

The environmental impact of PET-CT

The assessment of the energy consumption and waste production throughout the PET-CT procedure and the production of the radiopharmaceuticals.

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Supervision

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Aim

- Measure the energy consumption and waste production and find the hotspots.
- Implement some measurements to reduce the environmental impact of PET-CT.

Introduction

Medical imaging is established to be a significant contributor to the greenhouse gas (GHG) emission of hospitals (13). Diagnostic imaging is performed with **high-tech and energy-intense medical equipment**. In addition, the material resource usage and waste production are presumed to be high. The environmental impact is measured for some imaging techniques, also shown in section Literature review. However, no research has been published on the environmental impact of Positron Emission Tomography (PET) imaging in combination with Computed Tomography (CT). Therefore, the **PET-CT Discovery MI 5-ring scanner** of the Alrijne Hospital in Leiderdorp is investigated. Additionally, the **production of radiopharmaceuticals** is also analyzed. This research is mainly focused on energy consumption and waste production since these life-cycle phases occur inside the hospital.

Energy consumption

The environmental impact of the energy that is consumed by different steps throughout the process will be obtained based on the Ecoinvent database.



Scanner

Energy measurements will be conducted for at least 1 month with the real-time Fluke power detector. In total, four different settings will be tested:

1. System on (computer and PET-CT system on).
2. Turning off the computers and leaving the PET-CT on during off-hours.
3. Turning off the computer system and putting the PET-CT in standby.
4. Turning off the computer system and putting the PET-CT in energy saving mode.



Reporting stations & Desktop computers

Energy measurements will be conducted with a real-time power detector measuring stand-by and off-mode during off-hours.



HVAC

Energy consumption of the HVAC of the PET-CT will be estimated based on a special software of Alrijne Hospital.



Radiopharmaceuticals

The energy consumption of the cyclotron and HVAC of the cleanrooms will be gathered from data of the RadboudUMC Translational medicine department. Additionally, an estimation of the waste production of the disposables used during production of the radiopharmaceuticals will be made.

Literature review

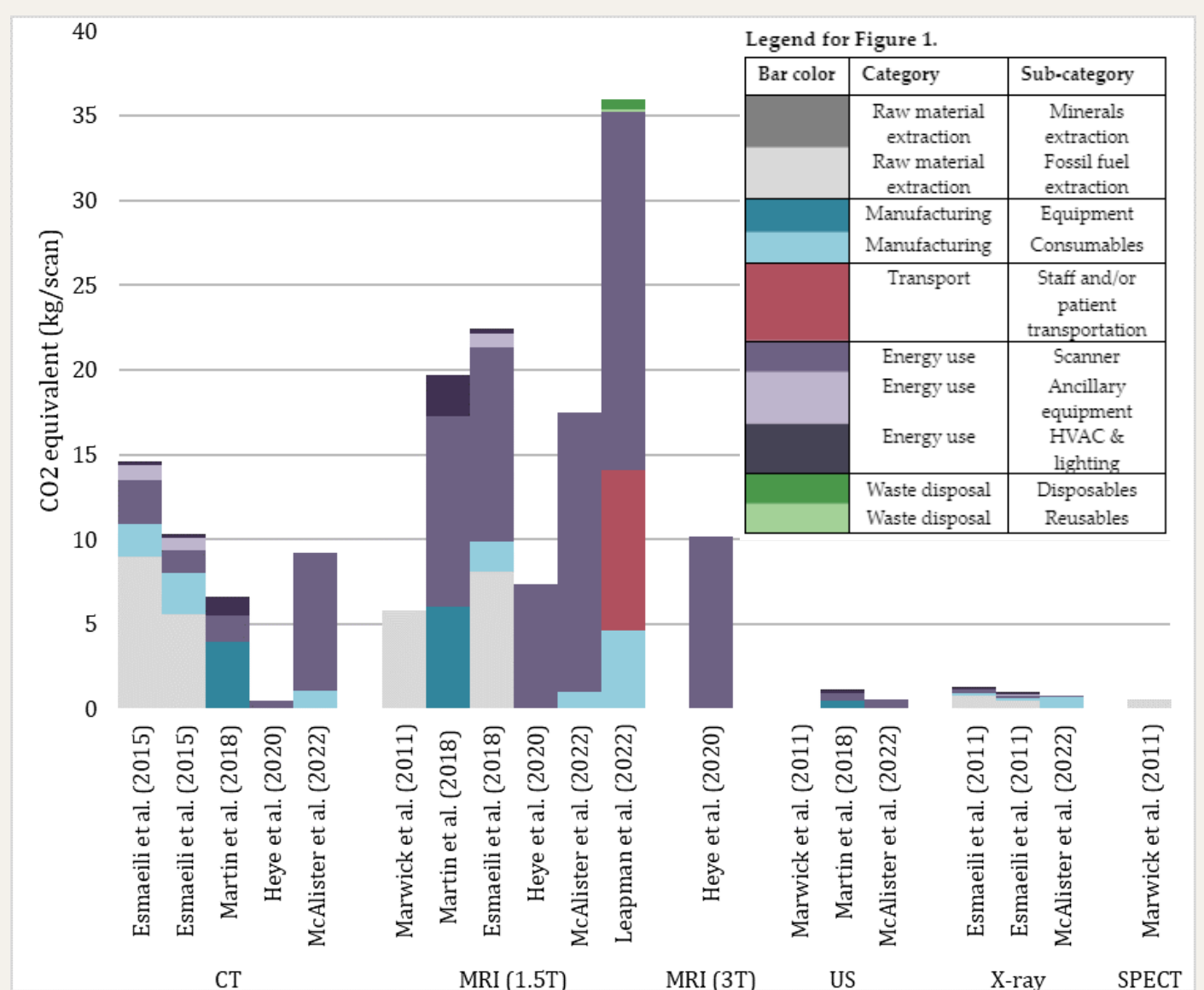


Figure 1. Carbon footprint results imaging modalities received from literature.

Waste production

The waste production for one F18 FDG PET-CT procedure.

3 pairs of gloves

1 NaCl syringe and 1 radiopharmaceutical syringe

1 reusable towel and 1 paper towel

1 celluloid mat

1 sodium chloride IV flush system

1 infusion patch

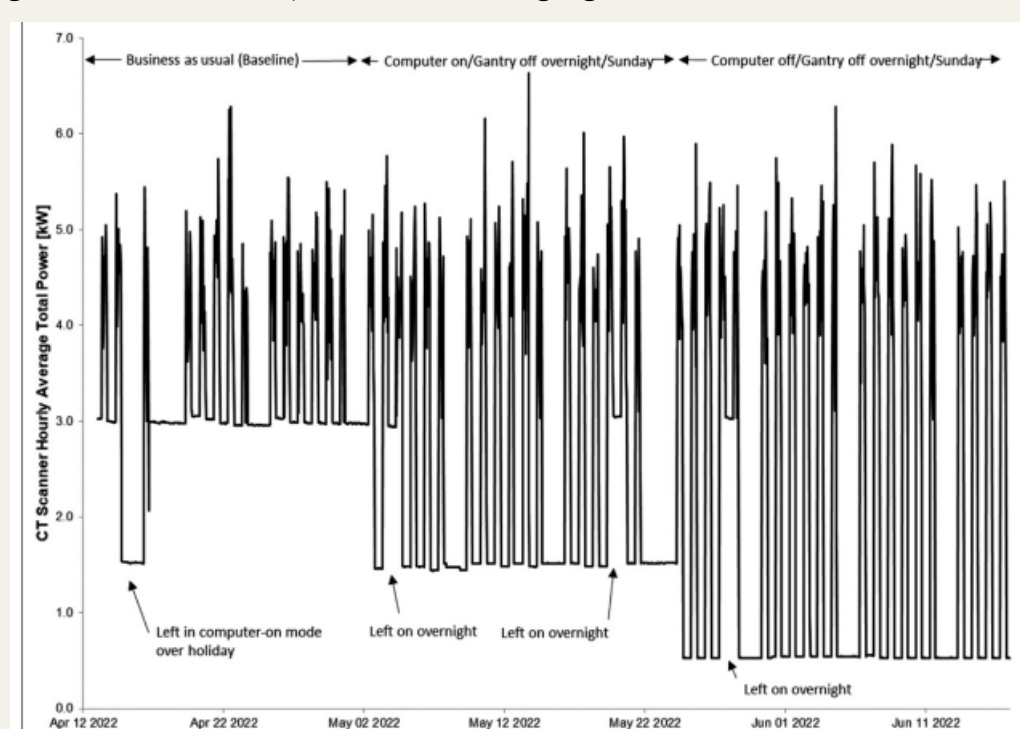


Figure 2. Example energy analysis of CT scanner (Brown et al.)