Loughborough University

24MPC101

Sustainability, Recycling and Environmental Issues

Semester 1 2024/25 In-Person Exam paper

This examination is to take place in-person at a central University venue under exam conditions. The standard length of time for this paper is **2 hours**.

You will not be able to leave the exam hall for the first 30 or final 15 minutes of your exam. Your invigilator will collect your exam paper when you have finished.

Help during the exam

Invigilators are not able to answer queries about the content of your exam paper. Instead, please make a note of your query in your answer script to be considered during the marking process.

If you feel unwell, please raise your hand so that an invigilator can assist you.

You may use a calculator for this exam. It must comply with the University's Calculator Policy for In-Person exams, in particular that it must not be able to transmit or receive information (e.g. mobile devices and smart watches are **not** allowed).

Answer **ALL** questions. Each question carries 20 marks.

1. (a) The recycling rates of household packaging waste collected in France in 2021 are given in Table Q1.

Table Q1

Packaging material	Recycling rate (%)
Aluminium	58
Cardboard	72
Glass	88
Plastic	30
Steel	100

(i) Explain why recycling rates vary significantly depending on material type. [6 marks]

(ii) Waste electrical and electronic equipment (WEEE) has a recycling rate of around 17%. Discuss reasons why this is so low in comparison to other types of waste and why WEEE is an important resource. [4 marks]

(iii) Bioplastics are becoming more commonplace. Give an example of a bioplastic and discuss the different waste management options for a bioplastic at end-of-life. [6 marks]

(b) The move towards electrification has seen a shift in the use of critical minerals in vehicles. Discuss factors which might impact the availability of such minerals and why the UK government recently announced a new “UK Critical Minerals Strategy” in 2022. [4 marks]

2. Water and energy requirements are being considered for a new settlement planned for 2028 on an island off the coast of a northern European country. The island contains a dormant volcano, and an aquifer has been identified on the island which can provide approximately 150,000 L of potable water per day.

(a) Discuss potential sources of low carbon energy which could be implemented for the community of this new settlement. [5 marks]

(b) Would it be possible for the community to solely rely on these low carbon energy sources? [2 marks]

(c) Initially, plans are being drawn up for an estimated population of 500 people in 2028, which will increase to 15,000 people over the subsequent 10 years.

(i) Would the aquifer be a suitable water source for the settlement? [2 marks]

(ii) Discuss other sources of water which the settlement could consider. [4 marks]

(d) You are advising the local authority on a waste management strategy for domestic waste for this new settlement.

(i) Compare energy recovery by incineration with managed landfill as waste management options. [4 marks]

(ii) Suggest some legislative actions that could be enforced to prevent environmental crime such as air and water pollution as the community grows. [3 marks]

3. (a) A UK-based company is developing new plastic packaging for their range of fruit and salad trays, which are made from polyethylene terephthalate (PET).

(i) Suggest some design considerations that will ensure the packaging is fully recyclable upon disposal. [3 marks]

(ii) Up until now the company has used 100% virgin PET for their trays. Discuss the implications of moving to 100% recycled PET. [4 marks]

(b) The company also manufacture plastic cups from a bioplastic which is compostable under industrial composting conditions. They claim the following statements when marketing these bioplastic cups. Discuss reasons why these statements might be misleading.

(i) “This cup is 100% Biodegradable and Recyclable” [3 marks]

(ii) “Using these cups is kinder to the planet” [2 marks]

(c) Life cycle assessment (LCA) is a process for evaluating the environmental burdens associated with a product, process or activity. State the components of LCA and discuss why each is important to the LCA process. [8 marks]

END OF PAPER

Dr F Hatton