NYU Stern Center for Sustainable Business

# The financial benefits of sustainability from more efficient operations

March 2020

NYU STERN

## Sustainability Drivers of Financial Performance and Competitive Advantage

When a company embeds sustainability in its strategy and practice, it...

### Improves:

- Customer Loyalty
- Employee Relations
- Innovation
- Media Coverage
- Operational Efficiency
- Risk Management
- Sales & Marketing
- Supplier Relations
- Stakeholder Engagement

### Drives:

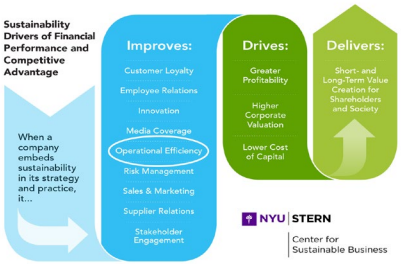
- Greater Profitability
- Higher Corporate Valuation
- Lower Cost of Capital

### Delivers:

Short- and Long-Term Value Creation for Shareholders and Society

NYU STERN
Center for Sustainable Business

When a company embeds sustainability in its strategy and practice, it improves Operational Efficiencies through:




# Challenges to Monetizing Operational Efficiencies

1) There is a LOT that could fall into the operational efficiency category, so the scale / scope of these calculations can vary dramatically.

2) Many of these initiatives will be taking place at the same time, so attributing an outcome to a specific action may be challenging.

3) Depending upon the intended purpose, this can get very granular and complicated.

## A more sustainable approach to manufacturing

*Actions here relate to Operational Efficiency* only, even if it may improve other mediating factors.
*Note that embedding sustainability will also generate benefits through talent management, risk management, innovation, etc.*
***Only one benefit example listed when more are conceivable.***

| Sustainability Action | Benefit Example | Key Value Indicators | Monetization Method |
|---|---|---|---|
| Revised enzymatic process for pharmaceutical manufacturing | Decreases in Resource Consumption | - Reduction in quantity and / or cost of raw material inputs<br>- Reduction in quantity and / or cost of electricity consumption<br>- Reduction in quantity and / or cost of water consumption<br>- Reduction in quantity and / or cost other inputs into the manufacturing process | On a per unit of production basis, multiply the change in quantity of each input purchased by per unit change in cost for each input, and multiple the product by the total production |
| | Decrease in Waste Generation | - Reduction in quantity of waste generated and / or cost of traditional waste disposal | On a per unit of production basis, multiply the change in quantity of each input purchased by per unit change in cost for each input, and multiple the product by the total production |
| | Decrease in emissions | - Reduction in exposure to carbon regulatory carbon fees | Subtract the quantity of emissions produced by the new process from the quantity of emissions produced in the original process. Likewise, subtract the regulatory limit on emissions from the quantity of emissions produced in the original process. Take the smaller of the two remainders and multiply it by the regulatory per unit cost of emissions. |
| | Additional process capacity for new production | - Freed capacity through increased efficiency | Multiply the freed capacity by the per unit revenue that could be generated through the production and sale of either the same product or an alternative product, and subtract the costs incurred as a result of the production and sale of the additional product. |
| | Maintaining market competitiveness | - Revenues preserved by maintaining / increasing product cost competitiveness | Estimate the expected loss in total revenues, and subtract it from the actual revenues. |

## A fictional automotive manufacturer improves operational efficiency through the implementation of a comprehensive waste management strategy

Americanauto is a growing automotive manufacturer, with current revenues of approximately $20 Billion. Its primary manufacturing sites are in California, Ohio and South Carolina, and across these three facilities they are producing approximately 1 million vehicles annually, with historic growth rates in production of about 5%. As CEO, you've observed other automotive manufacturers grow significant financial value from waste management. In an effort to spur innovation and reduce manufacturing costs in the short and for the long-term, you would like to launch a more robust waste management program that includes: (a) Increased recycling of recovered manufacturing scrap, (b) the incorporation of recovered and treated manufacturing scrap into manufacturing, and (c) a proactive program to recover end-of-life product from the consumer.

| Sustainability Action | Benefit Example | Key Value Indicators | Monetization Method |
|---|---|---|---|
| Manufacturing waste reuse and recycling<br><br>+<br><br>Product take back and reuse / recycling | Decrease in waste generation - avoided cost of traditional waste disposal | Annual reduction in waste generation<br><br>Cost of traditional waste disposal | Multiply the annual reduction in the quantity of waste generated by the per unit cost of waste disposal |
| | Decrease in waste generation - avoided cost from reusing recovered materials | Weight of recovered waste that can be reused<br><br>Weighted average cost of material that can be replaced with recovered manufacturing waste | Multiply the quantity of recovered waste material that can be reused in the manufacturing process by the cost of the virgin material that these recovered materials would replace, and subtract from this the total cost of recovering and reusing the waste |
| | Revenue from recycling waste | Annual change in the weight of recovered waste that can be recycled<br><br>Weighted average price of material that is sold for recycling | Multiply the annual change in the quantity of waste recovered that can be sold for recycling by the weighted average price for material that is sold for recycling |
| | Recovery and reuse / recycling of end-of-life product | Annual change in the quantity of end-of-life product that is recovered<br><br>Annual change in the quantity of end-of-life product that is recovered and reuse<br><br>Annual change in the quantity of end-of-life product that is recovered and recycled<br><br>Weighted average cost of virgin materials that can be replaced with recovered product<br><br>Weighted average price of recovered material that is sold for recycling<br><br>Total cost for implementing end-of-life product recovery and recycling program | 1) Calculate the annual change in: a) quantity of end-of-life product recovered; b) quantity of recovered end-of-life product that is reused, and c) quantity of recovered end-of-life product that is recycled<br><br>2) Multiply the quantity of waste that is recovered and reused in manufacturing by the weighted average cost of the materials those recovered materials are replacing<br><br>3) Multiply the quantity of waste that is recovered and recycled by the weighted average price of the materials that are sold for recycling<br><br>4) Sum the products of steps 2 and 3, and subtract from the total benefit the cost of implementing end-of-life product recovery and recycling |

*Notes*

This monetization method assumes an idealized one-year sustainability initiative.

Where possible, we use company-specific metrics not industry averages or population correlations.

**Select the benefits that are most relevant for the sustainability initiative.**

Benefits focus on a manufacturing business.

*This is work in progress and parts may not apply to specific companies.*

Figures are illustrative only!

| Total net benefits for operational efficiencies | | | |
|---|---|---|---|
| Net benefit | Methodology or example | Unit | Data |
| Total gross benefits | Sum benefits totals from 1, 2, 3, 4, 5, 6 | USD | $ 104,221,273 |
| Total cost and investments | Sum fields 0.1, 0.2 (at the bottom) | USD | $ 37,967,350 |
| **Total net benefits** | **Subtract field above from field two above** | **USD** | **$ 66,253,923** |
| **ROSI** | **Return of Sustainability Investment** | **%** | **175%** |

2

| Decreases in waste generation | | | |
|---|---|---|---|
| Total benefit | Methodology or example | Unit | Data |
| **Total cost avoided** | **Sum fields 2.1, 2.2, 2.3** | **USD** | **$ 100,915,949** |

2.0

| Cost Structure | | | |
|---|---|---|---|
| COGS | | UDS | $ 15,545,000 |
| Total Annual Manufacturing Waste Weight - base case | | Tonnes | 285,420 |

2.1

| Cost avoided of traditional waste disposal | Methodology or example | Unit | Data |
|---|---|---|---|
| Total weight of manufacturing waste produced - base case | Using available data sources, input the average quantity of waste generated per unit of production, before the sustainable initiative was implemented | Tonnes | 285,420 |
| Percent reduction in manufacturing waste from more efficient manufacturing | | % | 7% |
| Total weight of manufacturing waste produced - after | Using available data sources, input the average quantity of waste generated per unit of production, after the sustainable initiative was implemented | Tonnes | 264,727 |
| Units produced - base case | Annual production volume before sustainable approach was implemented | Vehicles | 1,050,000 |
| Units produced - after | Annual production volume after sustainable approach was implemented | Vehicles | 1,102,500 |
| Cost of waste disposal | Drawing data from available sources (i.e., waste disposal bills), include the total cost of waste disposal | USD / tonne | $ 2,750.00 |
| Per vehicle cost of waste disposal - base case | Calculated | USD / vehicle | $ 747.53 |

| | | | | |
|---|---|---|---|---|
| Per vehicle cost of waste disposal - after | Calculated | USD / vehicle | $ | 660.32 |
| Per vehicle waste disposal savings | | USD / vehicle | $ | 87.21 |
| **Cost avoided** | **Multiply the per unit savings by the total production volume** | **USD** | **$** | **96,150,863** |

2.10 **Relevant cost and investments**

2.11

| Cost of sustainability imitative | Methodology or example | Unit | Data |
|---|---|---|---|
| Operating expenses | Any typical cost for the sustainability initiative, e.g. alternative materials (cost differential * volume). | USD | $ 2,500,000 |
| Cost of time to implement initiative | Value of time (daily wage * days) for all employees implementing | USD | $ 1,750,000 |
| Any other variable cost not covered above | | USD | $ 585,000.00 |
| **Total cost** | **Sum of fields above** | **USD** | **$ 4,835,000** |

2.12

| Investments of sustainability initiative | Methodology or example | Unit | Data |
|---|---|---|---|
| Capital expenditure(s) | Depreciated or otherwise annualized value | USD | $ 22,300,000 |
| Investments in new processes and/or new | Amortized or otherwise annualized value | USD | $ - |
| Any other fixed cost not covered above | | USD | $ - |
| **Total cost** | **Sum of fields above** | **USD** | **$ 22,300,000** |

2.2

| Cost avoided from using recovered materials | Methodology or example | Unit | Data |
|---|---|---|---|
| Total manufacturing waste - base case | | tonnes | 285,420 |
| % manufacturing waste recovered and reused in production - base case | | % | 0.0% |
| Weight of waste recovered and reused in production - base case | | tonnes | - |
| Annual improvement in incorporating recovered material into new production | | % | 8.0% |
| % manufacturing waste recovered and reuse in production - after | | % | 8.0% |
| Weight of waste recovered and reused in production - after | | tonnes | 21,178 |
| Weighted Average Unit Price of Comparable Virgin Materials | | USD / tonne | $ 225 |
| **Cost avoided** | **Multiply the value of the virgin raw materials replaced by the volume of waste recovered and reused** | **$** | **$ 4,765,087** |

2.21 **Relevant cost and investments**

2.22

| Cost of sustainability initiative | Methodology or example | Unit | Data |
|---|---|---|---|
| Operating expenses | Any typical cost for the sustainability initiative, e.g. alternative materials (cost differential * volume). | USD | $ 325,000 |
| Cost of time to implement initiative | Value of time (daily wage * days) for all employees implementing | USD | $ 32,500 |
| Any other variable cost not covered above | | USD | $ 12,350 |

| | | | | |
|---|---|---|---|---|
| **Total cost** | **Sum of fields above** | **USD** | **$** | **369,850** |

| 2.23 | Investments of sustainability initiative | Methodology or example | Unit | Data |
|---|---|---|---|---|
| | Capital expenditure(s) | Depreciated or otherwise annualized value | USD | $ 72,500 |
| | Investments in new processes and/or new systems | Amortized or otherwise annualized value | USD | $ - |
| | Any other fixed cost not covered above | | USD | $ - |
| | **Total cost** | **Sum of fields above** | **USD** | **$ 72,500** |

## 3 Recycling of manufacturing waste

| Total benefit | Methodology or example | Unit | Data |
|---|---|---|---|
| **Total benefit** | **Sum fields 3.1** | **USD** | **$ 1,158,047** |

| 3.1 | New revenues from sales of manufacturing waste for recycling | Methodology or example | Unit | Data |
|---|---|---|---|---|
| | Total manufacturing waste - base case | From above | tonne | 285,420 |
| | % of manufacturing waste that is recovered and sold for recycling (by weight) - base case | | % | 18.5% |
| | Weight of manufacturing waste that is recovered and sold for recycling | | tonne | 52,803 |
| | Annual improvement in the proportion of manufacturing waste that is recycled | | % | 5.3% |
| | % manufacturing waste recovered and sold for recycling - after | | % | 23.8% |
| | Weight of waste recovered and sold for recycling (by weight) - after | | tonne | 62,873 |
| | Average unit price of recovered and recycled materials sold | | USD / tonne | $ 115 |
| | **Total benefit** | **Multiply the value of the manufacturing waste recycled by the additional volume of waste that is recycled** | **USD** | $ 1,158,047.05 |

## 3.11 Relevant cost and investments

| 3.12 | Cost of sustainability initiative | Methodology or example | Unit | Data |
|---|---|---|---|---|
| | Operating expenses | Any typical cost for the sustainability initiative, e.g. alternative materials (cost differential * volume). | USD | $ 15,000 |
| | Cost of time to implement initiative | Value of time (daily wage * days) for all employees implementing | USD | $ - |
| | Any other variable cost not covered above | | USD | $ - |
| | **Total cost** | **Sum of fields above** | **USD** | **$ 15,000** |

| 3.12 | Investments of sustainability initiative | Methodology or example | Unit | Data |
|---|---|---|---|---|
| | Capital expenditure(s) | Depreciated or otherwise annualized value | USD | $ 275,000 |

| | | | |
|---|---|---|---|
| Investments in new processes and/or new systems | Amortized or otherwise annualized value | USD | $ - |
| Any other fixed cost not covered above | | USD | $ - |
| **Total cost** | **Sum of fields above** | **USD** | **$ 275,000** |

5

## Recovery and reuse / recycling of end-of-life product

| Total benefit | Methodology or example | Unit | Data |
|---|---|---|---|
| **Total benefit** | **Sum fields 2.1, 2.2, 2.3** | **$** | **$ 2,147,277** |

5.1

| **Savings from recovery of products at end-of-life** | **Methodology or example** | **Unit** | **Data** |
|---|---|---|---|
| Annual Recovered End-of-Life Product Weight - base case | | tonnes | 1,905 |
| % of Annual Production that is Recovered at End-of-Life - base case | | % | 0.1% |
| % Annual increase in proportion of annual production that is recovered at End-of-Life | | % | 5% |
| % Annual Production that is Recovered at End-of-Life - new | | % | 5.1% |
| Amount of End-of-Life Product that is recovered - new | | tonnes | 102,017 |
| | | | |
| % of Total End-of-Life Product Weight Recovered and Reused - base case | | % | 0% |
| Amount of End-of-Life Product that is recovered and reused - base case | | tonnes | - |
| % Annual increase in proportion of End-of-Life weight that is recovered and reused | | % | 5% |
| % of Total End-of-Life Product Weight Recovered and Reused - new | | % | 5% |
| Amount of End-of-Life Product that is recovered and reused - new | | tonnes | 5,101 |
| Weighted Average Value of Virgin Materials / Components that can be Replaced with Recovered product | | USD / tonne | 225 |
| Process Savings from Using Recovered Components | | USD | $ 150,000 |
| **Total Benefit** | **Multiply value of virgin materials replaced by weight of recovered end of life product and add the process savings accrued** | **USD** | **$ 1,297,696** |

5.2

| Revenue from recycling of products at end-of-life | Methodology or example | Unit | Data |
|---|---|---|---|
| % of Total End-of-Life Product Weight that is Recovered and Recycled - base case | | % | 0% |
| Amount of End-of-Life Product that is Recovered and Recycled - base case | | tonnes | 0.0 |
| Annual increase in proportion of end-of-life product weight that is recovered and recycled | | % | 7% |
| % of Total End-of-Life Product Weight Recovered and Reused - new | | % | 7% |
| Amount of End-of-Life Product that is Recovered and Recycled - new | | tonnes | 6,631 |
| Average unit price of recovered and recycled materials sold | | USD / tonne | $ 115 |
| Process Savings from Using Recovered Components | | USD | $ 87,000 |
| **Total Benefit** | **Multiply revenues earned from recycling end of life product, by weight of recovered end of life product that is recycled** | **USD** | **$ 849,580.38** |

5.20

## Costs of recovering end-of-life product

5.21

| Cost of sustainability initiative | Methodology or example | Unit | Data |
|---|---|---|---|
| Operating expenses | Any typical cost for the sustainability initiative, e.g. alternative materials (cost differential * volume). | USD | $ 3,350,000 |
| Cost of time to implement initiative | Value of time (daily wage * days) for all employees implementing | USD | $ 750,000 |
| Any other variable cost not covered above | | USD | |
| **Total cost** | **Sum of fields above** | **USD** | **$ 4,100,000** |

5.22

| Investments of sustainability initiative | Methodology or example | Unit | Data |
|---|---|---|---|
| Capital expenditure(s) | Depreciated or otherwise annualized value | USD | $ 4,500,000 |
| Investments in new processes and/or new systems | Amortized or otherwise annualized value | USD | $ 1,500,000 |
| Any other fixed cost not covered above | | USD | $ - |
| **Total cost** | **Sum of fields above** | **USD** | **$ 6,000,000.00** |

*Notes*

This monetization method assumes an idealized one-year sustainability initiative.

Where possible, we use company-specific metrics not industry averages or population correlations.

**Select the benefits that are most relevant for the sustainability initiative.**

Benefits focus on a manufacturing business.

*This is work in progress and parts may not apply to specific companies.*

| Total net benefits for operational efficiencies | | | |
|---|---|---|---|
| **Net benefit** | **Methodology or example** | **Unit** | **Data** |
| Total gross benefits | Sum benefits totals from 1, 2, 3, 4, 5, 6 | USD | #DIV/0! |
| Total cost and investments | Sum fields 0.1, 0.2 (at the bottom) | USD | $ - |
| **Total net benefits** | **Subtract field above from field two above** | **USD** | **#DIV/0!** |
| ROSI | Return of Sustainability Investment | % | **#DIV/0!** |

| | | | | |
|---|---|---|---|---|
| 1 | **Decreases in resource consumption** | | | |
| | **Total benefit** | **Methodology or example** | **Unit** | **Data** |
| | **Total cost saved** | **Sum fields 1.1, 1.2, 1.3, 1.4** | **USD** | #DIV/0! |
| 1.1 | **Reduced raw material consumption** | **Methodology or example** | **Unit** | **Data** |
| | Quantity raw materials purchased - before | Drawing data from available sources include the quantity of raw materials purchased for this process *before* sustainable approach was implemented | kg | - |
| | Quantity of raw materials purchased - after | Drawing data from available sources include the quantity of raw materials purchased for this process *after* the sustainable approach was implemented | kg | - |
| | Units produced - before | Annual production volume before sustainable approach was implemented | tonne | - |
| | Units produced - after | Annual production volume after sustainable approach was implemented | tonne | - |
| | Total raw material cost | Drawing data from available sources include the weighted average cost of purchased raw materials | USD / kg | $ - |
| | Raw material cost per unit - before | Calculated | kg / unit | #DIV/0! |
| | Raw material cost per unit - after | | kg / unit | #DIV/0! |
| | **Cost saved from electricity** | **Subtract the electricity per unit before and after the sustainability initiative and multiply by cost and volume** | **USD** | **#DIV/0!** |
| 1.2 | **Reduced electricity consumption** | **Methodology or example** | **Unit** | **Data** |

| | | | | |
|---|---|---|---|---|
| | Quantity of electricity purchased - before | Drawing data from available sources (i.e., electric utility bills), include the quantity of electricity purchased used for this process *before* sustainable approach was implemented | kWh | - |
| | Quantity of electricity purchased - after | Drawing data from available sources (i.e., electric utility bills), include the quantity of electricity purchased used for this process *after* the sustainable approach was implemented | kWh | - |
| | Units produced - before | Annual production volume before sustainable approach was implemented | tonne | - |
| | Units produced - after | Annual production volume after sustainable approach was implemented | tonne | - |
| | Electricity cost | Drawing data from available sources (i.e., electricity utility bills), include the total cost of purchased electricity | USD / kWh | $ - |
| | Electricity per unit - before | Calculated | kWh / tonne | #DIV/0! |
| | Electricity per unit - after | | kWh / tonne | #DIV/0! |
| | **Cost saved from electricity** | **Subtract the electricity per unit before and after the sustainability initiative and multiply by cost and volume** | **USD** | **#DIV/0!** |

| 1.3 | **Reduced water consumption** | **Methodology or example** | **Unit** | **Data** |
|---|---|---|---|---|
| | Quantity of water purchased - before | Drawing data from available sources (i.e., water utility bills), include the quantity of water purchased and used for this process before sustainable approach was implemented | $m^3$ | - |
| | Quantity of water purchased - after | Drawing data from available sources (i.e., water utility bills), include the quantity of water purchased and used for this process after sustainable approach was implemented | $m^3$ | - |
| | Units produced - before | Annual production volume before sustainable approach was implemented | tonne | - |
| | Units produced - after | Annual production volume after sustainable approach was implemented | tonne | - |
| | Water cost | Drawing data from available sources (i.e., water utility bills), include the total cost of water | USD / m3 | $ - |
| | Water per unit - before | Calculated | $m^3$ / unit | #DIV/0! |
| | Water per unit - after | | $m^3$ / unit | #DIV/0! |
| | **Cost saved from water** | **Subtract the cost of electricity after from the cost of electricity before the sustainable approach was implemented** | **USD** | **#DIV/0!** |

| 1.4 | **Reduced consumption of other inputs** | **Methodology or example** | **Unit** | **Data** |
|---|---|---|---|---|
| | Quantity of input purchased - before | For each additional resource, identify the quantity of product purchased annually before the sustainable approach was implemented (add additional rows for each additional input) | kg | - |

| | | | | |
|---|---|---|---|---|
| | Quantity of input purchased - after | For each additional resource, identify the quantity of product purchased annually after the sustainable approach was implemented (add additional rows for each additional input) | kg | - |
| | Units produced - before | Annual production volume before sustainable approach was implemented | units | - |
| | Units produced - after | Annual production volume after sustainable approach was implemented | units | - |
| | Other input cost | For each additional resource, include the total cost before the sustainable approach was implemented (add additional rows for each additional input) | USD / kg | $ - |
| | Total input expense - before | Calculated | kg / unit | #DIV/0! |
| | Total input expense - after | | kg / unit | #DIV/0! |
| | **Cost saved from other inputs** | **Subtract the cost of electricity after from the cost of electricity before the sustainable approach was implemented** | **USD** | **#DIV/0!** |

| | | | | |
|---|---|---|---|---|
| 2 | **Decreases in waste generation** | | | |
| | **Total benefit** | **Methodology or example** | **Unit** | **Data** |
| | **Total cost avoided** | **Sum fields 2.1, 2.2, 2.3** | **USD** | **#DIV/0!** |

| | | | | |
|---|---|---|---|---|
| 2.0 | **Cost Structure** | | | |
| | COGS | | UDS | $ - |
| | Total Annual Manufacturing Waste Weight - base case | | Tonnes | - |

| | | | | |
|---|---|---|---|---|
| 2.1 | **Cost avoided of traditional waste disposal** | **Methodology or example** | **Unit** | **Data** |
| | Total weight of manufacturing waste produced - base case | Using available data sources, input the average quantity of waste generated per unit of production, before the sustainable initiative was implemented | Tonnes | - |
| | Percent reduction in manufacturing waste from more efficient manufacturing | | % | 0% |
| | Total weight of manufacturing waste produced - after | Using available data sources, input the average quantity of waste generated per unit of production, after the sustainable initiative was implemented | Tonnes | - |
| | Units produced - base case | Annual production volume before sustainable approach was implemented | units | - |
| | Units produced - after | Annual production volume after sustainable approach was implemented | units | - |
| | Cost of waste disposal | Drawing data from available sources (i.e., waste disposal bills), include the total cost of waste disposal | USD / tonne | $ - |

| | | | | |
|---|---|---|---|---|
| Per vehicle cost of waste disposal - base case | Calculated | | USD / vehicle | #DIV/0! |
| Per vehicle cost of waste disposal - after | | | USD / vehicle | #DIV/0! |
| Per vehicle waste disposal savings | | | USD / vehicle | #DIV/0! |
| **Cost avoided** | **Multiply the per unit savings by the total production volume** | | **USD** | **#DIV/0!** |

2.2

| **Cost avoided from using recovered materials** | **Methodology or example** | **Unit** | **Data** |
|---|---|---|---|
| Total manufacturing waste - base case | | tonnes | - |
| % manufacturing waste recovered and reused in production - base case | | % | 0.0% |
| Weight of waste recovered and reused in production - base case | | tonnes | - |
| Annual improvement in incorporating recovered material into new production | | % | 0.0% |
| % manufacturing waste recovered and reuse in production - after | | % | 0.0% |
| Weight of waste recovered and reused in production - after | | tonnes | - |
| Weighted Average Unit Price of Comparable Virgin Materials | | USD / tonne | $ - |
| **Cost avoided** | **Multiply the value of the virgin raw materials replaced by the volume of waste recovered and reused** | **$** | **$ -** |

2.3

| **Cost avoided from recycling water** | **Methodology or example** | **Unit** | **Data** |
|---|---|---|---|
| Annual volume of waste water produced from manufacturing process | | m3 | - |
| % of waste water that is recycled | | % | 0% |
| Average unit price of fresh water | | USD / m3 | $ - |
| **Cost avoided** | **Multiply the value of the fresh water replaced by the volume of water recycled** | **$** | **$ -** |

3

## Recycling of manufacturing waste

| Total benefit | Methodology or example | Unit | Data |
|---|---|---|---|
| **Total benefit** | **Sum fields 3.1** | **USD** | **$ -** |

3.1

| **New revenues from sales of manufacturing waste for recycling** | **Methodology or example** | **Unit** | **Data** |
|---|---|---|---|
| Total manufacturing waste - base case | From above | tonne | - |
| % of manufacturing waste that is recovered and sold for recycling (by weight) - base case | | % | 0.0% |

| | | | | |
|---|---|---|---|---|
| Weight of manufacturing waste that is recovered and sold for recycling | | tonne | | - |
| Annual improvement in the proportion of manufacturing waste that is recycled | | % | | 0.0% |
| % manufacturing waste recovered and sold for recycling - after | | % | | 0.0% |
| Weight of waste recovered and sold for recycling (by weight) - after | | tonne | | - |
| Average unit price of recovered and recycled materials sold | | USD / tonne | $ | - |
| **Total benefit** | **Multiply the value of the manufacturing waste recycled by the additional volume of waste that is recycled** | **USD** | $ | - |

4

## Decreases in emissions

| Total Benefit | Methodology or example | Unit | Data |
|---|---|---|---|
| **Total Benefit** | **Sum fields 4.1** | $ | $ - |

4.1

| **Reduced exposure to carbon emission fees** | **Methodology or example** | **Unit** | **Data** |
|---|---|---|---|
| Carbon emissions - before | | tonne | - |
| Carbon emissions - after | | tonne | - |
| Regulatory limit on emissions | | tonne | - |
| Emissions reduced to regulatory limit | Volume of carbon emissions reduction needed to be below the regulatory | tonne | - |
| Carbon price per tonne | Insert the regulatory fee / fine for exceeding emissions limit | USD / tonne | $ - |
| **Total Benefit** | **Multiply carbon price by volume of carbon emissions reduced to reach the regulatory limit** | **USD** | **$ -** |

5

## Recovery and reuse / recycling of end-of-life product

| Total benefit | Methodology or example | Unit | Data |
|---|---|---|---|
| **Total benefit** | **Sum fields 2.1, 2.2, 2.3** | **$** | **$ -** |

5.1

| **Savings from recovery of products at end-of-life** | **Methodology or example** | **Unit** | **Data** |
|---|---|---|---|
| Annual Recovered End-of-Life Product Weight | | kg | - |
| % of Total End-of-Life Product Weight Recovered and Reused | | % | 0% |
| Weighted Average Value of Virgin Materials / Components that can be Replaced with Recovered product | | USD / kg | $ - |

| | | | | |
|---|---|---|---|---|
| | Process Savings from Using Recovered Components | | USD | $ - |
| | **Total Benefit** | **Multiply value of virgin materials replaced by weight of recovered end of life product and add the process savings accrued** | **USD** | **$ -** |

| | | | | |
|---|---|---|---|---|
| 5.2 | **Revenue from recycling of products at end-of-life** | **Methodology or example** | **Unit** | **Data** |
| | % of Total Recovered End-of-Life Product Weight that is Recycled | | % | 0% |
| | Weighted Average Price of End-of-Life Product sold for Recycling | | USD | $ - |
| | **Total Benefit** | **Multiply revenues earned from recycling end of life product, by weight of recovered end of life product that is recycled** | **USD** | **$ -** |

| | | | | |
|---|---|---|---|---|
| 5.3 | **Reduction in waste disposal costs from recovery and reuse of product at end-of-life** | **Methodology or example** | **Unit** | **Data** |
| | % of Total Recovered End-of-Life Product Weight that is Reused or Recycled | Calculated | % | 0% |
| | Weight of Recovered End-of-life product that is Reused or Recycled | Calculated | kg | - |
| | Per unit cost of waste disposal | | USD / kg | $ - |
| | **Total Benefit** | **Multiply the weight of recovered end of life product that is not disposed by the per unit cost of waste disposal** | **USD** | **$ -** |

| | | | | |
|---|---|---|---|---|
| 6 | Additional process capacity for new production | | | |
| | Total benefit | Methodology or example | Unit | Data |
| | **Total benefit** | **Sum fields 6.1** | **USD** | **$ -** |

| | | | | |
|---|---|---|---|---|
| 6.1 | **New revenues from freed capacity** | **Methodology or example** | **Unit** | **Data** |
| | Freed capacity from operational efficiency | Percent of original production capacity freed through more efficient production process | % | 0% |
| | Volume of additional or new product that could be produced | Additional units of current product or new product that could be produced with production capacity made available through new production process | units | 0 |
| | Revenue of new sales | Per unit sale price of additional production | USD / unit | $ - |
| | Total revenue generated from new capacity | | USD | $ - |
| | Cost of production with freed capacity | | USD | $ - |

| | | | | |
|---|---|---|---|---|
| | Total Benefit | Subtract additional operating costs incurred when utilizing freed capacity from the revenue earned from new product sales | USD | $ - |

7 **Other relevant benefits**

| Total benefit | Methodology or example | Unit | Data |
|---|---|---|---|
| Total benefit | Sum fields 7.1 | USD | $ - |

7.1

| Maintaining market competitiveness | Methodology or example | Unit | Data |
|---|---|---|---|
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| Total Benefit | | | $ - |

0 **Total Relevant cost and investments**

0.1

| Cost of sustainability initiative | Methodology or example | Unit | Data |
|---|---|---|---|
| Operating expenses | Any typical cost for the sustainability initiative, e.g. alternative materials (cost differential * volume). | USD | $ - |
| Cost of time to implement initiative | Value of time (daily wage * days) for all employees implementing | USD | $ - |
| Any other variable cost not covered above | | USD | $ - |
| Total cost | Sum of fields above | USD | $ - |

0.2

| Investments of sustainability imitative | Methodology or example | Unit | Data |
|---|---|---|---|
| Capital expenditure(s) | Depreciated or otherwise annualized value | USD | $ - |
| Investments in new processes and/or new systems | Amortized or otherwise annualized value | USD | $ - |
| Any other fixed cost not covered above | | USD | $ - |
| Total cost | Sum of fields above | USD | $ - |

SASB Materiality https://materiality.sasb.org/

| Dimension | General Issue Category | Biotechnology & Pharmaceuticals | Medical Equipment & Supplies | Aerospace & Defense | Chemicals | Containers & Packaging | Electrical & Electronic Equipment | Industrial Machinery & Goods | Airlines | Auto Parts | Automobiles | Technology Hardware | Semiconductors |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Environment | GHG Emissions | | | | ■ | ■ | | | ■ | | | | ■ |
| | Air Quality | | | | ■ | ■ | | | | | | | |
| | Energy Management | | | ■ | ■ | ■ | ■ | | | ■ | | | ■ |
| | Water & Wastewater Management | | | | ■ | ■ | | | | | | | ■ |
| | Waste & Hazardous Materials Management | | | ■ | ■ | ■ | ■ | | | ■ | | | ■ |
| | Ecological Impacts | | | | | | | | | | | | |
| Social Capital | Human Rights & Community Relations | ■ | | | ■ | ■ | | | | | | | |
| | Customer Privacy | | | | | | | | | | | | |
| | Data Security | | | ■ | | | | | | | | ■ | |
| | Access & Affordability | ■ | ■ | | | | | | | | | | |
| | Product Quality & Safety | ■ | ■ | ■ | | ■ | ■ | | | ■ | ■ | | |
| | Customer Welfare | ■ | | | | | | | | | | | |
| | Selling Practices & Product Labeling | ■ | ■ | | | | | | | | | | |
| Human Capital | Labor Practices | | | | | | | | ■ | | ■ | | |
| | Employee Health & Safety | | | | ■ | ■ | | ■ | | | | | ■ |
| | Employee Engagement, Diversity & Inclusion | ■ | | | | | | | | | | ■ | ■ |
| Business Model & Innovation | Product Design & Lifecycle Management | | ■ | ■ | ■ | ■ | ■ | ■ | | ■ | ■ | ■ | ■ |
| | Business Model Resilience | | | | | | | | | | | | |
| | Supply Chain Management | ■ | ■ | | | ■ | | | | | | ■ | |
| | Materials Sourcing & Efficiency | | | ■ | | | ■ | ■ | | ■ | ■ | ■ | ■ |
| | Physical Impacts of Climate Change | | | | | | | | | | | | |
| Leadership & Governance | Business Ethics | ■ | ■ | ■ | | | ■ | | | | | | |
| | Competitive Behavior | | | | | | | | ■ | ■ | | | ■ |
| | Management of the Legal & Regulatory Environment | | | | ■ | | | | | | | | |
| | Critical Incident Risk Management | | | | ■ | | | | ■ | | | | |
| | Systemic Risk Management | | | | | | | | | | | | |

| | |
|---|---|
| ■ | Likely a material issue for companies in the industry |
| | Not likely a material issue for companies in the industry |