Naturally occurring materials were used as a source of energy before crude oil was extracted and used for fuel. As the oil economy developed over the years, the range of uses for crude oil diversified and we treated oil as an unlimited resource.

Our society is now dependent on oil products for a large number of materials used in our everyday lives, but we are coming to realise that crude oil resources are limited.

• Will we be able to replace all oil-based products when oil becomes scarce?
• If so, what will we use as raw materials?
• Will we return to using the naturally occurring materials that were used before crude oil?

Part 1

1. What is meant by the term ‘naturally occurring’?

2. What is meant by the term ‘raw material’?

3. Coconuts are one example of a material that can be used to create biodiesel. What other materials could be used?

4. What is the difference between a raw material that is renewable and one that is non-renewable? Give an example of each.
5. What is biodiesel?

6. Give three advantages for the use of biodiesel instead of fuels produced from crude oil.

7. Are there any disadvantages to using biodiesel instead of fuels produced from crude oil?
Part 2: Biodiesel in Western Australia

The following data has been extracted from reports by the Australian Bureau of Statistics and the West Australian Department of Agriculture.

- In 2007, there were 390,000 ha planted with canola in Western Australia\(^1\).
- The average yield of canola seed from these plantings in 2007 was 1.7 t ha\(^{-1}\).
- Canola seed contains an average of 44% oil.
- An oil extraction press typically extracts 90% of the oil from canola seed.
- Transesterification of one tonne of canola oil produces 700 L of biodiesel.
- Currently, canola is not used to make biodiesel in Western Australia — it is used in the food industry.
- In 2001/2, Western Australia used 1600 ML of petroleum-derived diesel\(^2\).
- In 2004, the following estimates were made of the costs of producing biodiesel from various materials\(^3\):

<table>
<thead>
<tr>
<th>Material</th>
<th>Cost per Litre</th>
</tr>
</thead>
<tbody>
<tr>
<td>waste cooking oil</td>
<td>$0.35</td>
</tr>
<tr>
<td>tallow (costs about $500 per tonne)</td>
<td>$0.66</td>
</tr>
<tr>
<td>canola (costs about $1000 per tonne)</td>
<td>$1.19</td>
</tr>
</tbody>
</table>

References

Use these data to answer the following questions.

8. Estimate how much petroleum-derived diesel was used in Western Australia during 2007.

9. Calculate the amount of biodiesel Western Australia could produce from the 2007 canola crop?

10. What percentage of the annual diesel usage could this supply, based on your estimate for diesel usage in 2007?
11. Is it feasible for Western Australia to use canola to produce enough biodiesel to supply the diesel needs for the state? Justify your answer.

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Research question

12. The Biofuels Association of Australia was formed to represent all stakeholders in the biofuel industry in Australia. Based on the information provided by their website at http://biofuelsassociation.com.au, what might be the future source of biodiesel in Australia?

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