

## *System Generation for Smart Waste Collection*

### Who is behind this challenge?

Infineon Technologies AG is a world leader in semiconductor solutions that make life easier, safer and greener. Microelectronics from Infineon are the key to a better future. With around 50,280 employees worldwide, Infineon is the link between the real and the digital world. In the fiscal year 2021, Infineon reported revenue of more than €11 billion.

Municipalities: The collection and recovery of household waste at the municipal level are mostly governed by municipal ordinances.

### Introduction

Increased pace in the development of cities and countries over the last decades, comes with the increased amount of consumption of resources. While consuming these resources, we usually neglect the fact that we are using far more than our earth can sustainably supply. According to PACE (Platform of Accelerating the Circular Economy), only 8.6% of our consumption is cycled back out of 100 billion tons of raw material annually. Poorly managed waste when contaminates with lands and oceans poses a danger to the environment and to human health, as well. Recent findings show that, humans in average may ingest up to 5 grams of microplastics weekly, which weighs equal to an average credit card that can be found in everyone's wallet.

With the technological developments in the last century, semiconductors have been an essential part of the information revolution, which reshaped our society. Modern society would not exist without this vital resource. Moreover, semiconductors are fundamental to many sustainability solutions such as automation, smart infrastructure, electrification, virtualization, and mobility.

### Problem Definition:

Solid waste management also known as municipal waste is a crucial part of planning sustainable and inclusive cities for communities. Contribution of waste management to total global greenhouse emissions is around 5 percent, which may be resulting from insufficient waste collection, inadequate waste dumping and/or burning strategies. Moreover, waste management can be the single highest budget item for many local administrations. Municipalities in low-income countries are spending about 20 percent of their budgets on waste management, on average—yet over 90 percent of waste in low-income countries is still openly dumped or burned.

Waste collection is a fundamentally important step in overall waste management. Collection strategies may vary depending on the geography, population, income levels, and many other factors. The main goal of a waste collection strategy is to collect in a timely and economical manner, in order to ease the subsequent waste sorting and/or treatment stage with the aim to maximize re-use and recycling for enabling circular economy.

## What is the waste challenge?

In the book *What a Waste 2.0* that is published by World Bank Group, annual municipal waste generation is around 2.01 billion tons worldwide and is expected to steadily increase up to 3.40 by 2050 according to their waste generation projection. In order to cope with this immense amount of waste generation, we need advance waste collection strategies.

How can Infineon products and services be used for enabling digitalization in waste management particularly waste collection strategies?

- What is the status on municipal waste collection? (e.g. current status + market research)
- How can the municipal waste collection be established, enabled, strengthened with technologies using semiconductors? (e.g. robotics, sensors, AI, IoT, Deep Learning, Quantum computing, Big data)
- What are the strengths, weaknesses, opportunities, and threats of the waste collection system you suggested and how can the risks be managed?
- What are the environmental, social, economic, and governmental implications of your waste collection?

## Desired Impact of Challenge:

**The proposed outcome is desired to hold a potential connected solution covering different aspects on:**

- Health and Well-being  
Improvement of overall well-being and creating safe living working conditions.
- Biodiversity  
Preserving the variety of life that can be found on the earth.
- Climate Protection  
Reducing greenhouse gas emissions.
- Food and Water  
Increasing access to healthy food and clean water.
- Energy and Mobility  
Ensuring access to energy, the ability to get around.
- Resilience  
Building people's capacity to survive or even thrive in the face of disruption.
- Jobs and Livelihoods  
Providing meaningful work and building assets in a community.

**The proposed solution to the challenge is also expected to be aligned with UN Sustainable Development Goals (SDGs).**

- GOAL 3: GOOD HEALTH AND WELL-BEING: Ensuring healthy lives and promoting the well-being for all at all ages is essential to sustainable development.
- GOAL 6: CLEAN WATER AND SANITATION: Clean, accessible water for all is an essential part of the world we want to live in.
- GOAL 7: AFFORDABLE AND CLEAN ENERGY: Ensuring access to affordable, reliable, sustainable and modern energy for all in order to accomplish continuous development

- GOAL 9: INDUSTRY, INNOVATION AND INFRASTRUCTURE: Investments in infrastructure are crucial to achieving sustainable development.
- GOAL 11: SUSTAINABLE CITIES AND COMMUNITIES: There needs to be a future in which cities provide opportunities for all, with access to basic services, energy, housing, transportation and more.
- GOAL 12: RESPONSIBLE CONSUMPTION AND PRODUCTION: Assurance of sustainable consumption and production patterns
- GOAL 13: CLIMATE ACTION: Taking action for climate change and its impacts
- GOAL 15: LIFE ON LAND: Protecting, restoring and promoting sustainable use of terrestrial ecosystems, management sustainably of forests, combat desertification, and halting and reverse land degradation and halting biodiversity loss
- GOAL 14: LIFE BELOW WATER: Careful management of this essential global resource is a key feature of a sustainable future.

### Skills needed/recommended

An **interdisciplinary team** approach is encouraged. People from different background of academic education is expected to contribute to the common goal.

### Relevant considerations for the challenge / theme:

In this challenge, technologies mainly refer to semiconductor-embedded electronics such as robotics, AI, IoT, deep learning, quantum computing, big data, and sensors. While providing solution proposal, business impact assessment should also be considered besides technological and innovative aspects.

### Relevant links:

- *Applications of Infineon semiconductors*  
<https://www.infineon.com/cms/en/applications/>
- *Infineon products*  
<https://www.infineon.com/cms/en/product/>
- *Sustainability at Infineon*  
<https://www.infineon.com/cms/en/about-infineon/sustainability/>
- *Infineon Sustainability Report*  
<https://www.infineon.com/cms/en/about-infineon/sustainability/csr-reporting/>
- *European Environment Agency – Digital Technologies on Waste Management*  
<https://www.eea.europa.eu/themes/waste/waste-management/digital-technologies-will-deliver-more>
- *What a Waste 2.0: A Global Snapshot of Solid Waste Management to 2050*  
<https://openknowledge.worldbank.org/handle/10986/30317>