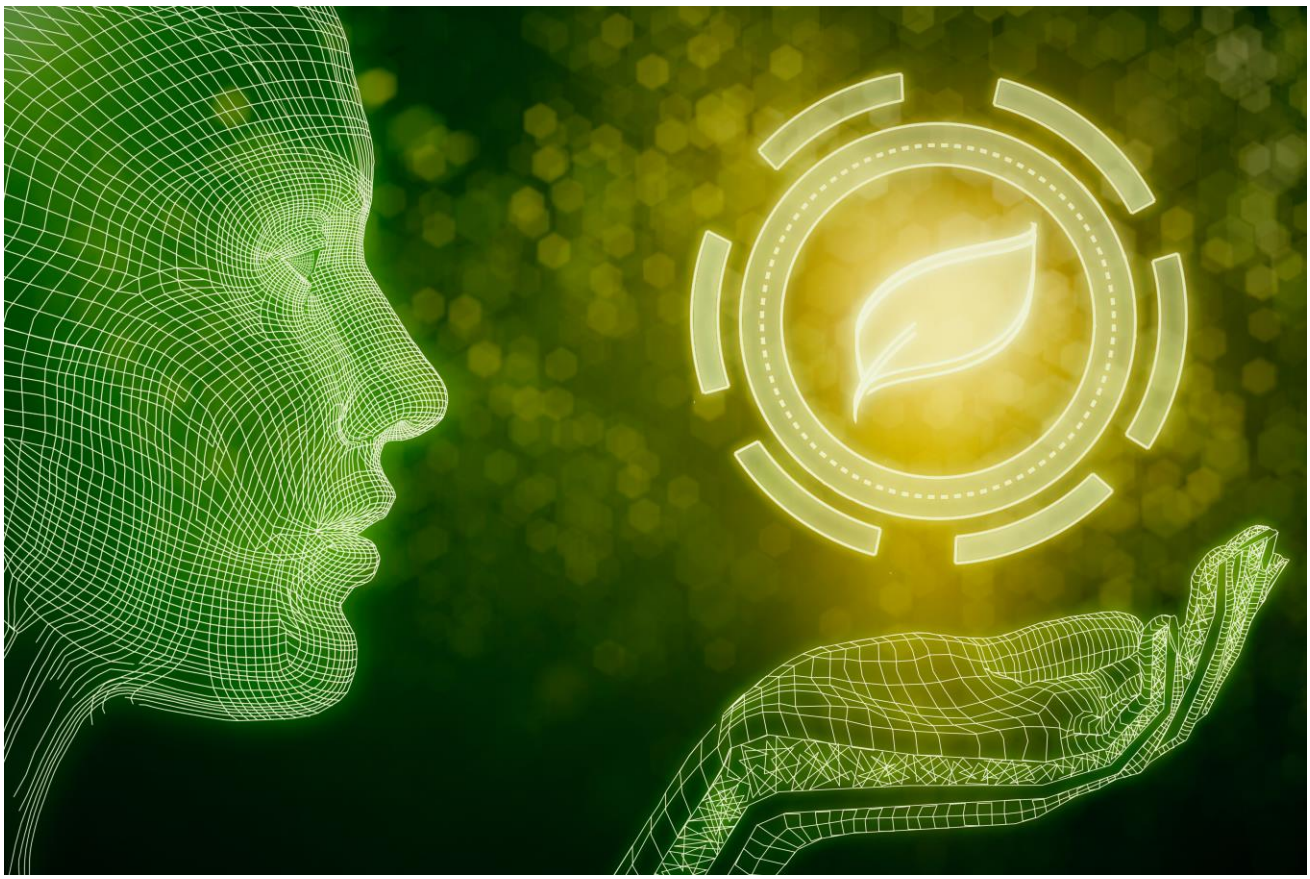
Green EU trade marks – 2022 update

Analysis of goods and services specifications, 1996-2021



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Foreword

Climate change and other environmental issues concern many citizens in the EU and beyond, and are increasingly prominent in politics, in business and in the public debate. In 2019, the European Commission established action on climate change as a priority, promising to deliver a European Green Deal with the aim of making Europe the first climate-neutral continent by 2050.

Intellectual property (IP) is, alongside financial resources, an important success factor in the achievement of the Commission's goals. In order to accomplish the Green Deal objectives, new technologies will be created, new products and services will be brought to market, and existing products will be redesigned to make them more sustainable.

The first study of Green EU Trade Marks (EUTMs), carried out in 2021 by the EUIPO through the European Observatory on Infringements of Intellectual Property rights, examines the increasing frequency with which goods and services specifications of EUTMs reflect issues related to environmental protection and sustainability. The present update to the study, adding data for 2021, shows that filings of 'green' EUTMs have increased significantly since the Office began operating in 1996, both in absolute figures and as a proportion of all EUTM filings, and that this trend continued in 2021.

The richness of this data, coupled with a new and innovative methodology, has made these insights possible. It is our hope that other researchers will take advantage of the possibilities offered by EUIPO's Open Data platform to deepen our knowledge of the role of IP in this important undertaking.

Christian Archambeau
Executive Director
EUIPO

1 Introduction

Climate change and other environmental issues concern many citizens in the EU and beyond. These issues are becoming increasingly important in politics, in business and in public debate. In 2019, the European Commission established that action on climate change was now a priority, promising to deliver a European Green Deal with the aim of making Europe the first climate-neutral continent by 2050.

Alongside financial resources, intellectual property (IP) is an important factor in the achievement of the Commission's goals. In order to accomplish the Green Deal objectives, new technologies will be created, new products and services will be brought to market, and existing products will be re-engineered to make them more sustainable.

The role of IP in environmental protection has traditionally been studied by focusing on technology and innovation, using patent filings as the principal indicator of innovative activity in this sphere. However, until the publication of EUIPO's inaugural study of 'green' EUTMs in September 2021, virtually no studies had considered trade mark filings as an indicator of innovation related to environmental protection.

In particular, this study examines the description of goods and services (G&S) of the trade marks filed at the EUIPO since it started operations in 1996 ([1]). It does so in order to to determine the presence of terms related to environmental protection and to sustainable development.

An inventory of 'Harmonised Green Terms' was developed based on the list of the standardised description of G&S in the EUIPO's Harmonised Database. This inventory contains about 85 000 terms that are accepted by all IP offices in the EU, as well as several non-EU countries. On this basis, a predictive model was developed that enabled the algorithm to determine if any of the terms covered by the trade mark application could be considered a 'green term', thereby classifying the EUTM under the 'green EUTM' category. More than 2 million EUTM applications received by the EUIPO since 1996 were searched using this

([1]) The EUIPO began accepting trade mark applications on 1 April 1996. The name of the Office at that time was Office for Harmonization in the Internal Market (OHIM), and the EUTM was called the Community Trade Mark. The current names of the Office (EUIPO) and the trade mark (EUTM) became effective in March 2016. For simplicity, the new names are used throughout this report.

algorithm. The output of this search constitutes the main results of this study, as presented in Chapter 5.

The remainder of this report is organised as follows. Following the Executive Summary, the main results are presented and discussed in Chapter 2. The annex explains the data and methodology used. In the interest of conciseness, the appendices containing the green terms and green expressions are not reproduced in this update. Readers wishing to consult this information are referred to the original 2021 study, available at https://euipo.europa.eu/tunnel-web/secure/webdav/guest/document_library/observatory/documents/reports/2021_Green_EU_trade_marks/2021_Green_EU_trade_marks_FullR_en.pdf.

This updated study is included in the Observatory's 2022 Work Programme. The terms of reference for the original 2021 study were discussed in the Public Awareness Working Group meeting, held online on 21 October 2020.

2 Executive summary

In this study, the G&S descriptions in the more than 2 million EUTM applications filed at the EUIPO since it began operations in 1996 are analysed for the presence of terms related to environmental protection and sustainability. Examples of these terms include 'photovoltaic', 'solar heating', 'wind energy', and 'recycling'. Using the EUIPO's Harmonised Database ([2]) as the source, approximately 900 such terms have been identified as 'green'; these terms have in turn been classified in 35 categories, which are further organised into 9 groups.

An algorithm was developed to search through nearly 70 million terms contained in the EUTM applications filed over the years in order to identify applications that contain at least one 'green' term ([3]). The purpose is to examine whether the increased concern among the public and policymakers over climate change and environmental degradation is reflected in the EUTM applications.

The main finding of the study is that growing interest in sustainability is indeed reflected in the EUTMs filed at the EUIPO. As seen in the graphs below, the absolute number of green EUTMs has increased significantly since 1996, as has the share of green EUTMs, although the latter has oscillated between 10 % and 12 % during the past decade.

([2]) The Harmonised Database (HDB) is a database of approximately 85 000 G&S terms available to EUTM applicants. These terms have been translated into all EU languages and have already been accepted by all IP offices in the EU as well as in some third countries.
([3]) These EUTMs are referred to as 'green EUTMs' in this report.

Figure 1. Green EUTM filings, 1996-2021

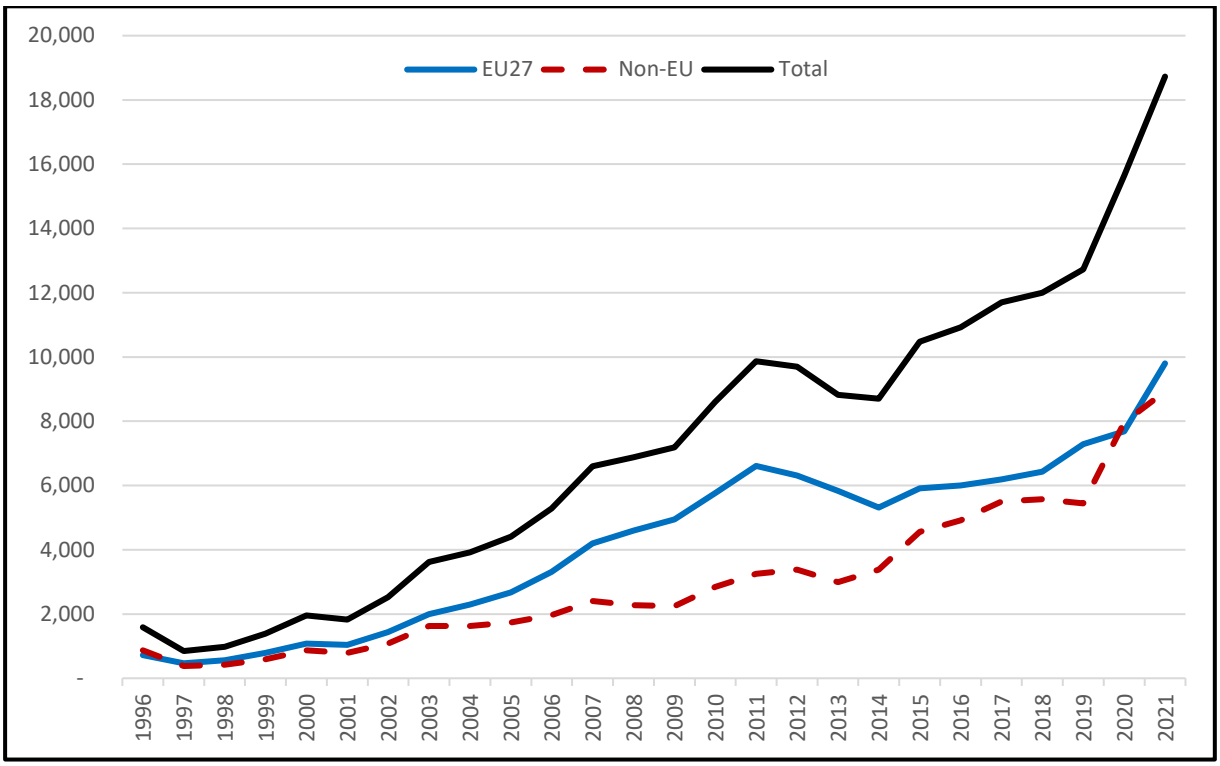
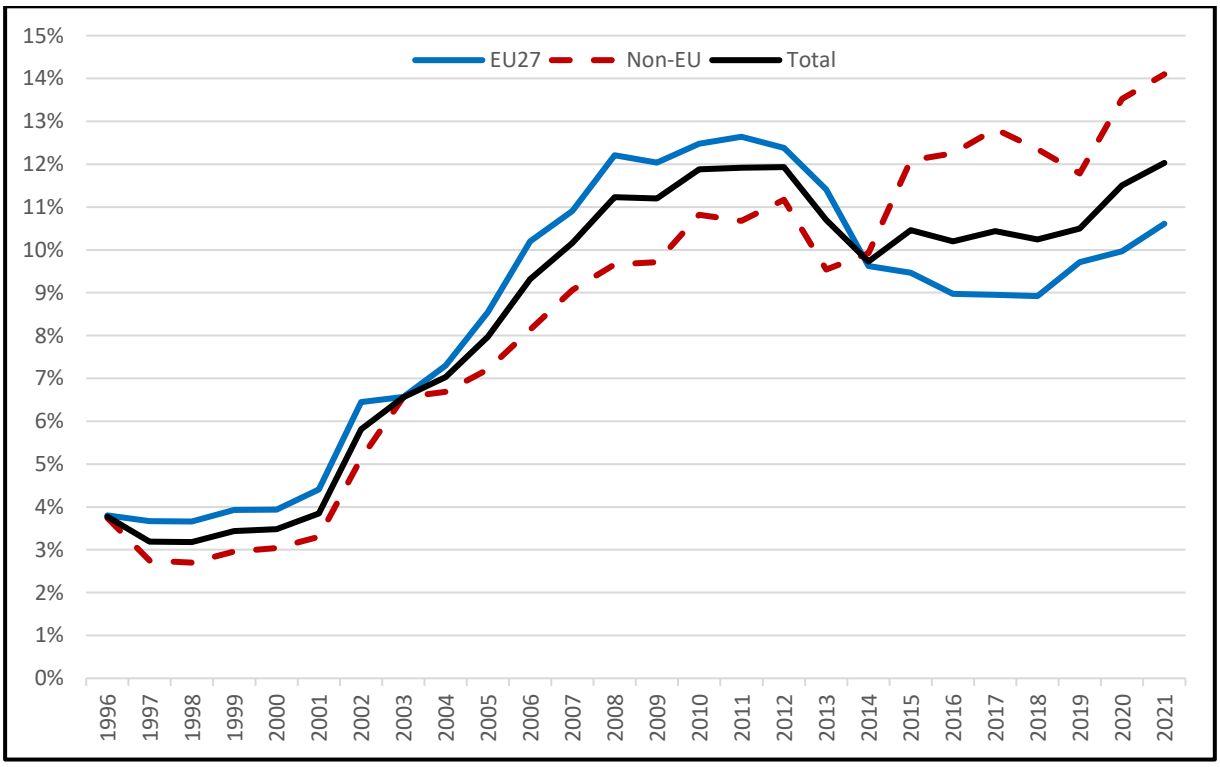


Figure 2. Green EUTM filings as a share of all EUTM filings, 1996-2021

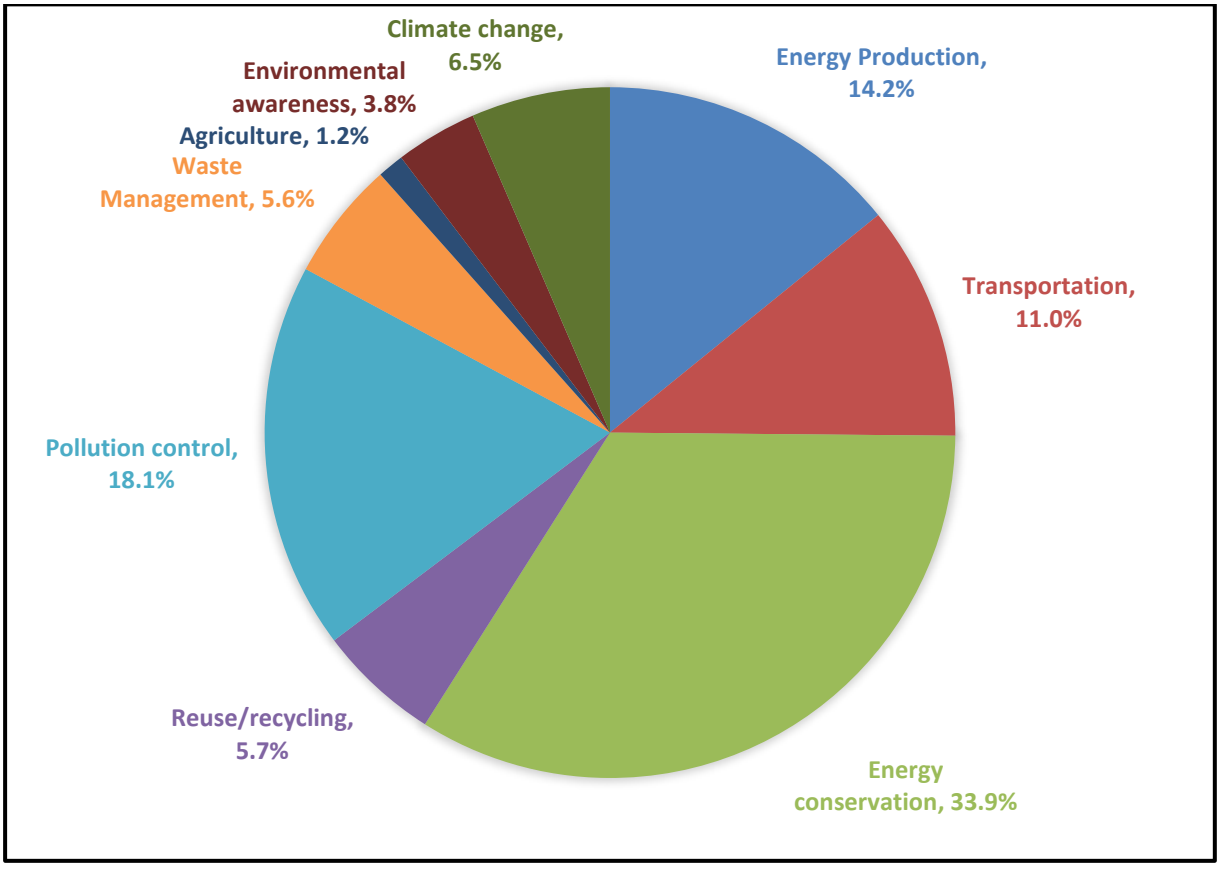


Both in absolute and relative terms, the importance of green EUTMs increased in 2021. In fact, the total number of green EUTMs in 2021 (18 726) and their share in overall EUTM filings in 2021 (12.0 %) are all-time highs.

A second trend that can be seen in the chart is the importance of green EUTM filings from outside the EU. While, in 2021, filings from EU-based applicants exceeded filings from outside the EU, the proportion of green EUTMs in all filings is higher for non-EU filers than for EU filers (14.1 % v 10.6 %). This mainly reflects filings from Chinese companies. Other non-EU countries with significant green EUTM activity in 2021 are South Korea, Switzerland, the United Kingdom and the United States. Among EU Member States, the top green EUTM filing countries in 2021 were Germany, Spain, France, Italy, the Netherlands, and Poland.

Figure 3 shows the distribution of green EUTMs filed since 2015 among the 9 main product groups. The dominant product groups are 'Energy conservation' and 'Energy production', which together account for more than 48 % of green EUTM filings, followed by 'Pollution control', with 18 % of filings, and 'Transportation' (11 %).

Figure 3. Green EUTMs by main product group, 2015-2021



Another interesting finding is that small and medium-sized enterprises (SMEs) are active in the sphere of green EUTMs, as shown in Table 1. The table shows the share of green EUTMs in the total EUTMs filed by companies of different sizes, both for the total period 2015-2021 and for 2021 separately.

Table 1. Green EUTMs by size of applicant, 2015-2021 and 2021 separately

Firm size	Green TMs	Total TMs	Green %	Green % 2021
Large	9 236	70 810	13.0 %	14.6 %
SME	14 284	142 194	10.0 %	11.2 %
medium	4 827	47 012	10.3 %	12.6 %
small	4 910	46 617	10.5 %	11.4 %
micro	4 547	48 565	9.4 %	10.3 %

For large companies in this sample, 13 % of EUTM filings are green. This percentage is somewhat lower for SMEs at 10 %, but even for the smallest companies in this group the share of green EUTM is more than 9 %. As shown in the last column, in 2021 all groups of companies increased their activity in the green EUTM space, with the percentage for large companies reaching 14.6 % and for SMEs 11.2 %.

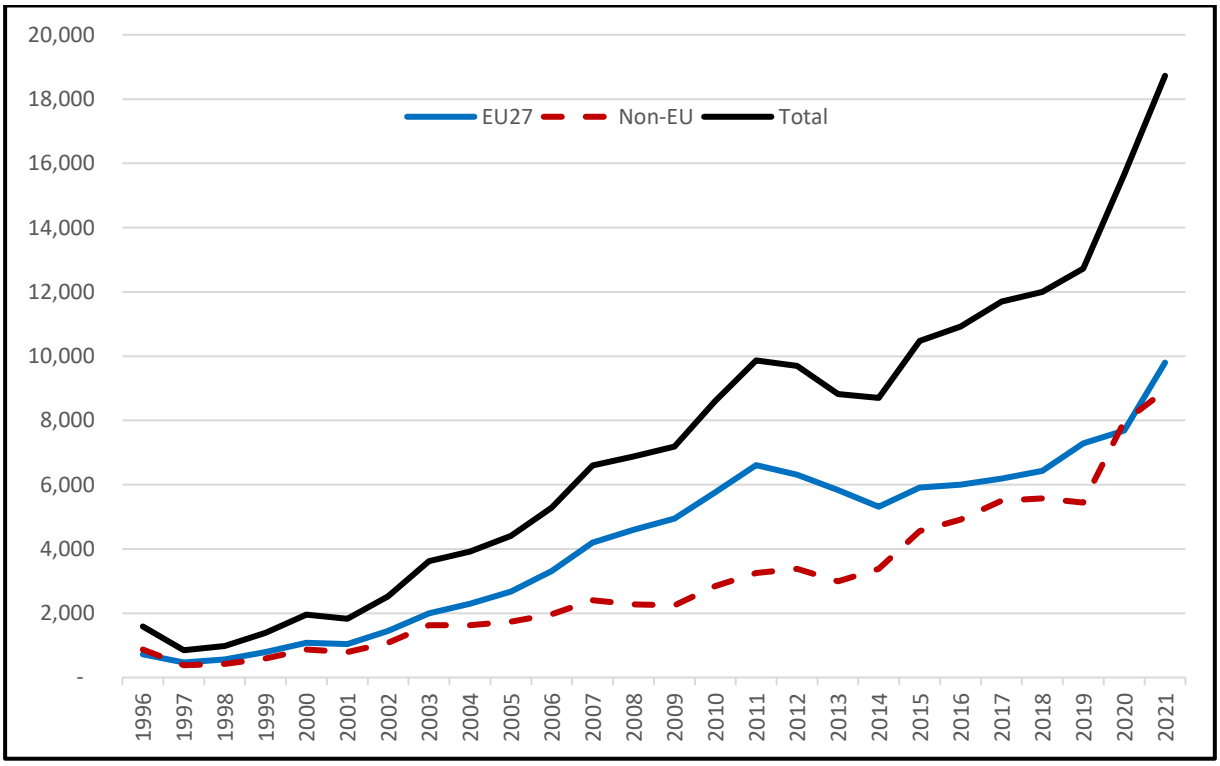
3 Main results

3.1 Overall trends

Of the approximately 46 700 EUTM applications received by the EUIPO in 1996, its first year of operation, 1 588 were green trade marks. Since then, the increase in green trade marks has been continuous, except for 2001 and 2011-2014. In 2021, the number of green EUTMs filed approached 19 000.

These trends are illustrated in Figure 5. Part of the overall rise is due to a strong increase in green EUTM filings from outside the EU. For most of the past two decades, green filings from the EU were higher than those from non-EU countries. However, in 2020 non-EU green filings had caught up with, and even slightly exceeded, filings from within the EU. In 2021, filings from within the EU again (slightly) exceeded filings from non-EU countries.

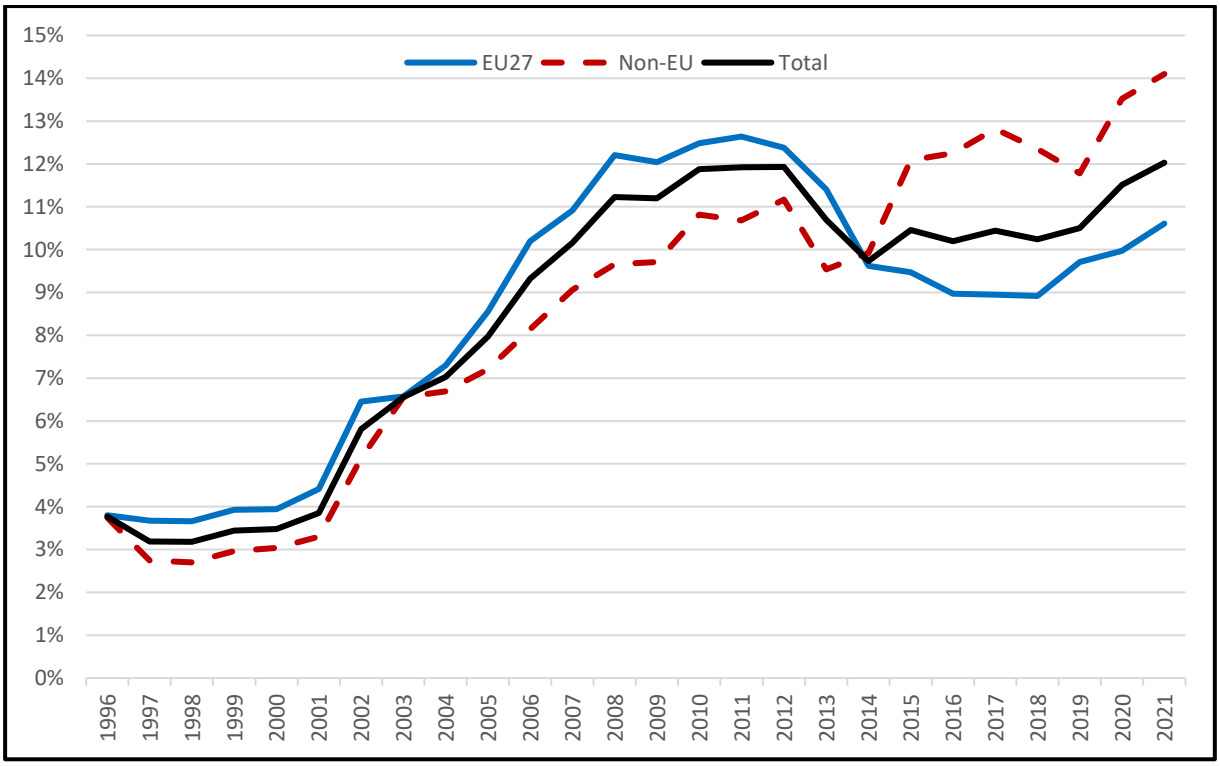
Figure 5. Annual number of EUTMs with at least one green term, 1996-2021



The temporary drop in 2011-2014 is mainly due to three categories: 'Storage of electricity', 'Solar energy' and 'Other energy'. All the other categories continued to grow. The fall in the first category is related to a fall in filings from EU firms. The others may be related to European Emission Allowances ([4]) prices and the level of investment in low-carbon energy.

Of course, the total number of EUTM filings has also increased significantly since 1996. Figure 6 shows the proportion of green filings. This proportion has also increased considerably, from less than 4 % in 1996 to more than 12 % in 2021. The importance of green EUTM filings from outside the EU is also evident: in 2020, the proportion of EU green filings was 10.6 %, while that of filings from outside the EU was 14.1 %.

Figure 6. Green EUTM filings as a share of all EUTM filings, 1996-2021



([4]) The European Union Emissions Trading System (EU ETS), launched in 2005, was the world's first major greenhouse gas emissions trading scheme. The ETS covers all EU Member States as well as countries in the EEA and Switzerland. According to the 'cap and trade' principle, a maximum (cap) is placed on the total amount of greenhouse gases that all participating entities can emit. EU allowances are auctioned or allocated free of charge and can subsequently be traded. If a participant exceeds its allowance, it must purchase allowances from others. Conversely, if a facility has done well in reducing its emissions, it can sell its excess credits. This allows the system to find the most cost-effective ways to reduce overall emissions using the market mechanism.

Although it is difficult to establish the causes of the temporary slowdown in 2011-2014, it seems consistent with Eurostat's Environmental Goods and Services Sector (EGSS) statistics on employment in the relevant sectors. The EGSS statistics show a decrease in employment and stagnation in Gross Value Added (GVA) in 2013 and 2014, with employment not regaining its 2012 levels until 2017. Figure 7 shows the evolution in EGSS employment in the EU, while Table 2 shows the underlying data for both employment and GVA. Nevertheless, the long-term trend in both employment and GVA is clearly positive.

Figure 7. Employment in EGSS – EU27

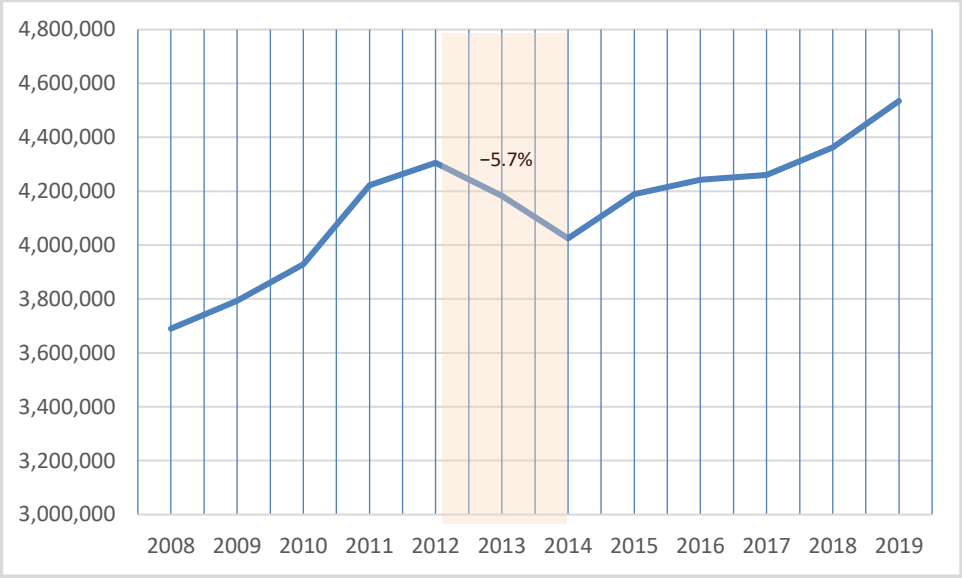


Table 2. Environmental Goods and Services Sector statistics

Year	Employment (thousands FTE)	GVA (billions EUR)
2008	3 690	N/A
2009	3 793	212
2010	3 929	231
2011	4 222	249
2012	4 306	256
2013	4 183	258
2014	4 025	255
2015	4 189	269
2016	4 242	282
2017	4 260	294
2018	4 362	308
2019	4 535	326

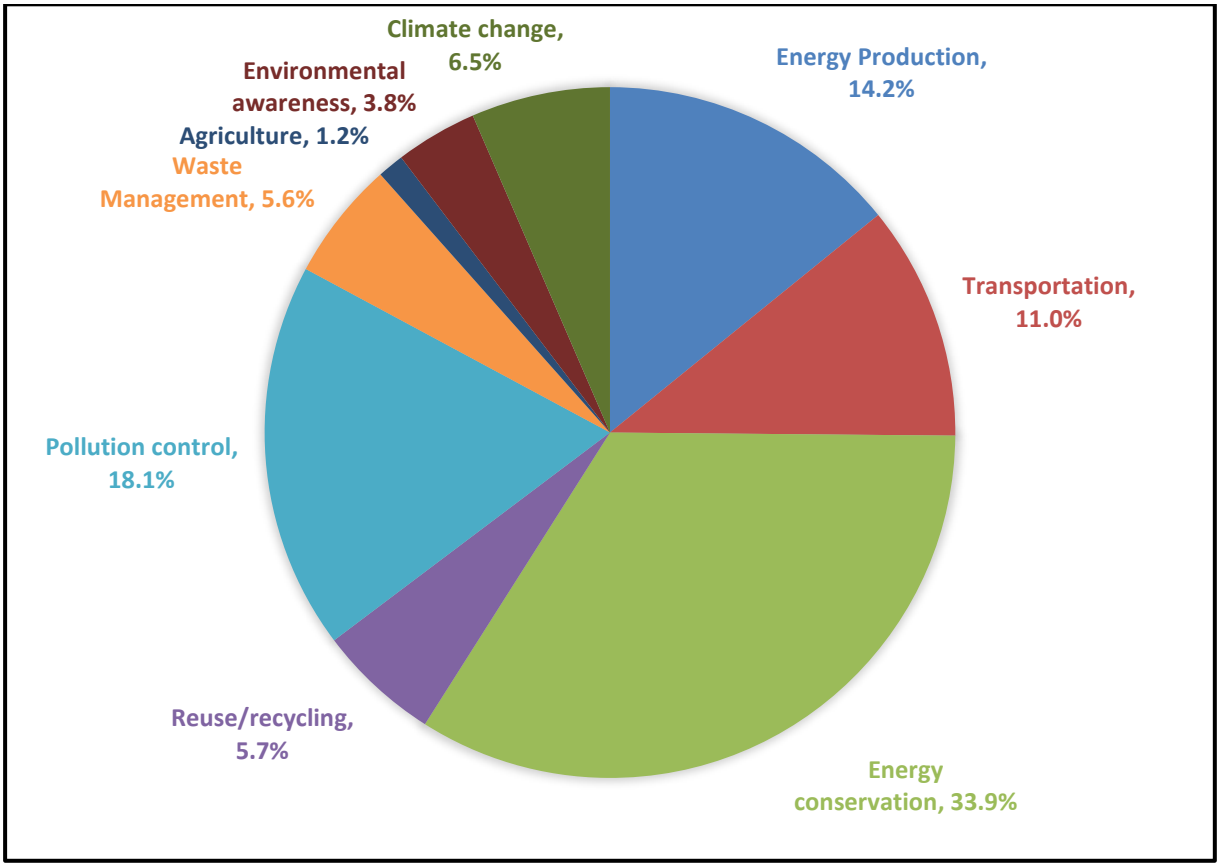
Source: Eurostat, TEN00132 and TEN00133

3.2 Green EUTMs by product categories, by countries, and by company size

In order to analyse the distribution of the green EUTMs among the various G&S, the algorithm distributes the green trade marks into 35 green categories, which are further aggregated into 9 green groups. Figure 8 shows the distribution of green EUTMs from 2015 to 2021 among the groups ([5]).

([5]) Green trade marks often contain more than one green term and may in some cases fall into more than one category. In the original 2021 study, each green EUTM was assigned to the first category found by the algorithm, and no additional search was carried out. This was done due to a technical limitation, since the search algorithm put a heavy strain on computing resources. In this updated study, improvements in the algorithm have made it possible to detect all the categories associated with every green trade mark. It has been found that the previous category assessment was slightly biased, inflating the share of the category 'Electricity storage'. Therefore, this report presents a new, more precise calculation of the relative importance of each green category in the total set of green EUTMs. Since each green EUTM can be classified in more than one category – on average, in 1.52 categories – the sum of the percentages of trade marks per category adds up to 152 %. The values shown in this report have therefore been normalised to ensure that the category shares add up to 100 %.

Figure 8. Percentage of green EUTMs by product group (2015-2021)



Energy-related products ([6]) are predominant, with energy production and conservation accounting for more than half of all green EUTMs. '**Energy conservation**' is the largest group, with 34 % of all green filings. Within this group, 'Storage of electricity' (i.e. mainly batteries of various kinds) with 28 % of all green filings, is the most important category. This category is dominated by Chinese and German firms. '**Energy production**' accounts for a further 14 % of green filings, with solar energy (7.4 % of all green filings) as the most important category.

The second most important group is '**Pollution control**', with 18 % of filings, dominated by water purification products (6.4 % of all green filings) and general pollution control (8.1 %). '**Transportation**' accounts for 11 % of all green filings and comprises many different categories, with Germany and China as the main filers.

Products related to '**Climate change**', '**Reuse/recycling**', and '**Waste management**' each account for about 6 % to 7 % of green EUTM filings. Finally, two smaller groups account for

([6]) As used here, 'products' refers to the groups or categories of G&S, as appropriate.

1 % and 4 %, respectively, with products linked to '**Environmental awareness**' (ecology and sustainability) and alternative products in '**Agriculture**'.

Table 3 provides a more detailed breakdown of the green EUTM applications by category and by group. It also indicates the main countries of origin of applications in each category.

The countries of origin of the applicants are quite varied, dominated in absolute terms by large countries (such as China or Germany) but with some smaller countries showing a much greater intensity in specific areas of specialisation, for example Denmark in 'Wind energy'.

Table 3. Green EUTM filings by category (2015-2021)

	Category	% green	Top countries
1	**Energy production**	**14.2**	
11	Biofuels	1.5	DE, UK
12	Solar energy	7.4	CN, DE
13	Wind energy	1.2	DE, DK
19	Other energy	4.1	DE, UK
2	**Transportation**	**11.0**	
20	General transport	4.5	DE, CN
21	Electric car	0.5	CN, DE, IT
22	Electric moto	0.7	CN, DE, TW
23	Electric bike	1.5	CN, DE
24	Hybrid vehicle	0.3	DE, IT, UK
25	Hydrogen vehicle	0.1	DE, IT
26	Electric engines	2.6	DE, CN
29	Other vehicles	0.6	CN, DE
3	**Energy conservation**	**33.9**	
31	Energy-saving	3.2	DE, FR, IT
32	Storage of electricity	27.7	DE, CN
33	Low-energy lighting	0.6	DE, IT, US
34	Energy management	2.3	DE, FR
4	**Reuse/recycling**	**5.7**	
41	Recycling	3.8	DE, UK, IT
42	Reusable bags	0.4	CN, US
43	Reusable bottles	0.3	CN, US, IT
44	Refilling cartridge	0.3	DE, UK
49	Other reusable	0.9	CN, DE
5	**Pollution control**	**18.1**	
50	Pollution general	8.3	DE, CN
51	Water purification	6.4	DE, CN
52	Air purification	2.5	DE, UK, US
53	Biodegradable	1.0	DE, IT
6	**Waste management**	**5.6**	
61	Waste disposal	1.4	DE
62	Process waste	4.2	DE, UK
7	**Agriculture**	**1.2**	
71	Fertiliser alternatives	0.8	ES, DE, IT
72	Pesticide alternatives	0.4	ES, IT, FR
79	Other agriculture	0.1	ES, IT
8	**Environmental awareness**	**3.8**	
81	Ecology	2.2	DE, UK, US
82	Sustainability	1.6	DE, US, FR
9	**Climate change**	**6.5**	
91	Environmental services	5.5	DE, US, UK
92	Carbon monitor	0.2	DE, US
93	Carbon brokerage	0.8	DE, IT

*Note: the column '**Top countries**' is the list of countries from which at least one third of the green applications in the category originate. In the case of 'Biofuels', for example, at least one third of the total filings come from firms in Germany or the United Kingdom. In some categories, for example 'Waste disposal', a single country (Germany) has at least a one-third share.*

Table 4 shows the distribution of green EUTM applications by country for the top 20 countries filing green EUTMs during 2015-2021 and for 2021 separately. These 20 countries account for approximately 90 % of all green EUTM filings.

Table 4. Green trade marks by country (2015-2021)

		2015-2021			2021		
Country		**% green**	**green TMs**	**total TMs**	**% green**	**green TMs**	**total TMs**
China	CN	20.9 %	21 943	104 764	17.3 %	5 587	32 342
Germany	**DE**	12.1 %	15 308	126 831	14.0 %	3 305	23 674
United Kingdom	UK	9.4 %	5 784	61 831	15.3 %	982	6 439
Italy	**IT**	8.7 %	6 341	72 689	11.7 %	1 593	13 586
United States	US	7.2 %	5 597	77 791	9.4 %	1 096	11 640
France	**FR**	11.3 %	5 001	44 227	13.5 %	976	7 256
Spain	**ES**	7.7 %	4 933	64 199	10.9 %	1 143	10 487
Netherlands	**NL**	11.6 %	3 366	29 053	13.7 %	699	5 086
Sweden	**SE**	10.0 %	2 306	22 949	12.0 %	497	4 133
Poland	**PL**	9.8 %	2 486	25 395	12.3 %	700	5 706
South Korea	KR	24.6 %	2 027	8 233	20.4 %	266	1 307
Austria	**AT**	8.5 %	1 788	21 003	10.5 %	428	4 062
Switzerland	CH	11.5 %	1 551	13 502	15.8 %	323	2 049
Finland	**FI**	12.4 %	1 306	10 545	13.6 %	242	1 773
Belgium	**BE**	8.6 %	1 305	15 103	10.9 %	275	2 532
Hong Kong	HK	15.0 %	1 294	8 636	18.9 %	299	1 584
Denmark	**DK**	9.8 %	1 148	11 744	11.2 %	234	2 082
Japan	JP	10.4 %	893	8 564	12.2 %	128	1 045
Czech Republic	**CZ**	10.4 %	805	7 707	11.6 %	210	1 804
Luxembourg	**LU**	10.9 %	684	6 271	11.6 %	103	890

The countries with the highest percentage of green trade marks in relation to all their EUTM filings are South Korea and China, with 24.6 % and 20.9 % respectively. However, China's filings became less green in 2021, with only 17.3 % of Chinese EUTMs filed that year falling into the 'green' group. The same is true for South Korean filings, of which 20.4 % were green in 2021. On the other hand, filings from most other countries became more green during 2021.

Table 5 shows the breakdown of green EUTMs by company size throughout 2015-2021 and for 2021 separarately. While large companies were slightly more active in filing green EUTMs, with 13 % of the EUTMs filed during 2015-2021 in the green category, SMEs also played a significant role, with about 10 % of their EUTMs classified as green. In terms of absolute figures, SMEs filed more green EUTMs than large companies during the period: 14 284 versus 9 236, respectively. This underlines the role played by SMEs in the EU economy, including in the green transformation.

In keeping with the overall increase in the share of green EUTMs in 2021, the proportion of green EUTM filings was higher in 2021 than in the total period for companies of all sizes.

Table 5. Green EUTMs by size of applicant, 2015-2021 and 2021 separately

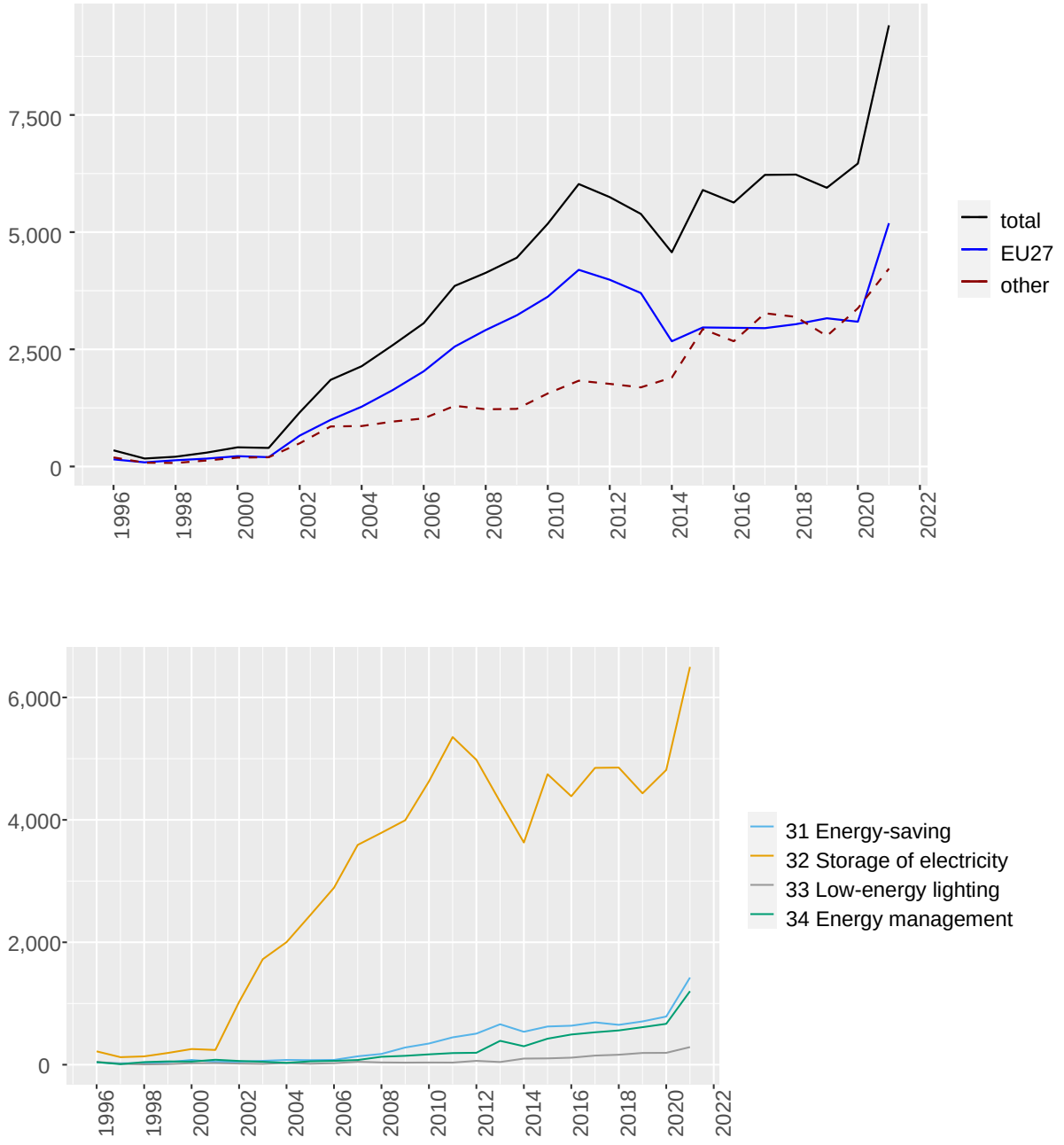
Firm size	Green TMs	Total TMs	Green %	Green % 2021
Large	9 236	70 810	13.0 %	14.6 %
SME	14 284	142 194	10.0 %	11.2 %
medium	4 827	47 012	10.3 %	12.6 %
small	4 910	46 617	10.5 %	11.4 %
micro	4 547	48 565	9.4 %	10.3 %

Sample: 27 % of total EUTMs filed during the period

3.3 Details of green EUTMs by product group

The remainder of this section presents the evolution of green EUTMs for each of the nine product groups and for the categories within those groups. For each group, the evolution of filings from EU Member States and non-EU countries, respectively, is shown, followed by a breakdown of the group into the relevant categories.

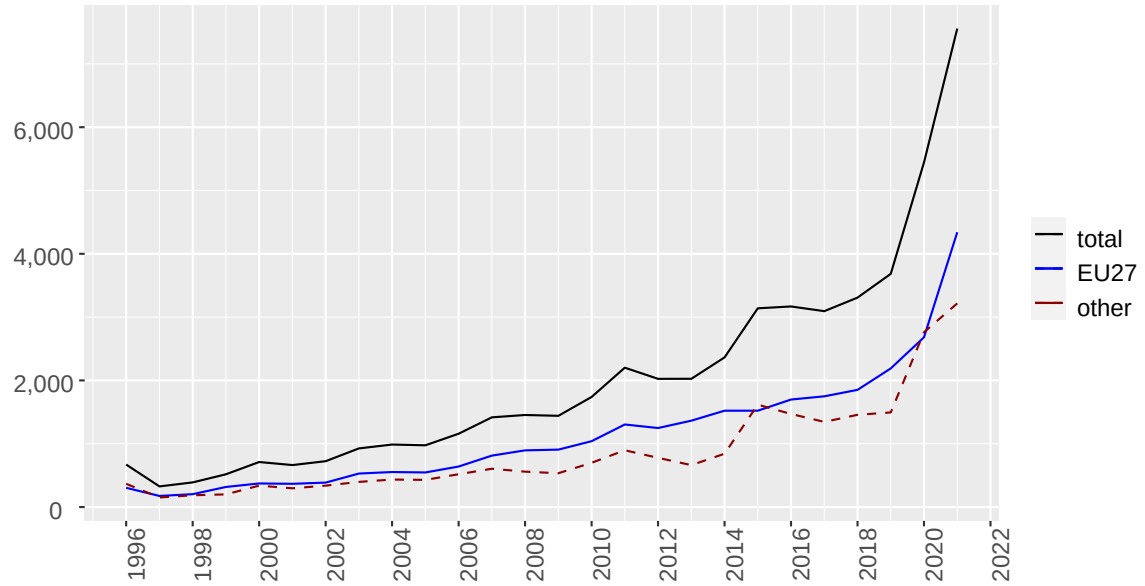
Figure 9. Number of green EUTMs: Energy conservation

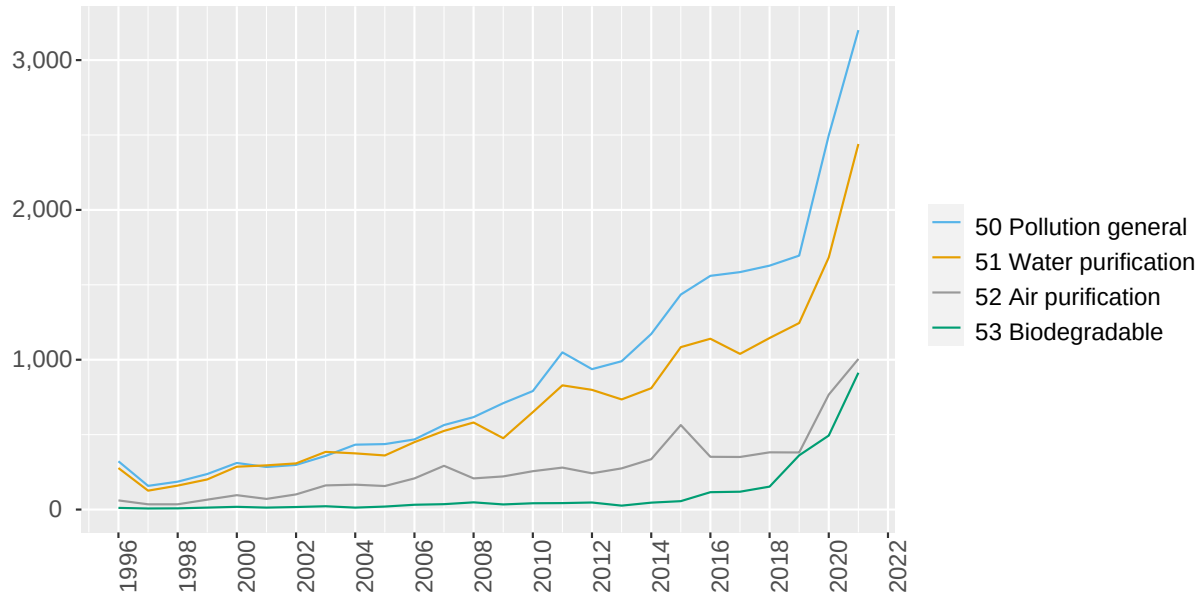


‘**Energy conservation**’ is the dominant product group among green trade marks, accounting for 33.9 % of all green EUTMs since 2015. Within this group, electricity storage is the most important category, accounting for 27.7 % of all green EUTMs. This category is dominated by German and Chinese firms, but it is also the most important category for many other countries.

Although still modest in absolute terms, the categories ‘Energy management’ and ‘Energy-saving’ grew strongly in 2021. The trade marks in this category contain, above all, the expressions ‘Energy management’, ‘Energy consumption’ or ‘Energy audit’ but also ‘Energy consultancy’. Like almost all service trade marks, these filings come mainly from the EU, with Germany, France and Italy being the most important filing countries.

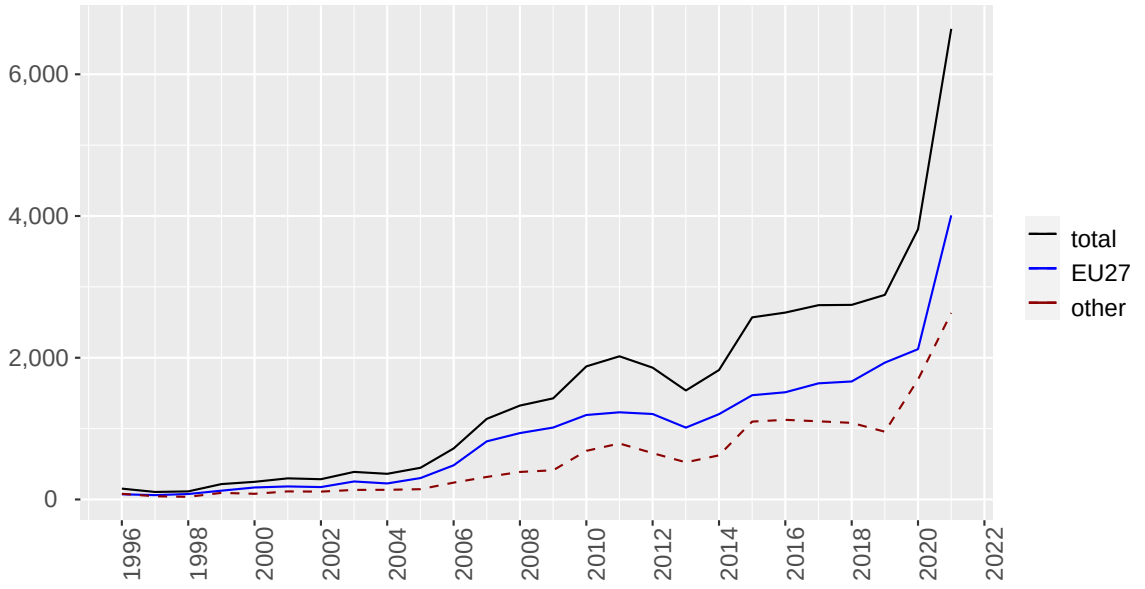
Figure 10. Number of green EUTMs: Pollution control

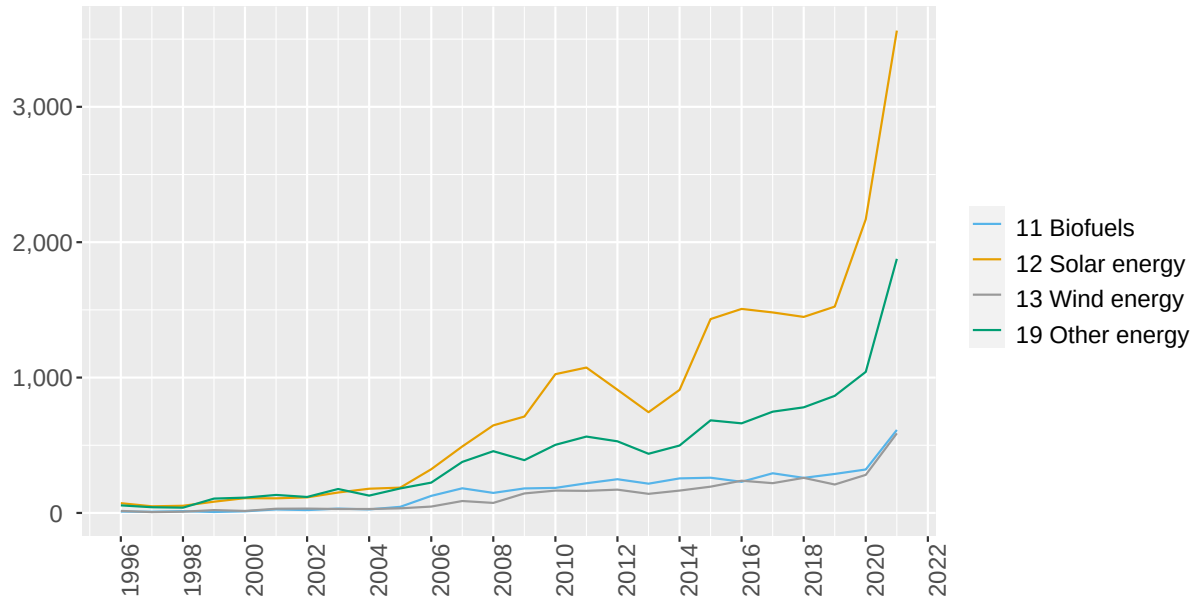




'Pollution control' is the second-largest group, accounting for 18.1 % of green EUTMs. Filings from the EU grew strongly in 2021, and Germany was the dominant country of origin, followed by China, the United States, the United Kingdom, and Italy. Overall, filings from the EU exceeded filings from outside the EU in 2021, and all four product categories in the group showed strong growth.

Figure 11. Number of green EUTMs: Energy production





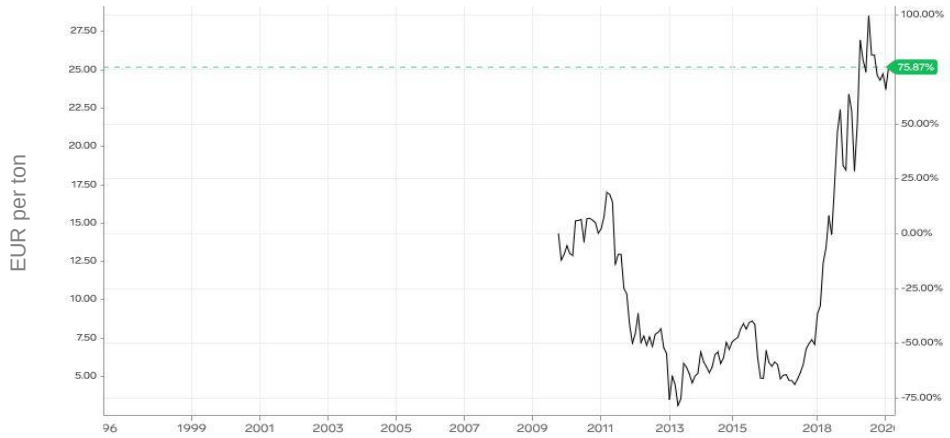
The '**Energy production**' group accounts for 14.2 % of green EUTM filings. It is one of the most interesting groups from an economic point of view and has also been extensively studied by examining the number of patent filings. Furthermore, this group is related to two other groups: 'Energy storage' and 'Transportation'.

The group is dominated by filings that contain terms related to solar energy such as 'photovoltaic', 'solar collector' or 'solar battery'. The group also contains terms such as 'wind energy', 'research energy', and 'biogas' or 'biomass'. It further includes trade marks with generic terms such as 'renewable energy'.

A significant decrease can be observed between 2011 and 2014. This decline coincides with a severe fall in the prices of CO_2 Emission Allowances and also a stagnation of public research and development (R&D) in energy, as shown in Figures 12 and 13. In 2018, the price of allowances grew strongly, and there was a strong increase in EUTMs related to solar energy, especially from Chinese firms.

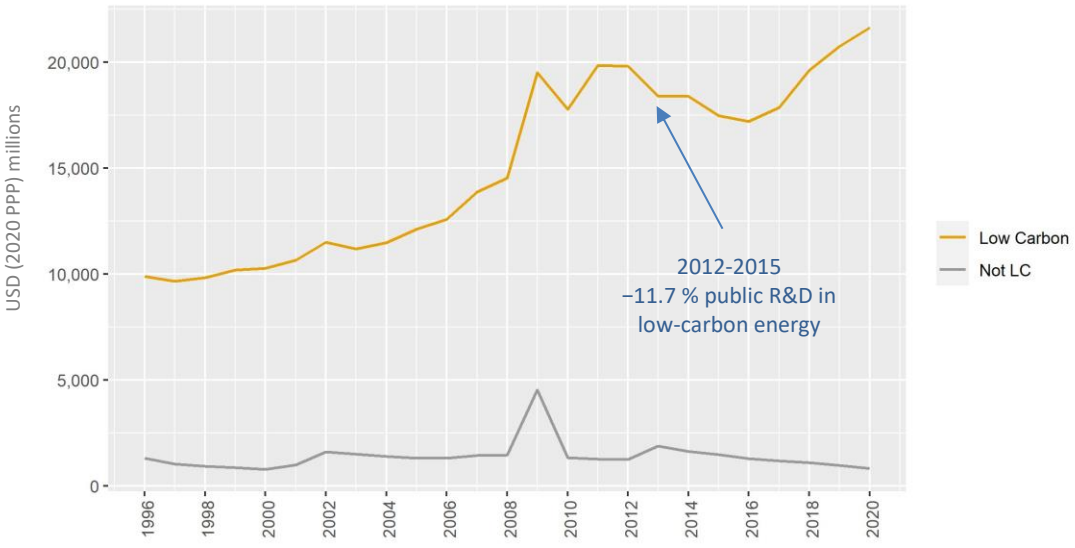
Overall, the group grew strongly in 2021, in particular filings from EU member states. Germany, China and the United Kingdom were the principal filing countries, although Denmark was also among the top filers in the 'Wind energy' category.

Figure 12. Price of European emission allowances



Source: Business Insider

Figure 13: R&D in energy (IEA members)



Source: International Energy Agency

The fluctuations in this product group and the stagnation in the linked category ‘Storage of electricity’ are responsible for the decline observed in the entire green EUTM filing volume in 2011-2014 (Figure 5), which was followed by the decline in EGSS employment shown in Figure 7.

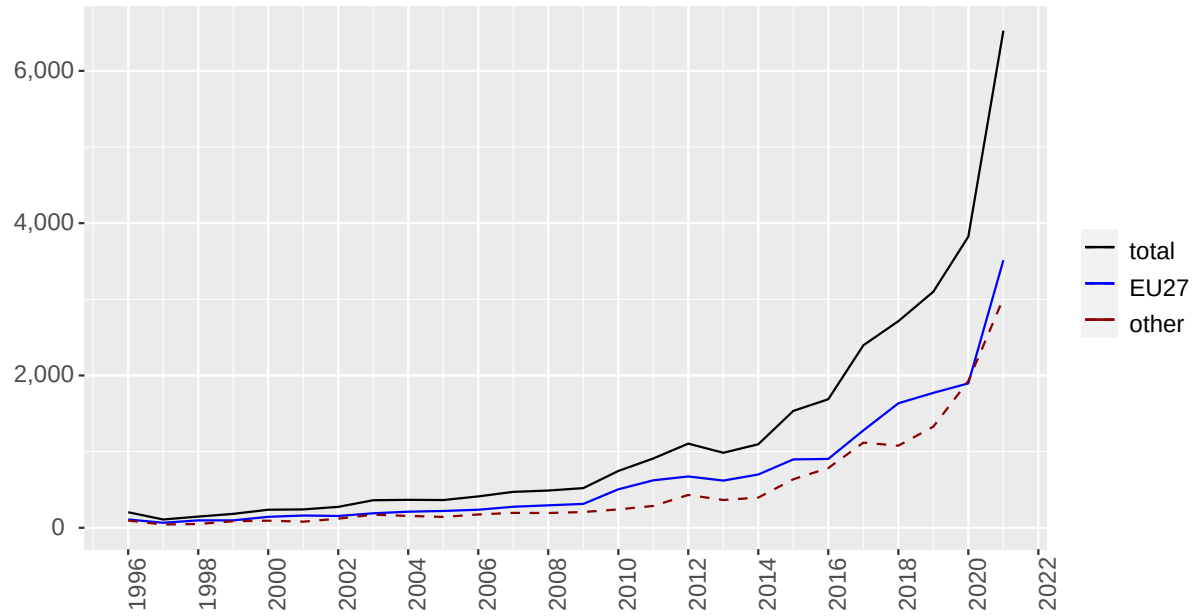
In absolute terms, the category ‘Biofuels’ is dominated by German, Italian and UK filings. In the case of ‘Solar energy’, more than a third of filings come from China and Germany; South

Korean firms are also well represented. ‘Wind energy’ is dominated by Danish and German firms.

The **transport sector** represents 11 % of green EUTM applications. This product group saw a continuous increase throughout the period, only dampened somewhat in 2013 by a decline in trade marks related to electric motors used in transport. In recent years, categories such as electric bicycles and motorcycles have seen steady growth.

Most categories in this group are dominated by Chinese and German firms, but also Italian firms in the case of ‘electric cars’ and ‘hydrogen vehicles’, and UK firms for ‘hybrid vehicles’. Overall, EU and non-EU firms file approximately the same number of EUTMs in this product group.

Figure 14. Number of green EUTMs: Transportation



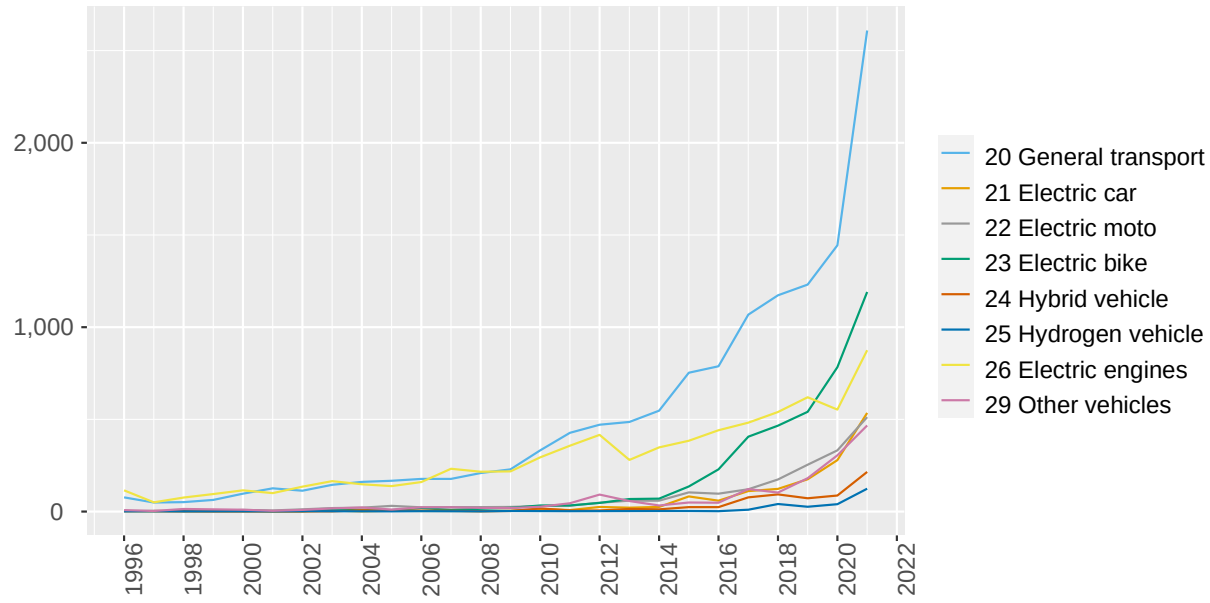
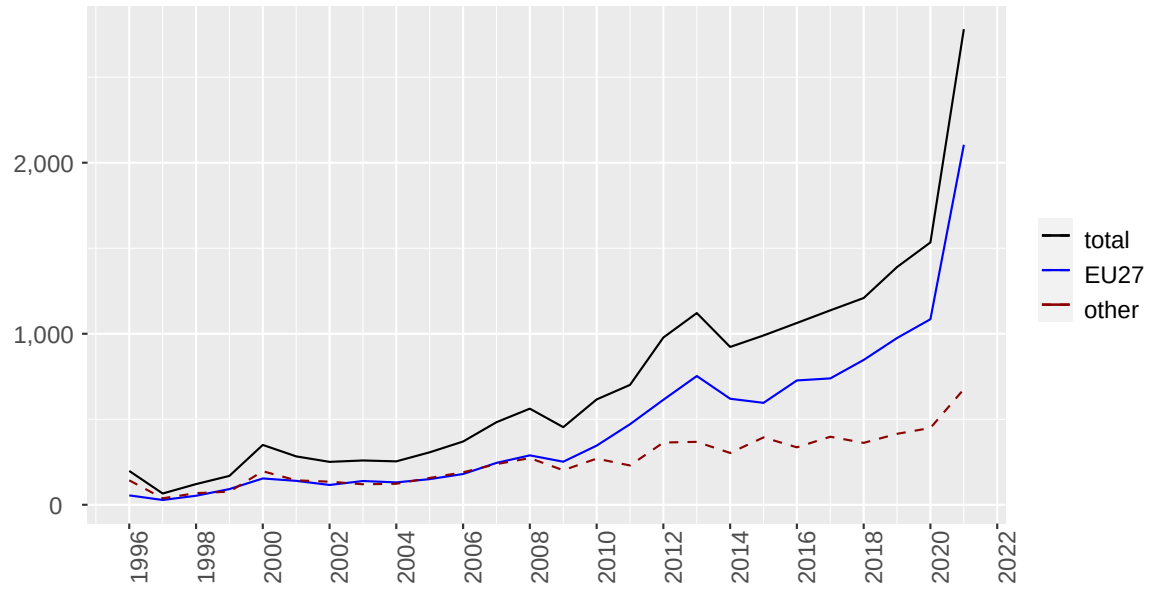
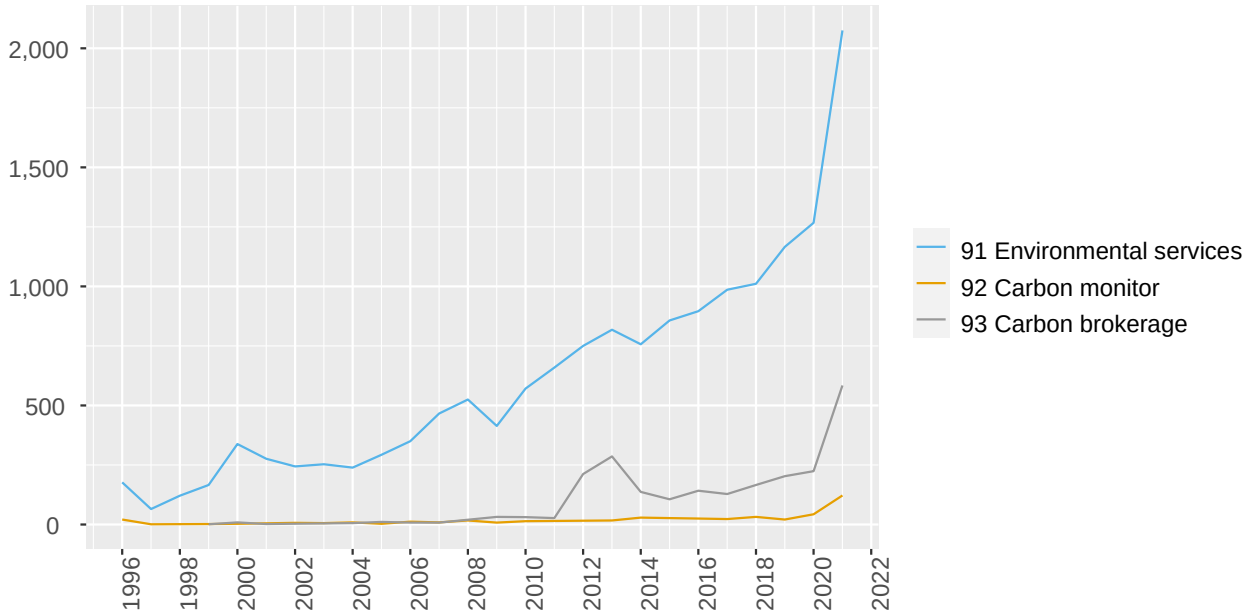


Figure 15. Number of green EUTMs: Climate change

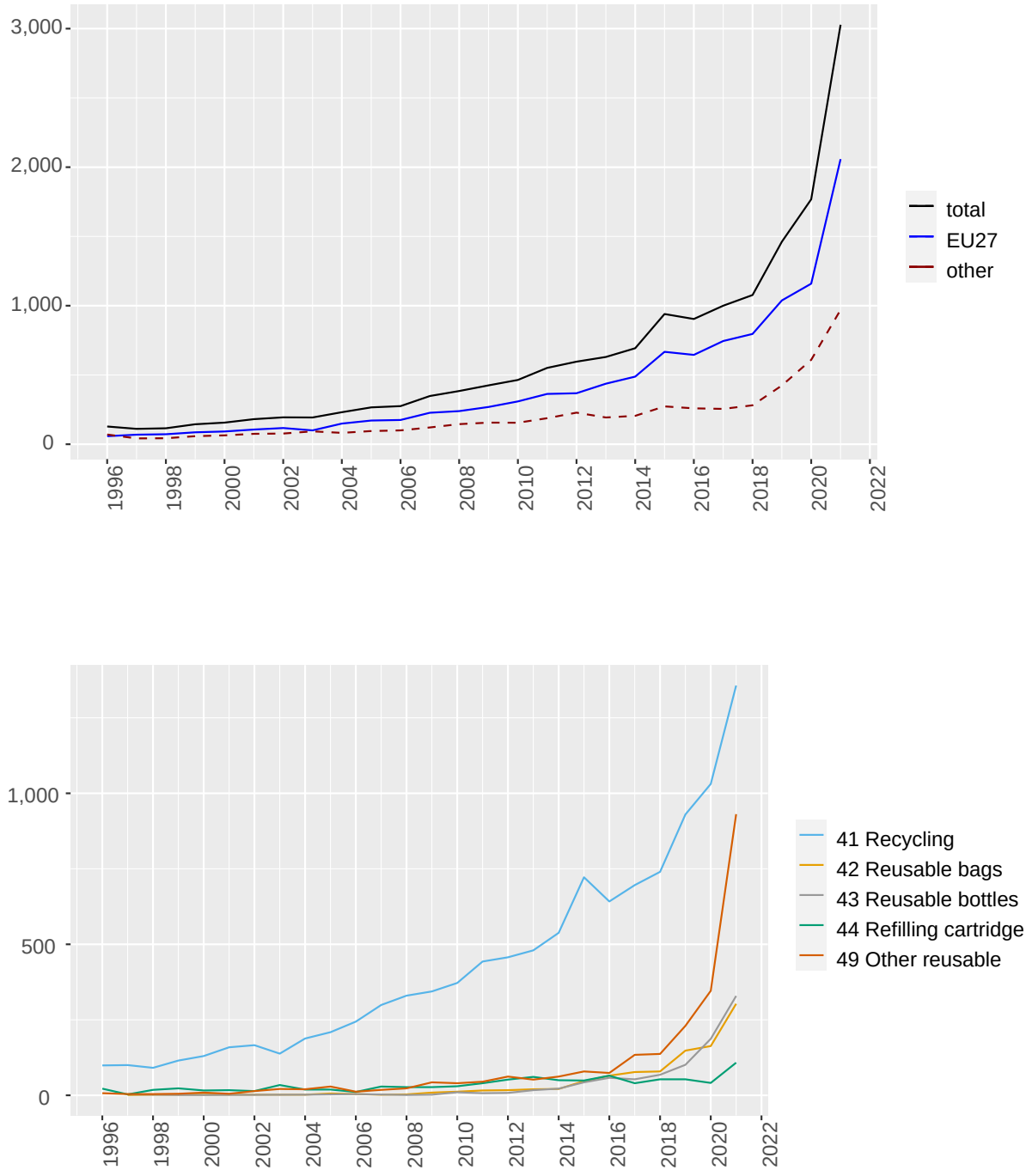




With 6.5 % percent of EUTM applications, the group '**Climate change**' is smaller than 'Energy production' or 'Transportation', but it has grown strongly since 2009, and this growth accelerated in 2021, in particular for filings from EU member states.

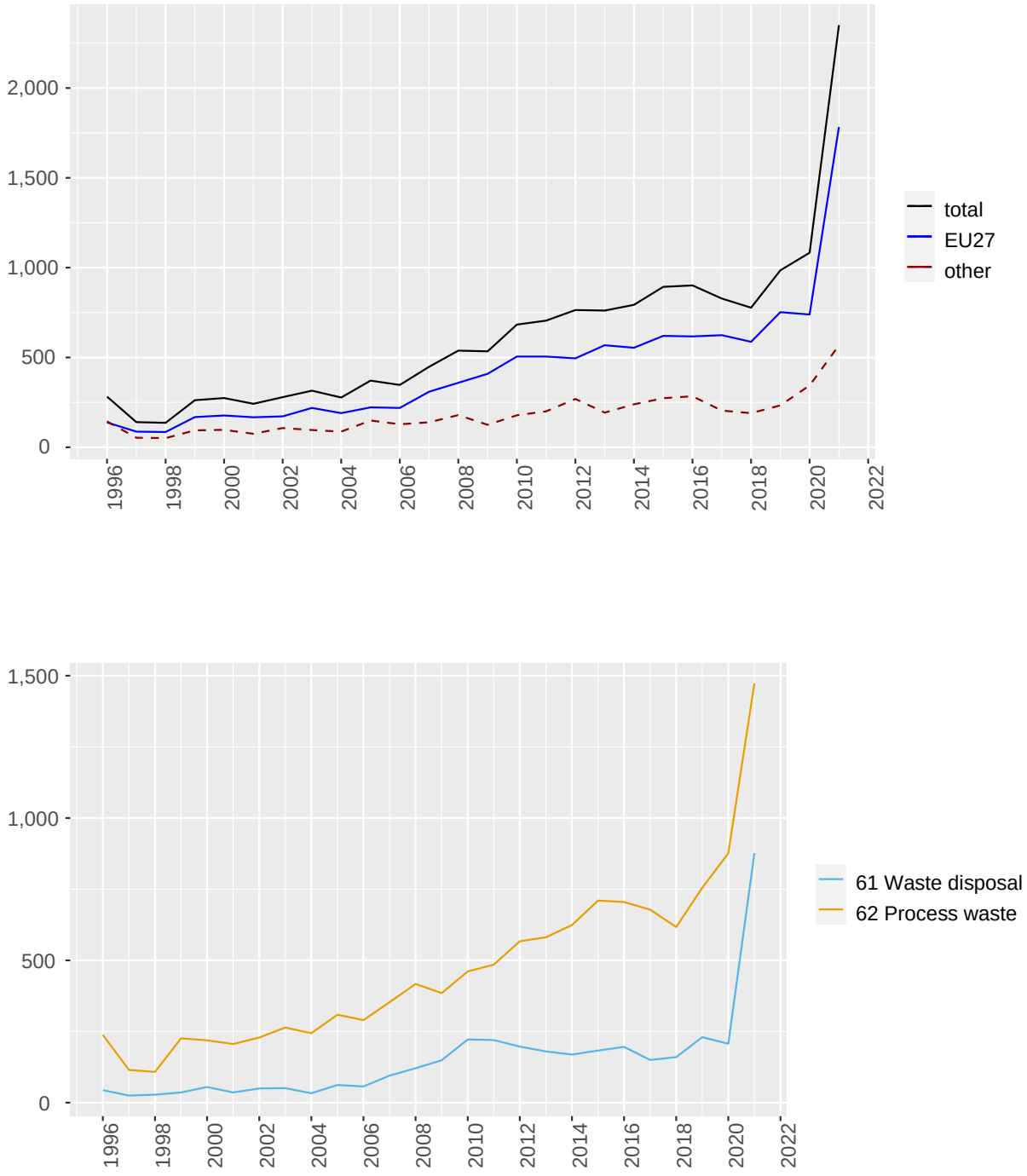
In this group, EU-based applicants account for the majority, especially German and Italian firms. Filings from the UK and the US also play an important role.

Figure 16. Number of green EUTMs: Reuse/recycling



This group, similar in size to 'Climate change', represents 5.7 % of green EUTM filings, and it has also grown significantly in recent years. Among EU member states, Germany and Italy are major sources of filings in this category, with China, the US and the UK also playing an important role. However, filings from the EU were double those from outside the EU in 2021.

Figure 17. Number of green EUTMs: Waste management



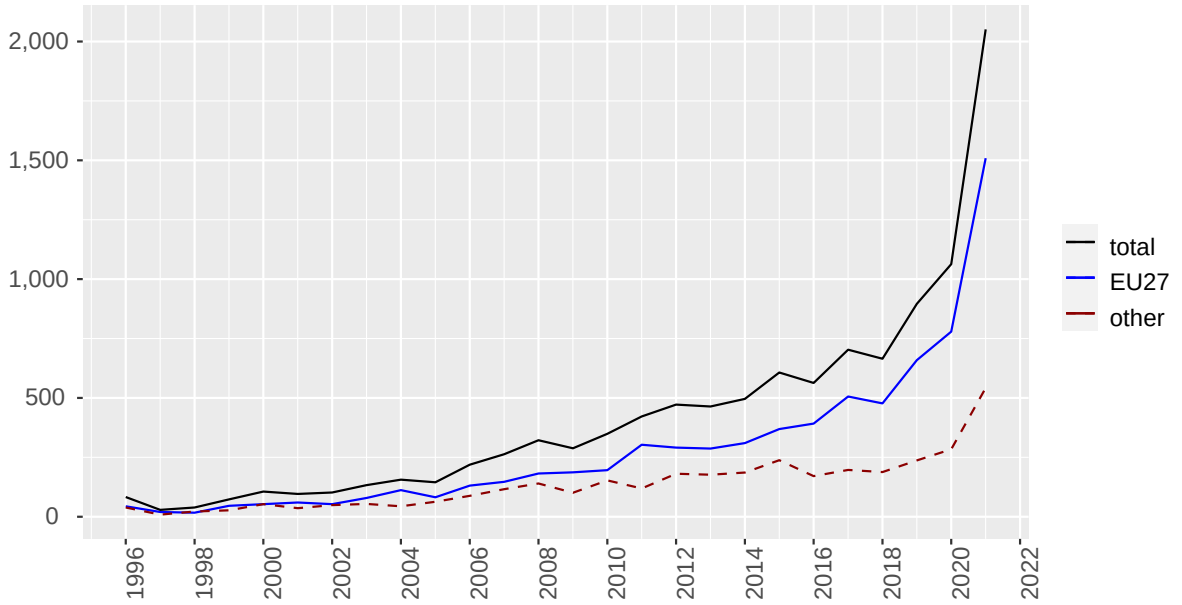
'Waste management' accounts for 5.6 % of EUTM filings. The most common references for these trade marks are 'waste process' or 'waste treatment'. The two main filing countries in

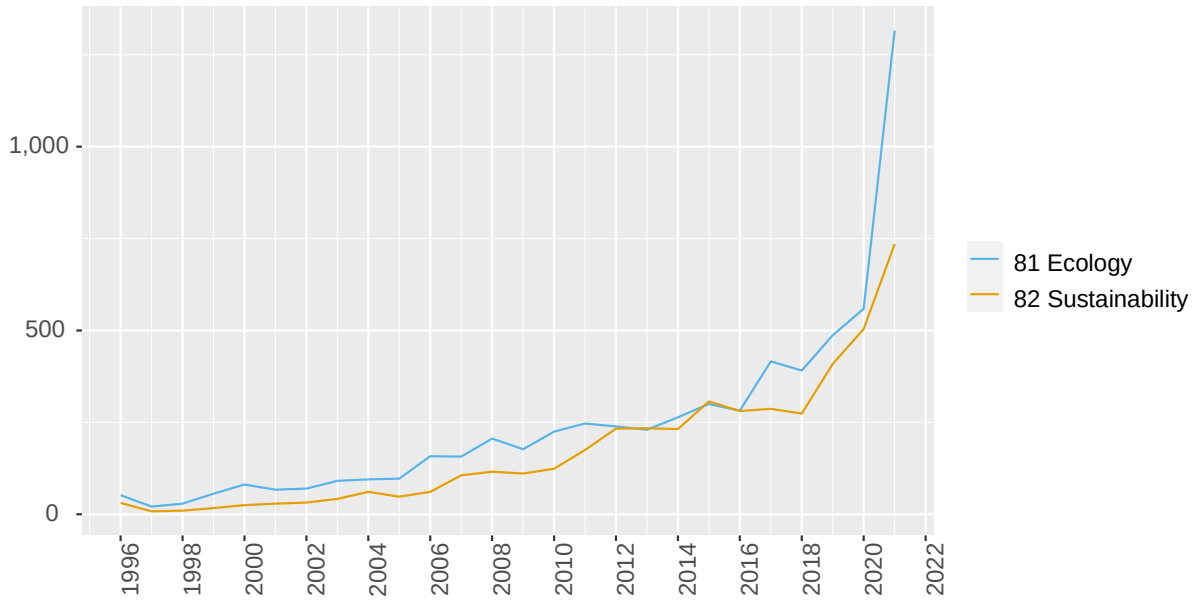
this group are Germany and the UK. As was the case with the climate change and reuse/recycling groups, filings from EU member states exceed filings from non-EU countries by a wide margin. The overall number of EUTMs filed in this group more than doubled between 2020 and 2021.

There are two more groups that in total account for 5 % of the applications. The first of these groups is **environmental awareness**, accounting for 3.8 % of green EUTM filings. Most of the EUTM filings in this group contain the terms ‘Ecology’ or ‘Sustainable’.

Although EU filings dominate, and the difference becomes greater over time, there are a significant number of Chinese, US and UK filings as well.

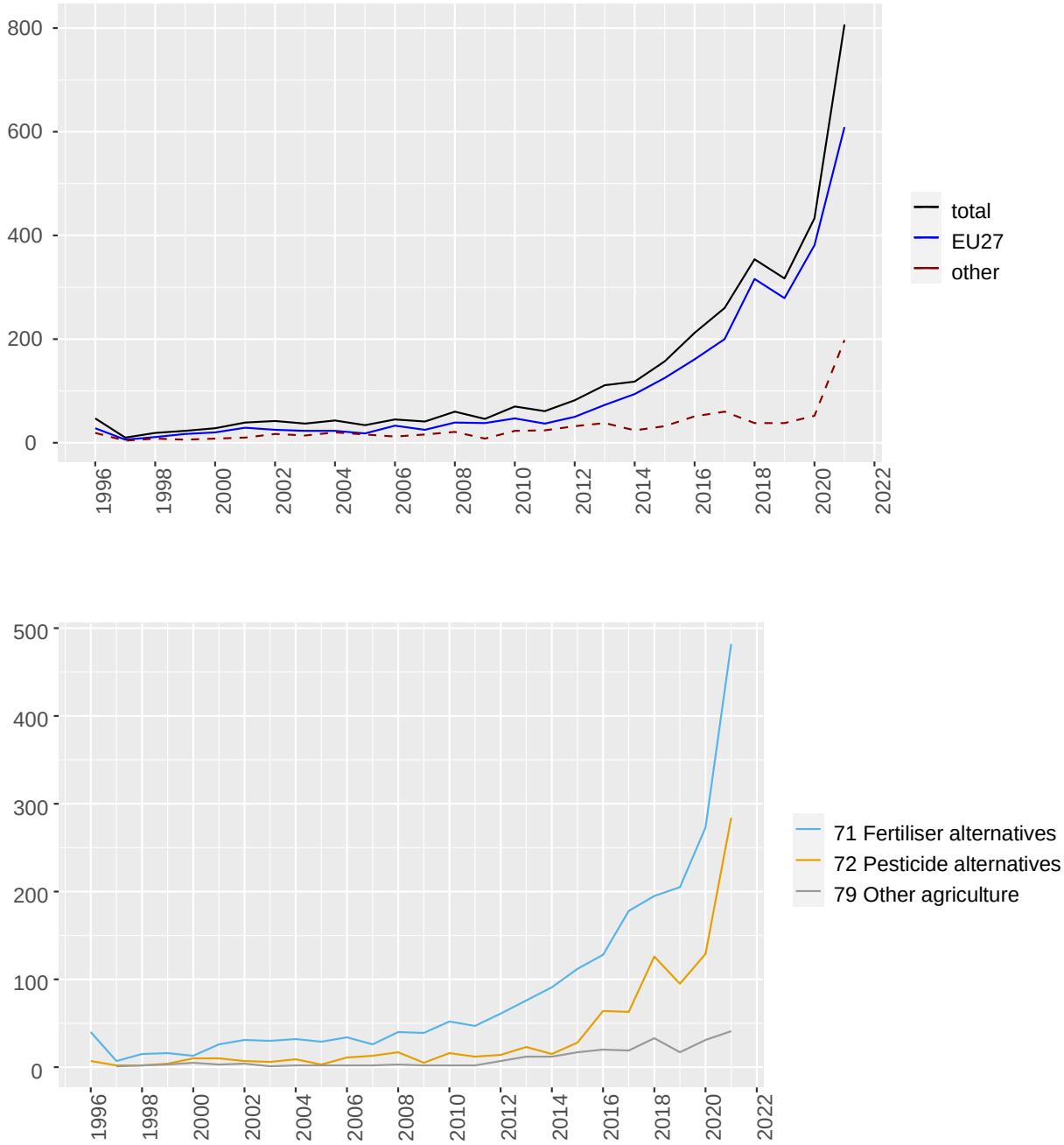
Figure 18. Number of green EUTMs: Environmental awareness





Finally, the group with the fewest green EUTMs (1.2 % of the total) but with significant growth in recent years consists of alternative products for '**Agriculture**'. The group is heavily dominated by filings from EU-based companies, especially companies from Spain, Italy, Germany and France.

Figure 19. Number of green EUTMs: Agriculture



Since 2011 there has been significant growth in filings related to alternative fertilisers from Spain and Italy, as well as growth since 2015 in alternative pesticides from these two countries.

4 Conclusions and areas for further research

Dealing with all forms of environmental degradation, and especially climate change, is one of the greatest challenges of our time. Many kinds of policies and resources need to be mobilised, among them innovation by European and global companies leading to products and services that pollute less and/or mitigate the impact of past pollution. Such innovations are often protected by IP rights.

Traditionally, patents are the IP right most closely associated with innovation in the eyes of policy makers and the general public. However, the 2021 report showed that trade marks, specifically EUTM filings that contain relevant terms in their G&S specifications, are also a valid indicator of innovation in the applicable sectors. The number of these trade marks has grown significantly since the EUIPO began accepting EUTM applications in 1996, both in absolute terms and as a proportion of total EUTM filings. This shows that environmental considerations are becoming increasingly important for brand owners filing trade mark applications and for consumers who buy the resulting products and services. The growth in green EUTM filings accelerated in 2021, as shown in this update. Green technologies and other activities related to the environment have been developing in the context of expanding markets, as shown by the growth in trade mark filings.

In several of the sectors examined in this report, EU-based companies perform well, judged by their EUTM filings. This observation is also reinforced by the examination of sectors active in climate change mitigating technologies and those filing green EUTMs in the EUIPO-EPO IP Contribution study (2022). Environmental protection and climate change mitigation is therefore an area of strength for the European economy, and this can be expected to contribute to the fulfilment of the European Commission's Green Deal objectives.

The data on which this study is based represents a rich source of information, which in the future could be combined with other data, whether on other IP rights such as patents or more granular data on sectoral economic activity, to get a better picture of the factors that drive innovation in this area.

The study has also shown that SMEs play an important role in bringing 'green' G&S to the marketplace. More detailed studies could determine the sectors in which these innovative SMEs are particularly active, and could conceivably help fine-tune policy instruments aimed at supporting SMEs, another important goal for EU policymakers.

Annex: Data and Methodology

Green trade mark

Trade marks distinguish the products of a firm from those of its competitors. Trade mark applications must contain a representation of the trade mark (typically words, graphic elements, or a combination thereof) and a list of the products (goods and/or services) to be covered by the trade mark.

In the case of the EUIPO, the atomic definition of a product is called a 'term'. The terms are classified under one of the classes of the Nice Classification and grouped accordingly ([7]).

The term (plus its Nice class) will be the basic data unit for this study. For example, 'Nice 9, Solar panels' or 'Nice 9, Carbon dioxide monitors' are both considered green terms (Nice Class 9 covers a broad range of technical goods). It is important to note that the term is comprised of the Nice class and the expression since, without this pairing, ambiguity can result. A particular expression (description) can be 'green' or otherwise, depending on the Nice class. For example, 'carbon dioxide monitors' will not be a green term if included in Class 10 (medical instruments), but will be green if included in other classes.

For example, the Swedish firm InnoVentum AB registered an EUTM in 2012 for the following goods:

Nice 6	Towers [metal structures];
Nice 7	**Wind turbines;**
Nice 7	**Generators for wind turbines;**
Nice 19	Towers [non-metallic structures].

The algorithm developed for this study will find the two green terms of this trade mark highlighted above. It will also assign the trade mark to the category 'Wind energy' within the broad group 'Energy production'.

([7]) The Nice Classification, administered by the World Intellectual Property Organisation (WIPO), is a system of classifying goods and services for trade mark applications. It consists of 45 classes, 34 of which cover goods and 11 cover services. Each class is represented by a class heading that gives general information about the type of goods or services covered, and further contains a set of terms within that class to better define the goods or services to be protected by the trade mark application.

An EUTM is considered 'green' if its G&S specification contains at least one green term, regardless of other non-green terms included. In the example above, two of the terms are green terms, and two are not. In this case, it seems clear that the main activity is related to the production of wind energy, the other terms being subsidiary to this activity. In other cases, the green activity of a trade mark will be secondary. Therefore, the definition 'a trade mark is green if at least one of its terms is green' can sometimes overestimate the degree to which a particular trade mark is truly related to environmental protection.

Defining sustainable activities

A challenge for the compilation of statistics on 'green IPR' is to define with the necessary precision the object of the study. In this case, it is a matter of giving a precise meaning to institutional declarations and international treaties, which by their nature may be ambiguous and in some cases contradictory ([8]).

In recent years, the EU and international organisations have sought to define the sustainable economy, drawing up green inventories or taxonomies, attempting to systematically include all the 'matters' (i.e. activities, technologies, and products) related to the protection of the environment and to sustainable development.

Going forward, the *EU taxonomy for sustainable activities* ([9]) will govern investment in activities that the EU classifies as environmentally friendly ([10]). The EU produced the taxonomy to help meet climate and energy targets for 2030 and reach the objectives of the European Green Deal. According to the European Commission, the taxonomy lays out clear performance criteria for determining which economic activities make a substantial contribution to Green Deal objectives. More information on the current list of activities can be found on the *EU Taxonomy Compass* page (https://ec.europa.eu/sustainable-finance-taxonomy/), where they can be listed and classified using NACE ([11]).

([8]) For example, discussions have taken place in the European Parliament on whether to include nuclear energy in the EU's Sustainable Finance Taxonomy. In this study, trade marks with terms related to nuclear energy are not identified as green.
([9]) The EU Taxonomy Climate Delegated Act entered into force on 1 January 2022.
([10]) See https://ec.europa.eu/info/business-economy-euro/banking-and-finance/sustainable-finance/eu-taxonomy-sustainable-activities_en.
([11]) The *Statistical classification of economic activities in the European Community*, abbreviated as NACE, is the classification of economic activities in the European Union.

Eurostat produces the *Environmental Goods and Services Sector* (EGSS) statistics, one of the modules of the environmental economic satellite accounts. The EGSS indicate the proportion of the economy that is engaged in producing G&S for environmental protection purposes and resource management activities. The EGSS consists of a heterogeneous set of activities to measure, prevent, limit, minimise or correct environmental damage to water, air and soil, as well as problems related to waste, noise and ecosystems.

Another important environmental classification is WIPO's inventory of 'green technologies', the *IPC Green Inventory*, which is a taxonomy of environmentally friendly technologies, where the terminal elements are the technology areas defined in maximum detail by the IPC ([12]) code.

Table 6 summarises the main taxonomies.

Table 6. Environmental taxonomies

Taxonomy	Object	Origin
EU taxonomy for sustainable activities	Economic activities (NACE)	EU
Environmental Goods and Services Sector	Economic activities (NACE), Environmental activities (CEPA & CREmA)	Eurostat, UN
IPC Green Inventory	Technologies (IPC)	WIPO
Harmonised Green Terms	Products (G&S) (HDB, Nice)	EUIPO

This study sets out a **green taxonomy for trade marks** and proposes methods that may be used for further mapping with the other classifications.

Methodology

Starting from taxonomies of activities and technologies, the first step was to 'project' the Green Deal objectives onto the specific scope of protection of the trade marks: that is to say, the

([12]) The International Patent Classification (IPC) provides a hierarchical system of language-independent symbols for the classification of patents and utility models according to the different areas of technology to which they pertain. Unlike the abovementioned taxonomy of activities, this list does include nuclear energy.

description of the products (goods and/or services) listed in the trade mark applications. The G&S are coded following the Nice classification. However, this classification lacks the necessary granularity for a precise 'green' definition. Instead, the Harmonised Database (HDB) was used for this purpose.

The HDB is used in the EUTM online application form. It contains more than 85 000 entries that have already been accepted by all intellectual property offices in the EU as well as in several non-EU countries. The HDB contains, for example, *0032872 Advertising by mail order* in Nice Class 35, or *0006396 Roofing, not of metal, incorporating photovoltaic cells* in Nice Class 19.

Thus, the **object to be measured** was defined by choosing, exhaustively, the terms in the HDB that are considered green. This inventory of 904 terms was the first output of this study and is reproduced in Annex 1 of the 2021 study.

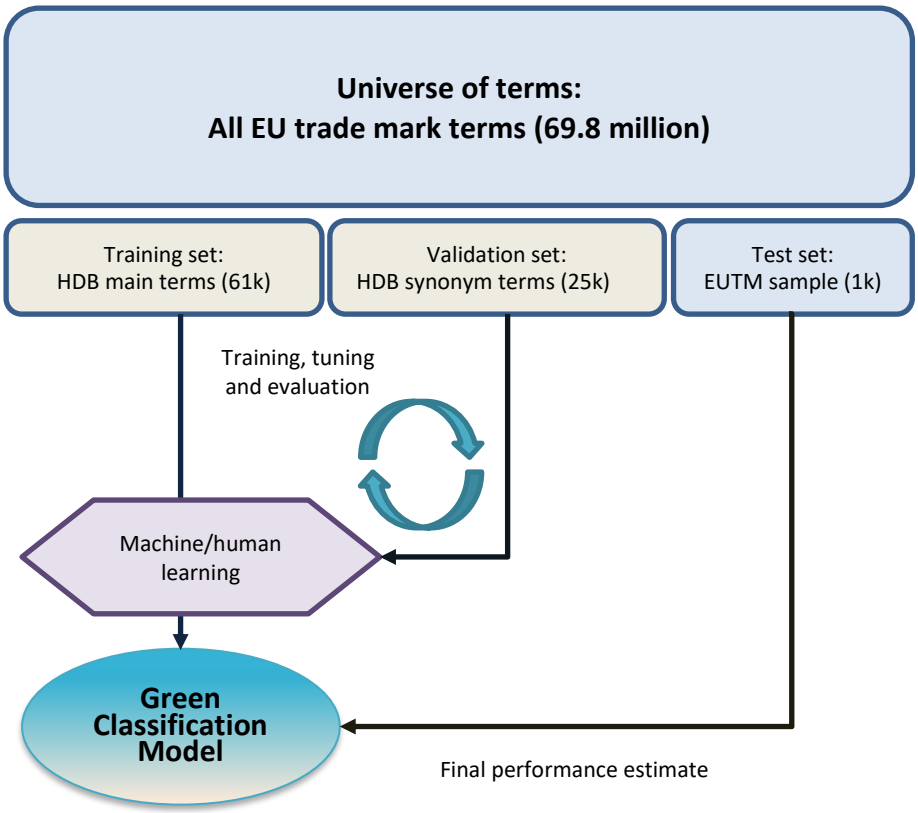
Once this *Harmonised Green Terms* inventory was established, an option considered for the analysis of all trade marks filed at EUIPO was to study only the applications that used HDB terms. In 2020 more than 85 % of the terms in applications filed at EUIPO were from the HDB.

However, during the first 10 years of operation of the EUTM system, the use of HDB terms was below 50 % ([13]). Therefore, instead of taking the subset of 'HDB trade marks' as the sample for the study, an algorithm was developed that could determine if a trade mark was green even if it used terms not included in the HDB. This approach has two advantages: older EUTM activity is better assessed, avoiding selection bias, and trade marks containing new green terms (not yet in the HDB) can be identified. This algorithm was able to recognise 120 000 different green terms ([14]) in the EUIPO registry. Therefore, the second output of the study is the **Green Term Classifier**, an algorithm that determines whether a product description is green and assigns to it the appropriate green category.

([13]) HDB use is relatively recent, but for this study all past trade marks (from 1996) containing terms consistent with the current version of the HDB were identified.
([14]) The terms are 'different' from a 'machine' point of view; many of the terms may be considered synonymous by humans; but searching for 900 terms and their synonyms in a database of tens of millions of terms is a task that can only be carried out if it is automated.

The algorithm combines machine learning with human intervention and is summarised in Figure 20.

Figure 20. Green TM algorithm development



The HDB, after having been classified into green/non-green terms by EUIPO experts ([15]), was selected as the training set for the algorithm. This set is made up of two parts: the 61 000 main terms, each of which has a unique identifier, and the 25 000 synonyms (sometimes several for each main term, sometimes none). Synonyms can be linked with their main term because they share the same HDB identifier. The main terms were used as the initial training set, while the synonyms were used as the validation set during the repeated tuning cycles.

The objective of the exercise was to find a final set of 'green expressions' that could be used to correctly classify all the terms in the HDB.

([15]) The classification created for this study was inspired by the existing taxonomies shown in Table 2. However, no attempt was made at creating a precise correspondence with those taxanomies.

Three examples of such green expressions are shown below.

REF	Green expression
35	+carbon +monitor –10
114	+filter.engine –air –oil
225	+solar +heating

The first expression (Ref. 35) means: *a term is green if it contains the word **carbon** and the word **monitor** except if it is in the class of Nice 10 'medical instruments'*. The second expression (Ref. 114) means: *a term is green if it contains the words **filter engine** (together, and in that order) and does not contain either the word **air** or the word **oil**.* The third expression (Ref. 225) means: *a term is green if it contains the words **solar** and **heating***.

Before the search, the descriptions and expressions were normalised, that is, stop words ([16]) and suffixes were eliminated in the green expressions and in the descriptions of the trade marks' G&S.

In each iteration, the set of rules was modified to maximise 'precision' and 'recall' ([17]), or, stated differently, to minimise false positives and false negatives. The development process did not fully follow the machine learning paradigm, as it required a significant number of human decisions. This development model can be described as 'machine-supported learning'.

A fully automated model is not optimal, for two reasons: human intervention is required for the correction of classification inconsistencies that are revealed after applying the first sets of rules; and spurious rules are sometimes generated by the machine ([18]).

Once the algorithm was fine-tuned, the 'green classifier' search program used 375 green expressions to search for green terms in the descriptions of all EUTM G&S specifications.

([16]) Stop words are a set of commonly used words in a language. Examples of stop words in English are 'a', 'the', 'is', 'are' 'and', etc. Stop words are commonly used in text mining to eliminate words that are so commonly used that they carry very little useful information.
([17]) 'Precision' is the percentage of truly green terms among those marked as green by the algorithm, while 'recall' is the percentage of green terms among all those found by the algorithm. The trade-off between precision and recall is one of the most complex parts of algorithm development.
([18]) In some cases, the HDB contains terms for 'green' goods but not their associated services, for example repair or installation of such goods. A fully automated learning system will tend to exclude such ancillary services, even if they appear in the G&S description of the relevant trade marks.

The grouping of these green expressions defined the 35 **green categories**: for example, the **'+solar +heating'** expression was assigned to category '*12. Solar energy*' along with (among other expressions) **'+photovoltaic'**. The expression **'+wind +power'** belongs to the category '*13. Wind energy*'.

The categories were further combined into nine **groups**. The two categories in the preceding paragraph both belong to the group '*1. Energy production*'.

A complete list of the resulting green expressions are shown in Annex 2 of the 2021 study. The algorithm can be applied to any trade mark G&S description in English.

Once the model has classified the terms, a green EUTM is defined as one that contains at least one green term. This definition requires that trade marks with a very large number of terms (up to 27 000 in some cases ([19])) should be excluded in order to avoid the spurious identification of green EUTMs. In this study, only directly filed EUTMs with fewer than 200 terms have been considered, representing 97 % of the EUIPO's direct filings registry.

Data

Trade mark data

As previously mentioned, the main data sources for this study were the 85 000 terms in the HDB and the 69.8 million terms in the G&S descriptions of the trade mark applications filed at the EUIPO from 1996 to 2021.

The data is publicly available data from the EUIPO's Open Dataset ([20]). From this data, the directly filed ([21]) trade marks and the descriptions of G&S in any of the official languages of the EUIPO can be extracted. The English version was used for this study.

([19]) There are several EUTMs with more than 25 000 terms, for example EUTM No 17 992 149 , with 27 128 terms in 12 Nice classes, of which 343 are green terms.
([20]) https://euipo.europa.eu/ohimportal/en/open-data.
([21]) G&S descriptions of EUTM applications filed using the Madrid Protocol route are not available in this database.

After excluding trade marks with more than 200 terms, 1 954 502 EUTMs filed from 1996 to 2021 constitute the universe of trade marks for this study. Some of the analyses in Chapter 5 are based on EUTMs filed between 2015 and 2021 (a total of 797 245 trade marks).

It is EUTM applications in general that are the subject of this study: that is to say, regardless of whether they were finally registered or not. The dates referred to are the filing dates.

For convenience, in this report 'trade mark' will always mean 'trade mark application'. Similarly, for simplicity, expressions such as 'Spanish trade marks' refer to trade mark applications filed by, or on behalf of, a resident of Spain (the same format is used for other countries). Finally, the acronym 'EU' refers to the 27 Member States of the European Union following Brexit, even for data referring to earlier years ([22]).

Economic data

Two main sources of economic data are used in this study.

The environmental economic statistics (EGSS) from Eurostat are defined as follows.

> *Environmental goods and services either reduce environmental pressures or help maintain the stock of natural resources (e.g. vehicle catalysts, soil remediation services) or they are designed to be cleaner and more resource efficient than conventional products (e.g. electric cars, zero-energy buildings). Environmental goods and services can be produced by corporations, households, governments and non-profit institutions.*

The EGSS comprises all entities in their capacity as 'environmental producers' (i.e. an undertaking engaged in economic activities that result in products for environmental protection and resource management). Producers in the EGSS may or may not be specialised in the production of environmental G&S, and may produce them as their principal or secondary activities, or they may produce these products for their own use. Consequently, the scope of the EGSS may overlap only to a certain extent with existing legal definitions or statistical classifications of units.

([22]) This is equivalent to the Eurostat acronym 'EU27_2020'.

Eurostat estimates four variables: ‘Output’, ‘Gross Value Added (GVA)’, ‘Employment’ and ‘Exports’. In this study, ‘GVA’ and ‘Employment’ are used.

The second economic data source consists of the data used in the EUIPO study ‘Use of IPR bundles by EU firms ([23])’. The study looks at EU firms’ simultaneous use of patents, trade marks and registered designs to protect their innovation. It is based on a sample of more than 63 000 companies across all EU Member States. The demographic data of the firms is used here, in particular their size, their economic sector and their use of IP bundles. This data is used in connection with EUTMs filed after 2015.

([23]) EUIPO (2020).

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