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# Household Waste Sorting and Engagement in Everyday Life Occupations After Migration—A Scoping Review

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**Abstract:** The aim of this scoping review was to gain an overview of the current state of the literature on the engagement in waste sorting post migration from an occupational perspective, in the light of two aspects sustainability efforts currently face: Increased human migration and environmental degradation. Both the resource recovery and occupational science literature were reviewed and analyzed. However, despite the current lack on studies on how migrants' transition into waste sorting schemes at the household level, this scoping review was able to provide a broad picture of the engagement in daily activities that support sustainability, such as household waste sorting. Given the current initiatives to develop efficient resource recovery from waste, such knowledge contributes to efforts to engage households with different cultures and experiences in waste sorting. The results highlight the importance of future research to better understand how people who are new to waste management schemes experience these, and study the way that engagement in waste sorting shifts and transforms. This is because providing such knowledge can contribute to raising awareness of the environmental impact of waste sorting, and inform policies aimed at sustainable waste management.

**Keywords:** resource recovery; occupational science; immigration; waste sorting; sustainability

## 1. Introduction

The notion of sustainability encompasses environmental, social and economic aspects, all of which are relevant to both waste sorting and human migration. Efforts to tackle economic sustainability are often oriented towards prosperity of the people through economic, technical and social progress [1]. Aims towards developing social sustainability include efforts to encourage the development of peaceful and inclusive societies, which are behaving on what is morally right and fair. Social sustainability efforts also aim to end hunger and poverty, and create environments in which people can live prosperous, healthy, equal and dignified lives [1]. Environmental sustainability efforts aim to protect the planet for the species that live on it now and for future generations. Such efforts can be achieved through sustainable consumption, production and by preventing further degradation of the planet and its ecology [1] with effective management of resources from waste.

Natural resource depletion enhances environmental degradation and the consequences of this put people and biodiversity all around the globe at risk. At the same time, human migration has increased over the past decade [1]. As an example, in 2018 around 19% of the Swedish society constituted first or second generation immigrants [2]. To an extent, migration to Sweden and other countries, is due to climate related issues, such as poverty resulting from natural disaster. However, people also migrate to flee war or prosecution or for work and better prospects. This mingling of people from different cultural and ethnic backgrounds presents opportunities to gain a better understanding of the diversity of people's engagement in sustainable lifestyle choices, such as waste sorting. Intercultural

understanding is of increasing importance for societies that aim to encourage all its members to engage in sustainability. Within any society, every person, regardless of cultural background or ethnicity, is a crucial enabler and contributes to sustainable development [1].

Environmental problems, such as global warming, are partly a consequence of people's disengagement with efficient waste management, which have led to initiatives to develop more sustainable waste systems that shift away from the traditionally linear way of production, consumption and disposal (e.g., European Commission [3–5] or Swedish Waste Management Association [6]). Waste sorting management now tends to encourage a circular model in which products can be reused, materials can be recycled for as many cycles as possible or energy can be recovered [7]. Producers in the European Union are encouraged to adopt a circular approach and establish goals for their products that span from production, throughout life cycle, to its waste management [3].

In order to manage waste appropriately, waste management relies on waste being sorted into its fractions. This can occur at many levels, such as recycling facilities, households or stores [8]. The more and the better the waste is sorted at the institutional or the household level, by the people who generate the waste, the more products can be reduced and reused, materials recycled and resources recovered [8]. This system, however, needs to be adaptive and responsive to the needs of the people that contribute to it. This is because, when the waste management system relies on household waste sorting, the recovery of resources from waste will ultimately only reach its fullest efficiency, thereby enhancing its contribution to sustainability, when it encourages everyone in society to participate in it [9,10].

According to Tucker [11], Barr [12], Ölander and Thøgersen [13] and Madden et al. [14], behavioral aspects, such as intentions, are crucial triggers for engagement in waste sorting. These researchers also identified barriers and enablers which can prevent or encourage waste sorting engagement. Among these can be psychological variables such as motivation, intention, subjective norms and environmental threat; and situational variables such as space to accommodate separate bins for separate fractions of the waste, knowledge, socio demographics and experience. This indicates that waste sorting behavior is, at least in part, subject to how well a person is acquainted with cultural aspects that underpin norms and impact how societies tend to act; how knowledge is distributed; and whether intention and motivation are focused on the individual or on collective causes. People who immigrate into a society may not be immediately aware of these and may face a process in which they enculturate differences [15]. As an example, people with an immigration background may be used to different perceptions of the impact of sustainable development through means such as sorting. Concerns about the consequences that human actions have on the environment can be embedded in the way societies expect their members to act. However, people who move into such societies may be used to other waste systems where it is not sorted at the household level, sorted differently, or perhaps not sorted at all. A shift in the way people go about waste sorting after immigration might thus take place.

In order to contribute to a better understanding of the complexities of the interaction of diverse societies with a waste management system it is suitable to adopt an occupational perspective as this can shed light on the choices, decisions and incentives that underpin engagement in the system. Occupational science specializes in these aspects that build the foundation of occupational engagement and patterns. In occupational science, doing is seen as an absolute necessity which enables people to be [16]. In this context, occupations include activities that people engage in as part of their daily life, play or productivity [17]. Waste sorting is an activity that can fall into either one or more of these categories depending on the individual. People may engage in it as part of a productive activity if they do it, e.g., for work or because they want to productively participate in efforts to sustain the greater good of their community and the environment [18]. People may also perceive waste sorting as an activity of play if they engage in it for its own sake during leisure [19], or as an activity of daily living that needs to be done as part of daily life tasks [17]. Whether people perceive waste sorting as an activity that they engage in as part of leisure, productivity or because it is an activity of their daily repertoire shapes the pattern of their engagement in it.

Occupational patterns refer to the way people engage in activities in the context of the culture of daily lives [20]. In this perspective focus is given to the person, why the person engages in an activity, and how the person does so, while also acknowledging the way in which culture shapes the expectations of what people should do as well as the significance of engaging in specific activities [21]. Such knowledge is important because it can then be utilized to identify ways to guide behavioral change in a culturally sensitive and holistic way. This approach makes an occupational perspective uniquely suitable to study the way people's engagement, regardless of immigration background or not, in activities that are congruent with sustainability developments can shift and transform.

At present, migrants' adaptation to new waste management systems in the hosting country has been neglected in research. This contribution is the first time that the relation of waste sorting and immigration is addressed. The objective of this scoping literature review is to identify mentions of waste sorting among people with an immigration background and extend the current body of knowledge by portraying the results from an occupational perspective. In order to achieve this, both resource recovery and occupational science literature were reviewed so to gain access to insight from both disciplines.

## 2. Materials and Methods

The aim of this scoping review was to explore the state of the literature on the phenomenon that is engagement in waste sorting post immigration in the resource recovery and occupational science literature. The review was conducted to gather and synthesize relevant evidence from the resource recovery and occupational science disciplines. The research aim in scoping reviews can be less concise than that of systematic reviews due to the broad conceptual range of literature that coping reviews encompass [22]. While other methods, such as systematic reviews and meta-analysis, typically answer clearly defined research questions within a narrow parameter of research studies, the scoping review is an appropriate methodology to address the broad aim of this study because it allows one to create an overview of a large body of literature regardless of the methodology and design of the literature included [23] by comparing and reviewing previous results rather than generating new data.

The overview is created by mapping out what could be found on the topic within the literature and then synthesizing the data found. During the synthesis, the data is integrated into a new interpretation by comparing the descriptions of the phenomena that are found in the literature and then assessing their meaning and relevance.

### *2.1. Data Collection*

Relevant electronic databases, such as the Web of Science, Scopus, ProQuest and CINAHL, were systematically searched for each discipline (occupational science and resource recovery). The hits were classed as either occupational science or resource recovery literature depending on the context. Furthermore, work by some of the key authors in the fields, such as Ikiugu, Miafodzyeva and Persson, was searched for relevant contributions. Indexes of publications were hand searched, non-electronic sources were manually searched, reference lists from selected articles were explored and journals of resource recovery and occupational science were searched to identify additional literature.

### *2.2. Selection*

The literature was selected based on the following criteria: Peer reviewed scholarly journals, reports and books; participants of all ages were relevant to the research question; relevant information on populations with a migration background (studies focusing on both 'immigrants' and 'ethnicities' were included); and relevant information on waste sorting post migration and/or sustainable occupational engagement. In order to be included, the literature had to be published before the start of the review process, which commenced in January 2019.

Separate literature searches were conducted for occupational science and resource recovery literature. The literature search on waste sorting and immigration within the occupational science

literature showed no results. The literature search within occupational science was thus widened to identify the literature concerned with occupational engagement and environmental sustainability. The scope of the literature search within the resource recovery was widened to include 'recycling' because it is in some instances used interchangeably with the term 'waste sorting'. Lastly, in instances, the resource recovery literature utilizes the concept of 'ethnic groups' rather than 'immigrants'. Ethnicity refers to factors that can be of national, cultural, ancestral or lingual nature. Therefore, it was assumed that when the literature mentioned ethnic groups, at least part of that study population had migrated at some point. For the purpose of this research project, it was not necessary to distinguish between the first or later generation immigrants.

### 2.3. Processing and Analysis

To prepare the data for synthesis, the process recommended by Arksey and O'Malley [23] was followed to identify the most relevant publications as demonstrated in Figure 1.

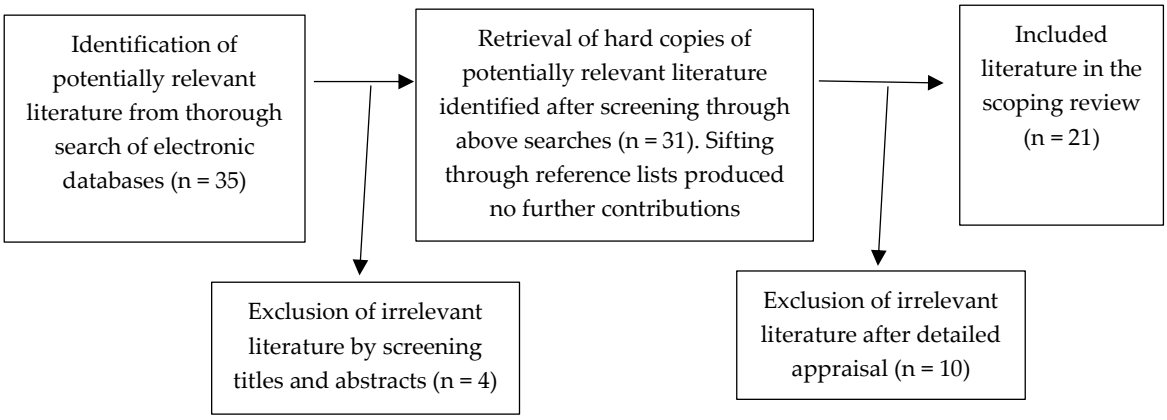



**Figure 1.** Identification of relevant literature (n is the number of relevant contributions).

As shown in the top box to the left in Figure 1, the identification of potentially relevant literature produced 35 hits. Thirty-one publications remained after four irrelevant publications were excluded when screening the titles and abstracts. Hard copies of the thirty-one potentially relevant publications identified through the search strategy were retrieved. Of these, ten publications were deemed irrelevant after they were appraised in detail because they were not on household waste sorting, migration or sustainable occupational behavior. This strategy resulted in the inclusion of twenty-one articles in this scoping review.

By design, this study utilized a less methodological interpretive way of synthesizing the data obtained and thus transparency was of utmost importance throughout the process. The synthesis was guided by the Arksey and O'Malley [23] guidelines to scoping reviews which include the identification of the research aim, identifying relevant literature, selecting the literature, charting of the data, and collating, summarizing and narratively reporting the data.

To analyze the range and diversity of the material reviewed for this scoping review, a detailed description of the literature that met the inclusion criteria was created. Data generated from each discipline was developed separately through inductive data-analysis. A table for the included publications from both disciplines was then created in which the information was described in detail. Based on this, themes that emerged within each discipline were developed and analyzed in order to establish interdisciplinary thematic links. Differences and similarities of the emerging themes were assessed before the descriptions of the phenomena were systematically lifted from their original context. The thematic groups were then arranged on a map which visually aided to illuminate the dynamics of resource recovery and occupational science data; and the research context in which demonstrations of waste sorting among people with an immigration background or occupational science concerned with sustainability were found. Emerging categories were then developed and compared with one another

in as many ways as possible by grouping and regrouping them. In the next stage, the key concepts and interpretations that emerged after the grouping, re-grouping and comparing process were developed.

## 3. Results and Discussion

The literature included consists of eighteen peer reviewed journal articles, one book and two reports. The studies included are of qualitative, quantitative and mixed method design and descriptive information on them can be found in Appendix A. The publications by Miafodzyeva et al. [24], Gregson et al. [25], and Bonatti [26] study waste sorting among people with an immigration background or ethnic minorities. All other resource recovery studies that were included in this review do not study waste sorting among people with an immigration background per se, but meet the inclusion criteria because information on waste sorting among ethnic groups or immigrants was presented as a byproduct of their objectives [27–33]. One study considered people with an immigration background in their tables but did not discuss this further in the text [28].

There was no literature within occupational science on people with an immigration background and/or waste sorting, even though the engagement in recycling has been identified as an indispensable activity for environmentally sustainable societies within occupational science [34]. However, recycling was mentioned in the occupational science literature [35–37]. Occupational science literature was only considered when it was concerned with the environment in terms of global issues, sustainability or ecology [35–45]. The literature included in this review was published between 1997 and 2018.

Waste sorting and recycling among people with an immigration background and ethnic minorities were mentioned in studies that were conducted in Italy [26]; Northern Europe and the UK [25]; the UK [30–33]; the Netherlands [28]; and Sweden [24,27,29]. All these studies used the concept of 'recycling' rather than 'waste sorting'. The literature included refers to either 'immigrants' [25–29] or 'ethnic groups' [31–33] in general terms, or specify ethnic groups [24,30]. Among people with an immigration background or ethnic groups mentioned in the literature were people from the Nordic countries, the European Union, other European countries, Asia, Africa, North America and South America. Furthermore, some studies distinguished between ethnicities such as 'Asian British', 'Asian', 'black', 'white' or 'white British'. The studies that referred to 'immigrants' disclosed further information such as the total number of immigrants in the sample compared to the number of new immigrants (0–4 years) [27,29]; that immigrants were defined as foreigners [27–29] or foreigners that were either born abroad or whose both parents are foreigners [24]; and immigrants who moved specifically for work (migrant labor) [25,26]. None of the included articles specified the length of stay in the host country of immigrants or people that belong to ethnic minorities, but as earlier mentioned Hage, Sandberg, Söderholm and Berglund [27], and Hage and Söderholm [29] distinguish between the total number of immigrants and immigrants that have immigrated within the past four years prior to the start of their study.

The results were drawn from studies in which the phenomenon was mentioned, but which had varying objectives and foci. The way that human activities impact environmental and social sustainability is a major concern for occupational scientists and such activity patterns and desirable changes are being discussed across various contexts. These include sustainable responses to climate change through lifestyle choices [35]; ethical issues related to post-industrial societies [36]; occupational contributions to ecological sustainability [37]; eco-social occupational therapy [38]; occupationally mediating ecosystem services with human well-being [39]; occupations determining population health [40]; transpersonal dimensions of ecology and occupation [41]; possible contributions of occupational scientists in solving global issues [42]; a framework for occupational behavior to address global problems [43]; empowering people to change occupational behavior to address global issues [44]; and the connection of sustainability, globalization and well-being through occupations [45].

The results exhibit that the resource recovery literature considers people with an immigration background and waste sorting in a wide spectrum of categories, including household recycling behavior in a multicultural urban area [24]; resource recovery and migrant labor in the EU [25]; female migrant

environmental work [26]; econometric analysis of regional heterogeneity of household recycling and plastic packaging waste [27]; financial benefits of unit-based pricing of household waste [28]; econometric analysis of regional differences in household waste collection [29]; social, cultural and structural influences on household waste recycling [30]; household waste behavior [31,32]; and waste prevention responsibility policy options for producers and consumers [33].

Thematic groups that emerged during the analysis were derived from the applicable discipline (occupational science or resource recovery), the focus of the literature, and the concepts or theoretical orientation of the literature. The thematic groups that were established from the reviewed literature are presented in Figure 2.

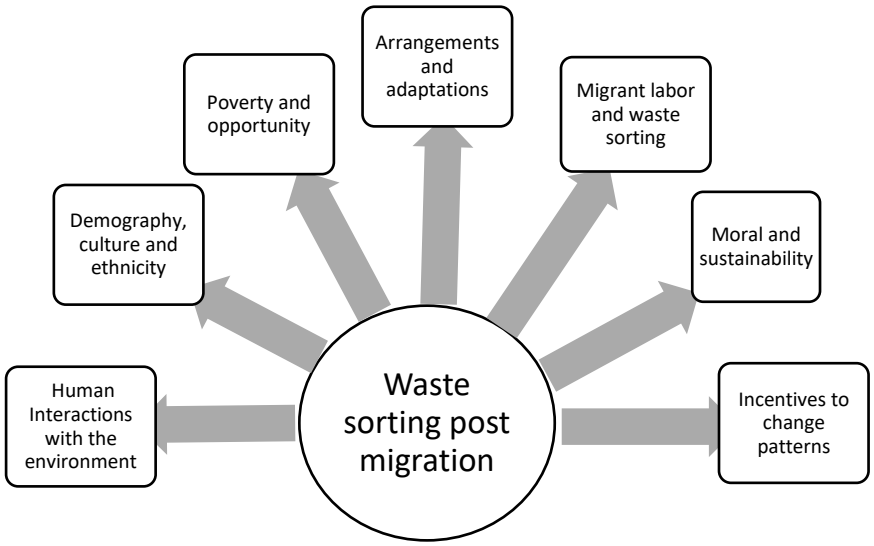



**Figure 2.** Thematic groups encompassing sustainable occupational engagement and waste sorting post migration.

Descriptions of the phenomenon found in the literature in which people's choices regarding the engagement in activities, such as waste sorting, link with sustainability came apparent during the above mentioned analysis strategy when focusing on aspects such as human interaction with the environment; demography, culture and ethnicity; poverty and opportunity; arrangements and adaptations; migrant labor and waste sorting; moral and sustainability; and incentives to change patterns. Each aspect will be discussed in the following sections.

### *3.1. Human Interactions with the Environment*

The notion of human activity being inseparable from the environment that people live in is central to the foundations of occupational science. The activities that people engage in have caused the current need to develop environmental and social sustainability, and targeted engagement in activities is needed to achieve this [46]. Within occupational science, at the center of sustainable global well-being is the interaction between humans and the global ecosystem [47]. Given this interaction of people with the ecosystem, activities that people engage in are very much of ecological nature [36]. One way for people to contribute to sustainable development is by reusing materials and sorting household waste as part of their daily routines as this can enable waste management systems to recirculate material and avoid depleting the planet's resources [48].

Waste management systems are often set up in a way in which minimizing the amount of waste is the highest priority to achieve sustainability. Figure 3 displays the hierarchy model in which landfilling is the least preferred option of waste management. Other waste management options, such as material recycling, reuse and energy recovery are preferable but depend on the type of waste and available treatment options [9].

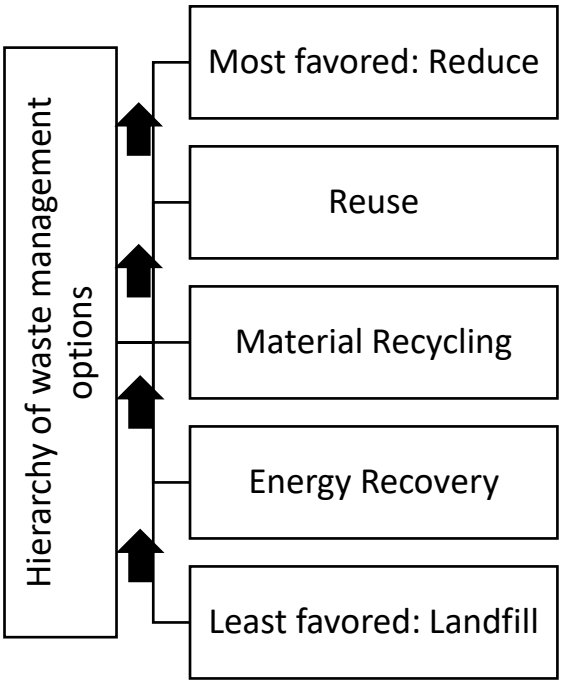



**Figure 3.** Waste hierarchy model adapted from Rousta [9].

Generally, recycling of materials is preferred over energy production through, for example, combustion. This is because material recycling is often more beneficial for the environment than transforming the material into energy [49]. Similarly, avoiding filling landfills with organic waste, such as food, can contribute positively because resources that would otherwise be lost can be recovered from organic waste through composting or anaerobic digestion [9]. In addition, landfilling of organic waste results in the production of methane, which is a strong greenhouse gas [50]. Within this approach, it is crucial not only to ensure that all waste will be managed and uncontrolled dumping is avoided, but also to direct the different types of waste into the relevant waste management option [9].

In Sweden, waste sorting at the source (i.e., where the waste is generated) plays a vital role in the recovery of resources [8]. Landfilling of municipal solid waste dropped from 62% in 1975 to less than 1% in 2016, and the recycling rate climbed from 6% to 35% [9]. Around the globe initiatives aim to decrease the amount of landfilled waste because of the loss of resources and because of the environmental and social concerns that arise from landfills [51].

Occupational science also recognizes recycling as an environmentally and socially sustainable activity [35–37]. By increasing the effectiveness of resource recovery from waste rather than further depleting the planet's resources, a contribution can be made to implementing the Paris Climate Agreement in ways such as decreasing the release of greenhouse gases, among other aims and policies.

Three of the occupational science publications emphasized, in the context of occupations determining population health, possible contributions of occupational scientists in solving global issues and occupational behavior changes to address global problems, that activities such as waste sorting also link the interconnectedness of human well-being and the ecosystem [39,41,42]. Understanding the way people engage in waste sorting from an occupational perspective can contribute to efforts towards environmental and social sustainability, but also to efforts to increase sustainable global health and well-being. For example, the correct handling of waste can avoid health concerns arising from uncontrolled dumping [51]. Furthermore, managing food waste can contribute to combating hunger and malnutrition; proper chemical waste management can improve air, water and soil quality/pollution levels thereby minimizing illnesses and prevent deaths from (unintentional) poisoning; proper management and avoiding landfills can minimize breeding grounds for water-borne and other communicable diseases; recovering resources from waste can prevent the unnecessary depletion of

resources and thereby lower the impact on the climate, which in turn lowers the health risks of natural disasters [1]. However, reducing and reusing products, recycling materials and recovering energy from local waste also link to geopolitics because it avoids conflicts of interests in resources that have historically caused war, suffering and migration among the civil societies where resources such as oil and gas are found. Increasing the effectiveness of resource recovery can also contribute to energy security because the amount of waste produced by the industry and civil society is ever increasing, thus ensuring the supply of resources from which energy can be recovered.

Material wealth through consumption appears to have become a priority over conservation in many societies around the world. However, the way this jeopardizes the environment and future generations, is not always acknowledged [52]. Waste sorting thus emerges as a link that connects people's choices of everyday actions with sustainability. Environmental problems, such as global warming, can be viewed partly as a consequence of people's disengagement with efficient resource recovery. Aoyama, Hudson and Hoover [39], however, emphasize in their article on occupations determining population health that the interaction people have with the ecosystem through their engagement in activities needs to be analyzed further by focusing on the way people choose to perform and engage in the activities that are part of their lifestyle. Wagman's [37] literature review on ecological sustainability within occupational science could not identify the literature that addresses waste sorting or recycling but nevertheless created a guideline for occupational scientists who wish to contribute to efforts within sustainability. The occupational perspective can contribute by utilizing its underlying knowledge to guide adaptations of preferred activities for greater ecological sustainability. Another way the occupational perspective can contribute is through exploring the underpinning principles of activity choices by asking 'who', 'what', 'where' and 'why'. This perspective is suitable to examine the link between waste sorting and ecology, and can contribute to efforts aimed at sustainability by warning that people's (in-)actions can have ecologically devastating consequences that will impact people's everyday life. However, Wagman [37] also highlights the contribution occupational scientists can make through cooperation with other disciplines, and that these ways of contributing should also be seen as a starting point for future research. In the context of knowledge on waste sorting and how individuals adapt to engaging in it when they immigrate into different ways of sorting, the occupational perspective has the potential to contribute to and complement multidisciplinary scientific efforts to increase environmental and social sustainability by increasing the amount of resources that can be recovered from waste.

People who immigrate may be in a unique position in which they transition away from any previous knowledge or experience and adapt the way they sort their waste. They may learn how waste is sorted in the hosting country and adapt the way they engage in it. Not only would an occupational perspective enhance attention to the ecological context of the engagement in this and other sustainable activities, but it could also inform behavioral interventions to mitigate, prevent or reduce the effects of climate change; or interventions that guide the adaptation to climate related changes [39]. Mitigating, preventing and reducing waste, as well as recovering resources is in the interest of environmental sustainability [1]. Yet, people need to engage in recycling schemes by sorting their waste or reusing products. Motivating people to participate in the systems or changing their waste sorting patterns is a constant challenge for the actors in waste management systems [9].

### *3.2. Demography, Culture and Ethnicity*

As stated above, people can make a direct impact on environmental sustainability by sorting their waste. Since human activity all around the globe has a profound impact on health and ecology it is important to consider demography when debating sustainability, so Capon [40] in the article on human occupations as determinants of population health. This would seem especially important given the increase in human migration in recent years [53].

Despite some doubts identified in the literature [54], sociocultural factors, such as gender, age, income and also culture, are sought to impact the waste sorting engagement [55,56]. However, exactly

how they do is not fully understood and much of the research on the impact of sociocultural factors has been conducted in case studies limited to specific regions and cultures [57]. These studies nonetheless provide a broad range of knowledge on cultural aspects that impact the waste sorting engagement.

While there tends to be a stigma surrounding immigrants in which they are pictured as environmentally oblivious, Bonatti [26] contrasted such alleged indifferences in her study on the environmental work of female migrant domestic workers, and found that the participating immigrant women actively engage in waste sorting schemes.

Martin, Williams and Clark [30] indicated in their case study on social, cultural and structural influences on household waste recycling that, regardless of age, ethnic minorities displayed attitudes towards recycling that were no different from non-immigrants. In fact, Miafodzyeva, Brandt and Andersson [24] noted in their study on an ethnically diverse urban area that the perception of the importance of recycling is the main determinant of the waste sorting behavior. However, they also found that interest in environmental issues, confidence in the trustworthiness of the recycling system, satisfaction with the provided recycling facilities, the perception of identification to a local community and socio-demographic aspects did not impact the waste sorting behavior [24]. Hage and Söderholm [29] found that the presence of immigrants, among other factors, positively impact the household plastic waste collection rates in Sweden.

Cultural aspects can impact whether or not people engage in waste sorting but characteristics of different cultures must be recognized when determining the relevance of the cultural background on the waste sorting engagement [58]. Congruent with this, Martin, Williams and Clark [30] highlight that the current literature does not sufficiently address whether aspects such as cultures and traditions, language and attitudes, or different factors altogether, impact the engagement in waste sorting. Hage and Söderholm [29] found in an econometric analysis of regional differences in household waste collection on plastic packaging waste that socio-demographic factors do not determine engagement in waste sorting. On this there seems to be consensus across other research contexts, such as the role of personal motives in the assessment of household recycling costs [59]; behavioral determinants of household recycling participation [60]; norms and economic motivation in household recycling [61]; a research synthesis of determinants of recycling behavior [62]; and personal and situational factors that impact whether and when people recycle [63].

A number of studies noted that immigrants or ethnic minorities sort less than the wider population. This result was observed across various research contexts, including a spatial-econometric analysis of the regional heterogeneity of household recycling of plastic packaging waste [27]; a study on the financial benefits of unit-based pricing of household waste [28]; an econometric analysis of the regional differences in household waste collection of plastic packaging waste [29]; a case study about social, cultural and structural influences on household waste recycling [30]; one study and its four-year follow up assessment on the household waste behavior [31,32]; as well as in the context of the shared responsibility among consumers and reducers to prevent waste [33].

Miafodzyeva, Brandt and Andersson [24] found that ethnically diverse people tend to sort waste because of legal norms. Yet, the reasons offered for why people with an immigration background may sort less include unfamiliarity with laws and regulations, language barriers [27,29], and lesser distribution of information to them [32]. People who immigrate may not be familiar with how to do the waste sorting in their new country of residence and have to learn either through guidance or by themselves. On this, Miafodzyeva, Brandt and Andersson [24] suggested that easily accessible information provided in the languages of ethnic groups would probably increase the waste sorting participation.

People are thought to be altering the way they engage in waste sorting post immigration. Martin, Williams and Clark [30] suggest that second degree immigrants are less inclined to sort than their parents. Hage, Sandberg, Söderholm and Berglund [27] and Hage and Söderholm [29] conclude that first degree immigrants integrate existing social norms and eventually sort more waste than the wider population. Cultural aspects should be acknowledged when studying the waste sorting engagement

among people with an immigration background. Such aspects include, for example, the role that food plays in demonstrating hospitality. It may be culturally expected of a host to offer food in abundance when guests visit. However, if leftover food is not separately discarded then valuable resources, such as biogas, cannot be recovered from it. Furthermore, there is a stigma surrounding waste sorting in that recycling is often thought to be dirty and unhygienic [64]. Waste sorting is also perceived as labor that is in many countries predominantly done by poor and underprivileged parts of society [58].

### *3.3. Poverty and Opportunity*

Occupational science is concerned with answering the need to develop transcultural, holistic and community-based interventions together with the populations that these interventions aim to serve [65]. According to the UN 2030 Agenda for Sustainable Development [1], the poor are often most affected by the climate caused disasters, which could be reduced by sustainable ways of recovering resources from waste. By recovering resources and recycling, a fairer and more sustainable share of resources can also be accomplished.

Martin, Williams and Clark [30] reason in the context of their study on social, cultural and structural influences on household waste recycling that ethnic minorities or immigrants might sort less than wider populations because of higher priorities due to economic deprivation. Coggins [33] notes in the article on policy options and measurements of the shared responsibility of waste prevention that ethnic minorities or immigrants may sort less because of lower affluence rather than cultural or national attributes.

Algado and Townsend [38] argue that engaging in activities in ecologically sustainable ways is occupational in nature and thereby also a matter of occupational justice given the consequences that natural degradation has, especially on the poor. This justice relates to the intrinsic need for every person to engage in activities that appropriately stimulate intellectually, yield the opportunity to support livelihood, and enable safety, personal care and social ties [66]. Both migrants that move voluntarily or involuntarily, such as asylum seekers or refugees, often face legal limbo after arriving in their hosting countries which causes disruptions of the patterns in which they would otherwise engage in activities [67,68]. Often this is due to the time taking processing of their asylum or residency statuses, which restrains immigrants from engaging in activities that would yield an income. This lack of income after arrival might then become a priority to solve over adopting environmentally sustainable behavior. According to the UN 2030 Agenda for Sustainable Development [1], poverty reduction is thus a crucial element in rebuilding resilience among economically and otherwise vulnerable parts of society. Eco-social occupation-based interventions in poverty reduction projects have been shown to embrace ecological challenges, and even to help find funding to enable people to engage in ecological sustainability through the means of activities [38].

### *3.4. Arrangements and Adaptations*

In line with international studies from, for example South Africa [69], Malaysia [70] and Bangladesh [71], which found that aspects such as time, space, knowledge and inconvenient waste management schemes most prominently deter the participation in household waste sorting, Miafodzyeva, Brandt and Andersson [24] stated, in their study on the household recycling behavior in a suburban area of Stockholm with a high density of people from different ethnicities, that among the survey respondents, 44% percent identified the aspect of space as the most common inconvenience. Separate bins for the different fractions of the sorted waste may take up room that may be scarce in some living arrangements. The availability of space was also described as a determining factor for the waste sorting engagement by McDonald and Oates [72], Ando and Gosselin [55] and Jesson [73].

Furthermore, 28% of the ethnically diverse respondents in the study by Miafodzyeva, Brandt and Andersson [24] identified the time it takes to sort their waste as an inconvenience. This is consistent with other studies that found that the time it takes to sort waste deters the engagement in the waste schemes [74]. Another inconvenience that 23% of the survey ethnically diverse respondents identified

was that the nearest recycling station was too far away [24], which is congruent with similar findings in the study by Bonatti [26] on the waste sorting efforts among female migrant workers. Numerous studies, including the study on social, cultural and structural influences on the household waste recycling by Martin, Williams and Clark [30], found that convenient infrastructure impacts the waste sorting behavior. Rousta et al. [75] found that lengthy distances to recycling stations commonly determine whether or not household waste is properly sorted. Similarly, Gonzalez-Torre and Adenso-Diaz [76] found that as the distance to the recycling stations decreases, the number of fractions that people sort at the household level increases.

In addition to these aspects, 20% of the ethnically diverse survey respondents also did not know how to sort or where to bring their sorted waste [24], which is in line with other studies that found that a lack of knowledge prevents the engagement in the waste sorting schemes [77,78]. Communication symbols can also help immigrants adapt to new waste sorting schemes. Bonatti [26] found that a color-coded system for which fractions of the waste goes into which bin made it easy for immigrants to learn how to sort the waste before they learned the language spoken in the hosting country. The benefits of using stickers to visually and non-verbally aid waste sorting has also been confirmed by Rousta, Bolton, Lundin and Dahlen [75] whose case study on the use of stickers led to a 70% decrease of mis-sorted waste.

This indicates that the way waste sorting and recycling systems are set up can both positively and negatively impact the engagement in waste sorting among immigrants and people with varying ethnic backgrounds. The recycling and waste sorting system needs to be adapted to the target group in order to encourage people to take part in it. Many initiatives aim to improve the waste system through innovations that aim to increase participation (e.g., [9]). When adapting the system further to make it inclusive despite cultural diversity, it would appear to be insightful to learn more from people who experienced adopting to waste systems because they can contribute to such initiatives with their experiences and perspectives.

### *3.5. Migrant Labor in Recycling and Waste Sorting*

Regarding attitudes towards immigrants, Gregson, Crang, Botticello, Calestani and Krzywoszynska [25] have demonstrated that people who immigrate to work in recycling facilities and who therefore sort waste for a living experience, have a sense of exploitation and stereotyping in which the reputation of the labor is connected with 'dirty work'. This is in line with Dauvergne and LeBaron [79] who argue that while recycling is beneficial for the environment, corporate schemes rely on and ingrain harm and exploitation of the growing number of laborers who make a living on waste sorting, thereby devaluing marginalized populations.

Migrant workers are also often thought to have more acute concerns than environmentally sustainable choices given that they face cultural and language barriers in addition to possibly having fled war, famine and disasters [26]. Bonatti [26] furthermore highlighted how domestic female migrant workers do the waste sorting in addition to their jobs for their employers when faced with the precariousness of their immigration and employment status; and despite experiencing racism, xenophobia and street harassment when taking waste to the recycling stations. When families outsource the waste, and the sorting and disposing of it to immigrant domestic workers, material circumstances can be the defining factors for whether or not immigrant workers sort the waste or not. For example, immigrant workers may be asked to carry the sorted waste to the recycling stations after paid working hours. Furthermore, the availability and proximity of the recycling stations were often mentioned by immigrant workers as obstacles to discarding the sorted waste.

Interestingly, this review revealed contradictory conclusions regarding community identity and the engagement in waste sorting. Miafodzyeva, Brandt and Andersson [24] noted that community identity does not correlate with the waste sorting behavior, but Bonatti [26] highlights that domestic female immigrant workers do the waste sorting because they perceive it as a way to express commitment to the local community.

### *3.6. Dynamics between Moral, Ethics and Sustainability*

On ethical considerations regarding the impact that people's actions and choices have on the environment, do Rozario [41] calls for occupational science to examine its underlying paradigms and assumptions in order to discuss whether they are congruent with ecological sustainability. She proposes a holographic paradigm and a transpersonal ecology of living as a way to pattern occupations because individuals as well as societies, organizations and nations need to shift away from the 'I am' ideology towards an attitude of being together on the planet. Do Rozario [41] prompts scientists to contemplate: "do we continue to separate occupation from the individual and collective consciousness in which we are enfolded? Do we only investigate the explicate order of life and leave the implicate foundation to the rigor of quantum physics or the relativism of the interpretative method? Which community of scholars do we choose to create our rules and directions for research and action?" (p.117).

Do Rozario embeds her line of argumentation by referring to the social psychologist Csikszentmihalyi's theory of flow, which has influenced much of occupational science's development. His theory of flow is a psychology of consciousness that encourages individuals to find their means to optimally live their lives, which originates in the 1990s and has since developed towards the evolution of transcendent societies. Csikszentmihalyi believes that humanity needs to move beyond the reductionism of separate individuals, causes, actions, disciplines and societies but rather develop a consciousness for the development that can take place when societies move away from egocentric positions of power and control and instead embrace the transcendent experiences of joy, virtue and harmony with life because "in doing so, we not only strengthen our selves but create solutions that will guide humanity into a more harmonious future" [80] (p. 247). Do Rozario refers to this theory in relation to the occupational science's developments targeting sustainability because worldviews impact and shape the actions that people choose to take [81]. Do Rozario highlights how Csikszentmihalyi's theory can be complimented by the postmodernist view, which is a position that rejects universal value judgements and therefore centers around the principle that all truth is relative and arbitrary [82]. It is positioned in efforts to move away from ego-centric choices that negatively impact environmental sustainability towards more sustainable choices that are imbedded in collectivism and environmentally and global community conscious choices. It thereby encourages to critically analyze the fragmented parts that contribute to reality. In the context of this scoping review, these parts can refer to the different aspects that affect each other, such as the moral towards social and environmental sustainability and engagement in waste sorting; but also aspects such as interdependence on environmentally sustainable choices by other individuals and actors, effectiveness of resource recovery and climate neutral economies that encourage environmentally sustainable choices.

However, policies and responsibilities may require people to engage in the waste sorting schemes making it mandatory rather than voluntary. Coggins [33] highlighted that the responsibility of waste prevention and management is shared by both producers and consumers. Due to the reason that voluntary engagement in sustainable waste practices seems hard to achieve, the European Union introduced the first concept of producer responsibility in 1994 [83] which obliges producers to manage the waste affiliated to their products. The producer responsibility led producers to add the cost of the waste management to the price of their products. The responsibility to appropriately manage the waste thereby shifts to the consumer when they purchase products. According to Coggins [33], involving consumers in this way requires appropriate education and publicity, and incentives for people to reduce and sort waste. Hage [84], furthermore, stated that regardless of whether the ordinance is a packaging fee, i.e., producer responsibility, or an alternative packaging tax supply chain management regime (UCTS), waste management systems often rely on how the people that participate in the waste schemes value sorting efforts.

The notion of value in this context, however, may differ across cultures and societies. According to Wilcock [85], people are influenced by the culture they find themselves in. In addition, to Wilcock [85], societies are the result of the activities that people choose to engage in as well as the consequences these choices have on the environment. In order to understand the current human behavior in the light of its

consequences on the environment, the occupational scientists Persson and Erlandsson [36] compliment prevailing frames of reference with an ethical view that finds its beginnings in the perceptions of everyday human activities, one of which is waste sorting. Persson and Erlandsson [36] highlight that in order to pattern activities in a sustainable way, the quality and content of the activities that make up interactions with the environment must be better understood in terms of their consequences on the personal organism, the human environment and the planet. This is because the ethical considerations that these activities entail can impact the guidelines of contemporary and future activities. According to Persson and Erlandsson [36] ecopations are eco-ethical when the choice of the activity relies on reverence, responsibility, simplicity, multiplicity and justice. The concept of ecopation thus signifies activities that are informed by regard for the ecological context through the reflection and experience of meaning [36]. Inherent in the process of reflecting on the choices of activities and how activities are engaged in is the belief that acting in an environmentally sustainable way may entail greater self-reward than "any bittersweet enjoyment obtained from competing with others, and creating destruction along the way" (p. 98).

Given this, the occupational perspective can complement waste management in that it highlights that sorting waste is an activity with which people can make a direct impact on the future sustainability of the environment and the global society. This perspective also raises awareness of the cognitive and behavioral aspects that can, when people are encouraged to engage in such reflections, lead to incentives for occupational lifestyle choices such as whether or not, and why to sort waste.

However, the notion of ethics and moral can be important determinants for the waste sorting engagement, even if they do not directly respond to the notion of the environment. Young people in China have been shown to sort waste rather because of the moral obligation they feel to act in a certain way along with the perception of the behavioral control and subjective norms rather than attitude or concerns for the environment [86]. A Slovenian study confirmed that the three key aspects in the ethical decision making regarding whether or not to participate in waste sorting are moral recognition, moral judgement and moral intention [87]. Even though "few concepts are as important in explaining social life as are moral ideas"(p. 2), the concept of moral tends not to be theorized in research on environmentally sustainable engagement patterns [88]. Despite the moral dilemma that people encounter when they purchase items that contributed to the depletion of resources and harm sustainability, ethics tends not to be at the center of the research [89].

### *3.7. Incentives to Change Patterns*

Incentives to sort and the individual waste sorting behavior has been studied among ordinary residents of different countries and areas, as well as in the context of their affluence and other socio-demographical aspects [30,63,86,90–92]. However, none of these studies aimed to understand incentives to engage in waste sorting specifically among immigrants.

Two studies that assessed the household waste behavior in London [31,32] noted regarding incentives to engage in the waste sorting schemes, that some ethnic minorities favor financial incentives. Shaw and Maynard [93], however, found that it is not fully understood if and how financial rewards or penalties would encourage the engagement in the waste sorting schemes. Aoyama, Hudson and Hoover [39] highlight that people tend to change the patterns in which they engage in activities for more sustainable ones only if this would not impact their occupational needs, which is why occupational science aims to create knowledge that can be utilized by advisors aiming to guide behavioral transitions which suit the individual yet sustain both resources and the environment [94].

The United Nations acknowledge that the way people live their lives, thus their occupational choices and patterns, impacts environmental, social and developmental sustainability. The UN surveyed young people's (18–35 years of age) values, aspirations, experiences, and challenges in relation to adopting a sustainable lifestyle [95] and found that preferences and sustainable choices differ between countries [96]. Hocking and Kroksmark [35] illustrated these findings from an occupational science perspective and argue that while young people are concerned with the environmental degradation

and care for others, they do not clearly perceive the link between the individual and collective action but instead tend to make self-serving choices over choosing options that are regulated by others or where resources are shared. This indicates that people either do not receive enough relevant information on sustainable developments or that the awareness raised by the information does not lead to more sustainable activity choices and patterns. Insufficient awareness and education are, to Rajendran et al. [97], a significant obstacle to overcome when aiming to encourage people to change their waste sorting patterns and increase the efficiency of the waste management systems. This could mean that information on the developments within the resource recovery and the possibilities of recycling do not reach the stakeholders within a society whose engagement can make a direct difference. Given that incentives tend to trigger behavioral change, awareness of what can be done with properly sorted waste might thus increase participation on the societal level within the recycling schemes and result in a more environmentally sustainable reusing and waste minimizing behavior. However, no research on whether such knowledge impacts engagement in waste sorting could be identified.

Ikiugu's [42] conceptual framework encompasses the enhancement of people's awareness of the impact that their choices have in regard to environmental issues; and claims that people who have experienced similar transitions in engaging in activities can utilize their experiences and knowledge in understanding the rationale of the choices people make and encourage people to engage in activities in different "ways of obtaining the same benefits" (p 97). This indicates that there may be a lot that can be learned from people who have immigrated and gone through the process of changing the way they engage in environmental sustainability through the means of sorting their waste. This knowledge on their experiences may be rich in information on attitudes and beliefs, as well as perceived hindrances or aids, that trigger participation in waste sorting. Increased information on this may not only enhance knowledge on how adapting to waste sorting systems can be made more efficient for people immigrating to new places but also to those who offer waste management, all of which would ultimately increase environmentally sustainable recovery of resources and thereby also global social sustainability.

Given the increasing calls for humane global solutions to the negative way in which people's choices impact sustainability and the need to explore how people engage in activities during social and environmental stress [98], Persson and Erlandsson [45] call, in their article on how ecopations connect sustainability, glocalisation and well-being, for a better general understanding of the human as a being for whom doing and engaging in activities are necessary and essential. The engagement in activities needs to especially be better understood, which relates to the interconnectedness of the personal, local and global perspective of people's interaction with the ecosystem. The concept of glocalization was introduced into occupational science to answer this call for knowledge because it centers around the Person-Environment-Globe interrelatedness that activities involve in when they are guided by the earlier mentioned reflective process that underpin ecopations. The conscious engagement in activities locally but with the global impact in mind has the potential to promote well-being on both the individual and population levels [45]. Attempts to raise environmental sustainability through the resource recovery can so benefit from tailored interventions that encourage people, regardless of whether they have an immigration background or not, to reflect upon the personal, local and global implications of waste sorting so that informed choices can be strategically reasoned.

Congruent with this is the emphasis by Ikiugu et al. [44] that increased awareness of the impact that the activities people chose to engage in have on the environment can encourage people to take responsibility and become an incentive for change towards more sustainable choices. Psychological aspects such as limited cognition, uncertainty, judgmental discounting, perceived control, ignorance, mistrust, and blame of others are often identified as obstacles encountered regarding change towards more environmentally sustainable behavior [99]. However, regardless of whether people do not engage in waste sorting because they have recently immigrated and are unfamiliar with the system, or whether people choose not to engage in waste sorting for other reasons, people could be empowered to change their participation to address current ecological issues. For example, frustration and helplessness

with environmental degradation can shift into a desire for action when people are encouraged to find solutions that are embedded in the activities they engage in [44]. There are multiple examples in the literature that provide valuable insight into such solutions that are embedded in occupational engagement on the institutional level [100–103]. The awareness of the power that people have to mitigate environmental degradation through waste sorting could thus lead to a shift in the perception of control, which in turn can lead to a sense of empowerment and an incentive for change. This would be in line with the notion that psychological empowerment positively impacts participation in waste sorting and waste reduction by acting as an amplifier to the critically important aspect of meaning [104].

Ikiugu and McCollister [43] furthermore studied measurements that encourage people to participate in activities of daily life which are environmentally sustainable using MIOT (Modified Instrumentalism in Occupational Therapy), and showed that participants started engaging more frequently in activities that are environmentally sustainable. The MIOT is a three-phase process in which individuals first learn about issues of concern to social and environmental sustainability, their causes and how the engagement in activities contributes to such. A personal mission statement is then established indicating the legacy one wants to make and acknowledging the difference one can make through the way one engages in activities. Finally, goals are identified which take form in the engagement in activities that enable achieving the mission set.

The MIOT thus centers around encouraging people to live principled lives which, in the occupational science perspective, means a meaningful life. Meaningfulness can be achieved by routinely engaging in activities that assist individuals to achieve the things that are meaningful to their lives. This notion can be understood as an individual's intentional and systematic creation of a personal legacy by carefully making choices about which activities to engage in to ensure that legacy. Meaning can, in this sense, be understood as an incentive that can guide individuals not only through decisions on whether or not to engage in waste sorting but also through how to make arrangements needed to enable engagement. Meaningfulness in waste sorting is reflected in the contribution it can make to healthier and thriving lives for future generations as well as the preservation of the environment.

## 4. Reflection

This review focused on waste as an environmentally sustainable material and energy source, and on understanding the motivation and engagement in waste sorting performed by immigrants despite different knowledge, experience and culture. The focus of this scoping review was to contribute to scientific efforts towards societal and environmental sustainability by providing knowledge on the relationship of people with resource recovery and household level waste sorting from an occupational perspective.

It emerged from the literature that the individual, the actions the individual chooses to engage in, and sustainability can be recognized as three components that are interconnected (Figure 4).

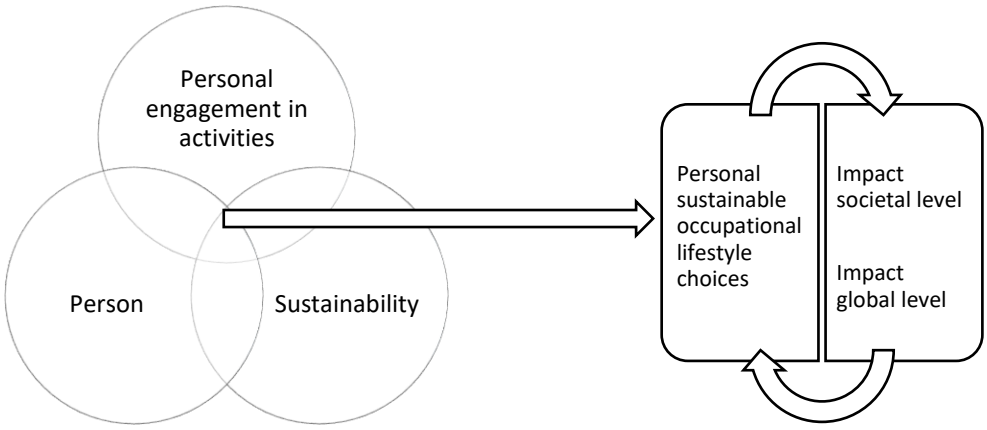



**Figure 4.** The interconnectedness of sustainable engagement.

When these three aspects intercept, the consequences of a person's engagement in activities impacts the broader society as well as the global community in chain-like reactions. Likewise, the engagement in activities by the broader society or the global society can impact a person. For example, a person who engages in waste sorting in Scandinavia might contribute to efforts to minimize carbon release and prevent further climate change. This individual engagement can therefore be a tool which would contribute to environmental sustainability. At the same time, people are confronted with the consequences of the actions of the society they find themselves in as well as the choices that are made globally. A farmer in rural Australia for example may endure droughts that are the result of climate related changes caused by activities undertaken by others and elsewhere. Yet, as it emerges from the literature, frustration can be overcome through a process of reflection and engagement in activities that mediate negative consequences on sustainability and so create a sense of being in control.

The contribution of the occupational perspective sheds light on how people can be guided through the process of altering the patterns of their engagement in activities. An increased body of knowledge on this might also contribute, within its parameters, to efforts to integrate migrants into society. Awareness, information and reflection appear to be dominant factors that encourage people of any cultural or ethnic background to act in more sustainable ways. However, the occupational perspective also highlights the importance of meaning. When people perceive their engagement in activities as meaningful, they are likely to resiliently engage more often in them even though changing behavioral patterns is a process that is not always easy to maintain.

## 5. Conclusions

Over the past decade, dramatic changes have been made to the waste management systems in Sweden and across the globe. With it came an increased awareness of the environmental impact of consumerism and the importance of reducing and reusing products, recycling materials and recovering resources from waste. Waste is often perceived as undesirable and dirty and, understandably, people want to dispose of it without delay. Yet, there are differences in how waste is perceived. These different perceptions, which are underpinned by culture, experience and knowledge can impact the way people manage their waste.

It is increasingly important to understand what impacts people's engagement in everyday life activities such as waste sorting. The occupational perspective highlighted the impact that awareness and reflection have on occupational patterning. However, aspects such as whether eco-ethical reflection about the impact of (dis-)engagement with waste schemes or awareness of what can be made from the recycled waste impacts the engagement in waste sorting, seems to have been neglected in the research at present. The results of this review have shown that there is a need to better understand how people think and act rather than merely focusing on qualitative outcomes or technical aspects of the waste system. It is urgent to catch people's perspectives on waste sorting in a culturally sensitive and holistic way in order to find ways to encourage diverse societies to live sustainable daily lives. When people are new to waste management schemes, whether this is because they recently immigrated or because the system has lately been installed or changed, it might be worthwhile studying the way that engagement shifts and transforms from an occupational perspective. In this review, the focus was specifically on waste sorting, but many of the underpinning aspects that can become incentives to engage in activities in a sustainable way are likely similar for other activities. Future research should take advantage of an occupational perspective which is uniquely suitable to better understand occupational patterns [105].

Understanding the activity of waste sorting as people who adapt to new ways of doing it experience it can stimulate the development of a more environmentally critical and reflexive stance. Immigrants have unique experiences in this regard as waste sorting systems differ across regions and countries. People who immigrate experience an occupational transition from which a lot can be learned. This, in turn can make robust and relevant contributions to societal reform and sustainability by providing people with the awareness and the knowledge of how their local individual actions can impact larger issues at the global level.

In line with existing calls for multidisciplinary research, from Rousta et al. [106] among others, the reviewed literature revealed that in order to support sustainable development and increase the amount of products reduced and reused, material recycled and resources recovered from waste, multidisciplinary research is needed to scientifically identify sustainable interventions aimed the waste management system, as well as the people that participate in it. Future research should focus on learning from the experiences that people make when they are new to a waste management scheme, and what the meaning of these experiences are. Based on that, innovative solutions can be created to assist people in adapting to engaging in waste sorting. Underpinned by such knowledge, the waste management system can then be adapted using user-centered approaches aimed at increasing participation in waste sorting.

The reviewed literature also showed that knowledge of societal engagement in sustainable activities would, in addition, be a valuable contribution to efforts to address climate change through means such as renewable energy as seen in the Paris Climate Agreement. Moreover, in line with the United Nations 2030 Sustainability Goals, knowledge on this accentuates the implications that sustainable occupational engagement can have on the individual people's and global health [107]. Providing knowledge that can contribute to attempts at raising awareness about the importance of waste sorting and inform policies aimed at reducing waste seems increasingly necessary given the increase in consumption as well as the increase in variety and quantity of waste affiliated to it.

## 6. Limitations

Despite efforts to find literature in German and Finnish, all the included literature is in English. Limitations of the search strategy may exist even though best efforts were made to scan for relevant literature. Even though sustainability is of increasing importance to occupational science, no literature on waste sorting was found using the search strategy stated above. However, the literature enhanced the understanding of people's engagement in sustainable behavioral patterns broadly. The aim of this scoping review may be less concise than that of a systematic review, but this is due to the broad context in which literature on sustainable engagement in waste sorting post migration is embedded.

Due to the interpretive nature of this scoping review, it must be stated that the synthesis emerging is the authors' interpretation [108] and that replication may not lead to the same outcome.

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## Appendix A

**Table A1.** Descriptive information about the included literature and relevant findings.

| Ref. | Objectives | Focus and Methodology | Relevant Findings |
| --- | --- | --- | --- |
| Miafodzyeva, Brandt and Andersson [24] | To investigate possible determinants of recycling behavior among Järva (Sweden) householders (home to a significant proportion of immigrants from different parts of the world/diverse ethnic minorities) | The recycling behavior of householders living in a multicultural urban area Quantitative questionnaire and qualitative interviews | • Attitude towards the importance of recycling is the main determinant of the recycling behavior among ethnically diverse households.<br>• Environmental concern, satisfaction with the facilities provided, recycling confidence, community identity and socio-demographic factors showed no correlation with the recycling behavior.<br>• Despite a self-reported high level of environmental concern among multicultural respondents, the recycling behavior was not determined by this factor.<br>• Variables such as satisfaction with the facilities provided, personal confidence that collected waste is treated in a good way, community identity and various socio-demographic variables did not determine the recycling behavior of multicultural householders.<br>• Most widespread obstacle to recycling was lack of 'space' (for recycling in the home) and the most widespread motive for participating in recycling was the acceptance of legal norms.<br>• The provision of clear, understandable and easily accessible written information in the language of the ethnic groups, supported by word-of-mouth information, could probably improve participation in the recycling schemes. |
| Gregson, Crang, Botticello, Calestani and Krzywoszynska [25] | To analyze three sectors "inside the EU's green economy: recycling 'dry recyclables', textiles and ships" | Migrant labor and ship recycling, textile recycling and dry recyclables Analysis of three sectors | • Resource recovery is a new form of "dirty work", located in secondary labor markets and reliant on itinerant and migrant labor, often from accession states.<br>• When waste stays within the EU, labor moves to process it.<br>• The positioning of migrant workers is shown to rely on stereotypical assumptions that create a hierarchy, connecting reputational qualities of labor with the stigma of different dirty jobs. |

**Table A1.** *Cont.*

| Ref. | Objectives | Focus and Methodology | Relevant Findings |
| --- | --- | --- | --- |
| Bonatti [26] | To address the intersection of gender, race and immigration in urban recycling schemes in the city of Naples, Italy, a growing destination for labor migrants and an area with a long history of waste management crises | Migrant women's environmental work<br>Ethnography | • Shows how precarious immigration and employment statuses push migrant workers to take on burdensome recycling work for their employers.<br>• Despite concerns of street harassment and xenophobia, contributing to neighborhood recycling efforts are also important ways in which migrant women express their commitment to the local community.<br>• Shows how green practices and jobs can become avenues for host society members to express racist beliefs or inclinations, whether it is in the form of personal prejudice or outright harassment against migrant women.<br>• Debunks a lingering prejudice against non-EU migrants' alleged indifference to green matters.<br>• Foreign-born domestic workers' experiences further highlight how a combination of environmentalist ideologies, accessibility of recycling stations and working conditions intersect in allowing them to recycle or not, in safe or exploitative conditions. |
| Hage, Sandberg, Söderholm and Berglund [27] | To investigate the regional heterogeneity of household plastic waste collection among Swedish municipalities, and how collection rates have been influenced by local waste management policies, geographical conditions and socio-economic conditions | Regional heterogeneity of household recycling of plastic waste<br>Spatial econometrics | • Lesser recycling participation among immigrants (especially newly immigrated) can be a result of unfamiliarity with the law and regulations and language barriers.<br>• Immigrants integrate existing social norms and eventually show more increased recycling than the Swedish citizen on average.<br>• Immigrants are defined as foreigners born outside the Nordic countries.<br>• Distinguished are Tim (total immigrants) and Newim (foreign citizen with 0–4 years in Sweden). |
| Dijkgraaf and Gradus [28] | To estimate household reactions to the implementation of unit-based pricing for the collection of residential waste in The Netherlands | Cost savings of unit-based pricing of household waste<br>Cross-sectional analysis | • Negative relationship between immigrants and recycling in the Netherlands.<br>• Foreigners are considered in the statistics (Mean 0.04; maximum 0.31; Standard deviation 0.04).<br>• For dependent variable is In (waste), In (Foreigner) was described in "Total" −0.03 (0.01), "Unsorted" −0.00 (0.01), "Compostable" −0.12 (0.02), "Recyclable" −0.02 (0.01).<br>• Foreigners are defined as non-westerners. |

**Table A1.** *Cont.*

| Ref. | Objectives | Focus and Methodology | Relevant Findings |
| --- | --- | --- | --- |
| Hage and Söderholm [29] | To investigate the main determinants of collection rates of household plastic packaging waste in Swedish municipalities | Regional differences in household waste collection for plastic waste<br>Regression analysis based on cross-sectional data | • The collection rate appears to be positively affected by an increase in the unemployment rate, the share of private houses, and the presence of immigrants (unless newly arrived) in the municipality.<br>• Authors call for more in-depth studies of the household behavior, including qualitative and quantitative studies. |
| Martin, Williams and Clark [30] | To ascertain whether householders' attitudes to recycling were contributory factors to the generally poor recycling performance and to investigate other social, cultural and structural influences | Social, cultural and structural influences on household recycling in the U.K.<br>Qualitative and quantitative surveys | • Special attention was given to asserting the attitudes towards recycling of the large Asian British population where recycling rates were particularly low.<br>• Asian British attitudes to recycling were found to be no different than those of the wider population, with their low participation being linked to higher priorities imposed on them by economic deprivation.<br>• Suggests that second degree immigrants are less willing to recycle than their parents. |
| RRF [31] | To explore households' attitudes to waste and the environment, how dealing with waste fitted within their household routines, and what they claimed to recycle in London, UK | Household waste behavior<br>Quantitative questionnaire and interviews | • Ethnic minorities were reported to recycle less and this was represented in the statistics but this was not discussed further. |
| RRF [32] | To measure how much has changed since the original RRF survey in 2001 in London, UK | Household behavior in 2005<br>Quantitative survey | • The broad socio-demographic pattern remains similar in 2005 as in 2001, with High and Medium recyclers tending to more likely to be White than in a minority ethnic household. The usage of the curbside is also slightly below average for younger and Black households. Asian households are significantly more in favor of incentives than others, which is in keeping with their earlier response when asked what would help them recycle more. White households received more information on recycling than black. |
| Coggins [33] | To list a number of aspects that impact policy options in regards to the shared responsibility of waste prevention in the UK | The shared responsibility of waste prevention for producers and consumers<br>n.a.<br>(communication paper) | • Ethnic minorities may be recycling less because of lower affluence but not for any cultural or national attributes. |

**Table A1.** *Cont.*

| Ref. | Objectives | Focus and Methodology | Relevant Findings |
| --- | --- | --- | --- |
| Hocking and Kroksmark [35] | To illustrate the insights contained in the reports of a UNEP survey of four countries: New Zealand and Sweden, the Philippines and Lebanon, and to suggest how these findings can be applied to individual and community-based interventions to promote more sustainable lifestyles | Sustainable occupational responses to climate change through lifestyle choices<br>n.a.<br>(discussion paper) | • Described investigations conducted by the United Nations Environment Program, which found that young people's preferred sustainable choice differs between countries.<br>• The survey objectives were to explore how the sustainable respondents' perceptions of daily life, their local environment, and the future are; their responses to various sustainability options (such as community gardens and communally owned cars); and their attitudes towards sustainability.<br>• The survey findings are a valuable resource for occupational therapists who are concerned about global climate change, providing valuable insights into concerns and preferences in relation to sustainability.<br>• It is shown that young adults are concerned about environmental degradation and poverty, but do not clearly perceive the relationship between their actions and the benefits of collective action.<br>• Of the sustainability options presented in the survey, the overall preference was for self-service options (access to a bicycle, urban gardens, composting) rather than options that others controlled (such as on-demand access to a car) or options where neighborhoods or co-ops would share resources (e.g., a shared laundry or car-pooling). |
| Persson and Erlandsson [36] | To discuss the ethics underlying the occupational repertoire of the post-industrial citizen, giving attention to lifestyle phenomena such as increased tempo and quantity of occupations; manipulation of time, organisms and environments; decreases in sleep, rest and play etc. | Reevaluating post-industrial ethics from an occupational perspective<br>n.a.<br>(discussion paper) | • The concept of "ecopation" is introduced as an optional choice denoting occupations that are performed with concern for the ecological; and emphasizes the eco-ethical chain of action and participation which is built on reverence – responsibility – simplicity – multiplicity – eco- justice.<br>• The questions raised in this paper may be important for occupational scientists to more fully understand the implicit guidelines of contemporary and future occupation and for occupational therapists taking an active part in future healthcare.<br>• Need to question how we chose to engage in occupations and pattern our lives.<br>• Eco-ethical occupations regarding the environment include the possibility for recycling.<br>• Humans can engage in occupations in an eco-ethical way.<br>• Problematic is the current need for humans to compete with machine performances. |

**Table A1.** *Cont.*

| Ref. | Objectives | Focus and Methodology | Relevant Findings |
| --- | --- | --- | --- |
| Wagman [37] | To explore and describe what has recently been written about how occupational therapy/ therapists/science can contribute to ecological sustainability and the prevention of more severe climate change | Occupational contributions to ecological sustainability<br>Literature review | • Fourteen items published between 2008 and 2013 were included.<br>• Ways to contribute include adapting occupations to become more ecologically sustainable.<br>• Adaptations and strategies for doing preferred occupations in other ways or for different reasons are familiar within occupational therapy, and are also appropriate in relation to climate change and ecological sustainability.<br>• Exploring was also identified as a way to contribute: Ways to do this practically include the questions ("who", "what", "when", "where", "how", and "why") when studying occupations.<br>• Contribution through warning was another topic identified in the results: Showing the occupational consequences of ecological disasters is important. |
| Algado and Townsend [38] | To propose a new narrative for humanity by connecting ecology with broad ideas about occupation and occupational justice | Eco-social occupational therapy<br>n.a. (research paper) | • The authors reflect on the literature and action projects on ecology, occupation, and occupational justice.<br>• Doing ecology is essentially occupational, and necessarily a matter of occupational justice given the strong link between poverty and the degradation of the natural environment.<br>• The potential to expand eco-social occupational therapy lies in publicly embracing ecological challenges, focusing practices on changing the environment, and attracting partners to find new funding for enabling people everywhere to participate in ecological sustainability through occupation.<br>• Dialogues and action in doing ecology and justice should be sparked through occupations. |
| Aoyama, Hudson and Hoover [39] | To argue that the concept of "occupation" is a crucial addition to understanding connective relations between the ecosystem and human well-being, and to propose that human well-being, human activity, and ecosystem services are mediated by occupational performance | Occupations mediating the ecosystem with human well-being<br>n.a. (opinion piece) | • Occupation is seen to be the missing link in theorizing the relationship between the ecosystem and human well-being and occupational science is promoted as having the potential to generate new understandings of ways to change humans' occupations to benefit the earth's ecology.<br>• Viewing human activity as an occupation is an important addition to analyzing the relationships between ecosystem services and the human well-being.<br>• The concept of occupation may also help in behavioral interventions in climate change mitigation and adaptation.<br>• People are more likely to voluntarily change their daily activities into more sustainable forms if those changes also support their occupational needs. |

**Table A1.** *Cont.*

| Ref. | Objectives | Focus and Methodology | Relevant Findings |
| --- | --- | --- | --- |
| Capon [40] | To address human occupations as Determinants of health and to link the perspectives on people, places and the planet | Occupation, population health and linking the perspectives of people, places and the planet<br>n.a. (lecture) | • It is important to consider demography when discussing sustainability (reg. occupations).<br>• Human occupations of each domain have potentially profound implications for health and the planetary systems.<br>• Low-carbon lifestyles are health beneficial and those benefits should be used to engage people in lifestyle changes that benefit people and the environment. |
| do Rozario [41] | To examine the major paradigms of thinking that have created human and environmental crises | Shifting paradigms of the transpersonal dimensions of ecology and occupation<br>n.a. (research paper) | • Proposes a holographic paradigm and a Transpersonal Ecology of Living as a way of thinking and action which can be supportive and nurturing of all of nature.<br>• Additionally asks the question of occupational science to examine the paradigms and assumptions that steer its development and whether these beliefs are congruent with the ecological sustainability of life.<br>• Paradigms and worldviews describe as well as shape and create the course of human action which leave occupational science in a position in which it cannot escape the process but must develop the science accordingly.<br>• Occupational science appears to be neutral, open, and inclusive of many different methodologies but this openness can also be viewed as naive when in considering the philosophical and metaphysical issues that underpin any investigation into the nature of reality.<br>• Questions to be asked include: Should occupation be separated from the individual and collective consciousness in which they enfold? Should only the explicate order of life be investigated and the implicate foundation to the rigor of quantum physics or the relativism of the interpretative method be left? Which community of scholars should be chosen to create the rules and directions for research and action? |
| Ikiugu [42] | To describe a conceptual framework that includes the enhancement of people's awareness of their occupational impact on issues such as climate, and to develop measurements for occupational adjustment | Possible contributions of occupational scientists to the solution of prevailing global problems<br>n.a. (book) | • Described a conceptual framework including the enhancement of people's awareness of their occupational impact on issues such as climate.<br>• Measurements for making people adapt their occupation in another direction were developed.<br>• Occupational knowledge is useful for exploring the rationale behind people's occupational choices when discussing climate change together with other occupational injustice issues because this "could help us guide them so that they can find other ways of obtaining the same benefits" (p 97).<br>• People need to have experience of the change themselves before working on adaptations with clients. |

**Table A1.** *Cont.*

| Ref. | Objectives | Focus and Methodology | Relevant Findings |
| --- | --- | --- | --- |
| Ikiugu and McCollister [43] | To investigate the effectiveness of the Modified Instrumentalism in Occupational Therapy (MIOT) in facilitating change in occupational choices and performance patterns to help address global issues of concern to humanity | Occupation-based framework changing human occupational behavior to address critical global issues<br>Mixed method multiple case phenomenology | • Indicates that participants' occupational choices and participation patterns changed after intervention using MIOT resulting in more frequent engagement in occupations that were likely to impact global issues positively.<br>• Measurements for making people adapt their occupation in another direction were developed and investigated.<br>• "It could even be argued that most of the problems that trouble humanity are at some level a result of human occupational choices and performance patterns. This means that a professional/scientific discipline that understands human occupation is in a unique position to contribute meaningfully to the resolution of major global issues." (p. 405). |
| Ikiugu, Westerfield, Lien, Theisen, Cerny and Nissen [44] | To examine the effectiveness of the Modified Instrumentalism in Occupational Therapy model as a framework for facilitating occupational behavior change to address climate change and related issues | Empowering people to change their occupational behavior to address critical global issues<br>Two- and three-standard deviation band analysis and heuristic phenomenology | • A shift in awareness as illustrated by a change in the locus of control as seen when participants' feelings shifted from frustration and helplessness to empowerment and a desire for occupation-based solutions to global issues.<br>• Occupation-based interventions that increase personal awareness of the connection between occupational performance and global issues could empower people to be agents for action to ameliorate the issues.<br>• Findings indicate that the MIOT model could be a good intervention guide to help individuals and groups think about their personal contribution to global issues.<br>• MIOT-based interventions can be used to help individuals improve awareness about global issues and change the OP to address the issues. |
| Persson and Erlandsson [45] | To examine the current perspective of sustainability and to explore its relation to occupation, and to introduce an elaborated version of the concept of 'ecopation' | Connecting sustainability, glocalization and well-being through the concept of ecopation<br>n.a.<br>(discussion paper) | • The concept of glocalisation is introduced as a means by which to capture the interconnectedness of personal, local and global perspectives.<br>• A core proposition in the article is that doing, if guided by ecopation, could start promoting well-being on individual and population levels if it takes into account the personal as well as the local and global contexts.<br>• Current planetary economic and ecological crises and the increasing call for humane global solutions are discussed in relation to how ecopation and a deepened knowledge of the human as an occupational being, might contribute to such solutions. |

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