



International Sustainable Chemistry
Collaborative Centre

Summary: Report on Sustainable Building and Living, Focus on Plastics

Abstract

Summary: Report on Sustainable Building and Living, Focus on Plastics

The International Sustainable Chemistry Collaborative Centre (ISC₃) has two main tasks:

- work on issues that are important to reach the Sustainable Development Goals (SDGs) and
- find out what Sustainable Chemistry can contribute to these goals.

The dimensions of this field are enormous. Chemicals are used in various ways in modern life. In particular, plastic materials have become extremely important in the building industry in the recent decades. Plastics are attractive for a few reasons: they are easy to handle, they are widely available, and they are relatively cheap. New and recycled plastic materials can play an important role in sustainable development. But they must be used responsibly.

In this report, experts, public authorities, and industry leaders discuss the sustainability of plastics as building materials through regional perspectives. The findings came from international workshops, interviews, online surveys, and contributions from experts. We approached the methodology in three steps:

1. A preliminary study to identify the main megatrends in the sector and the resulting questions we wanted to answer.
2. Dialogue with stakeholders through workshops in China, Kenya, Austria, and the USA.
3. The final report.

Chapter 1 – Introduction

We begin by laying out current plastics production in the world, which account for around 20 % of building materials used today. We investigate how the topic of ‘building’ is linked to the SDGs and the main megatrends in construction. This chapter describes in more detail the main questions related to these global megatrends: urbanisation, affordable housing, and resilience (Chapter 2); protection of human health and the environment (Chapter 3); and energy demand and energy resources in the life cycle of the building (Chapter 4). Some of the main questions that we investigate are:

- How can Sustainable Chemistry support sustainable building?
- How can we produce construction products that support the SDGs?
- What are the most relevant innovations and opportunities in Sustainable Chemistry?
- How can costs be reduced in the life cycle of a building?
- How can we create sustainable solutions for developing countries to construct ‘resilient buildings using local materials’?

Chapter 2 – Urbanisation, affordable housing, and resilience

The plastic building materials industry is now the second pillar in the plastics industry (after packaging), thanks to the rapidly growing real estate sector and increasing investments in infrastructure. We expect that about 10 billion people will live on this planet in 2050, and more than two-thirds of them will live in urban areas. Because this boost in urbanisation is expected to take place mainly in Africa and Asia, we focus on these perspectives in our investigations. Developing countries will be confronted with two main challenges related to this growth: providing affordable and quality homes and infrastructure, and battling the destruction of the environment. So we focus on the question:

- What role can policy decision-makers, companies, researchers, or communities play in finding alternative solutions to the threats of this global trend?

Chapter 3 – Protecting human health and the environment

Plastic building materials can help us reach important SDGs, such as reducing the energy consumption of buildings. But at the same time, they can conflict with other goals, like the protection of health and environment. We investigate polymers and chemical additives in buildings, which have a life cycle that is not in line with the 2030 SDG Agenda. To make matters worse, the content of building materials is not regulated in large parts of the world. Investments have been made in linear, toxic, wasteful production for decades, which is now the status quo. We discuss the questions:

- If additives in plastic materials cause indoor air problems, should the plastic materials be avoided altogether?
- What if the workers cannot process hazardous materials in a safe manner?
- Can we use alternative products, especially from renewable sources?
- What if it is not possible to reuse or recycle plastic materials?

The chapter also looks at the question of whether fire/smoke toxicity is a considerable problem, and at policy, regulations, and necessary innovations from a US perspective.

Chapter 4 – Resource demand and recycling

Experts estimate that there is a very high potential for energy-saving in plastic insulation. But they also point out that the production, recycling, and disposal of plastics demand a high amount of energy as well. The report shows how life cycle analysis can assess overall energy use from construction to maintenance. We asked an architect the following questions:

- What kind of expertise can the architect provide to cover all aspects of this project, from design to mathematics, from physics to chemistry?
- Amidst global challenges in ecology and sustainability, how can we ensure future-proof construction?

From the perspective of the closed-circle economy, our experts discuss the ‘dissipative use’ of products, the dual character of waste and resources, the role of time and the ‘entropy dilemma’.

Chapter 5 – Summary, outlook, and recommendations

In this final chapter, we discuss how conditions and resources vary in each country and region. There is no one-size-fits-all solution for making the construction and housing industry sustainable in one go. Solutions depend on the region’s climate, available raw materials, and other local conditions. We want to know:

- How can we motivate all stakeholders to support sustainable construction and buildings, with or without plastics?

For this purpose, we make a list of recommendations related to research, innovation, development of competencies, policy, and dialogue with stakeholders. Some recommendations need an international solution to be successful, while other recommendations need a regional solution. And in some cases, a local solution must be found. Although we believe a top-down approach is the best, a bottom-up approach or a combination of the two may be more appropriate in some circumstances. In any case, putting these recommendations into practice will lead to a more sustainable building sector.

About ISC₃

ISC₃ is an international centre that promotes the transition of the chemical and related sectors to Sustainable Chemistry. The Centre takes a multi-stakeholder approach, targeting policy makers, the public and private sectors, academia and civil society. ISC₃ contributes to international chemicals policy, develops professional and academic trainings, offers advisory services, fosters innovations, supports entrepreneurship and conducts research. Its international activities are focused on Europe as well as on selected developing and emerging countries. The ISC₃ is hosted by the German GIZ (Gesellschaft für Internationale Zusammenarbeit) in cooperation with Leuphana University Lüneburg as ISC₃ Research & Education Hub and DECHEMA e. V. (Society for Chemical Engineering and Biotechnology) as ISC₃ Innovation Hub. The centre was founded in 2017 on the initiative of the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU now BMUV) and the Federal Environment Agency (UBA).

Read our [full report](#) for more information. | www.isc3.org

Contact:

Claudio Cinquemani,
Director Science & Innovation
M + 49 228 90 241 130
E claudio.cinquemani@isc3.org

Oleg Ditkovskiy, Workstream Manager
M + 49 175 447 64 86
E oleg.ditkovskiy@isc3.org

ISBN 978-3-9823669-0-6



97 839823 66906