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DRIVERS OF FAST FASHION CONSUMPTION PRACTICES AND ECOLOGICAL FOOTPRINT GROWTH

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The analysis of the main environmental impacts of the fashion industry at various stages of the textile product life cycle, supported by carbon and water footprint data was conducted. The life-cycle of clothing from raw materials acquisition to landfill is deeply resource-intensive and generate pollution at each stage. The main factors contributing to environmental degradation include high water consumption, toxic pollution from textile processing, greenhouse emissions at all stages of production, as well as during transportation, storage and retailing, and the massive accumulation of textile waste. The synthesis of research data on the ecological footprint to a range of clothes items was conducted and demonstrated considerable difference in assessment approaches applied, lack of standard methodology and relatively high ecological footprint of both naturally produced and synthetic items. Interviews with a sustainable designer and former managers at fast fashion brands provided valuable insights into real-world practices of fast fashion promotion and combating. The brands under study were found to adhere to typical fast fashion models characterized by rapid turnover, globalized production and weak environmental practices, suggesting that existing green initiatives remain largely superficial or marketing-oriented. The findings also confirm that small-scale upcycling initiatives can significantly reduce resource use and emissions, offering viable alternatives to mass production. Main recommendations for sustainable wardrobe formation are provided, as well as strategic options for the whole industry. The general conclusion of the research is that major fashion brands are still largely engaged in unsustainable practices, but there are effective and efficient countermeasures at both the individual and industrial levels. Recycling and conscious consumption are highly effective personal strategies, while institutional changes in materials, design and business models offer scalable pathways to sustainable fashion. *Key words:* fast fashion, textile industry, ecological footprint, life cycle assessment, upcycling, consumer behavior.

Рушійні фактори поширення швидкої моди та зростання її екологічного сліду. Радомська М.М., Клименко Н.А.
В роботі проведено аналіз основних впливів модної індустрії на навколишнє середовище на різних етапах життєвого циклу текстильного виробу, підкріплений даними про вуглецевий та водний слід. Життєвий цикл одягу від отримання сировини до захоронення на сміттєзвалищі є надзвичайно ресурсоємним та створюють забруднення на кожному етапі. Основними факторами, що сприяють погіршенню стану навколишнього середовища, є високе споживання води, токсичне забруднення від обробки текстилю, викиди парникових газів на всіх етапах виробництва, а також під час транспортування, зберігання та роздрібної торгівлі, а також масове накопичення непотрібного одягу. Було проведено синтез дослідницьких даних про екологічний слід для низки предметів одягу, який продемонстрував значну різницю в застосованих підходах до оцінки, відсутність стандартної методології та відносно високий вплив як природних, так і синтетичних виробів на довкілля. Інтерв'ю з дизайнером сталого розвитку та колишніми менеджерами брендів швидкої моди надали цінну інформацію про реальну практику просування та боротьби зі швидкою модою. Було виявлено, що досліджувані бренди дотримуються типових моделей швидкої моди, що характеризуються швидкою оборотністю, глобалізованим виробництвом та слабкими екологічними практиками, що свідчить про те, що існуючі зелені ініціативи залишаються значною мірою поверхневими або орієнтованими на маркетинг. Результати дослідження також підтверджують, що дрібномасштабні ініціативи з апсайклінгу можуть значно скоротити використання ресурсів та викиди, пропонуючи життєздатні альтернативи масовому виробництву. Надано основні рекомендації щодо формування сталого гардеробу, а також стратегічні варіанти для всієї галузі. Загальний висновок дослідження полягає в тому, що великі модні бренди все ще значною мірою займаються нестійкими практиками, але існують ефективні та дієві контрзаходи як на індивідуальному, так і на промисловому рівнях. Переробка та свідоме споживання є високоефективними особистими стратегіями, тоді як інституційні зміни в матеріалах, дизайні та бізнес-моделях пропонують масштабовані шляхи до сталого розвитку моди. *Ключові слова:* швидка мода, текстильна промисловість, екологічний слід, оцінка життєвого циклу (LCA), апсайклінг, поведінка споживачів.

Problem statement. Consumption practices are shaped by the impact of marketing strategies, economic systems and general level of development. At the same time, they define the magnitude of the society's impact on the environment. The current mode of consumption seems to be the most wasteful in human history. Even though the sustainable development and economic practices are being actively promoted, companies are able to find new ways to push people towards excessive spending of natural resources, pursuing stable increase of their incomes. This is true for all parts of human life, including personal belongings, which they try to transform into disposable things. The notable example is the fashion industry, which has produced the phenomenon of "fast fashion" – a model of production and consumption focused on the mass production of cheap clothing with

a short lifespan. As a result, the global clothing market is experiencing unprecedented growth, accompanied by a catastrophic impact on the environment. According to international studies, the textile industry is one of the most resource-intensive and environmentally harmful sectors of the modern economy: it is responsible for up to 10% of global greenhouse gas emissions, consumes billions of cubic metres of water each year, pollutes water with chemicals and dyes, and causes the accumulation of textile waste, microplastics and toxic residues. It is extremely important to formulate and apply scientifically sound approaches to measuring the ecological footprint of clothing, as well as study the drivers of people's adherence to fast fashion.

Relevance of the problem. The problem is particularly acute in the context of sustainable development, the global climate crisis and the depletion of natural resources. Ignoring the environmental impact of the textile and fashion industry leads not only to environmental degradation, but also to human rights violations, increased social inequality and a decline in the quality of life in manufacturing countries. In this situation, a comprehensive study of the environmental footprint of clothing is particularly important. This will help in developing effective applied methodologies and contribute to the transformation of the fashion industry to sustainable direction. The relevance of the topic is also determined by the need to develop new management, design and consumer solutions that can reduce the environmental footprint of fast fashion and promote the transition to a circular economy. However, it is important to analyze the sustainability and environmental friendliness of alternative trends and practices to avoid wrong decisions.

Ukraine is actively working on integration to the European society, but Western culture is not perfect and it has its own shortcomings, such as overconsumption clearly embedded in fast fashion practices. So, it is important to detect such trends among population, define their driving forces and create means of their avoidance.

Novelty. The paper presents the comprehensive analysis of the fast fashion problem in terms of its environmental dimensions, fast fashion brands contribution to the problem and offers a range of possible solutions.

Applied importance. The results of the clothes footprint assessment can be used for the promotion of sustainable consumption practices among population, and giving them possibility avoid supporting fast fashion brands and trends.

Literature review. Fast fashion pollutes the environment at all stages of its life cycle, which includes production of raw materials, fabrication, sewing, distribution, purchase and use by the consumer, and disposal at the end of the life cycle [1].

The most intensive impact at the initial stage is production and treatment of fibers, where natural and synthetic ones do not have noticeable difference in terms of total destructive impact on the environment. The thing is that natural fibers is resource intensive, in particular, water, land and agrochemicals. Recent data show that cotton accounts for about 4.7% of global pesticide use and about 10% of insecticide use, which is much higher than the share of agricultural land. It was also responsible for considerable amount of greenhouse emissions, which is estimated at 0.9 CO_2 per kg of cotton (to a larger extent due to nitrogen fertilizers) [2]. On the positive side, some initiatives, such as organic cotton, aim to reduce the use of chemicals, and technologies, such as the Better Cotton Initiative and GOTS certification, promote more sustainable and environmentally friendly practices to mitigate these impacts [3].

Synthetic fibres are petroleum-based products, and their production requires large amounts of electricity and heat, which leads to increased CO_2 emissions. For example, producing 1 kg of polyester can result in 5-9 kg of CO_2 emissions, depending on the energy source [4]. While it is a higher carbon footprint than that of cotton, production of synthetic fibres does not require as much water as cotton.

The conversion of fibres into yarn (spinning) and yarn into fabric (weaving/knitting) are mechanical processes that mainly require electricity to run machines and looms. These steps have a relatively lower environmental impact compared to fibre production and dyeing, but it is not negligible.

Dyeing and finishing textiles are among the most polluting stages of clothing production. In traditional dyeing, fabrics are treated with dyes, which often contain heavy metals or toxic organic compounds, fixatives, salts, acids or alkalis, detergents, enzymes, and softeners. This process is also water-intensive: it is estimated that 17-20% of global industrial water pollution, causing increased pH and chemical oxygen demand (COD), as well as heavy metals pollution [5]. Additionally, it is estimated that dyeing and finishing accounts for around 3% of global CO_2 emissions [6].

In addition to dyes, a wide range of chemicals are used in textile production – it is estimated that more than 1900 chemicals are used at different stages of textile production, many of which are hazardous. These include bleaching agents (chlorine or hydrogen peroxide), optical brighteners, pesticides/repellents to protect wool from moths, formaldehyde resins to prevent wrinkles, flame retardants, waterproofing agents (often per- and polyfluorinated substances, PFAS). These chemicals can be released or leached during production and then during use or disposal. Many of these substances are being regulated or phased out in the EU/US, but in unregulated environments they can still be used freely, increasing the toxic burden on the environment [7].

Turning fabric into clothing is less harmful compared to the previous stages, but sewing machines, lighting, ironing equipment, and climate control fans produce noticeable CO_2 emissions. If the garment is washed or laundered as part of the finishing process, it also involves water consumption and pollution.

The main problem in the cutting and sewing process is the generation of textile scraps: on average, 10-20% of fabric is lost during the cutting process [8]. With global fibre production of around 116 million tons in 2022, 10-15% cutting waste means that between 11 and 17 million tons of fabric is wasted in garment factories every year instead of becoming garments [9]. Some of this waste is recycled into industrial rags or low-quality insulation, but most is thrown away or incinerated. This is not only wasted material, but also wasted energy/water that went into the production of this fabric. Moreover, if the trimmings are synthetic, they contribute to the generation of plastic waste. If they are cotton, they emit greenhouse gases when they decompose and are landfilled [10].

Apart from environmental issues, garment factories often raise social sustainability issues such as hard labour conditions and low wages, which is a contradiction to sustainability principles as well. Usually, neglect of environmental protection is accompanied by worse labour practices due to desire for cheap production [11].

In terms of emissions, the production stage (from fibre to finished garment) is dominant in the overall carbon footprint of clothing: 70-80% of the total climate impact of clothing comes from production (including fibre, yarn, fabric and sewing), with the rest coming from the use and end-of-life stage [1].

After production, clothing has to be transported over long distances. The apparel supply chain is highly globalised. Most of the international transport of garments is carried out by cargo ships (container ships). Shipping is more carbon-efficient per tonne-kilometre than air transport, but the distances are huge and the volumes are even greater. Once in the consumer country, distribution centres and retail stores also have an impact on the environment. Warehouses consume electricity (lighting, heating, ventilation and air conditioning). Retail stores also consume energy for lighting, heating/cooling and electronics. Online retail shifts some of this impact to warehouses and delivery vehicles. However, online shopping has its own impacts such as packaging waste, shipping emissions [12].

Being a source of multiple impacts on the environment textile industry has increased its share in modern degradation of environment considerably due to fast fashion trends. A 2024 report states that clothing production has doubled since 2000, and consumers are buying 60% more clothes than they did 17 years ago, while keeping half as many. This throwaway culture is a defining feature of fast fashion's environmental impact – it multiplies waste and the demand for continuous resource extraction [13]. As a result, fashion's environmental impact has increased over the past 20-30 years due to accelerating production cycles and higher rates of consumption. In terms of global impact, the industry is now comparable to sectors such as oil and agriculture, which was not the case before [14]. If left unchecked, trends show further growth in fiber production and waste by 2030, which could exacerbate the problems.

One of the main characteristics of fast fashion is the extremely short cycle of design, production and delivery of products to stores. This continuous pursuit of novelty leads to the loss of value of clothes and its instant substitution, thus creating skyrocketing volumes of waste, sent to landfills, but not ending their impact on environment. Piles of discarded clothing produce emissions of toxic substances, microplastic pollution, and raises demand for waste textile management. For example, in the EU, consumers throw away around 5.8 million tonnes of textiles annually, and approximately 87% of this textile ends up in landfills or incinerated, with only 13% reused or recycled [15]. Many developing countries, like Ghana and Chile have become dumping grounds for used or unsold clothing. This puts pressure on waste management systems and stretches the capacity of landfills. However, minimal efforts are still made by producers to deal with it.

Natural fibers such as cotton, linen, wool and silk are biodegradable in the environment, but because landfills are often low-oxygen (anaerobic), these materials decompose. These decomposition processes release methane, a greenhouse gas that has more than 25 times the global warming potential of CO_2. Clothing made of polyester or nylon can stay in a landfill for hundreds of years without decomposing, taking up space and potentially leaching toxic additives and plastic.

By understanding trends and drivers of the situation, we can see that the environmental problems associated with fashion are systemic – they are rooted in its business model and consumer culture, which needs through study and development of correction actions despite the opposition of industry.

Methods and materials. The methodology for the assessment of environmental impacts of fast fashion should include both quantitative analysis (LCA, footprinting, carbon accounting) and qualitative understanding of the structural causes of environmental degradation associated with the industry. It is equally important to consider changes in consumer behavior, brand policies, and the impact of global trends on sustainable development, as the ecological footprint of clothing is not just a technical indicator, but also the result of socio-cultural and economic interactions.

The structure of the given research includes a list of tasks, each performed with relevant methodology. First of all, the analysis of a range of case studies on assessing the environmental footprint of different types of clothing was conducted and the issues of methodologies applied by the authors were studied.

The second task was to collect information from the staff of the leading fast-fashion brands on the brand environmental policy to evaluate their potential contribution to fast fashion. To obtain these data interviews were conducted to get the insider's view of the problem. The interviewing was also applied to study the possible alternatives to fast fashion, which in this case was upcycling, described from the perspective of a practicing designer.

This dual approach helped compare industrial-scale practices with sustainable alternatives on a micro level.

The first interview was conducted with a former employee of two leading fast fashion brands, Zara (Inditex) and Mango, who held managerial positions in several European and Middle Eastern countries. This interview focused on identifying internal sustainability practices, the frequency of collection renewals, the fate of unsold goods, and the real implementation of corporate environmental policies. The second interview was conducted with a young Ukrainian designer engaged in upcycling, creating new clothing items from second-hand materials. The objective was to understand the motivations, challenges, and environmental benefits of alternative, small-scale sustainable practices.

Both interviews were conducted in written form using a questionnaire format, allowing participants to respond in detail. The interviews followed a semi-structured format, meaning that a list of core questions was provided but respondents were free to elaborate and include additional relevant insights.

Results and discussions. A comprehensive assessment of the environmental footprint of clothing involves systematizing data on different types of impacts for the main categories of clothing, followed by an analysis of these indicators. This section presents a summary table with typical numerical indicators of carbon and water footprints for different clothing items. This data is based on LCA studies [16, 17] and water footprint assessment [18-20], which allows us to compare the environmental profile of different products with each other. Table 1 summarizes the carbon and water footprint per item for common clothing categories.

The table provides a comparative overview of the environmental impact of different types of clothing depending on the fibre composition. It is clear that natural fibre products generally have a higher water footprint, especially silk, which stands out with approximately 360,000 litres per scarf, significantly exceeding all other products. Cotton products, such as T-shirts and jeans, also consume large amounts of water, while wool has moderate impact. In contrast, synthetic products, including polyester, acrylic and nylon clothing, typically have lower water consumption, but stand out in terms of carbon emissions. Notably, polyester jeans have an extremely high carbon footprint of approximately 35 kg CO_2e, which is close to that of cotton denim, indicating that blending fibres does not necessarily reduce environmental costs. These data highlight the complex trade-off between fibre types, emphasizing the need to choose more environmentally friendly materials in fashion.

The methodology of assessment, used in the mentioned papers varies in details, but mostly represents LCA, and carbon and water footprint assessments. However, the results obtained are quite different between the authors and the data given in this paper are illustrative. This demonstrates the need to develop standard methodology for the assessment of an integral ecological footprint for clothes and make it obligatory procedure for all fashion brands. Moreover, it should be added to the labels of clothes and thus help consumers make more responsible and motivated choices of garments. The researches note that quite often high-water-footprint materials are perceived as environmentally friendly by consumers [21], therefore, dissemination of relevant information via informative labeling will definitely contribute to the reduction of ecological footprint from each item and industry on the whole. Apart from choosing more sustainable products, it is also necessary to work on reducing the number of clothes owned by people, which is a top priority on the way to slow fashion.

To illustrate the involvement of famous brands in the fast fashion trends, interviews with the sales managers of Zara and Mango were conducted. The purpose of this interview was to find out the real state of implementation of environmental programs and daily sustainability practices in fast fashion retailers, as opposed to their public statements. The results of interviews were used to evaluate the sustainability vs. fast fashion contribution by the following criteria: the existence of sustainability

Table 1

Approximate values of the ecological footprint for different categories of clothing

Item (Fiber)	Carbon Footprint	Water Footprint
Cotton T-shirt	2.1 kg CO_2e	2,700 L
Cotton denim jeans	33.4 kg CO_2e	3,780 L
Wool sweater (Merino)	≈9.7 kg CO_2e	≈2,500 L
Silk scarf (mulberry silk)	36.0 kg CO_2e	≈360,000 L
Down-filled winter jacket	25.4 kg CO_2e	274 L
Polyester T-shirt	5.5 kg CO_2e	<1,000 L
Polyester dress	≈1.1 kg CO_2e	<1,000 L
Acrylic sweater	≈1.1 kg CO_2e	<1,000 L
Nylon jacket (windbreaker)	2.7 kg CO_2e	<1,000 L
Polyester-blend jeans	≈35 kg CO_2e	≈1,060 L
Acrylic scarf	≈1.1 kg CO_2e	<1,000 L

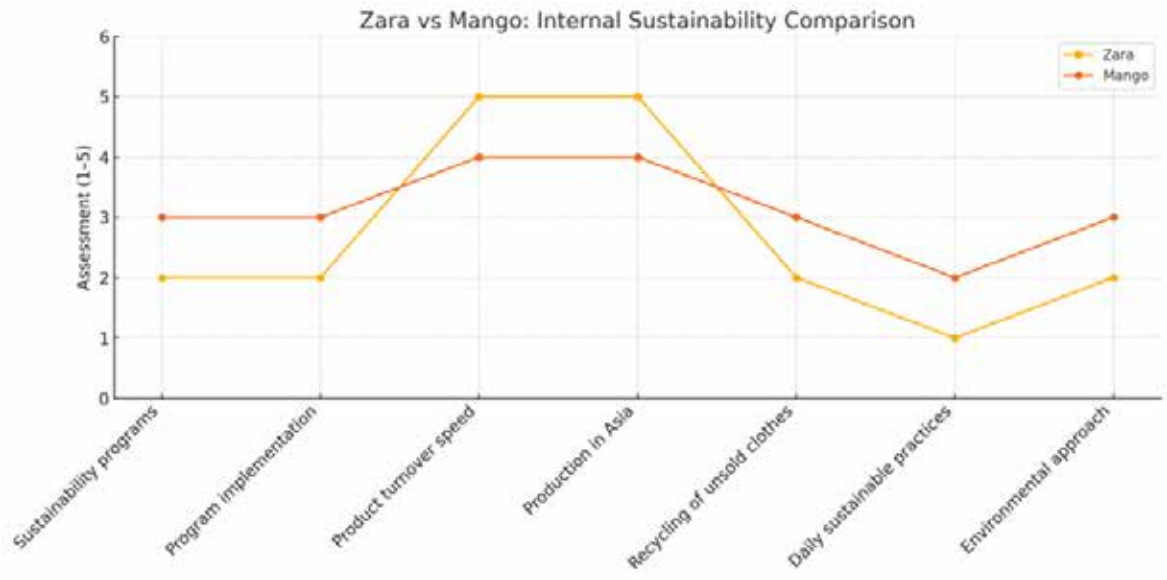

Fig. 1. Internal sustainability comparison for Zara vs Mango

programs, the actual implementation of these programs, the frequency of collection updates, the geography of production, the management of unsold goods, the existence of daily resource saving practices in stores, and the overall eco-strategy of the brand (Fig. 1). The interviewed ex-manager noted that Zara formally has many green programs (e.g. Zero Paper Waste, waste sorting, accepting used clothes from customers), but their actual effectiveness was low due to poor staff discipline and control. Mango did not have a clear environmental policy, and implemented only basic measures, such as collecting old clothes in stores and offering bonuses to customers through an app.

Neither brand systematically donated unsold clothes to charity. Zara tried to sell the leftovers through sales and outlets, while Mango mainly sold them through outlets, without organized recycling. Both companies had a very high turnover (Zara and Mango update their collections up to 2 times a week) and a high share of production in Asia, which generates a significant carbon footprint from logistics. There are almost no energy saving or waste reduction practices in the stores' daily operations (Zara had none at all, Mango had minimal ones). The answers were systematized in the form of a comparative assessment of the two brands for each criterion (scale of sustainability compliance from 1 to 5) and graphically presented for clarity. The results showed that both brands demonstrate a low level of actual sustainability, with Mango slightly ahead of Zara due to simple initiatives (e.g., a clothing collection programme).

The overall conclusion of the interviews is that at the level of fast fashion stores, sustainability is declarative or fragmented, not supported by systemic change. There is a considerable gap between brands' marketing claims and their actual actions.

In contrast, an interview with a designer involved in upcycling provided valuable insights into sustainable alternatives at the individual level. The practice of upcycling making new clothes from used materials diverts textile waste from landfills, but also significantly reduces carbon emissions, water consumption, and manufacturing waste. A quantitative comparison of traditional and upcycling scenarios (using 75 cotton T-shirts as an example) shows a reduction in greenhouse gas emissions by 97% and water saving by 81%.

Based on the data obtained the general strategy for shifting towards slow and circular fashion and reducing the environmental footprint could be offered, as well as practical recommendations for the implementation of sustainable practices at personal level. These include: buying fewer but higher-quality garments, choosing natural or recycled materials, extending clothing lifespan through repair, and supporting local or second-hand markets. These actions, when adopted on a larger scale, can significantly reduce the environmental impact of fashion consumption.

Conclusions. Fashion brands are highly interested in fast fashion trends and support such consumption patterns in their consumers. However, strong impact on the environment from textile and clothing industry has been already demonstrated by numerous researches, which contributes to the interest in alternative practices and opportunities for reduction. Environmental footprint labeling for clothes, legal obligation for organized management of discarded closes, and consumer education, like promoting wearing clothes throughout its entire life expectancy, clothing libraries, upcycling and reuse, repairment and conscious buying strategy will all contribute to the reduction of impact on the environment and resources saving.

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