# *INDICATORS OF MATERIAL FLOWS: CONCEPTUAL FRAMEWORK, USE AND ASSESSMENT OF TRENDS IN THE CZECH REPUBLIC*

## *1. Socio-economic metabolism*

*In order for an economic system to function and produce goods and services necessary for meeting human needs, it behaves similarly to a living organism. It absorbs substances from the surrounding environment and transforms them into products, but ultimately all the materials are transformed into some kind of waste and emitted back into the environment. The economic system above all absorbs fossil fuels, other mineral resources, biomass and water on the input side while emits emissions to the air, water and solid wastes on the output side. This flow of materials is referred to as an industrial or socio-economic metabolism (Baccini and Brunner, 1991; Fischer-Kowalski and Haberl, 1993; Ayres and Simonis, 1994).*

*The theory of socio-economic metabolism considers socio-economic system to be a sub-system of the environment connected to its surroundings through energy and material flows. These flows burden the environment and along with land use and other biological and social factors they belong to the key source of environmental problems. If the volume of these flows was reduced, a decrease in environmental pressure could be expected (Schmidt-Bleek, 1993; Bringezu et al., 2003; Weizsäcker et al., 2009).*

*Environmental pressure is already related to the extraction of mineral resources. The crude oil extraction involves leakages both during extraction phase and oil transportation. The negative impacts on the environment take place during the underground and surface extraction of minerals as well (Neužil, 2001). These impacts include air emissions (mostly of CO, $CO_2$, $SO_2$, $SO_3$, $CH_4$, NO, $NO_2$, and PM), disturbance of water regimes and water contamination, land appropriation and contamination, direct disturbance of biotopes, noise, vibrations and changes in landscape. Other pressures are related to pre-processing of minerals – sorting, crushing, rinsing and drying.*

*Much bigger environmental burden is related to the consumption of mineral resources. It is besides others caused by the fact that while number of mineral resources entering the economic system is limitted, the number of pollutants emitted due to the consumption of minerals has been growing (Spangenberg et al., 1999). Moreover, these pollutants enter the environment by huge number of gateways: each dumping place, each smokestack and each exhaust pipe presents such a gateway. Consumption of mineral resources contribute, for instance, to global climate change, depletion of stratospheric ozone, eutrophication, acidification, radioactive pollution, etc. (Giljum et al., 2005).*

*The environment is able, to some extent, to neutralize the environmental pressure imposed on it by human society in relation with the consuption of materials. If the rate of use of renewable resources is lower than the rate of their renewal, or wastes are emitted in such volumes, which can be absorbed by the environment, any severe damage to the environment should not take place (Bringezu and Bleischwitz, 2009). This rate is, however, often exceeded (World Resource Institute, 2005) and there is a problem with non-renewable resources. Their sustainable rate of use is difficult to determine, above all with respect to their maintenance for future generations.*

*So far, there has been a positive relation between meeting human needs and pressure exerted on the environment. When standards of living went up, this pressure was growing as well, even though it was often shifted abroad in the case of developed countries (import of resources or transfer of "dirty" industries to developing countries). The environment of developed countries was thus cleaned up (Giljum et al., 2009; Schütz et al., 2004). On the global level, however, the human society recorded an unprecedented growth in annual material and energy inputs and outputs over the 20th century (Krausman et al., 2009). As argued above, this was also accompanied with the growh of environmental pressure. Developed countries within their strategies of sustainable development therefore adopted a goal to break the relation between pressure exerted on the environment and economic growth, i.e. to meet human needs and improve the standard of living. This phenomenon is shortly called decoupling (from longer "decoupling of environmental pressure from economic growth") (Fischer-Kowalski et al., 2011; OECD, 2002).*

## *2. Economy-wide material flow analysis, meaning and use of material flow indicators*

*Material flow analysis belongs among the methods, which allow for quantification of socio-economic metabolism and assessment of environmental pressures related to the use of materials. Nowadays, the attention is drawn to economy-wide material flow analysis (EW-MFA). EW-MFA was developed during the 1990s by various research institutes and organizations (principally the World Resources Institute, the*

*Wuppertal Institute for Climate, Environment and Energy, the Department of Social Ecology at the Faculty for Interdisciplinary Studies of the University in Klagenfurt, Japanese National Institute for Environmental Studies, and Eurostat). Afterwards, EW-MFA was standardized in methodological guides of Eurostat (Eurostat, 2001, 2018).*

*The Czech Statistical Office focused on compilation of indicators of material input and material consumption. These are the best developed ones from the methodological point of view and are based on available data. Methodology for their compilation is described in the methodological chapter. Below is the summary of their possible uses (OECD, 2008):*

***Overall physical scale of the economy and total environmental pressure related to use of materials***
*To study overall physical scale of the economy over time, it is advisable to refer to material flow indicators in absolute terms. These indicators are considered proxies for environmental pressure related to use of materials and energy.*

***Equity and equal resource sharing***
*Relating material flow indicators to population allows for a comparison of material use and disposal of pollutants from the viewpoint of equity and equal resource sharing. Generally speaking, all people should have equal rights to consume natural resources and use the environment for assimilation of waste flows (Moldan (ed.), 1993).*

***Land use intensity***
*Consumption of materials can be related to the area needed for materials production. This issue has above all been developed for renewable resources and is well-known as a concept of Ecological Footprint (Wackernagel et al., 1996) and Human Appropriation of Net Primary Production (Vitousek et al., 1986). For cities, area for production of consumed materials is always larger than the area of a particular city. This is caused by high population density and low share of bioproductive areas. For countries and regions, the situation may be reverse.*

***Efficiency of use of materials and decoupling of environmental pressure from economic growth***
*Relating input and consumption material flow indicators to national account aggregates, such as gross domestic product (GDP), allows for measuring the efficiency by which an economic system transforms used materials into economic output. Such indicators reflect material productivity, i.e. the ratio of GDP over the material flow indicator, or material intensity, i.e. the ratio of the material flow indicator over GDP. These two measures are compatible with the inverse time development.*

*Assessment of material intensity and productivity is complementary to analysis of decoupling of environmental pressure from economic growth (see text above). Decoupling can be relative or absolute. When a relative decoupling occurs, there is a decrease in material consumption per unit of GDP, but the absolute material consumption is still growing. When an absolute decoupling occurs, the economy is growing while the absolute volume of resource consumption goes down. We should aim at absolute decoupling, as total environmental pressure is determined by absolute material consumption.*

***Shifting of environmental pressure between states and world regions***
*Many industrialized countries have decreased their amounts of domestically extracted and processed materials by importing them from other countries. The shift of pressure related to extraction and processing of these materials has taken place between states and world regions mainly to the detriment of developing countries (Giljum et al., 2009; Schütz et. al., 2004). To capture these shifts, it is necessary to study physical import and export and related flows.*

***Foreign material dependency and material security***
*Material flow indicators can be further used for monitoring of foreign material dependency. Economies fulfil their material demands partly from their own territory and partly by importing materials from other countries. The higher the share of import in domestic material input and domestic material consumption is, the more the economy is susceptible to incidental shortage of particular commodities abroad, increase in their price or to upheaval of other barriers to foreign trade.*

***Potential for future waste flows***
*All input material flows, which are going to be accumulated in form of physical stocks, will change into waste flows sooner or later. Knowing the volume of physical stocks in particular cities, regions and states and their durability, one can model waste flows to come. This is useful for planning of capacities for waste treatment within the waste management plans both in short, medium and long-term perspective.*

***Use of renewable and non-renewable materials***
*It is acknowledged internationally that the sustainable supply of materials should be based on renewable materials to a certain extent. This refers not only to scarcity of non-renewable materials but also to the fact that use of non-renewable materials is generally linked to comparatively higher negative impact on the environment*

*(EEA, 2006). This issue can be captured by input and consumption material flow indicators by monitoring ratios of renewable materials in particular indicators.*

## *3. Assessment of development of selected material flow indicators in the Czech Republic in 2019-2024*

*The used domestic extraction went down by 17.5% from 166.7 million tonnes to 137.6 million tonnes in 2019-2024 (Table 1). A decrease was only slight between 2019 and 2022 (by 2.6% from 166.7 million tonnes to 162.4 million tonnes), but then accelerated to 15.3% between 2022 and 2024. It is meaningful to relate used domestic extraction to the area of the Czech Republic – it expresses pressure coming from the extraction of resources exerted on one unit of the country's area. This pressure decreased from 2 114 tonnes per km$^2$ to 1 744 tonnes per km$^2$ in 2019-2024. The pressure covers structural changes of landscape related to extraction of non-renewable resources (moving of overburden, undermining) and pressures on biodiversity and land use in the case of extraction of renewable resources (above all when producing biomass in large-scale agro-ecosystems).*

*Breakdown of used domestic extraction by groups of materials shows that the overall decrease was caused by both renewable and non-renewable resources. Renewable resources went down by 14.4% from 43.5 million tonnes to 37.2 million tonnes and this decrease was caused by biomass from forestry, which dropped by 40% from 17.6 million tonnes to 10.6 million tonnes. This decrease could be associated with the subsiding bark beetle calamity, which culminated in 2020, when biomass from agriculture reached 20.7 million tonnes. Biomass from agriculture recorded a slight growth by 3% from 25.8 million tonnes to 26.6 million tonnes, while biomass from hunting and other biomass decreased by 3.4% from 18.5 thousand tonnes to 17.9 thousand tonnes and by 9.4% from 43.1 thousand tonnes to 39 thousand tonnes, respectively. It should be noted that absolute values of biomass from hunting and biomass from other activities were very low, so they influenced the trend of production of renewable resources only insignificantly. Non-renewable resources recorded a decrease by 18.6% in total from 123.2 million tonnes to 100.3 million tonnes in 2019-2024. The decrease was most significant in 2020 (by 7.8% from 123.2 million tonnes to 113.7 million tonnes), 2023 (by 12% from 120.1 million tonnes to 105.7 million tonnes) and 2024 (by 5% from 105.7 million tonnes to 100.3 million tonnes), while used domestic extraction of non-renewable resources grew in 2021 and 2022 (by 5.7% in total from 113.7 million tonnes to 120.1 million tonnes. All components of used domestic extraction of non-renewable resources contributed to its decrease over the whole monitored period: fossil fuels went down by 38.6% from 40.8 million tonnes to 25.1 million tonnes, industrial minerals by 24% from 11.3 million tonnes to 8.6 million tonnes and construction minerals by 6.2% from 71.1 million tonnes to 66.7 million tonnes. The extraction of metal ores was totally suppressed in the Czech Republic in previous years and went down to zero.*

*Physical import recorded a decrease by 10.3% from 81.1.3 million tonnes to 72.8 million tonnes in 2019-2024. It dropped down by 9.9% to 73.1 million tonnes in 2020, then it increased once again by 11.3% to 81.4 million tonnes in 2021, which was a volume somewhat higher than in 2019, and finally it went down by l 10.5% in total to 72.8 million tonnes in 2022-2024. Physical export recorded a decrease by 16.7% from 76.2 million tonnes to 63.5 million tonnes in 2019-2024. The volume of export was approximately the same in 2019 and 2020 while it slightly grew by 3.1% from 76.1 million tonnes to 78.5 million tonnes in 2021. Its decrease over the whole monitored period was thus similarly to physical import caused by the development in the last three years, when it went down by 19.2% from 78.5 million tonnes in 2021 to 63.5 million tonnes in 2024 (Table 2). Physical import can be viewed as a first indication of environmental pressure, which is shifted from importing countries to exporting ones – production of this import is related to environmental pressure in the exporting country (pressure from extraction of resources and production of commodities) and the driving force of this pressure is the importing country, which demands these commodities. Similarly, the physical export indicates shifts of environmental pressure from abroad to the Czech Republic. The shifts of environmental pressure from the Czech Republic to other countries as well as the shifts of environmental pressure from abroad to the Czech Republic were decreasing in the monitored period.*

*The decrease of physical import in 2019-2024 was mostly caused by metal ores, which went down by 17.9% from 22.8 million tonnes to 18.7 million tonnes, followed by fossil fuels(a decrease by 16.3% from 28.6 million tonnes to 18.7 million tonnes). Other non-specified products and non-metallic minerals decreased significantly less by 6.6% from 6.5 million tonnes to 6.1 million tonnes and by 5.4% from 9.3 million tonnes to 8.8 million tonnes, while biomass increased by 9.5% from 14 million tonnes to 15.3 million tonnes. In the case of physical export all its components went down with the exception of waste. The largest decrease was recorded for non-metallic minerals (by 25.7% from 10.1 million tonnes to 7.5 million tonnes), followed by fossil fuels (a decrease by 22.8% from 9.7 million tonnes to 7.5 million tonnes), biomass (by 19.4% from 32.1 million tonnes to 25.9 million tonnes) and metal ores (by 7.8% from 18.3 million tonnes to16.9 million tonnes). The highest increase occurred in the case of waste import and export in the relative terms, as it went up more than 2 times from 1 543 tonnes to 3 480 tonnes and more than 90 times from 2 tonnes to 218 tonnes, respectively. Similarly to used domestic extraction of biomass from hunting and biomass from other activities, however, the absolute* *mass of waste was very small and influenced the total volume and trend of physical import and physical export only insignificantly. Moreover, physical import and export of waste tends to fluctuate greatly.*

*Both DMI and DMC indicators decreased by 15.1% from 247.8 million tonnes to 210.4 million tonnes and by 14.4% from 171.7 million tonnes to 146.9 million tonnes, respectively, in 2019-2024. In per capita terms, DMI dropped from 23.2 tonnes per capita to 19.3 tonnes per capita and DMC from 16.1 tonnes per capita to 13.5 tonnes per capita. Considering the whole monitored period, a decrease in DMI and DMC was only modest up to 2022 (by 2.3% and 2.1%, respectively), but it accelerated in 2023-2024 and DMI and DMC went down by additional 13.1% and 12.6%, respectively (Table 3). This development reflected the development of used domestic extraction and physical import and export, which also decreased most significantly in 2023-2024.*

*DMI and DMC can be understood as proxies for total environmental pressure related to use of materials in the Czech Republic (pressure related to extraction of raw materials, their processing and output waste flows). The DMC indicator represents pressure, which is driven by the consumption in the Czech Republic while the DMI also comprises pressure, which is driven by consumption in the countries the Czech Republic exports to. The DMC indicator is further interpreted as a waste potential, because all consumed materials will turn into waste eventually. This shows the linkage between input and output indicators of material flows and the fact that the only way to effectively decrease output material flows is to reduce material consumption. DMI and DMC decreased in the monitored period, it means that there was a decrease in environmental pressure driven by consumption in countries we export to, as well as a decrease in environmental pressure related to material consumption in the Czech Republic. At the same time, the potential for waste flows in the years to come went down.*

*Non-metallic minerals are the most significant material group of DMI in absolute values (their share in DMI was 37% in 2019 and 40% in 2024). DMI of non-metallic minerals went up by 4.7% from 91.7 million tonnes to 96 million tonnes in 2019-2022 and then it dropped by 12.4% to 84.1 million tonnes in 2023-2024. On the other hand, DMI of fossil fuels went down both in 2019-2022 (by 9.5% from 69.4 million tonnes to 62.8 million tonnes) and in 2023-2024 (by 22% from 62.8 million tonnes to 49 million tonnes) and similar development was also recorded for metal ores (a decrease by 8% from 22.8 million tonnes to 21 million tonnes in 2019-2022 and then an additional decrease by 18.8% to 18.7 million tonnes in 2024) and other unspecified products (a decrease by 6% from 6.5 million tonnes to 6.11 million tonnes and then an additional slight decrease by less than a percent to 6.07 million tonnes). DMI of biomass went up by 7.1% from 57.5 million tonnes to 59.8 million tonnes in 2020, after that it went down by 14.6% in total to 51.8 million tonnes in 2023 and then it grew by 1.5% to 52.5 million tonnes in 2024. Non-metallic minerals are the most significant material group in absolute values also in the case of DMC with shares of 47.5% and 52.1% in 2019 and 2024, respectively. Similarly to DMI, DMC of non-metallic minerals went up by 6% from 81.6 million tonnes to 86.5 million tonnes in 2019-2022 and then went down by 11.5% to 76.5 million tonnes in 2024. DMC of fossil fuels went down both in 2019-2022 (by9% from 59.7 million tonnes to 54.3 million tonnes) and particularly in 2023-2024 (by23.6% from 54.3 million tonnes to41.5 million tonnes), while DMC of biomass decreased by 8% from 25.4 million tonnes to 23.3 million tonnes in 2019-2022 and then grew by 14.3% to 26.7 million tonnes in 2024. Metal ores fluctuated over the first three years and then dropped significantly by 51.7% from 3.8 million tonnes in 2022 to 1.9 million tonnes in 2024. The trend of other unspecified products was fluctuating over the whole monitored period, but it went down by 40% from 539.8 thousand tonnes to 324 thousand tonnes 2019-2024. Waste constitutes a special item, which also fluctuated quite a lot both in the case of DMI and DMC, but its volume was very small in absolute values and thus influenced the total trend of the indicators only insignificantly. Since physical export of waste was higher compared to physical import of waste in 2020 and 2021, DMC indicator showed a negative value for this material group in these years (Tables 4 and 5). The above text suggests that accelerating decreasing trend of DMI and DMC in 2023-2024 was largely caused by a decrease in DMI and DMC of non-metallic minerals. It reflects the decrease in construction production index for buildings by 4.9 percentage points in these years (Czech Statistical Office, 2025a), since non-metallic minerals are predominantly used in construction. A decrease of both indicators was further largely supported by fossil fuels during the whole monitored period, which was caused by a decrease of their share in total energy supply from 72.4% in 2019 to 67.6% in 2023, mostly thanks to renewable resources and biofuels, which share went up from 11.6% to 13.8% over the same period (Czech Statistical Office, 2025b).*

*Share of renewable resources (biomass) in DMI went up from 23.2% to 25% and in DMC from 14.8% to 18.2% over the monitored period. Considering that consumption of renewable resources is usually related to lower environmental impacts, this trend can be considered favourable for both indicators. In addition, a decrease in the share of fossil fuels is favourable, since consumption of fossil fuels is related to emissions of greenhouse gases, which contributes to global climate change. The share of fossil fuels in DMI and DMC went down from 28% to 23.3% and from 34.8% to 28.2%, respectively, in 2019-2024.*

*Material intensity expressed as DMI to GDP ratio went down by 17.3% from 40.3 kg per 1 000 CZK to 33.3 kg per 1 000 CZK, material intensity expressed as DMC to GDP ratio decreased by 16.6% from 27.9 kg per 1 000 CZK to 23.3 kg per 1 000 CZK in 2019-2024. Material productivity expressed as GDP per DMI and DMC,* *which time development is an inverse of the time development of material intensity, went up by 20.9% from 24.8 kg per 1 000 CZK to 30 kg per 1 000 CZK in the case of DMI and by 19.9% from 35.9 kg per 1 000 CZK to 43 kg per 1 000 CZK in the case of DMC (Tables 4 and 5). It can be assumed from the decrease in material intensity and the increase in material productivity that the efficiency by which an economic system transformed used materials into economic output was growing and that there was a decrease of environmental pressure per unit of GDP. This was allowed by implementation of modern technologies, changes in structure of the economy and by an increase in recycling. Moreover, it is also possible to assume a growing competitiveness due to decrease in production costs related to purchasing of raw materials and other materials needed for production. There is currently a discussion if GDP is a proper indicator to calculate material intensity and productivity. To maintain consistency an indicator should be used, which contains similar items in monetary units that are comprised in material flow indicators in physical units. Alternative indicators to GDP, which are mentioned in these discussions, include, for instance, economic output or GDP plus import for DMI and GDP plus import minus export for DMC (OECD, 2008; Hirschnitz-Garbers et al., 2014).*

*DMI and DMC indicators can be represented in a single graph together with GDP, when an index value of 100 is attributed to all indicators for the starting year and the percentage change of this index is shown for the following years. This allows for expression of decoupling of environmental pressure (represented by DMI and DMC, respectively) from economic growth (represented by GDP) (Graph 10), which is mentioned in the previous chapter. There was an absolute decoupling in the Czech Republic in 2019-2024 in the case of DMI and DMC: both indicators decreased over the whole period while GDP went up. A notable development occurred in 2020 when DMI decreased less than GDP (by 5.1% while GDP decreased by 5.3%). It means that there was no decoupling in the case of DMI in this year. On the other hand, DMC recorded a relative decoupling, since this indicator decreased more than GDP (by 7.5% as compared to 5.8%). It can be claimed that it is necessary to achieve an absolute decoupling for an absolute reduction of environmental pressure.*

*The PTB indicator increased by 88.3% from 5 million tonnes to 9.3 million tonnes over the whole monitored period 2019-2024. However, a pronounced decrease to -3 million tonnes was recorded in 2020. This drop was caused by the fact that physical import went significantly down this year, but physical export stagnated. Since the volume of physical export was higher compared to physical import, PTB is negative in 2020. In the following years, physical import again reached a higher level than physical export, which was the reason why physical trade balance became positive again and increased up to 9.3 million tonnes in 2024. In per capita expression, PTB ranged from -284.7 kilograms to 856.5 kilograms per capita (Table 6). The PTB indicator indicates whether there are shifts of environmental pressure from the Czech Republic abroad and vice versa. It is possible to assume from the positive values that, with the exception of 2020, there was a net export of environmental pressure (the pressure exerted by the Czech Republic abroad by import was bigger than the pressure exerted on the Czech Republic by foreign countries by their export). This fact could be controversial from the viewpoint of sustainable development. The PTB indicator further shows foreign material dependency of the Czech Republic. When PTB shows high positive values, the country may encounter problems if there is a scarcity or a steep increase in prices of commodities on international markets.*

*Looking at the PTB material categories, fossil fuels and metal ores recorded the most positive values, but positive values were also recorded for non-metallic minerals in 2021-2024 and other unspecified products in all years except for 2023. These commodities had to be imported, because their sources were either insufficient in the Czech Republic or their mining was not profitable. PTB of fossil fuels went down by 12.9% in 2019-2024 and PTB of metal ores significantly decreased by 58.8%, which can be considered a positive development. On the other hand, PTB of biomass recorded significantly negative values, but they were growing – by 41.8% in total from -18.1 million tonnes in 2019 to -10.5 million tonnes in 2024. Physical trade balance was negative also for waste in 2020 and 2021.*

*DMI and DMC are internally inconsistent indicators, as one of their parts – used domestic extraction – is accounted for in terms of raw materials while physical import and export are accounted for in terms of products. It can therefore happen that a country decreases its material consumption measured by DMI and DMC by ceasing manufacturing of some products from domestic raw materials and importing them from abroad. It can be allowed by the fact that the weight of raw materials, which needs to be extracted for manufacturing and which is accounted for under used domestic extraction, is always higher than the weight of manufactured products, which are parts of physical import and export. This is true because a part of extracted raw materials is transformed into waste flows already during manufacturing and a part is used for covering energy needs of manufacturing. To overcome these distortions in measuring material consumption new indicators have currently been under development, which include imported and exported products in terms of all raw materials needed for their manufacturing, i.e. in terms of raw material equivalents (RME). These indicators are called Raw Material Input (RMI), which is calculated as a sum of used domestic extraction and raw material equivalents of import, and Raw Material Consumption (RMC), which is calculated as used domestic extraction plus raw material equivalents of import minus raw material equivalents of export. RMC is also called Material Footprint (MF) and belongs to the same group of indicators as Carbon Footprint (CF) and Ecological Footprint (EF). RME of import and export can be used also for calculation of physical trade balance and evaluation of* *shifts of environmental pressures between countries, which is more precise than using PTB based on the simple weight of import and export.*

*Methodology of calculation of raw material equivalents of import and export has still been under development by various international institutions and research organizations. Eurostat is currently the most advanced as regards implementation of the standardized approach for calculation, as it has been involved in this kind of research since 2009. Eurostat developed a model calculating RME, RMI and RMC for the European Union as a whole. It also developed a country tool based on this model, which allows for an estimation of raw material equivalents for particular EU countries. This is the reason why, in 2018, Eurostat could include data entries on physical import and export in terms of RME into a questionnaire by which it collects data on material flows from EU countries. This part of the questionnaire, however, is voluntary for the time being. Details on the Eurostat RME project, material consumption in the EU in terms of RME and about the country tool can be found at* https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Material_flow_accounts_statistics_-_material_footprints#Accounting_for_trade_flows_in_terms_of_raw_materials_equivalents.

*The country tool has also been used by the Czech Statistical Office since 2024, which delivers an official estimation of the raw material equivalents of import and export for the Czech Republic (https://ec.europa.eu/eurostat/databrowser/view/env_ac_rme/default/table?lang=en). The results show that raw material equivalents of import and export are approximately 2.6 times higher and 2.3 times higher, respectively, compared to the simple weight of imported/exported commodities in the Czech Republic. The largest part of raw material equivalents of import was composed of metal ores in 2022 while raw material equivalents of export was dominated by fossil fuels. The second position was held by fossil fuels followed by non-metallic minerals for raw material equivalents of import and by non-metallic minerals followed by metal ores for raw material equivalents of export. The smallest part of raw material equivalents was biomass for both import and export. Due to increase in weight of raw material equivalents of import compared to the simple weight of import, RMI indicator was by 53.1% higher compared to DMI indicator in 2022. On the other hand, RMC only was by 17,9% higher compared to DMC, as an increase in raw material equivalents of import and export was partly cancelled out during the calculation of RMC.*

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