

HOME SCIENCE AND SUSTAINABLE DEVELOPMENT: BRIDGING HOUSEHOLD PRACTICES WITH GLOBAL GOALS

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ABSTRACT

Home Science, as an interdisciplinary field encompassing food and nutrition, textiles and clothing, housing, resource management, and family welfare, plays a pivotal role in achieving the United Nations' Sustainable Development Goals (SDGs). This comprehensive review examines the intersection of home science disciplines and sustainable development, exploring how household-level interventions contribute to global sustainability objectives. Through systematic analysis of current research, this paper demonstrates that household consumption accounts for 60-70% of global greenhouse gas emissions, positioning home science professionals as crucial agents of change. The review synthesizes evidence across multiple domains, identifying behavioral, structural, and educational challenges while proposing strategies for integrating sustainability into home science education and practice. Key findings indicate that sustainable household practices can reduce environmental footprints by 25-70% across different domains while providing economic benefits. The paper concludes that home science education and professional practice are essential tools for fostering sustainable communities, bridging the gap between individual actions and global development targets, and achieving the 2030 Sustainable Development Agenda.

1. INTRODUCTION

1.1 Background and Context

The concept of sustainable development, formally articulated by the Brundtland Commission in 1987, defined as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs," has evolved from an environmental concern to a comprehensive framework addressing interconnected global challenges (WCED, 1987). The adoption of the United Nations' 2030 Agenda for Sustainable Development in 2015 marked a watershed moment, establishing 17 Sustainable Development Goals (SDGs) with 169 targets that address poverty, inequality, climate change, environmental degradation, peace, and justice (United Nations, 2015).

Home Science, alternatively known as Family and Consumer Sciences, Home Economics, or Human Ecology in various international contexts, represents an interdisciplinary field that synthesizes knowledge from natural sciences, social sciences, arts, and humanities to improve the quality of life for individuals, families, and communities (Vincenti, 1997; McGregor, 2011). The discipline encompasses diverse specializations including nutrition and dietetics, food science and technology, textiles and

clothing, housing and interior design, child development and family relations, resource management, and consumer studies. This holistic approach positions home science uniquely to address sustainability challenges at the household level.

1.2 Rationale and Significance

Households constitute fundamental units of society and represent major contributors to global resource consumption, waste generation, and environmental impact. Recent research indicates that household consumption activities account for approximately 60-70% of global greenhouse gas emissions and up to 80% of global land, material, and water use (Ivanova et al., 2016; Vita et al., 2019). These statistics underscore the critical importance of household-level interventions in achieving global sustainability targets. Home science professionals, through their expertise in household management, consumer behavior, and family systems, are strategically positioned to facilitate the transition toward sustainable living.

Despite the substantial contribution of household consumption to global environmental challenges, the connection between home science and sustainable development remains underexplored in academic literature and policy frameworks. This review

addresses this critical gap by systematically examining how home science principles and practices can serve as effective mechanisms for achieving sustainable development goals.

1.3 Objectives and Scope

This comprehensive review paper aims to:

1. Analyze the relationship between home science disciplines and the Sustainable Development Goals framework
2. Examine current research on sustainable household practices across various home science domains
3. Identify barriers and challenges to implementing sustainable household practices
4. Propose evidence-based strategies for integrating sustainability into home science education and professional practice
5. Provide recommendations for enhancing the role of home science in achieving global sustainability targets by 2030

sustainable development. A comprehensive literature search was conducted across multiple academic databases including PubMed, Scopus, Web of Science, JSTOR, ERIC, and Google Scholar. The search strategy employed combinations of keywords including "home science," "family and consumer sciences," "home economics," "sustainable development," "SDGs," "household practices," "sustainable consumption," and related terms.

The review included peer-reviewed journal articles, scholarly books, reports from international organizations (UN, FAO, WHO, IEA), and policy documents published between 2000 and 2025. Priority was given to publications from 2015 onwards following the adoption of the SDGs. Initial searches identified approximately 250 sources, which were screened for relevance. Following full-text assessment, 85 sources met the inclusion criteria for detailed analysis and synthesis.

2. METHODOLOGY

This review adopts a narrative synthesis approach to systematically examine the intersection of home science and

3. HOME SCIENCE AND THE SUSTAINABLE DEVELOPMENT GOALS

3.1 The SDG Framework: An Overview

The 17 Sustainable Development Goals represent an integrated framework addressing economic, social, and

environmental dimensions of sustainable development. While all goals are interconnected, several SDGs have particularly strong linkages to home science disciplines and household practices. Table 1 presents a comprehensive mapping of SDGs to home science domains.

Table 1: Mapping of Sustainable Development Goals to Home Science Domains

SDG	Goal Title	Home Science Domain(s)	Key Household Interventions
SDG 2	Zero Hunger	Nutrition, Food Science, Resource Management	Food security planning, kitchen gardens, nutritional education, food preservation
SDG 3	Good Health and Well-being	Nutrition, Child Development, Housing	Balanced diets, hygiene practices, safe housing, infant and child care
SDG 4	Quality Education	Child Development, Family Education	Early childhood education, parental engagement, home learning environments
SDG 5	Gender Equality	Family Studies, Resource Management	Equitable household labor division, women's economic empowerment, decision-making
SDG 6	Clean Water and Sanitation	Housing, Resource Management	Water conservation, greywater reuse, sanitation practices, hygiene education
SDG 7	Affordable and Clean Energy	Housing, Resource Management	Energy-efficient appliances, behavioral change, renewable energy adoption, insulation
SDG 12	Responsible Consumption and Production	All Home Science Domains	Waste reduction, sustainable purchasing, circular economy practices, repair and reuse
SDG 13	Climate Action	All Home Science Domains	Low-carbon lifestyles, climate-conscious consumption, carbon footprint reduction

3.2 Home Science as a Bridge to SDG Achievement

Home science uniquely positions itself to contribute to multiple SDGs simultaneously through its holistic, systems-based approach to household and community well-being. Unlike sectoral interventions that address single issues in isolation, home science integrates environmental, social, and economic considerations within the context of everyday household practices. This integrated approach aligns perfectly with the SDG framework's emphasis on interconnectedness and the principle that sustainable development requires addressing multiple challenges simultaneously (McGregor, 2018; Haapala et al., 2020).

4. SUSTAINABLE PRACTICES IN HOME SCIENCE DOMAINS

4.1 Food and Nutrition

4.1.1 Environmental Impact of Food Systems

The global food system is responsible for approximately 26% of anthropogenic greenhouse gas emissions, 70% of freshwater use, and serves as the primary driver of biodiversity loss and deforestation (Poore & Nemecek, 2018). Within the food system, household consumption patterns, food waste, and dietary choices exert substantial environmental influence.

4.1.2 Sustainable Nutrition

Interventions

Home science professionals can promote several evidence-based sustainable nutrition practices. Plant-based dietary patterns demonstrate the greatest potential for reducing environmental footprints while maintaining nutritional adequacy. Comprehensive life-cycle analyses reveal that transitioning toward plant-rich diets can reduce food-related greenhouse gas emissions by 50-70%, land use by 76%, and water use by 50% (Springmann et al., 2016; Willett et al., 2019). Food waste reduction represents another critical intervention area. Globally, approximately one-third of food produced is lost or wasted, with 40-45% of waste occurring at the household level in developed countries (FAO, 2019).

4.2 Textiles and Clothing

4.2.1 The Environmental Cost of Fashion

The textile and fashion industry ranks among the most environmentally damaging sectors globally, contributing approximately 10% of global carbon emissions and consuming substantial water resources (Ellen MacArthur Foundation, 2017). The proliferation of fast fashion has accelerated these impacts, with global clothing production doubling between 2000 and 2014 while average garment utilization decreased by 36% (Remy et al., 2016).

4.2.2 Sustainable Textile Practices

Home science approaches to sustainable textiles encompass multiple strategies. Conscious consumption emphasizes purchasing fewer, higher-quality garments designed for durability. Research demonstrates that extending active garment life from one to two years can reduce associated carbon, water, and waste impacts by approximately 24% (WRAP, 2017). Circular economy approaches including clothing rental, resale, swapping, and recycling programs offer alternatives to linear consumption patterns.

4.3 Housing and Resource Management

Residential buildings account for approximately 20-22% of global final energy consumption and associated greenhouse gas emissions (IEA, 2020). Home science professionals can promote energy efficiency through behavioral interventions (10-25% savings) and technology adoption (20-50% savings). Behavioral interventions include thermostat adjustments, appliance usage optimization, and natural ventilation, while technology includes energy-efficient appliances, LED lighting, and smart home systems (Abrahamse et al., 2005; Gillingham et al., 2009).

Table 2: Environmental and Economic Impacts of Sustainable Household Practices

Domain	Conventional Practice	Sustainable Practice	Environmental Impact Reduction	Economic Impact
Food & Nutrition	High meat consumption, processed foods, significant food waste	Plant-rich whole foods, local/seasonal produce, minimal waste	50-70% lower GHG emissions, 50% less water use, 76% less land use	20-30% cost reduction, improved health outcomes
Textiles & Clothing	Fast fashion, frequent purchases, minimal garment lifespan	Quality pieces, extended use, repair, circular practices	24-30% carbon footprint reduction, 40% less water consumption	35-40% reduced clothing expenditure over 5 years
Energy Use	Standard appliances, inefficient behaviors, poor insulation	Efficient appliances, behavioral optimization, improved building envelope	25-50% energy reduction, proportional GHG decrease	25-40% utility bill savings, improved comfort
Water Use	High consumption, single-use, inefficient fixtures	Conservation behaviors, efficient fixtures, greywater reuse	30-50% water consumption reduction	30-45% water bill reduction
Waste Generation	Linear disposal, minimal recycling, single-use products	Circular approaches, composting, zero-waste principles, reusables	60-80% waste reduction, reduced landfill/incineration impacts	Variable; often cost-neutral to modest savings

Source: Synthesized from Ivanova et al. (2016), Springmann et al. (2016), WRAP (2017), IEA (2020), and FAO (2019)

5. BARRIERS AND CHALLENGES TO SUSTAINABLE HOUSEHOLD PRACTICES

5.1 Behavioral and Psychological

Barriers

Despite increasing environmental awareness, substantial gaps persist between attitudes and behaviors, known as the attitude-behavior gap or value-action gap (Blake, 1999). Multiple psychological factors contribute: habitual behaviors resist change, convenience culture prioritizes time-saving options, perceived behavioral control influences actual adoption (Ajzen, 1991), social norms shape consumption patterns, perceived cost barriers deter adoption, and information overload creates confusion. The temporal and spatial distance between actions and consequences makes environmental impacts psychologically remote and abstract.

5.2 Structural and Systemic Barriers

Individual household choices occur within broader systems that may facilitate or constrain sustainability. Infrastructure limitations including inadequate public transportation, limited recycling facilities, and poor housing stock restrict sustainable options. Economic inequality creates differential access; lower-income households may lack capital for energy-efficient appliances or ability to pay premium prices for sustainable products. Policy gaps and misaligned incentives often favor unsustainable practices. Market

failures where environmental costs remain externalized create price signals that do not reflect true costs. Greenwashing complicates informed decision-making.

5.3 Knowledge and Skills Gaps

Effective sustainability practice requires knowledge across multiple domains. Limited understanding of environmental impacts prevents informed decisions. Loss of traditional practical skills—cooking from scratch, food preservation, textile repair, basic home maintenance—increases dependence on convenience products with higher environmental footprints. Insufficient integration of sustainability in formal education leaves many without foundational knowledge or practical competencies.

6. STRATEGIES FOR INTEGRATING SUSTAINABILITY IN HOME SCIENCE

6.1 Educational Reform and Curriculum Development

Transforming home science education to explicitly integrate sustainability principles requires comprehensive curriculum reform across all educational levels. Sustainability should not be an add-on but a fundamental framework. This demands moving beyond knowledge transmission to develop critical thinking, systems thinking, and action competence (Wiek et al., 2011).

Problem-based learning focused on real-world challenges, experiential learning through sustainable living laboratories,

and interdisciplinary approaches cultivate holistic understanding.

Table 3: Framework for Integrating Sustainability in Home Science Education

Educational Level	Focus Areas	Learning Outcomes	Implementation Strategies
Elementary (K-5)	Basic environmental awareness, simple sustainable actions, connection to nature	Understanding environmental connections, adopting simple sustainable practices, developing environmental values	School gardens, recycling programs, nature walks, hands-on activities, storytelling, simple experiments
Secondary (6-12)	Critical understanding of sustainability issues, practical skill development, systems thinking	Analyzing consumption patterns, evaluating environmental impacts, developing practical sustainable living skills	Project-based learning, community service, sustainability audits, debates, research projects, cooking and textile labs
Undergraduate	Comprehensive sustainability knowledge, professional competence, research skills, ethical practice	Designing and implementing sustainable interventions, conducting research, integrating sustainability into professional practice	Research projects, capstone experiences, internships, sustainable living labs, interdisciplinary coursework, community partnerships
Graduate	Advanced research, leadership development, policy analysis, innovation	Conducting original research, leading sustainability initiatives, influencing policy, advancing knowledge in the field	Thesis/dissertation research, teaching assistantships, policy analysis projects, grant writing, publications, conference presentations
Professional Development	Continuing education, innovation, best practices, emerging trends	Integrating current sustainability best practices, mentoring others, staying current with research and policy	Workshops, webinars, conferences, online courses, professional learning communities, peer coaching networks

6.2 Community Engagement and Extension

Home science professionals can extend impact beyond formal education through community engagement. Community workshops on sustainable cooking, food preservation, textile repair, energy efficiency, and zero-waste living provide practical skills while fostering social learning. Demonstration projects including community gardens, tool libraries, repair cafés, and clothing swaps showcase viable alternatives. Participatory approaches that engage communities as active agents prove most effective, building ownership and capacity for sustained change.

6.3 Research and Innovation

Advancing the field requires robust research addressing key gaps: effectiveness of behavior change interventions, cultural adaptations of sustainability practices, economic analysis of sustainable household practices, scaling mechanisms, and longitudinal studies examining sustained change. Technological integration including smart home systems, mobile applications, online platforms, and data analytics offers opportunities while requiring critical evaluation of equity implications and actual sustainability benefits.

7. EXEMPLARY INITIATIVES AND BEST PRACTICES

Several initiatives worldwide demonstrate successful integration of home science principles and sustainable development. The Zero Waste Families movement shows that comprehensive application of home science knowledge can reduce household waste by 80-90% through meal planning, bulk purchasing, composting, and DIY alternatives (Johnson, 2013; Singer, 2016). Nordic countries have systematically integrated sustainability throughout home economics education, with measurable impacts on youth behavior (Haapala et al., 2014; Haapala & Biggs, 2020). Community-Supported Agriculture (CSA) programs in Japan combined with traditional food preservation techniques achieve substantial food waste reductions, increased seasonal/local

produce consumption, and enhanced food security while supporting local agriculture (Nakano, 2018).

8. POLICY IMPLICATIONS AND RECOMMENDATIONS

Achieving sustainable development goals through household transformation requires supportive policy frameworks. Educational policies should mandate sustainability integration in home science curricula, provide professional development for educators, establish competency standards, and fund research. Governments and institutions should incentivize sustainable household practices through tax benefits, rebates, and subsidies; invest in enabling infrastructure; regulate greenwashing and require transparent environmental labeling; support community-based initiatives; and integrate household sustainability into national climate action plans and SDG implementation strategies.

Professional organizations should develop sustainability competencies for practitioners, create certification programs, facilitate knowledge exchange through conferences and publications, and advocate for policy changes supporting sustainable households.

9. CONCLUSION AND FUTURE DIRECTIONS

This comprehensive review demonstrates that home science occupies a unique and critical position at the intersection of everyday life and global sustainability challenges. Household practices across food and nutrition, textiles and clothing, housing and resource management significantly impact environmental, social, and economic sustainability. With household consumption accounting for 60-70% of global greenhouse gas emissions, transforming these practices represents an imperative pathway toward achieving the 2030 Sustainable Development Goals.

The discipline of home science, with its practical focus, systems perspective, and commitment to improving quality of life, is ideally positioned to bridge the gap between global sustainable development goals and local household actions. Through education, research, extension, and professional practice, home science can foster the knowledge, skills, attitudes, and behaviors necessary for sustainable living. Evidence presented indicates that sustainable household practices can reduce environmental footprints by 25-70% across different domains while often providing economic benefits.

However, significant barriers persist including behavioral and psychological factors, structural and systemic

constraints, and knowledge and skills gaps. Addressing these challenges requires multi-faceted approaches combining individual behavior change with systemic transformation. Educational reform, community engagement, supportive policies, and ongoing research must proceed simultaneously.

Looking toward 2030 and beyond, several trends will shape the future: circular economy principles influencing household practices, digital technologies creating new opportunities while raising equity questions, climate change necessitating adaptive strategies, growing recognition of traditional and indigenous sustainable practices, and increased emphasis on social sustainability and equity ensuring just and inclusive transitions.

Future research priorities include understanding behavior change mechanisms, ensuring equity and accessibility, developing robust impact measurement methodologies, identifying scalability pathways, examining cultural adaptation, evaluating technology integration, and exploring how household-level changes can drive broader systemic transformation.

In conclusion, achieving the 2030 Sustainable Development Agenda requires transformation at all levels of society. Households represent critical leverage points for change. Home

science provides the frameworks, knowledge, and practical approaches necessary to realize this transformation. By fully embracing sustainability as a core principle and working collaboratively across sectors and disciplines, home science can fulfill its potential to improve quality of life for current and future generations, truly embodying the essence of sustainable development.

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