Climate Impact Assessment

PLY-5800-25

28-10-2025

Plymouth Food Waste Service Collection Service

Project details

Assessment author

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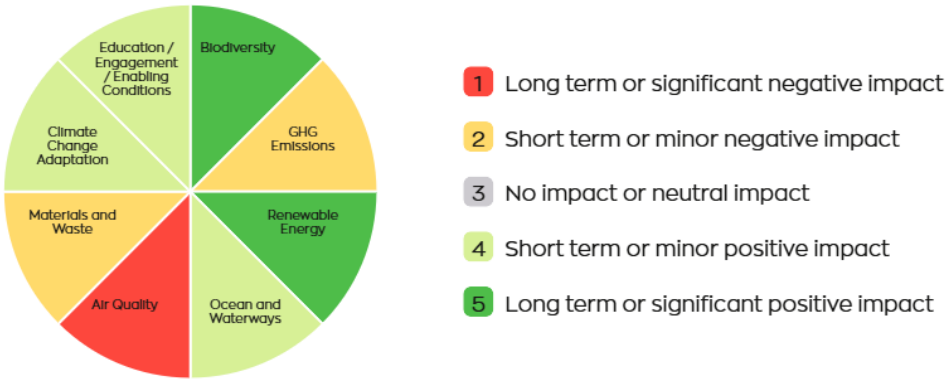
Project summary

The project is a legislatively driven initiative in accordance with section s45A of the Environment Act 1990 brought into legislation by The Environment Act 2021. The implementation of a city-wide food waste service is mandatory and scheduled to be implemented by 1 April 2026

Summary of assessment



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Assessment scores

Biodiversity

Score

(5) Long lasting or extensive positive impact

Score justification

Bio Diversity 5

Positive impact of removing food waste:
Climate Impact on Biodiversity

Introducing a food waste collection service supports biodiversity by reducing the volume of organic waste that would otherwise be improperly disposed of. When food waste is collected and treated through composting or anaerobic digestion, it can be transformed into nutrient-rich outputs such as compost or biogas. These outputs contribute to healthier soils and cleaner energy, which in turn support plant growth and reduce environmental stressors. By encouraging responsible food waste management, the service helps protect habitats, supports pollinator populations, and reduces the presence of harmful substances in natural ecosystems.

The project also has indirect impact on Biological Diversity in the following ways.
1. Habitat destruction and land use change. Growing and producing food requires a significant amount of land, water, and other resources. When food is wasted, all those resources go to waste as well. This land use change can lead to the destruction of natural habitats. This project will in the long term encourage people to change their consumption which originally leads to food waste but also to recycle food which can then be used for manure, renewable fuel to encourage biodiversity.
2. Water pollution: Food waste can pollute water sources. When food waste is dumped it decomposes and produces methane gas, which can seep into nearby water sources and contaminate them. Food waste can also contain harmful chemicals and pesticides that can pollute water sources and harm aquatic life. Anaerobic digestion significantly alters the chemical composition of food waste. Volatile fatty acids (VFAs), proteins, and lipids are broken down by microbial consortia into simpler compounds like methane, carbon dioxide, and digestate. Ammonia and hydrogen sulphide, which can be toxic in high concentrations, are produced but typically managed through process control. Digestate, the solid and liquid residue, contains fewer harmful organic compounds than raw food waste and can be used as fertilizer if properly treated. By treating food waste in this way there is a greater chance of a flourishing ecosystem that encourages biodiversity.
3. Loss of pollinators: Pollinators such as bees, butterflies, and birds are essential for maintaining plant biodiversity and food production. However, food waste can reduce the number of pollinators by destroying their habitats and reducing the availability of food sources. In addition, food waste can also contain harmful chemicals that can harm pollinators and other beneficial insects.
At present food waste goes to Energy for Waste. Energy for Waste facilities often require significant land area, which can lead to the destruction or fragmentation of natural habitats that support pollinators like bees, butterflies, and hoverflies. Incineration-based EfW plants may emit pollutants such as nitrogen oxides, particulate matter, and heavy metals. These can settle on nearby vegetation, potentially affecting the health of pollinators and the plants they rely on. Energy for Waste facilities with large paved or industrial surfaces can increase local temperatures, which may alter flowering times or reduce the availability of nectar and pollen.

By creating a food waste collection service, the amount of uncontrolled food waste can eliminate this issue.

GHG Emissions

Score

(2) Short term or limited negative impact

Score justification

Untreated food waste alone generates about 8% - 10% of global greenhouse gas emissions. Most of Plymouth's food waste goes to the Energy for Waste plant. UK EfW facilities emitted approximately 14.4 million tonnes of CO₂ equivalent (MtCO₂e) in 2022, accounting for 3.5% of the UK's net annual territorial GHG emissions. About 50% of the waste processed in EfW plants is biogenic (e.g. food, paper), which can be considered carbon-neutral. The remaining fossil-based portion (e.g. plastics) contributes to net GHG emissions. Anaerobic digestion can reduce net CO₂e emissions by up to 30 million tonnes per year in the UK if scaled properly. There will be emissions from food waste vehicles which have been estimated at 568 tCO2e/year based on mileage of existing waste collections.

Renewable Energy

Score

(5) Long lasting or extensive positive impact

Score justification

First, the food is separated from its packaging and to further sort plastic packaging/polymer type. The food is converted to energy using the anaerobic digestion process which generates heat, biogas (biomethane) and electricity. The electricity generated is fed into the national grid. What is left after the anaerobic digestion process is pasteurised into a nutritionally rich slurry and used as organic fertiliser. This process will be critical for producing a closed loop sustainability cycle.

initially diesel trucks will be used which will increase the use of fossil fuels in the short term but that the plan would be for them to be replaced with EV trucks at the next scheduled replacement of the fleet.

Mitigatory measures applied:

To ensure that there are contractual KPIs to demonstrate sustainability outputs from the Anaerobic Digestion process which will be delivered by a third party. Ocean and Waterways Score:

Ocean and Waterways

Score

(4) Short term or limited positive impact

Score justification

Incineration process at the Energy for waste plant produces toxic ash and airborne pollutants (e.g. dioxins, heavy metals) that can settle into water bodies via atmospheric deposition or runoff from ash Leachate from storage or disposal of incineration residues can contaminate groundwater and surface water if not properly managed. Incineration does not remove microplastics from food packaging. These can enter waterways if waste is mismanaged before incineration. Marine debris and plastic pollution are exacerbated by poor segregation and pre-treatment of food waste streams. Incineration also destroys organic nutrients that could otherwise be recycled, reducing the potential for soil improvement and nutrient retention that helps prevent runoff into waterways.

The processing of food waste via an Anaerobic Digestion process minimizes the release of nutrients and organic pollutants into water systems by stabilizing waste and producing digestate that can be safely used as fertilizer if treated properly. It supports nutrient cycling, reducing the need for synthetic fertilizers that often contribute to eutrophication in aquatic ecosystems. AD systems can however accumulate microplastics from contaminated food waste, which may enter soils and potentially leach into waterways if digestate is not properly filtered or treated. It should be noted however that advanced mitigation strategies (e.g. biochar, filtration) are being developed to address this risk.
Compared to incineration, AD produces less hazardous waste and is less likely to contribute to toxic runoff or leachate that harms aquatic life.

Air Quality

Score

(1) Long lasting or severe negative impact

Score justification

This project is likely to increase the number of diesel-powered waste vehicles on the road which is negative. Emissions of particular concern are NOX and particulates. NOX emissions arise primarily as nitric oxide (NO) which is rapidly oxidised to nitrogen dioxide (NO2). At high ambient concentration levels, NO2 has health impacts on sensitive people. Particulates arise from diesel vehicles and contain a mixture of soot, unburned fuel and hydrocarbon compounds produced during incomplete combustion. They are now the major source of grime in towns and cities throughout the UK. Air Quality in Plymouth is monitored and deemed to be overall "good". Adding an additional 10 diesel vehicles will add to the deterioration of air quality but at in incremental and insignificant level.

The allocated DEFRA funding for vehicle procurement was not sufficient for the operational requirement within Plymouth to purchase Electric vehicles at the time of purchase deadlines, the requirement for suitable infrastructure was not a consideration within the funding, which to convert the current depot was considerable. Current high costs of these vehicles would be prohibitive to budgets and not bring value for money to the Council. Future consideration once infrastructure and suitable alternatives are available can be reviewed with future procurement.

Mitigatory measures applied:

1.Procuring an Anerobic Digestion Site within close proximity to reduce the impact of using Diesel vehicles.
2. Procuring some or all electrical waste vehicles in the future when the market matures and infrastructure technology is competitive.
3. Cost v Benefit Analysis on procurement of hydrogen vehicles.

Materials and Waste

Score

(2) Short term or limited negative impact

Score justification

Food Waste Material:

Indicative food waste studies conducted in 2022 by a “Local Partnerships” study estimates a yield of a little over 10,000 tonnes per annum of food waste for Plymouth in 2026/2027. Frith RM Consultants working with the project estimated in 2024 food waste for Plymouth to be around between 4,483 tonnes (FRM ‘top down) to 6,736 tonnes (WRAP yield). The food waste project would mean that in due time (depending on participation rates) the tonnage of food waste going to the Energy for Waste plant will be taken to an Anaerobic Digestion site which will produce slurry that goes back to the earth as fertilizer for plants and for renewable energy to be produced.

Plastic Footprint:

There is however a plastic footprint disbenefit of providing more than 200,000 plastic containers where potentially 60-80% may not be used for food waste recycling. This will be mitigated by a robust public engagement exercise to increase participation.

Plastic Lifecycle:

Environmental Performance of IPL Plastics Caddies: The Council has awarded a contract to IPL Plastics UK Ltd to supply its internal and external caddies. According to the IPL the caddies produced for PCC are produced from 100% recycled material and can be recycled at the end of life. In producing the caddies they produced 85% less GHG emissions from recycled plastics compared to virgin plastics.
66,500+ tonnes CO2 (equivalent) avoided, equivalent to powering over 13,000 homes for a year. Emission factors for IPL’s recycled PP and HDPE are lower than DEFRA’s closed-loop plastic benchmark

Liners:

Residents have the choice to use the initial "compostable" liners at the beginning of the roll out of the food waste collection service. In the future residents have the choice to use supermarket plastic bags, newspapers or nothing to collect their food waste. The Climate impact assessment of the different choices are:

Compostable Bioplastics (e.g. PLA, PBAT blends)

Made from renewable resources like corn-starch or sugarcane.
Designed to break down in industrial composting or anaerobic digestion (AD) facilities. Lower GHG emissions compared to conventional plastics.
Risk: If not certified or properly processed, may contaminate compost or digestate.

Conventional Plastics (e.g. HDPE, LDPE)

Durable and cheap but non-biodegradable. Can introduce microplastics into soil if not removed before composting or AD. Higher carbon footprint due to fossil fuel origin and poor end-of-life outcomes.

Paper Liners or Newspaper

Biodegradable and compostable. Low embodied carbon. May lack durability or leak resistance.

Climate Change Adaptation

Score

(4) Short term or limited positive impact

Score justification

Food waste recycling plays a critical role in climate adaptation by reducing greenhouse gas emissions and enhancing the resilience of urban systems. When food waste is processed through anaerobic digestion it prevents the release of methane—a potent greenhouse gas—and instead generates renewable energy or nutrient-rich soil amendments. This not only mitigates climate impacts but also supports sustainable agriculture and urban greening initiatives. By embedding food waste recycling into local infrastructure and behaviour change campaigns. Plymouth can reduce their carbon footprint, improve waste system efficiency, and foster community-level climate resilience.

Mitigatory measures applied:

By continuously consulting with the Net
Zero Delivery Team throughout the life cycle of the project.

Education / Engagement / Enabling Conditions

Score

(4) Short term or limited positive impact

Score justification

This project is not just a technical delivery to meet legislative requirements. At the heart of the success of the project is winning the hearts and minds of the public through a robust, well managed, consistent, informed educational campaign. The message will likely need to be novel, innovative and collaborative and have long term climate awareness beyond food waste. Public engagement will begin with learning lessons from other local authorities on what has and has not worked well in the past. This will be followed by a steady messaging vehicle to include.
1. Roadshows
2. Engagement and collaboration with Green communities
3. A school’s programme
4. Videos
5. Targeting all social Media platforms
6. Leaflets
7. Press articles
The overarching achievement of the education programme is to raise awareness of climate change and to change personal behaviour and personal responsibility towards climate change.

Mitigatory measures applied:

1. Research what has worked.
2. Collaboration.
3. To have champions in problem areas.
4. To have recycling officers.

5. To undertake a through stakeholder Analysis.
6. To understand stakeholder needs thoroughly.