# Life-cycle assessment

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[rsc.li/2YTOmOl](https://rsc.li/2YTOmOl)

Use this worksheet to scaffold your students in evaluating a life cycle assessment for the three types of bags mentioned in the article.

Life cycle assessments commonly make up longer answer questions for 14–16 year olds, requiring them to evaluate the sustainability of products from their raw materials and processing through to disposal. The article alongside other research sources will help students make a full evaluation of the different bag materials mentioned and prompt debate about which kind of bag is ‘best’.

Page 2: Teacher answers

Page 3: Blank table for student use

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| --- | --- | --- | --- | --- |
| **STAGE OF LIFE CYCLE** | ***Key questions*** | **Poly(ethene) bag** | **Cotton bag** | **Compostable bag** |
| **RAW MATERIALS** | *Made from* | Poly(ethene) an addition polymer made from ethene | Cotton | Starch |
| *Source of raw materials* | Crude oil | Cotton plant | Potato |
| *Geographic location of raw material* | Middle East, Russia, USA | USA, India, China, Brazil, Pakistan | Worldwide |
| *Pollution and associated energy use in raw materials (eg transport)* | Raw materials transported across the world in tankers | Raw materials transported across the world in tankers | Can be made from vegetables in most countries so low transport. |
| *Sustainability of raw materials* | From fossil fuel – not sustainable | Sustainable | Sustainable |
| **MANUFACTURING AND PROCESSING** | *Processes needed to make raw material into the material used in the bag* | Fractional distillation of crude oil  Polymerisation  Shaping/colouring | Harvesting, separating cotton fibre from other plant material, carding and combing, spinning, weaving. Bleaching may also be carried out. | Harvesting, pulping, starch extraction, pH adjustment, shaping |
| *Pollution and associated energy* | Lots of energy needed in both processes | Lots of energy needed in processes  Bleaching may produce chemical waste | Low energy process |
| **CONSUMER USE** | *Likely useful lifetime of the product (years)* | 1–5 years depending on thickness | 10 years | 6–12 months |
| *How many times is the consumer likely to reuse?* | Potentially lots but consumer practice tends to mean they are reused much less | Hundreds | 10–20 |
| **CONSUMER DISPOSAL** | *Disposal at end of useful life*  *Can it be recycled?* | Landfill, limited recycling | Landfill or charity shop/rag bin | Landfill or compost bin |
| **STAGE OF LIFE CYCLE** | ***Key questions*** | **Poly(ethene) bag** | **Cotton bag** | **Compostable bag** |
| **RAW MATERIALS** | *Made from* |  |  |  |
| *Source of raw materials* |  |  |  |
| *Geographic location of raw material* |  |  |  |
| *Pollution and associated energy use in raw materials (eg transport)* |  |  |  |
| *Sustainability of raw materials* |  |  |  |
| **MANUFACTURING AND PROCESSING** | *Processes needed to make raw material into the material used in the bag* |  |  |  |
| *Pollution and associated energy* |  |  |  |
| **CONSUMER USE** | *Likely useful lifetime of the product (years)* |  |  |  |
| *How many times is the consumer likely to reuse?* |  |  |  |
| **CONSUMER DISPOSAL** | *Disposal at end of useful life*  *Can it be recycled?* |  |  |  |