Cost Benefit Analysis Case Study – Plastics

ALL SECTIONS DUE, 3pm 5th June. Submitted online.

Instructions:

This assignment will consist of a group task worth 30% and an individual reflection worth 10%, for a total of 40% of your final grade. The case study can be done individually or as a group. Please note that this task is a significant amount of work for an individual, so groups are encouraged.

The assignment must be submitted electronically through the Online Submission links in the Assessment section of the Course Blackboard site.

- Part 1 MUST be submitted as an Excel file (.xls or .xlsx) – only one submission per group is required.
- Part 2 MUST be submitted as a Word file (.doc or docx) – only one submission per group is required.
- Part 3 MUST be submitted as a Word file (.doc or .docx) – each student must submit *their own reflective task* for marking.

Further details to be announced on Blackboard.

Groups must be finalised by 5pm, 2nd June. No changes are allowed after this date.

Remember that each value should be entered into the spreadsheet only once.

Marked out of 80 points (weighted to 40% of your final grade).

Background:

Australia's plastic waste problem has sparked a major overhaul of the recycling sector, China's decision to stop accepting certain types of recyclables from other countries, including Australia, has had significant impacts on the industry. Following this, the Federal government has implemented new policies that place a greater emphasis on recycling and waste reduction, further driving changes in the sector. These policy shifts have led to the emergence of new recycling programs aimed at increasing the number of recyclable materials processed within Australia and reducing the reliance on exporting waste overseas.

ReNew is an up-and-coming company that is considering investing in a plastics recycling program to reduce waste, capitalising on the market changes driven by the Federal government's policies. To assist in evaluating the investment, ReNew has asked you to provide a cost-benefit analysis (CBA) to determine the feasibility of the project. "ReNew Furnishings" will be the subsidiary that specializes in creating eco-friendly furniture and textiles from recycled plastics. By implementing a recycling program, the company hopes to reduce its environmental impact and position itself as a leader in sustainable manufacturing practices.

ReNew is expected to begin production in 2024 and will run for 20 years. The initial capital investment will occur in 2023. In your report to ReNew, you will need to discuss the results from the Investor, Social and Disaggregated analysis. You will also need to consider any relevant literature or reports on the evaluation of the external benefits of the recycling program to the Government and local communities.

Part 1- Spreadsheet Group Task – 30 marks (15%)

[Use the template Excel File on the BB website]

a) Market and Investor Analysis

The recycling project is complex and will consist of a full-scale recycling plant that will produce both recycled textiles and recycled chairs. Both will be made from rPET which comes from donated materials.

The project is expected to be implemented in two stages. Stage 1 will focus on setting up the facility and begin production of recycled polymer textiles (polyester fabric). Stage 2 will involve expansion into furniture production where ReNew will produce outdoor plastic chairs for sale.

To begin the project, ReNew will purchase an existing warehouse facility at a cost of 1.1 million dollars. ReNew will need to purchase the following as part of the initial investment:

- 5 plastic shredding machines to break down the plastics into smaller chunks. Each shredder costs $200,000.
- 5 plastic granulator machines to prepare plastic for re-moulding at a cost of $50,000.
- 10 plastic extruders at a price of $75,000.

- 300 storage containers to store the granulated plastic between stages of production. Each container costs $400.
- 3 Forklifts to move containers around the facility at a cost of $30,000 per forklift.

As ReNew plans to produce textiles and chairs from donated plastics, the company will need to also purchase 20 drop-off bins for donations at a price of $605 and two transportation vehicles at a cost of $150,000 to move donations between the drop-off points and the recycling facility.

Stage 2 is expected to start in 2026. As part of Stage 2, ReNew will need to purchase two recycled plastic chair machine moulds at a cost of $150,000.

As part of the project, the ReNew will need invest in working capital in 2024 to assist in developing the project. The working capital includes the resources highlighted in Table 1:

Item	Units	Price Per Unit
Fuel (litres)	200	$1.80
Spare Blades	15	$1,500.00
Spare Sieves	10	$750.00
Storage Containers	40	$400.00

Table 1: Working Capital

In addition to the working capital, ReNew expects the following operating costs:

Item	No.	Price/Cost
Water (ML)	450	$45.00
Waste Disposal & Maintenance	12	$1,100.00
Utilities	4	$3,500
Administration (/month)	12	$1,500.00
Management (/month)	12	$2,000.00
Miscellaneous		$18,000.00

Table 2: Operating Costs

As part of the upkeep of the shredder and granulator, ReNew will need 15 spare blades per year at a cost of $1,500 per blade and the plastic sieves will need to be replaced each week at a cost of $750 per week.

ReNew will require a business licence, renewed each year at a cost of $60,000 and will need to rent 150 hectares of land for extra storage of the granulated plastics. This will cost $300 per hectare. It is expected that the transportation vehicles will use 5000 litres of fuel each year to collect the donated plastics and move the granulated plastics between storage and the facility.

The wage expenses for the project include:

- One project manager at a salary of $185,000 per year.
- The project requires 4 casual workers who are expected to work 300 days of the year on average. Each day of casual labour is expected to cost $250 per worker.

Insurance is complicated. The insurance will be 2.5% of the initial investment cost (fixed costs). However, the insurance must increase when the additional assets are purchased in 2026. After 2026, the insurance cost will remain the same.

To finance the initial investment costs, ReNew will take out a business loan of 2 million dollars at an interest rate of 6.5% per annum. The loan will have a 12-year term starting from 2024. Additionally, in 2026 ReNew will borrow the full cost of the recycled chair mould machines at an interest rate of 8.9%. This second loan will have a balloon option of 30% (a lump sum payment at the end of the loan) and a term of 4 years with repayments starting in 2027. The company will use the interest rate of the balloon loan to determine the repayments for the loan (i.e., the 8.9% fixed rate). *Both loans are from foreign banks*.

For depreciation purposes, only the following assets are eligible to be depreciated:

Shredders	15
Granulators	15
Extruders	10
Transportation Vehicles	5
Forklifts	5
Recycle Plastic Chair Machine	10

Table 3: Depreciation

Assume the depreciation of the recycled plastic chair machines starts in the year of purchase. The tax rate on profits is 30%. Assume the salvage value for all investment costs is 10% of the initial fixed investment cost plus 10% of the additional investment cost (for capital purchased in year 2026).

ReNew expects 165 tonnes of granulated materials will be recycled per year through their facility (accounting for losses in the process). There are two sources of revenue, to calculate the expected revenue ReNew provides you with the following information.

1) 20% of production will focus on textiles. The price of recycled textiles is $1.50 per metre and each meter of recycled textiles weighs 250g.
2) 80% of production will focus on outdoor chairs. It takes 6kg of recycled plastics to produce a single recycled outdoor chair. Each chair can be sold for $60.

Full capacity of the project is not realised immediately. To account for this, assume the project is expected to reach 50% capacity in 2024, 80% capacity in 2025. *In the first two years ReNew can only produce textiles.* By 2026 the facility will be at full capacity, producing textiles and chairs.

Using a conversion factor of 10,000 and the information above, you have been asked to calculate the following:

i) The IRR and NPV for the Market Analysis at a 5%, 10% and 15% real discount rate.
ii) The IRR on equity and NPV for the business at a 5%, 10% and 15% real discount rate for the Investor Analysis.

b) Social Analysis

You now need to consider the social CBA. Due to taxes, duties, and subsidies we are required to calculate the relevant shadow prices for the following:

Input Item	Percentage
Duties*:	
- Shredders	15%
- Granulators	10%
- Transportation Vehicles	20%
- Forklifts	15%
Subsidies:	
- Drop-off Bins	10%
- Spare Sieves	15%
- Recycled Plastic Chair Machine	10%
- Water (ML)	20%
Taxes:	
- Fuel (litre)	10%

Table 4: Taxes and Subsidies *remember that duties are only paid once.

It is also noted that land has an opportunity cost of $0 and the opportunity cost of labour is 50% of the market wage for casual workers. The site manager is employed from elsewhere and should be costed at the market wage. There is no shadow price for textiles or chairs.

To estimate the external benefits of the project you consider the following:

1) Research by the US EPA found that recycling can reduce emissions by approximately 1.4 - 1.7 tons of CO_2 equivalents per tonne of material recovered. Based on this, you expect the external benefit for producing outdoor plastic chairs using the recycled plastic saves 1.5 tonnes of CO2 equivalent per tonne of recycled plastics, on average.

2) You have conducted some preliminary research on the external benefits of using plastics for recycled textiles. You found a paper that suggests 5777.9 kgs per tonne of CO2 equivalents is saved per recycled tonne.

3) The price of carbon in Australia peaked at $37.00 in November 2021 (based on Australian Carbon Credit Units).

i) Building on the spreadsheet completed in a), calculate the NPV and IRR of the Social Cost Benefit Analysis using a 5%, 10% and 15% discount rate.

c) Disaggregated Social Analysis

Now you want to disaggregate the results of the analysis. In this case you would like to evaluate who gains and who loses from the project. As part of the approach to disaggregation you are asked to exclude the *private investor* and the *foreign bank* from the Total Disaggregated CBA, and then identify the remaining stakeholders with standing. The remaining stakeholders include landowners, local labour, local communities, and the government. Using the template identify:

i) The NPV for the total disaggregated group of interest (without the investor and foreign bank) using a 5%, 10% and 15% discount rate.
ii) The NPV for each remaining stakeholder group using a 5%, 10% and 15% discount rate.

d) Sensitivity Analysis

Now as part of the cost-benefit analysis, ReNew is interested in evaluating the assumptions and how sensitive or insensitive the results are to the best guess inputs. Specifically, ReNew would like to answer the following:

i) There are two key uncertainties for ReNew. The price of the outdoor chairs and the tonnes of granules available for recycling via the facility. ReNew would like to see how the NPV changes for the investor analysis at the 5% discount rate. Allow the per tonne production change between 155, 165, and 175 tonnes and the price of the chairs to vary between $50, $60, and $70 respectively. Comment on the results.
ii) ReNew would like to achieve a minimum of 10% IRR as the investor. Use the "Goal Seek" command to identify the minimum price ReNew can charge for each outdoor chair that would achieve this.
iii) Given the current government initiatives, ReNew is considering asking for additional tax breaks from the government to support the project. ReNew would like to achieve an NPV of 1.7 million at a 5% discount rate. How much would the tax rate need to decrease to achieve this?

Part 2 – Written Report Group Task – 30 marks (15%)

Using your results from Part 1 of the case study, write a comprehensive report analysing the results of your CBA. In your report ensure you:

1) Provide professional recommendations to the investors whether they should invest money in recycling program. You are expected to research relevant literature plastic recycling.
2) Outline the approach and results of sections a) to d) in Part 1. In your response you should investigate which variables should be subject to a partial sensitivity analysis inaddition to the results of d).
3) Identify considerations for your analysis or any alternative approaches that would improve on the current format of the CBA.

Word limit 1,500 words (+/- 10 %).

The rubric for this component of the case study can be found on the course website.

Part 3 – Reflective Assessment Individual Task – 20 marks (10%)

Critically reflect on the CBA task from the Case Study. In your answer,

(1) determine and establish the relevance and authenticity of the case study task as part of your development in a professional context.

(2) reflect on your individual challenges or challenges faced as part of a group.

Word limit 750 words.

The rubric for this component of the case study can be found on the course website.