

INTERNATIONAL TRADE IN WASTE: THE CASE OF CROATIA

MAJA BAŠIĆ, MILE BOŠNJAK, IVAN NOVAK

University of Zagreb Faculty of Economics and Business, Zagreb, Croatia
mbasic1@net.efzg.hr, mbosnjak1@net.efzg.hr, inovak@efzg.hr

Abstract The aim of this paper is to analyse Croatia's international trade in waste, in terms of both export and import quantity, value, origin and destination. Data on trade in waste are available from Eurostat for the period 2004-2020. Results show that extra-EU trade in tonnes increased dramatically. Extra-EU export of waste increased for 3475% and extra-EU imports for 433% in the observed period. Intra-EU exports increased for 50% and intra-EU imports increased for 417%, especially after 2013. Intra-EU exports of waste are 3.45 times larger than extra-EU exports. Intra-EU imports are on average 1.76 times larger than extra-EU imports. Croatia's trade in waste is predominantly with other EU member states. In order to make national and global economy resilient to environmental changes and decrease material footprint, generation of waste followed by a trade in waste should be decreased by establishing and following responsible consumption and production patterns.

Keywords:

sustainable development, trade in waste, material footprint, Croatia, EU

JEL:

F18, F64, Q56

1 Introduction

In today's economy waste has outgrown its locally generated problematics. Waste generated locally requires appropriate disposal techniques. Demand for waste disposal sites outgrows their supply, thereby presenting an environmental problem and pressuring waste generators to seek new waste disposal sites. Waste can be traded, as other goods and services, especially internationally. This paper looks into the Republic of Croatia's trade in waste to answer the question: *Where does Croatia dispose its waste? and Which countries dispose their waste into Croatia?*

The next section portrays the literature in the field of international trade in waste, after which it explains the used methodology and presents the results of the descriptive analysis. The paper finishes with conclusion and discussion.

2 Literature Review

Global consumption increased by more than 65% in the period 2000-2019 (the United Nations, 2022). An increase in the global consumption (demand) raises global production thereby raising the amount of generated waste. Eurostat (2023a) defines waste as “any material *which the holder disposes of or is required to dispose of pursuant to the provisions of national law in force.*” Even in case of the appropriate disposal of waste, waste disposal causes environmental and health consequences. Landfills cause soil, water and biodiversity depletion, as well as air pollution. Herewith connected loss of biodiversity occurs globally. In that manner the United Nations addressed responsible consumption and production in the Sustainable Development Goal 12 (SDG12), closely relating to SDG 8 Economic growth and SDG 15 Life on Land, the protection and restoration of ecosystems and preservation of biodiversity. Table 1 depicts differences between developed, developing countries, EU-27 member states and Croatia in terms of income per capita, biocapacity, consumption and production ecological footprint and air pollution.

Global average in generated waste is 0.74 kg per capita per day, while the average for the Europe and Central Asia amounts to 1.18 kg per capita per day, and in Croatia 1.1 kg per capita per day of waste is generated (World Bank, 2018). In 2020 in Croatia, the greatest generators of waste by sectors are construction (23.8%), households (20.2%), waste/water (16.3%), mining and quarrying (11.6%), manufacturing (7.5%) and energy (1.1%) (Eurostat, 2023a). This section points out

that consumption generates large ecological footprint, even larger than production, and that ecological footprint, which measures the quantity of nature necessary to support people and their economies, is larger in developed economies as opposed to less developed ones. As economic growth is inseparable from consumption and production, and with intertwined waste generation and trade, this paper explains the importance of dealing with the topic of trade in waste and describes the waste trade flows from and into the Republic of Croatia in order to depict the underlying Croatian waste trade flows.

Table 1: Income shares, waste trade shares and socioeconomic differences by groups

	Developed countries	Developing countries	EU-27	Croatia
GDP per capita	42,539.9	1,061.9	32,828,5	15,166.4
Renewable energy consumption rate (%)	11.42	72.95	21.8	33.1
Biocapacity	2.7	1.0	2.7	2.8
Ecological footprint (production)	5.6	0.9	4.6	3.1
Ecological footprint (consumption)	6.0	1.1	6.1	3.9
CO2 emissions per capita	9.8	0.3	6.1	4.1
Share of world income	41.17	58.83	14.92	0.09

Source: Authors' compilation according to Kellenberg (2015) and World Economic Forum (2019) data. GDP per capita in constant US\$ in 2021 (World Bank database, 2023). Share of world income based on GDP based on PPP (IMF, 2023). Biocapacity and ecological footprint for 2018 (Global Footprint Network, 2018). Share of energy from renewable resources from 2021 are available from Eurostat (2023b) for European union-27 and Croatia for 2021, and for developing and developed countries from the World Bank in 2015.

3 Methodology

This paper analyses Croatian international trade in waste in terms of exports and imports quantity, value, waste origin and destination in order to gain an understanding of Croatian waste in trade flows, namely: Where is the Croatian waste disposed and which countries dispose their waste into Croatia? Data for the analysis are extracted from the Eurostat (2023a) database. Eurostat database offers the data about trade in waste in the following manner: (a) quantity of trade in waste, (b) value of the trade in waste, and (c) the direction of waste in trade. This paper uses a

descriptive analysis of the data from the Eurostat database on waste and trade in waste to illustrate Croatian trade flows connected to trade in waste, and with it connected directions.

4 Results

This section illustrates the Republic of Croatia's trade in waste. Figure 1 illustrates total annual imports and exports in waste in tonnes and thousands of euros. Croatian exports of waste are larger than imports. However, both in terms of quantity and value, imports of waste show a tendency to increase exponentially, while an increase of waste exports seems to have slowed down in the period 2004-2021.

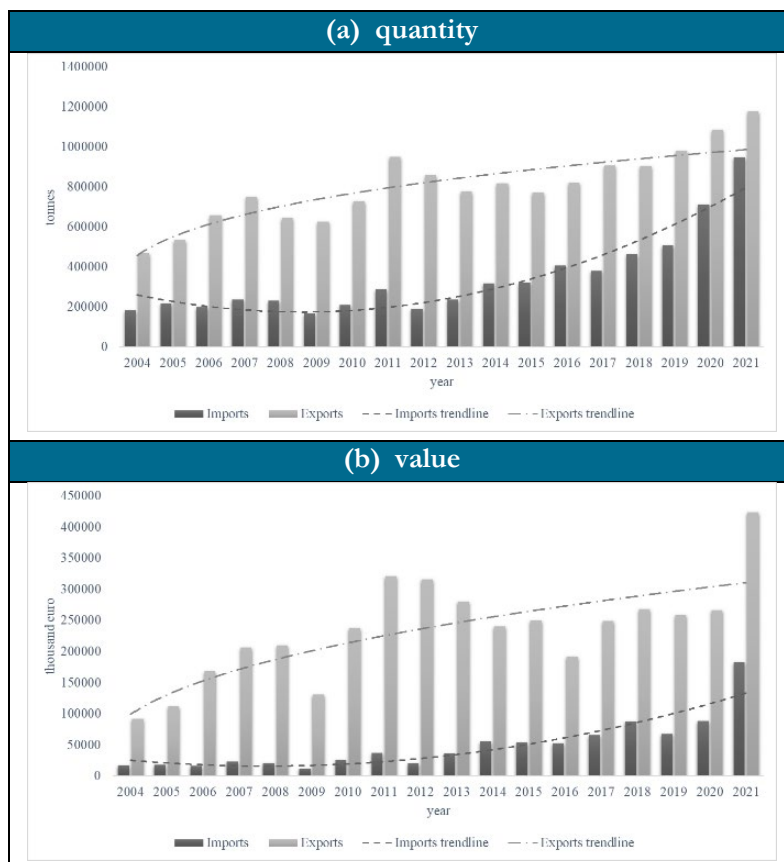


Figure 1: Imports and exports of waste in the Republic of Croatia
Source: Eurostat (2023a). Authors' representation.

Figure 2 shows the Republic of Croatia's imports of waste. The amount, in tonnes, and value of waste follow a similar pattern. It is interesting to note that waste imports from other EU-27 member states and from extra EU-27 were similar in quantity and value. However, after Croatia accessed into the European Union in 2013, imports in waste from other EU-27 member states increased drastically (417% in total in the period 2004-2021). Annual change in imports intra EU-27 was approximately 8% in the period 2004-2012 and increased to 33% in the period after the EU accession. The greatest increase in quantity was 113% in 2009-2010, followed by an increase of 76% in 2012-2013, 61% in 2013-2014 and 54% in 2019-2020 (Figure 4). An exponential increase in intra EU-27 imports is visible (Figure 2).

Intra EU-27 imports are on average 1.76 times larger than extra EU-27 imports. Extra EU-27 imports increased in total for 433%, amounting 13% annually, approximately 20% in the period 2004-2012 and increased to 8% in the period after the EU accession. The greatest annual increase was 72% in 2004-2005, 46% in 2007-2008 and 38% in 2017-2018. Figure 2 shows that both in terms of quantity and value intra EU-27 imports of waste show signs of exponential rise and extra EU-27 imports remain fairly constant compared to intra EU-27 imports.

Exports of waste show a somewhat different dynamic. Although intra EU-27 exports outstrip extra EU-27 exports in the entire observed period, extra EU-27 exports started to drastically increase after 2016. Extra EU-27 export of waste increased for staggering 3475% (27% annually on average). The largest increase was in the period 2004-2005 when extra EU-27 exports increased for 3,408%. Extra EU-27 exports increased annually for 27% on average in the period 2005-2012, and 12.5% annually on average in the period after the EU accession.

Intra EU-27 exports of waste are 3.45 times larger than extra-EU exports. Intra-EU exports increased for 50% (3% annually on average). In the period 2004-2012 intra EU-27 exports increased approximately 5% per annum, and approximately 1% per annum after the EU accession (Figure 3).

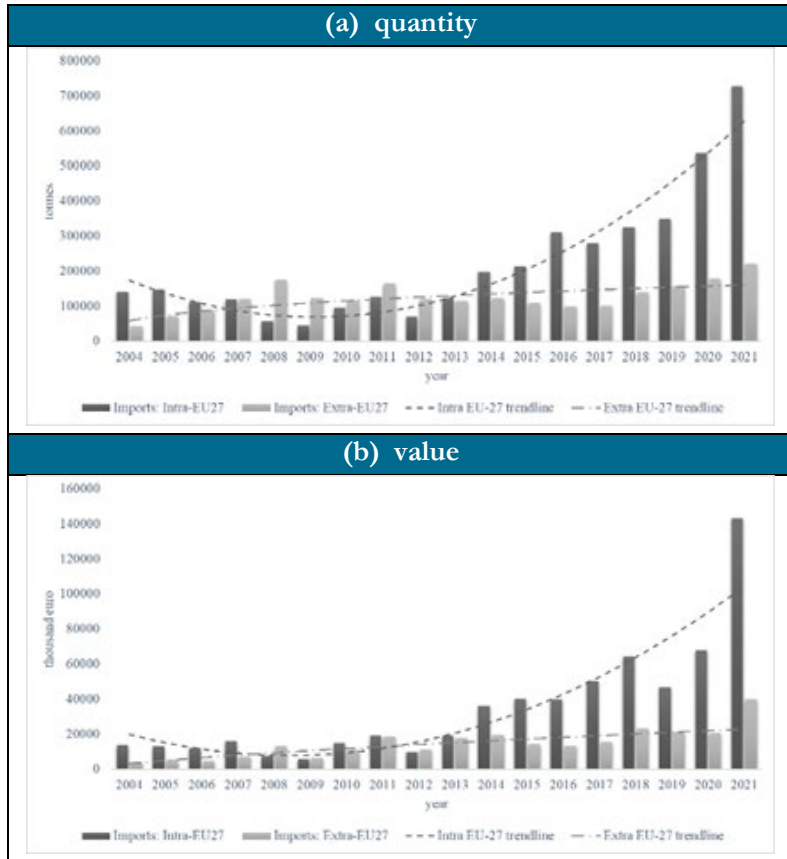
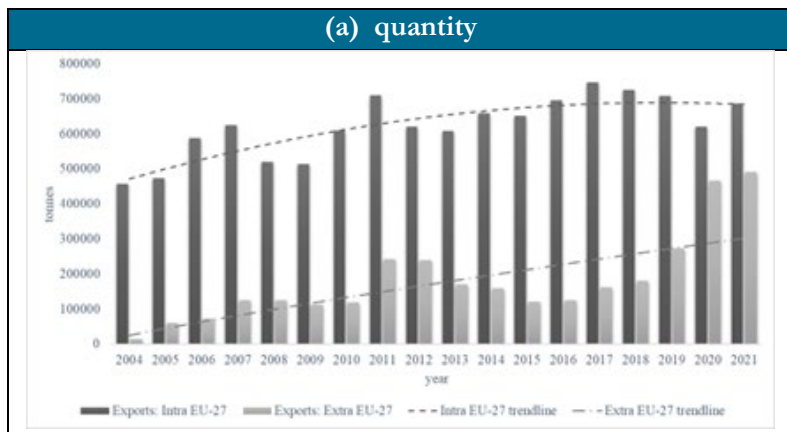


Figure 2: Imports of waste in the Republic of Croatia
 Source: Eurostat (2023). Authors' representation.



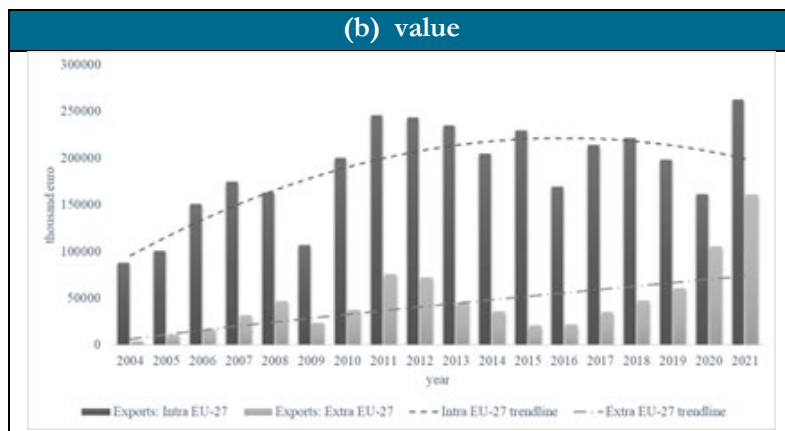


Figure 3: Exports of waste in the Republic of Croatia

Source: Eurostat (2023a). Authors' representation.

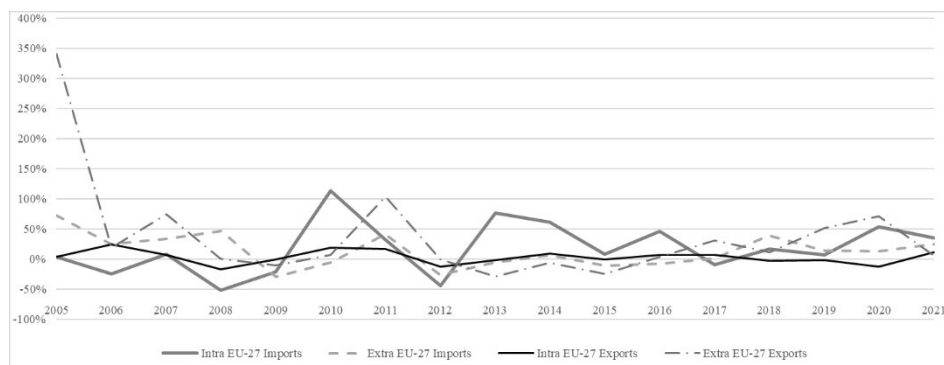


Figure 4: Percentage change in trade in waste

Source: Eurostat (2023a). Authors' representation.

Figure 4 shows the annual percentage change in intra and extra EU-27 imports and exports. The greatest positive change is evident in intra EU-27 imports increase, while the smallest oscillations in intra EU-27 exports.

Imports of waste from selected extra EU-27 countries and Greece shows that the structure of extra EU-27 imports has changed (Figure 5). Croatia imports majority of its extra EU-27 waste from Bosnia and Herzegovina (56% in 2004; 69% in 2021). However, in 2004 North Macedonia was the second largest exporter of waste into Croatia (29%), while in 2021 it is Serbia (23%).

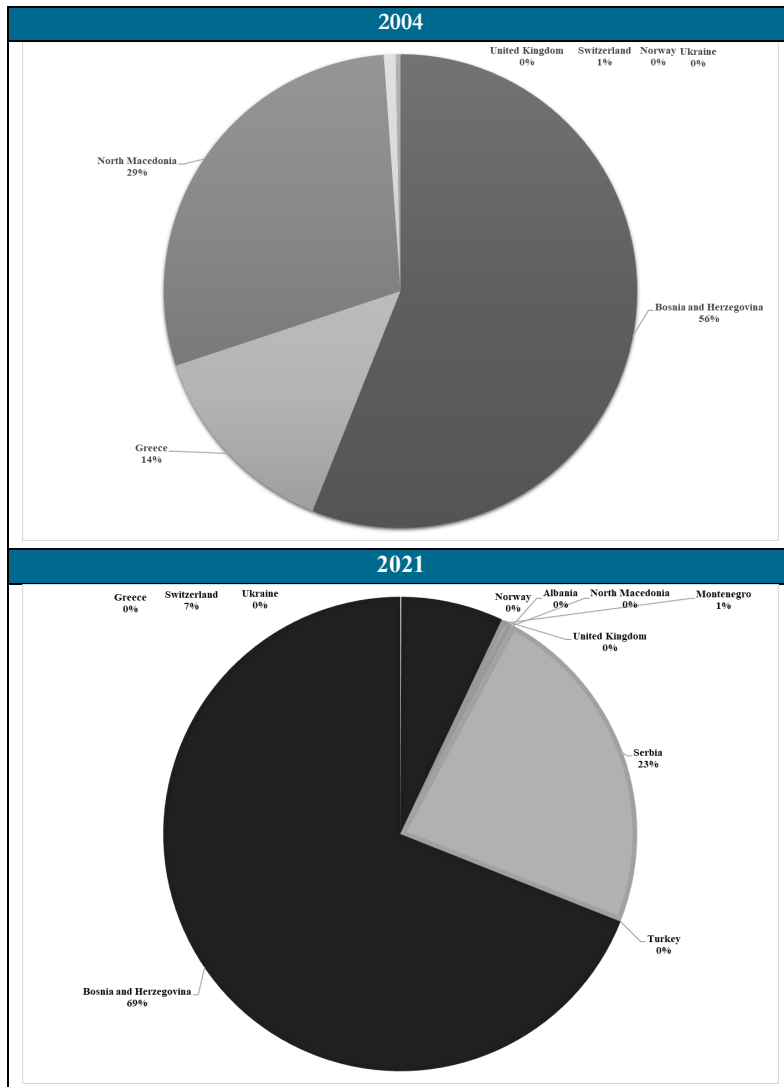


Figure 5: Imports of waste from selected extra EU-27 countries and Greece

Source: Eurostat (2023a). Authors' representation.

In terms of Croatia's structure of extra EU-27 exports and Greece, in 2004 the largest importer of Croatia's waste was Bosnia and Herzegovina (90%), while in 2021 it is Turkey (81%) (Figure 6).

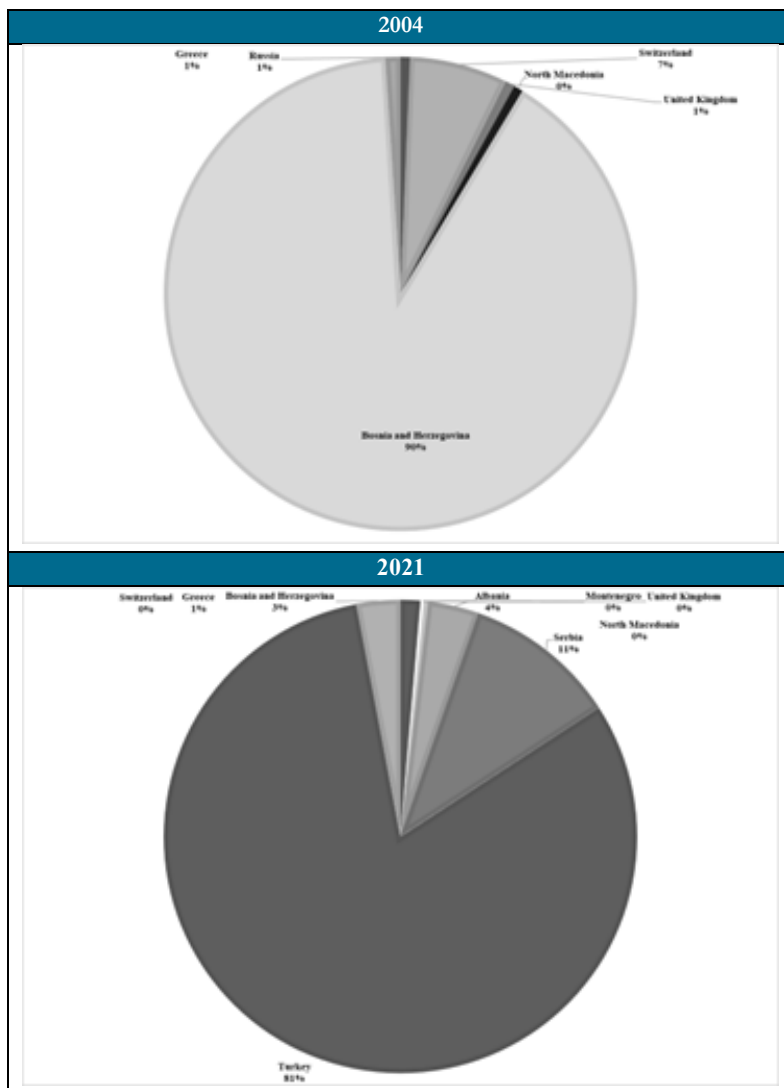


Figure 6: Exports of waste from selected extra EU-27 countries and Greece

Source: Eurostat (2023a). Authors' representation.

Figure 7 illustrates Croatia's terms of trade in waste, its material footprint and net exports, both in terms of quantity and value. Material footprint as a measure of raw materials required to meet final consumption demand is negative, thereby showing a positive tendency to decrease. Terms of trade in waste, as a ratio of export and import value, although positive point to a tendency to decrease, thereby showing an increase in import relative to export values.

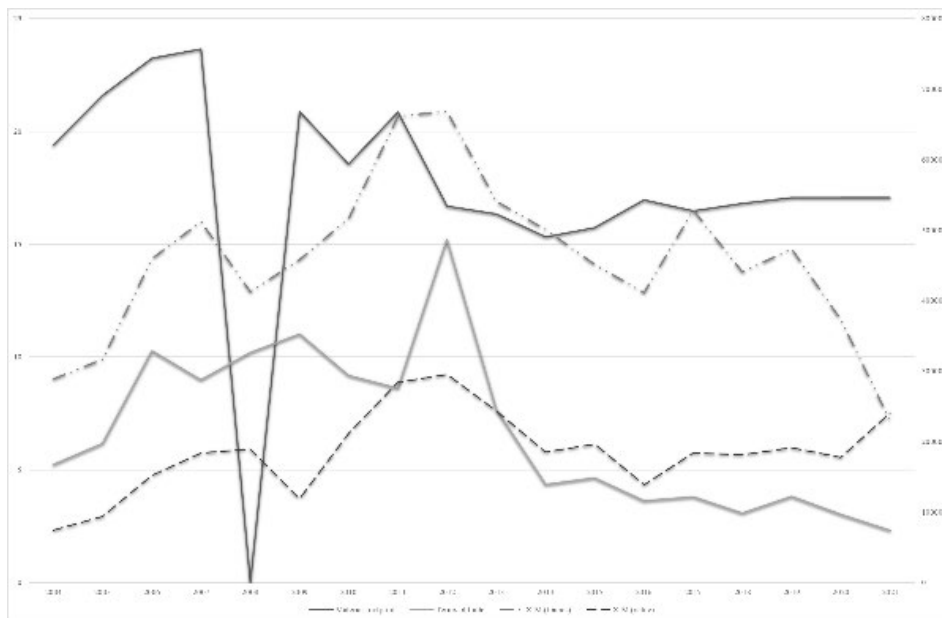


Figure 7: Terms of trade and material footprint

Source: Eurostat (2023a). Authors' representation.

Material footprint and Terms of trade (left axis). X-M (tonnes) and X-M (value) (right axis).

5 Conclusion

This paper attempted to portray a clearer picture of bi-directional trade in waste in and from the Republic of Croatia in order to answer the question: *Where is the Croatian waste disposed and which countries dispose their waste into Croatia?* In order to answer the question data on waste trade flows are retrieved from the Eurostat (2023a) database on waste. Data on the Croatian trade in waste show an exponential rise in waste imports, especially from EU-27 member states, and a decrease in rise in exports, especially to EU-27 member states. Additionally, Croatia's extra EU-27 exports are increasing whereby the destination of waste exports shows that larger amount of waste is sent to Turkey.

Future studies should look into the structure and hazardousness of imported and exported waste, examine the Croatian loss of biocapacity due to trade in waste, relate the trade in waste with the amount of consumption, production and with its connected amount of generated waste. Future studies should inspect whether Croatia has become the regional waste disposal or transfer site, and examine the impact of both on ecological and material footprint.

References

- Eurostat (2023a). *Waste statistics*. Retrieved from: https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Waste_statistics (10 March 2023)
- Eurostat (2023b). *Renewable energy statistics*. Retrieved from: https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Renewable_energy_statistics (10 March 2023).
- Global Footprint Network (2018). Global Footprint Network database. Retrieved from: <https://data.footprintnetwork.org/> (1 March 2023).
- IMF (2023). *GDP based on PPP, share of world*. Retrieved from: <https://www.imf.org/external/datamapper/PPPSH@WEO/OEMDC/ADVEC/WEOWorld> (10 March 2023).
- Kellenberg, D. (2015). The economics of the international trade of waste. *Annual Review of Resource Economics*, 7(1), 109-125. <https://doi.org/10.1146/annurev-resource-100913-012639>
- OECD (2023). Municipal waste (indicator). Retrieved from: doi: 10.1787/89d5679a-en (14 March 2023)
- United Nations (2022). *Sustainable Development Goals Report*. Retrieved from: <https://unstats.un.org/sdgs/report/2022/The-Sustainable-Development-Goals-Report-2022.pdf> (20 February 2023).
- World Bank (2018). What a Waste 2.0: A Global Snapshot of Solid Waste Management to 2050. Retrieved from: https://datatopics.worldbank.org/what-a-waste/trends_in_solid_waste_management.html (10 March 2023).
- World Bank (2023). *World Bank database*. Retrieved from: <https://data.worldbank.org/> (5 March 2023).
- World Economic Forum (2019). *The Global Competitiveness Report 2019*. Retrieved from: https://www3.weforum.org/docs/WEF_TheGlobalCompetitivenessReport2019.pdf (8 March 2023).

