



Charcoal

Part 2

2024



The Importance of Charcoal in the Modern World

One of the alternatives to "traditional" coal today is charcoal, unlike its relative - coal, it is an environmentally friendly and safer to use product, rich in carbon and containing approximately 2 times more energy per kg than fuel wood.





If the wood growth is equal to or greater than the amount of wood extracted per year, it is considered a renewable resource. This means that charcoal produced in sustainably managed forests does not have a negative impact on forest ecosystems. The potential of charcoal is inexhaustible. But it is necessary to remember about the rational use of natural resources so that the sources do not run out.

Charcoal is used in both low- and middle-income countries and high-income countries.

Charcoal is often referred to as a “bridge” fuel, indicating that it is the energy that will support the cooking needs of developing countries while other fuels are being explored and their distribution and adoption are more widespread. The undeniable fact about charcoal is that it will continue to be the dominant cooking energy in sub-Saharan Africa for decades to come.

In Asia, charcoal’s uses go beyond simply being used as a fuel. For example, in Japan, a special type of charcoal known as “binchotan,” or white charcoal, is used for water purification, dehumidification, and even cooking due to its ability to produce consistent heat.

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Using charcoal for cooking and grilling is a practice common all over the world. Charcoal is popular for the unique flavour it imparts to food and the high temperatures it can reach. However, these benefits come with longer cooking times compared to other fuel options such as gas or electricity.

Charcoal continues to play a key role in many industries. It serves as a key ingredient in steel and iron production and is also used in the chemical industry as a reducing agent.

The challenge is to balance the demand for charcoal with sustainable production methods.

Activated charcoal has applications in the healthcare and beauty sectors. It is used in medicine due to its toxin-absorbing properties.

Charcoal's versatility extends to the art world: from sketching to painting, artists favour charcoal for its ability to create a range of effects and tones.

Wood is the most common raw material for producing barbecue charcoal, including hardwood, mixed wood, fruit wood, but walnut shells, olive cores, dates and other fruits, coconut shells are also used. Wood waste such as sawdust, shavings, bamboo chips, rice husks, etc. are mainly used to produce charcoal and charcoal briquettes by machine.

All these factors indicate the existence of a large and viable market for charcoal.





World production of charcoal

In the last two decades, global charcoal production, according to the Food and Agriculture Organization Corporate Statistical Database (FAOSTAT)*, has increased by one and a half times, reaching 57,229,684 tons.



Food and Agriculture Organization
of the United Nations

* **FAOSTAT** is the FAO database that contains global data on forest products. Data are presented in annual cubic meters (m³) without bark or in tonnes (t). Initial data are published eight months after the end of the reporting period. For energy products, FAOSTAT contains data on the production and trade of firewood (softwood and hardwood), charcoal and wood pellets. However, products such as wood residues, wood chips and shavings, and pulpwood are also often used for energy purposes. It is not possible to determine the exact uses of products from the information available in FAOSTAT.

Renewable energy balances of the International Renewable Energy Agency are compiled in tonnes (t) on an annual basis, with initial data published 16 months after the end of the reporting year.

FAOSTAT Web: <https://www.fao.org/faostat/en/#data/FO>

During this time, there has been a steady global growth in the production of this type of product, which is reflected in Table 1 and Diagram 1.

In the period under study from 2000 to 2005, there was a significant increase in the production of charcoal in the world by 19.62%, in the next five years there was an increase of 5.92%, from 2010 to 2015 - 10.10%, from 2015 to 2020 - 3.32%, from 2020 to 2022 - 8.13%.

Such alternating ups and downs confirm the role of the growing use of charcoal in the metallurgical industry for the production of low-carbon metals, the growing culture of cooking in the countries of the Asia-Pacific region, at the same time the growing concern of governments and world communities about protecting the environment and improving environmental quality.

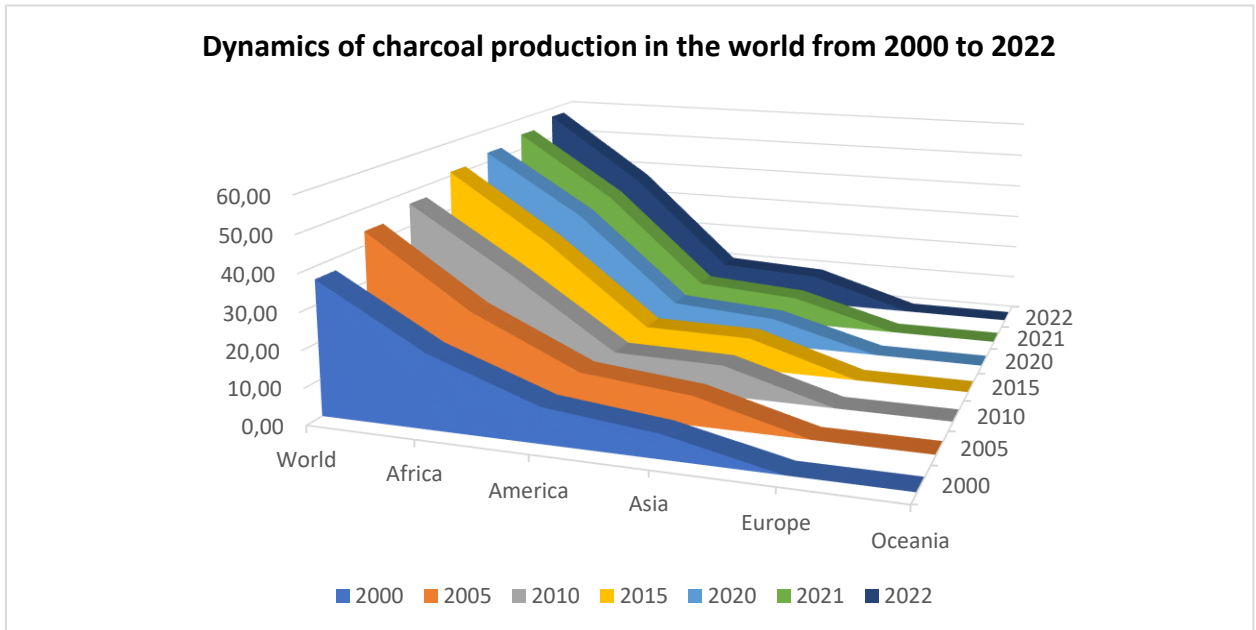
Table 1. Dynamics of charcoal production in the world from 2000 to 2022.

Year	World	Africa	America	Asia	Europe	Oceania
2000	36.7	20.2	9.7	6.54	0.30	0.04
2005	43.9	24.4	10.9	8.01	0.51	0.03
2010	46.5	28.5	8.9	8.54	0.57	0.04
2015	51.2	32.1	9.4	9.05	0.58	0.04
2020	52.9	35.1	10.1	8.02	0.62	0.04
2021	54.8	36.1	10.1	8.04	0.50	0.04
2022	57.2	37.2	10.5	8.96	0.57	0.39

All values in million tonnes



Diagram 1. Dynamics of charcoal production in the world from 2000 to 2022



Segmentation of charcoal production by region

To better understand the charcoal market, we will analyze the major regions and countries including America (North - US, Canada, rest of North America and South - Brazil, Argentina, rest of South America), Europe (Germany, UK, France, Spain, rest of Europe), Asia (China, Japan, India, Australia, Thailand, including rest of Asia Pacific), Africa (Nigeria, Ethiopia, Democratic Republic of Congo, Ghana, Tanzania, and rest of Middle East and Africa). South America, Middle East and Africa dominate the market, capturing a significant share of the pie.

Growing concern for protecting the environment from dangerous carbon emissions and population growth along with urbanization are driving the charcoal market in these regions.

Let us focus on the latest available data on the volumes of regional charcoal producers in descending order, displayed in Table. 2 and diagram 2.

Africa, the leader in charcoal production, produced 37,183,170 tons or 64.97% of the world's total in 2022, with its East African region producing 16,202,146 tons of charcoal, Central Africa - 4,774,143 tons, North - 3,332,327 tons, South - 639,308 tons.

America produced 10,472,680 tons of charcoal or 18.30%, 852,000 tons came from North America, 240,986 tons from Central America, 204,507 tons from the Caribbean, and South America produced 9,175,187 tons of this type of fuel.

The Asian region produced 8,963,223 tons of charcoal in 2022, or 15.66%, with its Central part accounting for 4,491 tons, East Asia - 1,793,364 tons, South - 3,580,804 tons, Southeast - 3,400,175 tons, and West Asia - 184,389 tons.



Europe produced 571,541 tons of charcoal (less than 1%), with Eastern Europe accounting for 336,720 tons, North - 15,073 tons, South - 138,528, and West - 81,220 tons.

The outsiders were the countries of Oceania with the production of 39,070 tons of charcoal, Australia and New Zealand – 24,006 tons, Melanesia, Micronesia and Polynesia – 12,812 tons, 836 tons, 1,416 tons respectively.

Thus, the African region accounted for 64.97% of the world's charcoal production, America – 18.30%, Asia – 15.66%, Europe about 1%.

Africa is the leader in coal production on the African continent. Coal mining is mainly carried out in the East Rand around Witbank, the Vaal Valley and the Waterberg in the Limpopo province.



Table 2 World charcoal production in 2022 by regional groupings

№	Manufacturing region	Production of charcoal, t	Share in world production, %
	Total	57 229 684	100
1	Africa	37 183 170	64,97
2	America	10 472 680	18,30
3	Asia	8 963 223	15,66
4	Europe	571 541	0,99
5	Oceania	39 070	0,07
6	Australia and New Zealand	24 006	0,04
7	Others	15 064	0,03



Figure 2 shows global charcoal production in 2022 by regional groupings:

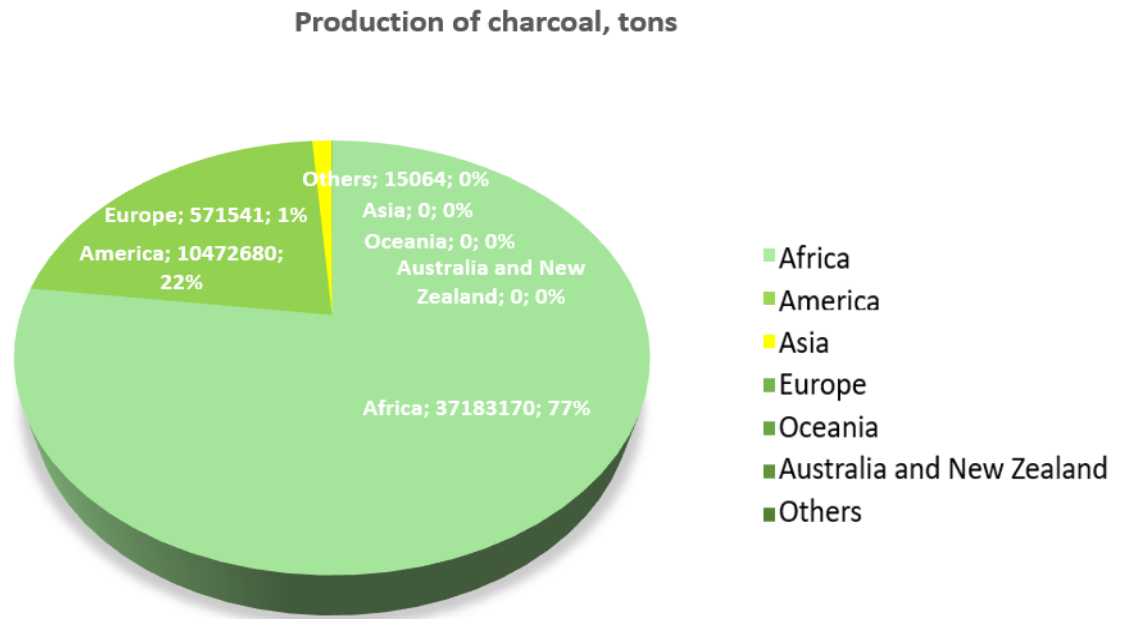
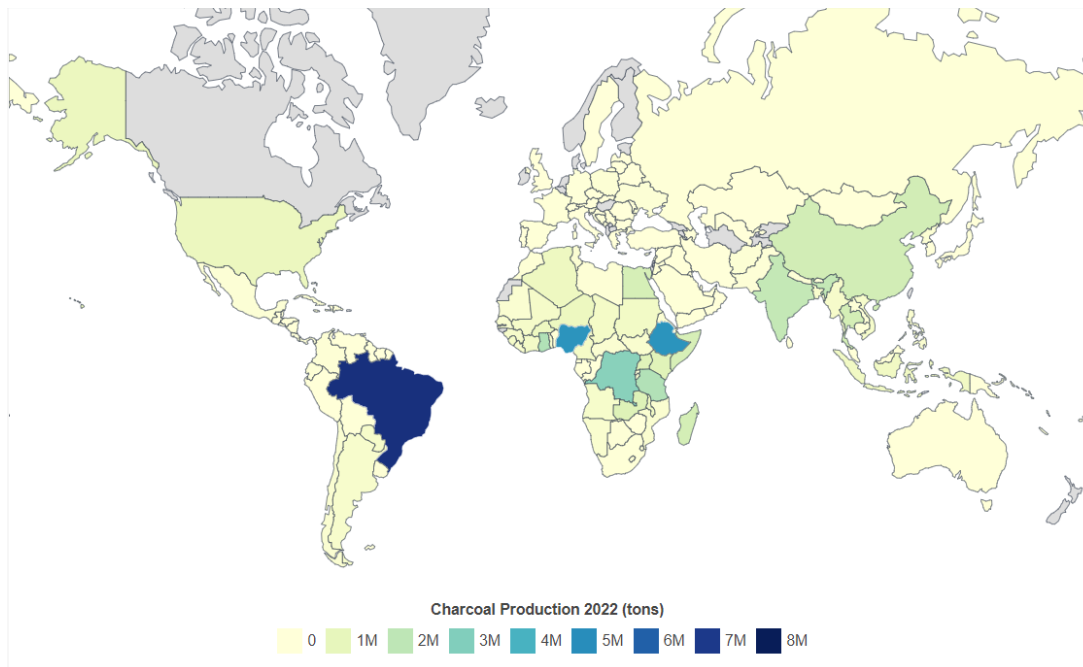


Figure 2: Global charcoal production in 2022 by regional grouping

The geography of production of charcoal producing countries for 2022 is presented in color ranking on map 1:



Map 1. Geography and volumes of countries producing charcoal



Ten years ago, according to the World Bioenergy Association (WBA) 2012 report, global charcoal production was almost three times greater than pellet production. The amount of wood used to produce charcoal is 4-5 times greater than that used to produce pellets, due to low conversion efficiency and lower energy content in the fuel. These factors have affected the market volumes of these fuels over the ten-year period, with charcoal production changing slightly from 52 million tons in 2012 to 57 million tons in 2022, while pellet production has almost reached the volumes of charcoal production, reaching 46.4 million tons in volume terms (versus 18.1 million tons in 2012).



Let's take a closer look at the top ten countries producing charcoal in 2022.

TOP 10 Charcoal Producing Countries in 2022

The TOP-10 charcoal-producing countries in 2022 are opened by the undisputed leader - Brazil, which accounted for 13.26% of world production or 7,591,000 tons in physical terms, which is shown in Table 3. Most of the Brazilian charcoal is used to produce pig iron, one of the country's main export goods.

The remaining 77% of the world's charcoal production is concentrated in Africa, in particular in countries such as Ethiopia, Nigeria, the Democratic Republic of the Congo, Ghana, Tanzania, and Madagascar. Six out of ten charcoal-producing countries are African.

This is largely due to the growth in the use and production of charcoal in developing African countries, where a third of the wood harvested for fuel is used to produce charcoal. The second and third positions, with almost equal production volumes, are occupied by Ethiopia and Nigeria, which account for 8.65% and 8.58%, or 4,951,374 tons and 4,907,916 tons, respectively. DR Congo and India account for 5.20% and 5.03%, respectively, and round out the top five with 2,973,887 tons and 2,880,000 tons in physical terms.

The next five lines have approximately the same annual production volume and are distributed as follows: Ghana produced 2,280,505 tons of charcoal or 3.99% of the world total, Tanzania - 2,273,000 tons or 3.97%, Madagascar - 1,583,154 tons or 2.77%, China - 1,582,969 tons or 2.76%, Thailand closes the top ten with 1,572,009 tons or 2.75% respectively.



Table 3. TOP 10 charcoal producing countries in 2022

№	Manufacturing region	Production of charcoal, t	Share in world production, %
	Total	57 229 684	100
1	Brazil	7 591 000	13,26
2	Ethiopia	4 951 374	8,65
3	Nigeria	4 907 916	8,58
4	DR Congo	2 973 887	5,20
5	India	2 880 000	5,03
6	Ghana	2 280 505	3,99
7	Tanzania	2 273 000	3,97
8	Madagascar	1 583 154	2,77
9	China	1 582 969	2,76
10	Thailand	1 572 009	2,75
	Other countries	49 638 684	43,04

TOP 10 Charcoal Producing Countries in 2022. Share in World Production, %

- Other countries
- Brazil
- Ethiopia
- Nigeria
- DR Congo
- India
- Ghana
- Tanzania
- Madagascar
- China
- Thailand

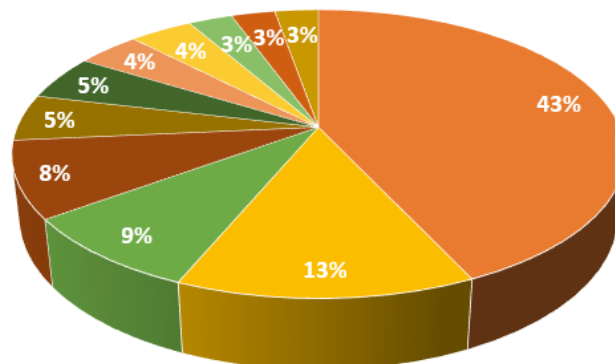


Figure 3. TOP 10 Charcoal Producing Countries in 2022





Charcoal production in the EU

Let's take a closer look at the charcoal-producing countries in the European Union.

In 2022, EU countries produced 338,854 tons of charcoal, which was less than 1% of world production.

The top ten were distributed as follows: Poland produced 140,000 tons, which was a quarter of all production, Spain produced 60,297 tons of this type of product and took 17.79% of the total EU share, and France - 50,000 tons or 14.76%, the remaining countries produced less than a tenth of all charcoal production in the EU, which is shown in Table 4 and Diagram 4.

Table 4. Leading countries in charcoal production in the European Union in 2022.

Manufacturing region	Production of charcoal, t	Share in EU, %
Total EU countries	338 854	100
Poland	140 000	41,32
Spain	60 297	17,79
France	50 000	14,76
Germany	30 000	8,85
Croatia	13 016	3,84
Italy	10 000	2,95
Portugal	8 800	2,6
Latvia	8 000	2,36
Czech Republic	5 556	1,64
Slovakia	4 100	1,21

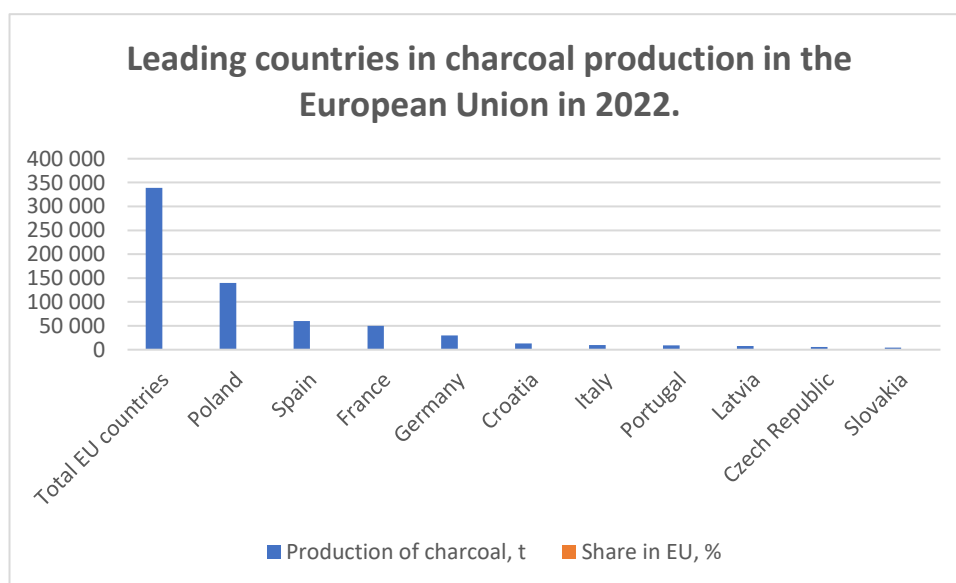


Figure 4: Leading EU charcoal producing countries in 2022.



The **27 EU countries** import very different amounts of charcoal.

The EU charcoal production, according to the data provided, is only a small fraction of the estimated global output, but the fuel is an important source of energy for cooking and heating. Due to the low efficiency of technologies for increasing the specific energy content of charcoal, the production of this type of fuel is of interest only as a way to increase the shelf life of firewood. Often, tropical wood used as charcoal in EU countries comes from uncertified forests, which is contrary to the principles of the international certification system for more sustainable forest management.

The World Wildlife Fund (WWF), Switzerland, believes that charcoal should have reliable **Forest Stewardship Council (FSC)** certification, **Programme for the Endorsement of Forest Certification (PEFC)** certification, which confirms environmental requirements for production

FSC Web: <https://fsc.org/en>

PEFC Web: <https://fsc.org/en>

Around half of the wood extracted from forests worldwide is used as fuel for energy production, around 17% is processed into charcoal (FAO 2017), which is one of the least controlled segments of the European wood market.

A significant portion of the charcoal sold in Europe comes from tropical forests and is often mislabeled, raising questions about whether it was harvested illegally.

For example, Poland imports a lot of charcoal from non-EU countries for its own market.

Research conducted in 2017 claimed that charcoal was purchased from countries where there are no FSC-certified charcoal producers.

This charcoal was repackaged in European countries and then sold as FSC-certified charcoal produced in Europe.

Similar violations were found in Italy, Spain, Denmark and other countries.

Confirmation of irregularities in the charcoal supply chain has led to mandatory transaction verification and fibre testing since Q4 2017.



Scientific institutions such as the Thünen Institute for Wood Research and the International Association of Wood Anatomists specialise in monitoring, research, scientific publications and innovative concepts in the field of forests, wood and ecosystems, working together with other scientific centres to pool their efforts and socio-economic, ecological and technological competencies to meet EUTR* regulations.

* *European Union Timber Regulation - a regulation aimed at combating illegal logging and related trade in timber and timber products in the Member States of the European Union.*

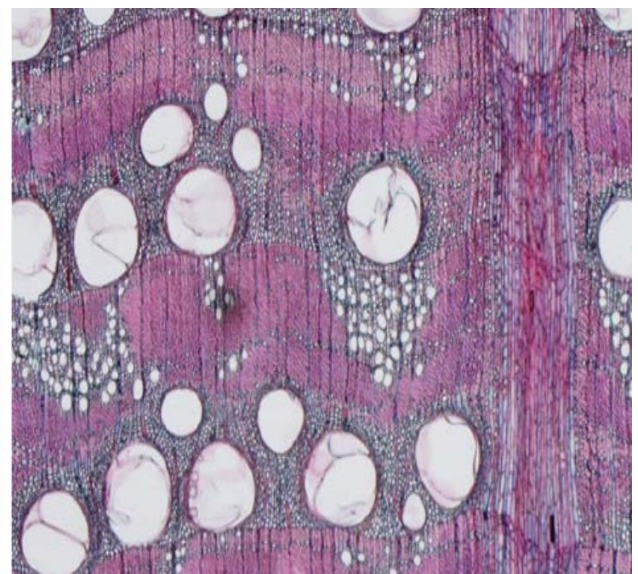
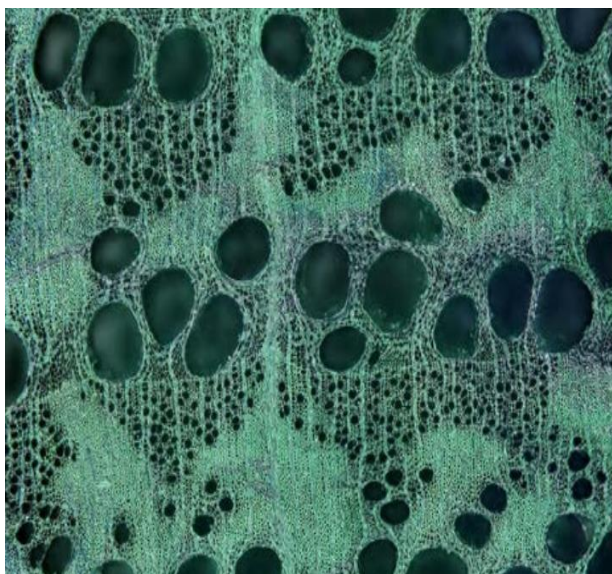
Johann Heinrich von Thünen-Institut in Hamburg uses 3D reflected light microscopy to provide information on the properties and origin of charcoal, what kind of wood was used, and conducts other laboratory studies.



Johann Heinrich von Thünen-Institut Web:

<https://www.thuenen.de/de/fachinstitute/holzforschung>

The International Association of Wood Anatomists (or IAWA), based in the Netherlands, also studies wood anatomy and is an expert in these matters, publishing lists of microscopic features for identifying wood and charcoal.



IAWA Web: <https://www.iawa-website2.org/>



Some figures on economic and environmental issues

Charcoal has a significantly higher calorific value, or in other words, higher energy content, compared to the original wood, reaching approximately 28-33 MJ/kg (the same as coal), while dry wood typically contains about 18 MJ/kg. However, this increase in energy content is achieved by losing more than half of the available energy of the wood during pyrolysis.

To produce one ton of charcoal, 4 to 12 tons of dry wood are required, and the conversion of wood into charcoal takes from several hours to several days, depending on the technology, type and moisture content of the wood.

In other words, 250 kg of charcoal is obtained from 1 ton of wood. However, when using weaker carbonization technologies in an earthen furnace, the yield often does not exceed 15-20 percent, in other words, about 150-200 kg from 1 ton of wood. Many charcoal producers, for example, use raw wood and the energy needed to dry it is provided by part of the batch, which reduces the yield by up to 15 percent.

The carbon content of wood and charcoal is 50 and 90 percent respectively, giving the following carbon equivalents:

- 1 000 kg древесины → 500 kg углерода;
- 250 кг charcoal → 225 kg carbon;
- 150 кг charcoal → 135 kg carbon.

Carbonization of a ton of wood releases 365 kg into the atmosphere with poorly managed technology and 275 kg with improved methods.

So improved technology prevents the emission of 90 kg of carbon per ton of wood carbonized, which is equivalent to 300 kg of carbon or 1.1 tons of CO₂ per ton of coal consumed.





In Antananarivo, Madagascar alone, 110,000 tons of charcoal are consumed annually, assuming an urban family consumes about 2 bags, or about 60-70 kg of charcoal per month. On the ground, this means the removal of 32,000 hectares of forest each year. In 2012, it was estimated that 402,000 tons of charcoal were consumed on the entire island, resulting in the destruction of about 110,000 hectares of forest. The problem is only partly the number of trees being cut down each year, the real problem is that the rate of deforestation far exceeds the natural regeneration potential of these forests, to the point that Madagascar has lost almost 45% of its natural forests since the 1950s, and the process does not seem to be slowing down. This trend is also typical of other countries in Africa.

Charcoal Market

The COVID-19 pandemic and its strong economic recovery, as well as the military conflict in Ukraine, have led to three turbulent years in charcoal markets, according to the International Energy Agency.

2023 has been the first year of relative predictability and stability in recent memory, with global coal demand up by around 1.5%. This translates into growth of 2% in non-energy industries and 1% in power generation.

China and India were the main drivers of this growth, with each country increasing its consumption by around 5% during the first half of the year. Meanwhile, coal demand fell by 24% and 16% in the US and EU, respectively.

In 2022, charcoal (including shell or nut charcoal) was the 1,580th most traded commodity in the world (out of 4,648), with a total trade value of \$1.83 billion.

From 2021 to 2022, charcoal exports increased slightly by 3.2%, from \$1.51 billion to \$1.56 billion. Trade in charcoal accounts for 0.0077% of total world trade.

In the International Harmonized Commodity Description and Coding System, Wood charcoal (including shell or nut charcoal), whether or not agglomerated has the HSN code 4402 and is included in Wood, products of wood and charcoal, code 440200, belonging to Chapter 44 Wood and products of wood, charcoal.

** The Harmonized Commodity Description and Coding System (abbreviated Harmonized System, HS) - 1992 contains 97 chapters, which are divided into 21 sections. The first two 2 digits in the commodity code are the chapter number, the next 2 refer to the section of the chapter, and the next 2 to the subsection of the chapter. These first six digits are standard for all countries.*



Charcoal exports in 2022.

In 2022, global charcoal exports totaled 3,161,081 t, with a value of \$1,556,967 thousand. In 2022, the largest exporters of charcoal (including shell or nut charcoal) were Indonesia (\$349.8 million), Poland (\$119 million), Laos (\$86.7 million), the Philippines (\$81.4 million), China (\$81.4 million).

Table 4. Largest charcoal exporting countries in 2022.

No	Exporting country	Quantity, t	Cost, thousand dollars
	The whole world	3 161 081	1 556 967
1	Indonesia	496 378	349 768
2	Poland	163 474	118 949
3	Laos	181 622	86 700
4	Philippines	117 343	81 448
5	China	50 600	81 412



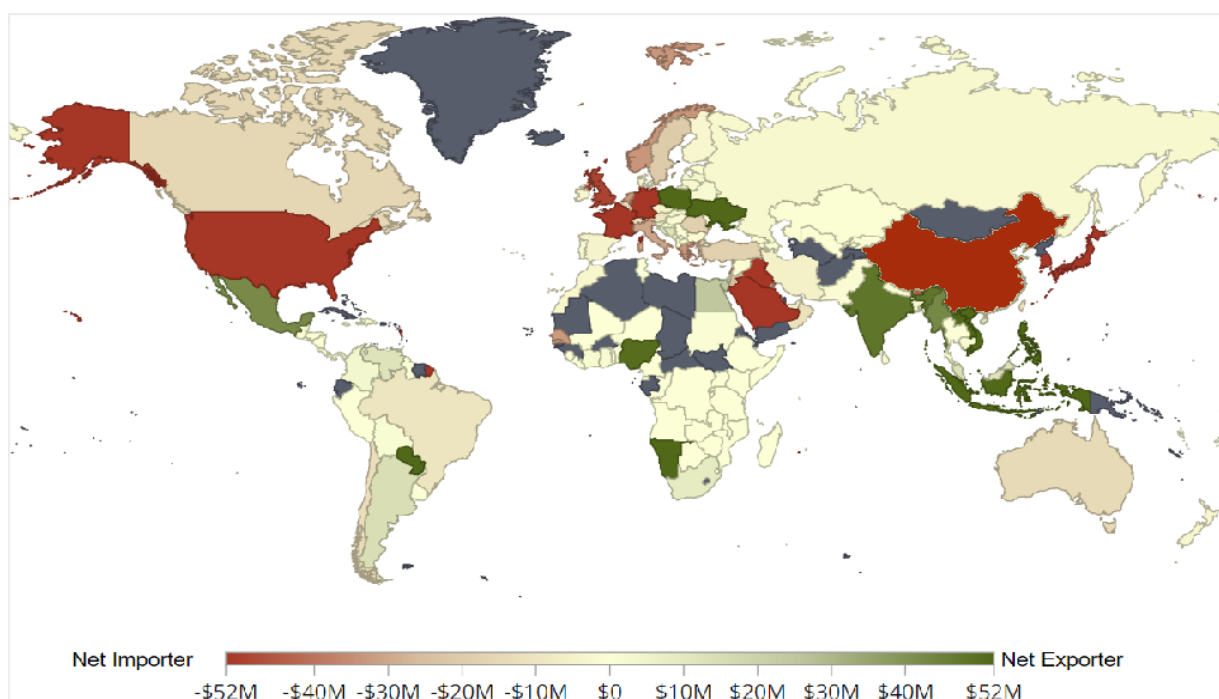


Charcoal imports in 2022

In 2022, global charcoal imports totaled 3,382,181 t, with a value of \$1,771,036, suggesting a small global deficit of 12%. However, increasing charcoal production and consumption could have significant negative environmental impacts. For countries with high consumption but weak supply sources, there is a risk of over-harvesting existing tree populations. A developing country's transition from fuelwood to charcoal could have devastating environmental consequences unless production and use are restricted. Coal stoves are much more efficient than wood stoves, and with proper monitoring, management, and support, charcoal could be a sustainable resource. In 2022, the largest importers of charcoal (including shell or nut charcoal) were China (\$195 million), Saudi Arabia (\$138 million), South Korea (\$115 million), Japan (\$113 million), and Germany (\$91 million).

Table 5. Largest importers of charcoal in 2022

No	Importing country	Quantity, t	Cost, thousand dollars
	The whole world	3 382 181	1 771 036
1	China	592 138	195 175
2	Saudi Arabia	180 553	138 558
3	South Korea	120 355	115 712
4	Japan	123 438	113 022
5	Germany	133 617	91 908



Map 2. Charcoal exporting and importing countries in 2022



Map 2 shows which countries export or import more charcoal. Each country is colored based on the difference in charcoal exports and imports in 2022.

Charcoal is an important natural resource that has been used throughout history for many purposes, but its primary use is as a fuel source. Although charcoal can be produced from a variety of animal and plant products, the most common commercially available charcoal is made from wood.

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Competitive Analysis of the Charcoal Market

There are many small private producers operating in the market that contribute to the global charcoal market.

The average person in the world consumes 0.276 cubic meters of charcoal per year, which is 2.5 times less than the amount of wood fuel consumed by the average person in sub-Saharan Africa, which is 0.69 cubic meters. Firewood and traditional charcoal remain the most widely available source of energy for households in more than 80% of the population in these countries.

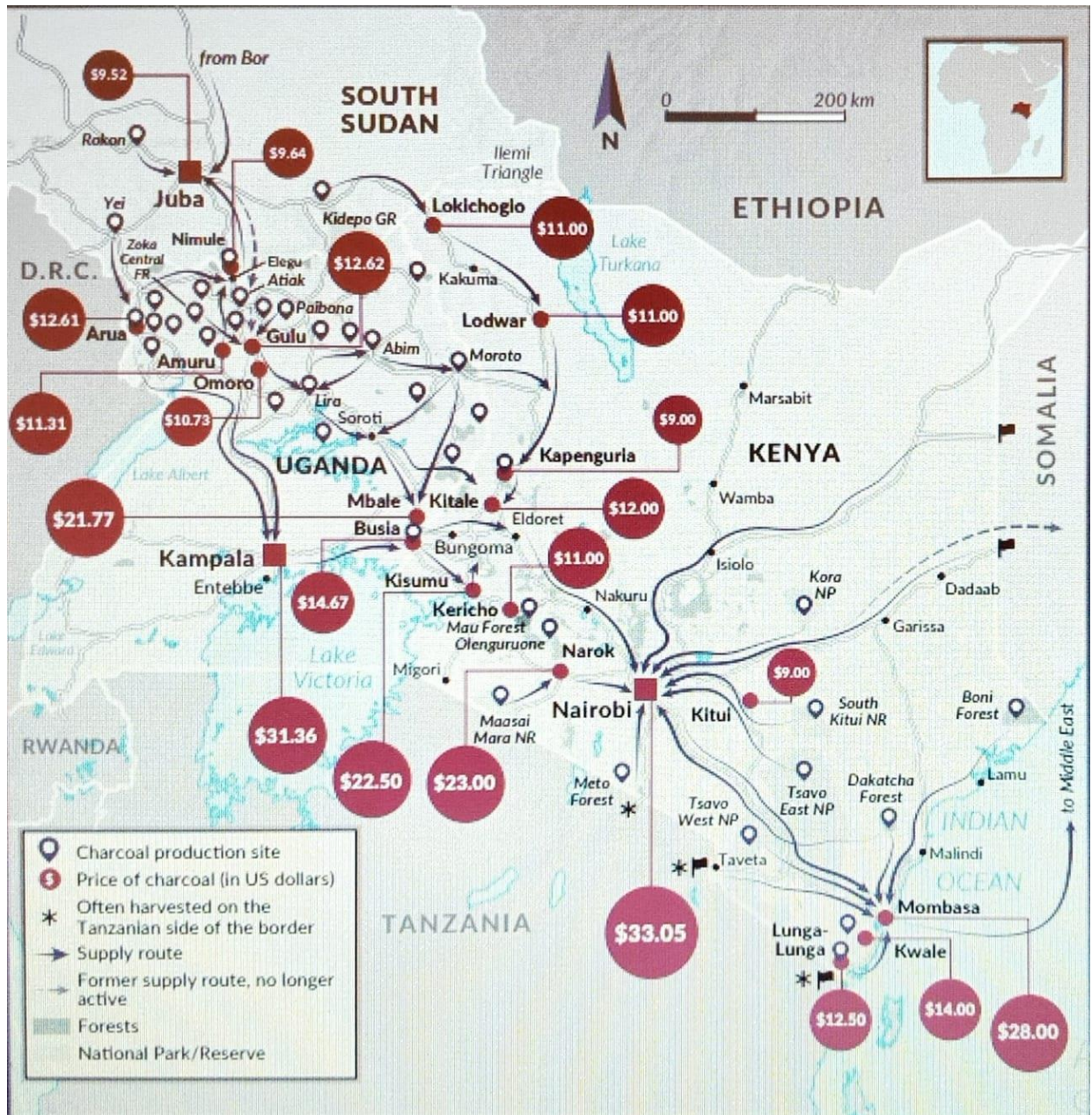
The use of charcoal, especially in the cooking industry, is growing due to its advantages such as quick ignition, smokeless fire, and no ash or dust formation. The market is also driven by increasing urbanization, easy availability of charcoal in urban areas, and advances in technology. The Asia Pacific region dominates the charcoal market, with China and India leading the consumption. Brazil remains the world's largest producer of charcoal, using managed eucalyptus plantations and the Amazon rainforest.

Charcoal is primarily sourced from the tropical forests of Nigeria, Tanzania, and the Democratic Republic of Congo. However, semi-arid countries such as Egypt, Ethiopia, Namibia, and Somalia also contribute steadily to the international supply of charcoal, which is primarily used for cooking and heavy industry. The charcoal supply chain is largely informal, with well-coordinated logistics to support intra- and intercontinental trade. Production is often rudimentary, involving single-use earthen kilns that are lit in open forests.





The lack of standardized specifications for the quantities and types of raw materials used creates high uncertainty about the quality and true economic value of charcoal. Depending on the markets, the value is determined by the origin and type of wood, volume, weight, or other subjective variables such as the duration of burning in kilns and the amount of smoke emitted.



Map 3: Map illustrating where production and export routes are concentrated in Nairobi-Kenya



A 3 kg bag of charcoal costs \$7-9 in the US and €3-7 in Germany. In contrast, charcoal in sub-Saharan Africa is mostly sold by volume, using bags and recycled containers as measuring devices. Charcoal exports and imports are often classified together with other forest products as “wood products”, which distorts their true identification and valuation as separate energy commodities.

In Kampala, Uganda, a 50 kg bag of charcoal costs approximately \$21.50-32.30 (Sh80,000-120,000).

In Malawi it costs about US\$8 (Sh30,000) for a 50kg bag, in Tanzania it costs three times as much, about US\$20 (Sh76,000), in Kenya it costs US\$32.30 (Sh120,000).



Major players in the charcoal market

E & C Charcoal (Pty) Ltd, Aperam BioEnergia, Jumbo Charcoal (Pty) Ltd, BRICAPAR S.A. Charcoal Briquettes, Duraflame, Etosha, GRYFSKAND, Fire & Flavor, etc. We will consider these and other players in the charcoal market with their profiles in the next part of the review.



Summary of Part 2

The use of charcoal is still controversial as the process of converting wood into charcoal results in significant energy losses, requiring significantly more forest resources to produce the same amount of energy.

This has led to many countries like Kenya, Tanzania, Gambia, etc., imposing bans on this type of wood fuel. However, these bans have not had much success and the use of charcoal continues to grow under the pressure of increasing urbanization. Charcoal burns cleaner than wood or dried biomass, producing higher temperatures, and is cheaper to transport and store.

For these reasons, there is a resurgence of interest in charcoal as a fuel and steps need to be taken to promote improved charcoal production technologies and thus reduce the amount of raw biomass required.

The production of charcoal is a labor-intensive process that employs a large number of people at different stages of the process and distribution. This production generates between 200 and 350 man-days of employment per terajoule of energy compared to 10 man-days per terajoule for kerosene.

Sustainable production of charcoal in particular can support rural development through decentralized processing and production, short low-risk transport distances, locally available and renewable resources, and the potential for short-term efficiency gains through improved stoves or replacement with more modern models. It can bring health dividends through reduced smoke levels, cleaner combustion, and ease of handling. To be environmentally beneficial, it requires highly efficient stoves and renewable fuels.

All this requires increased attention at the level of governments in developing countries, which are the main suppliers of this type of fuel, in the context of a sustainable (rural) development approach, as well as their intervention in the principles of local control and participation, which will be respected in the planning process.

The comparative advantages of local energy sources must be fully exploited to stimulate regional economic growth. The European market is almost entirely represented by small and medium-sized businesses that focus on selling charcoal for cooking - this allows them to get the maximum price with the current production technology. However, this market segment (charcoal for shashlik, barbecue, etc.) is characterized by pronounced seasonality and limitations, which does not allow building a sustainable business.

There is potential for increased wood fuel consumption and production in Europe and the rest of the UNECE region. Its implementation will depend on prices of competing energy sources, as well as government policies on renewable energy, greenhouse gas emissions and forest sustainability.

According to the baseline scenario of the UNECE region forecast, the growth of wood fuel production and consumption will be small to moderate.

Macroenvironmental factors have a largely negative impact on the development of charcoal.



Among the most negative factors in the market are: pronounced seasonality of demand, tense foreign policy situation, reduction of population incomes, population decline both due to natural depopulation and due to geopolitical challenges associated with the unstable political situation in the world.

Although globally charcoal consumption can be expected to decrease in the near future, locally or in individual countries (developing and developed) it can still increase as a result of new opportunities in the industrial market of "green energy".

Despite the fact that the endless pursuit of charcoal around the world puts a disproportionate burden on the forests of sub-Saharan Africa, Asia and South America, creating environmental threats, charcoal will remain a key part of global energy consumption for decades to come.

The use of charcoal is not necessarily associated with poverty or lack of access to other energy sources; many households with access to electricity simply choose to use charcoal regardless of other options.

In addition, "energy secure" countries such as Germany, Japan, the UK and the US are among the world's top ten importers of charcoal, valuing it for the flavour it adds to food and even for recreational use in hookahs.

