UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
General Certificate of Education Ordinary Level

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

ENVIRONMENTAL MANAGEMENT **5014/22**

Alternative to Coursework **May/June 2010**

1 hour 30 minutes

Candidates answer on the Question Paper.

Additional Materials: Ruler

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use a soft pencil for any diagrams, graphs or rough working.
Do not use staples, paper clips, highlighters, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
Study the appropriate Source materials before you start to write your answers.
Credit will be given for appropriate selection and use of data in your answers and for relevant interpretation of these data. Suggestions for data sources are given in some questions.
You may use the source data to draw diagrams and graphs or to do calculations to illustrate your answers.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.

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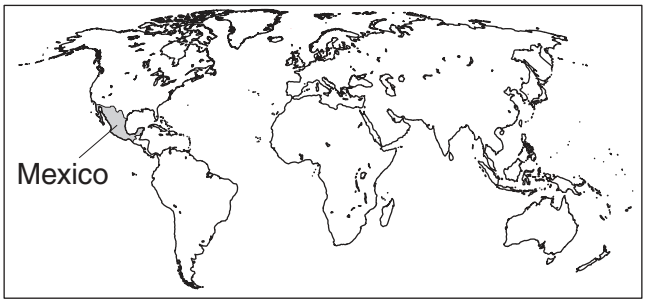
This document consists of **14** printed pages and **2** blank pages.

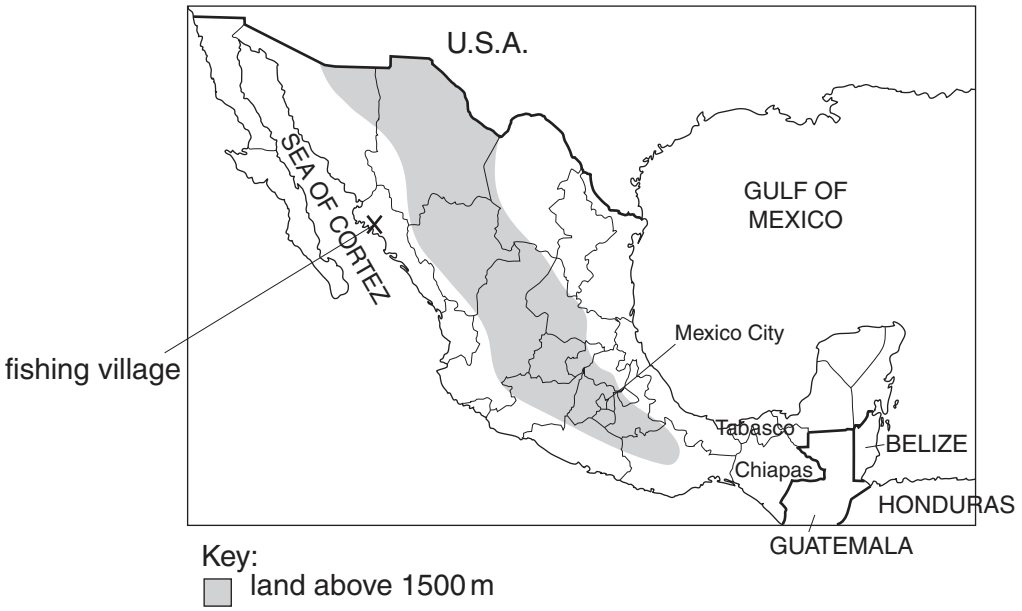
UNIVERSITY of CAMBRIDGE International Examinations

[Turn over

Map of the world showing Mexico shaded



Mexico



- Area of Mexico: 1 972 550 sq km
- Population: 115 million
- Children per woman: 2.34
- Life expectancy at birth: 76 years
- Currency: Mexican pesos (11.0 pesos = 1 US dollar)
- Languages: Spanish, local languages
- Climate: varies from wet tropical to desert
- Terrain: high, rugged mountains; coastal plains; high plateaus; desert
- Main exports: manufactured goods, oil and oil products, silver, fruits, vegetables, coffee and cotton

Mexico has a free market economy that depends on modern industries, agriculture and tourism. There are abundant reserves of oil, natural gas and minerals. Social concerns include low wages and underemployment, especially in the southern states such as Chiapas and Tabasco. Other problems include rural to urban migration, shortage of clean drinking water, deforestation and desertification.

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1 **(a)** Soil erosion is a serious problem in the uplands of Mexico.
Livestock, such as cattle and goats, trample the vegetation and the soil becomes exposed to heavy rain.
A research scientist set up a long-term project to measure the rate of soil erosion.

Look at Fig. 1.1. Steel pins with measuring marks were placed in the soil as shown.

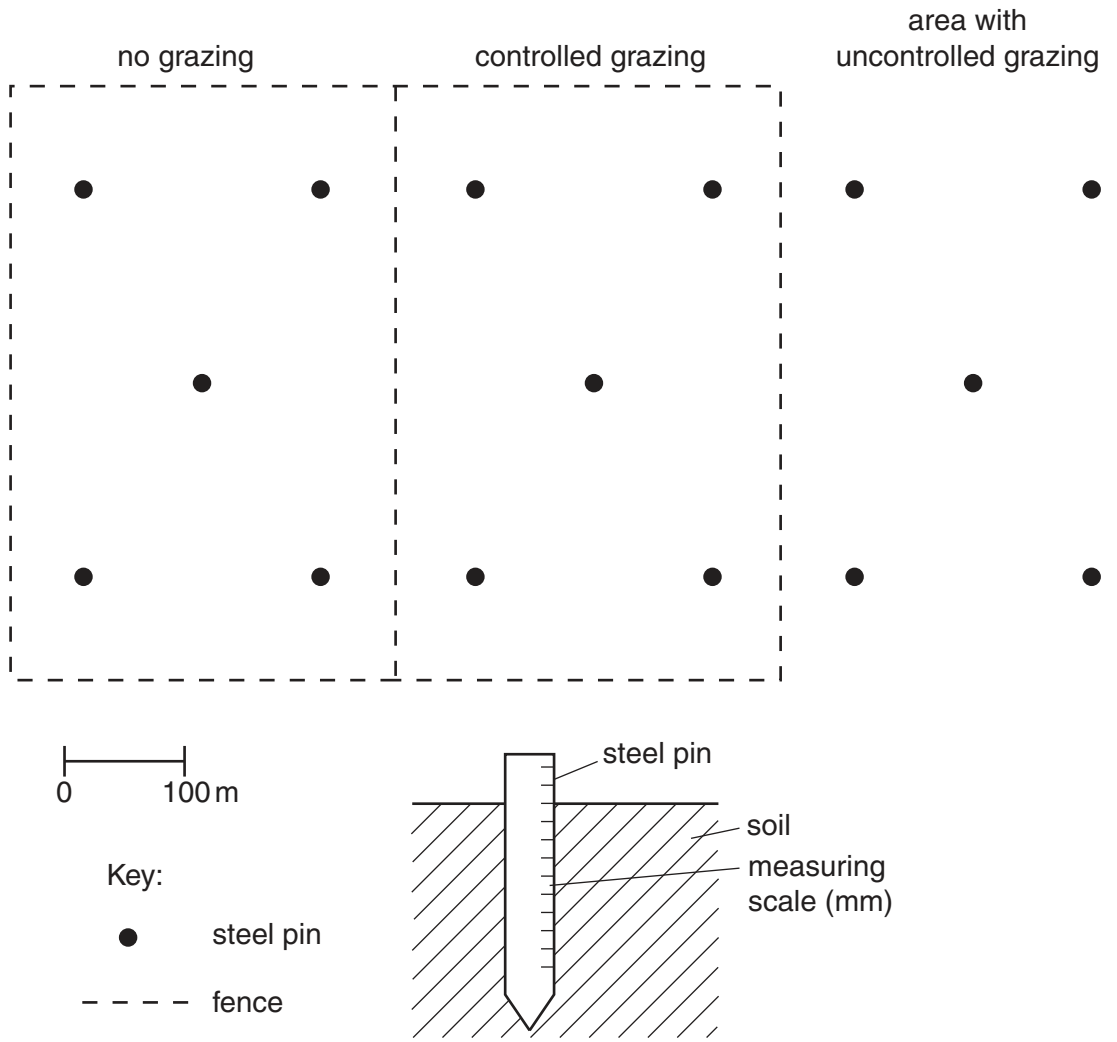

Fig. 1.1

(i) Suggest why five steel pins were placed in the soil in each experimental area.

.....

..... [1]

Table 1.1 shows the results of the project.

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Table 1.1

	average loss of soil (millimetres)		
year	no grazing	controlled grazing	uncontrolled grazing
2000	1	3	4
2001	0	2	3
2002	2	5	6
2003	1	3	4
2004	0	3	4
2005	0	4	5
2006	1	4	5
2007	2	5	6
2008	2	5	6
2009	1	4	5

(ii) Different grazing patterns affect soil loss.
Describe the trend shown by the data in Table 1.1.

.....

..... [1]

(iii) In which three years do the values suggest that the rainfall was most intense?

..... [1]

(iv) In which three years was the rainfall likely to be least intense?

..... [1]

(v) Another scientist claimed that the method used to measure the soil erosion was not accurate. Suggest **two** reasons why the method used might not be accurate.

.....

.....

..... [2]

(b) The research scientist decided to carry out a survey of the plants growing in the three areas shown in Fig. 1.1 using a quadrat. The equipment used and the results of the survey are shown in Table 1.2.

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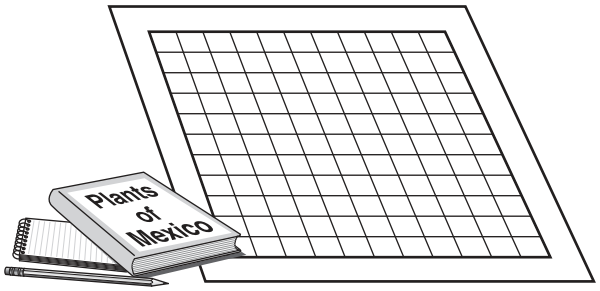

Table 1.2

area	number of plant species able to be eaten by livestock	number of plant species **not** able to be eaten by livestock	total number of individual plants/m^2
no grazing	15	10	46
controlled grazing	11	9	33
uncontrolled grazing	7	13	34

(i) Describe how the scientist used the quadrat to gather the data in Table 1.2.

.....

.....

.....

.....

..... [3]

(ii) Explain how grazing animals can cause the changes shown in Table 1.2.

.....

.....

..... [2]

(c) In 2004 the research scientist decided to find out if the plant community in the uncontrolled grazing area remained the same even if the grazing livestock were removed. Half of this area was fenced to exclude livestock from it. The other half was left with uncontrolled grazing. The number of plant species in the two halves was counted over six years. The results are shown in Table 1.3.

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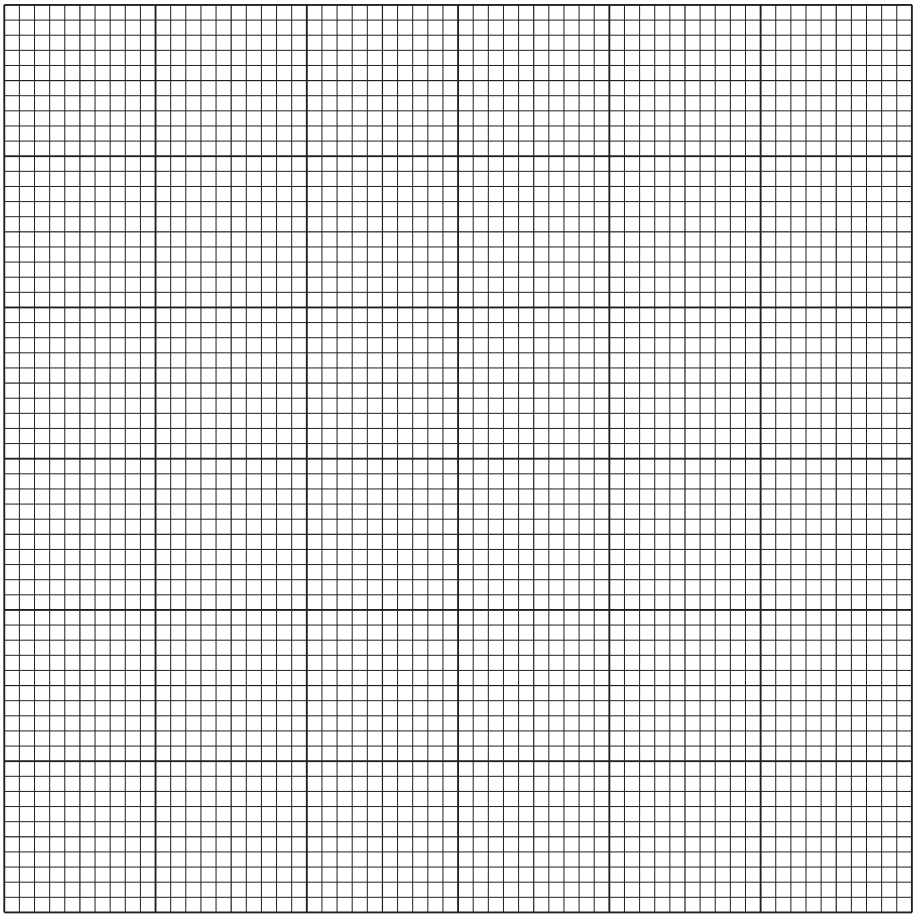
Table 1.3

	number of plant species able to be eaten by livestock	
year	no grazing	uncontrolled grazing
2004	7	7
2005	8	8
2006	9	7
2007	10	6
2008	10	8
2009	10	8

(i) Plot a graph of the data.



[4]

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(ii) Describe the trend shown in

the no grazing area .....

the uncontrolled grazing area ..... [2]

(iii) In 2009, the area that had been fenced in 2004 had 10 different plant species that could be eaten by livestock. The original no grazing area, that had been fenced before 2000, had 15 different plant species.
Suggest **two** reasons for this difference.

.....

.....

..... [2]

(d) Why is overgrazing especially damaging to the environment in uplands areas?

.....

.....

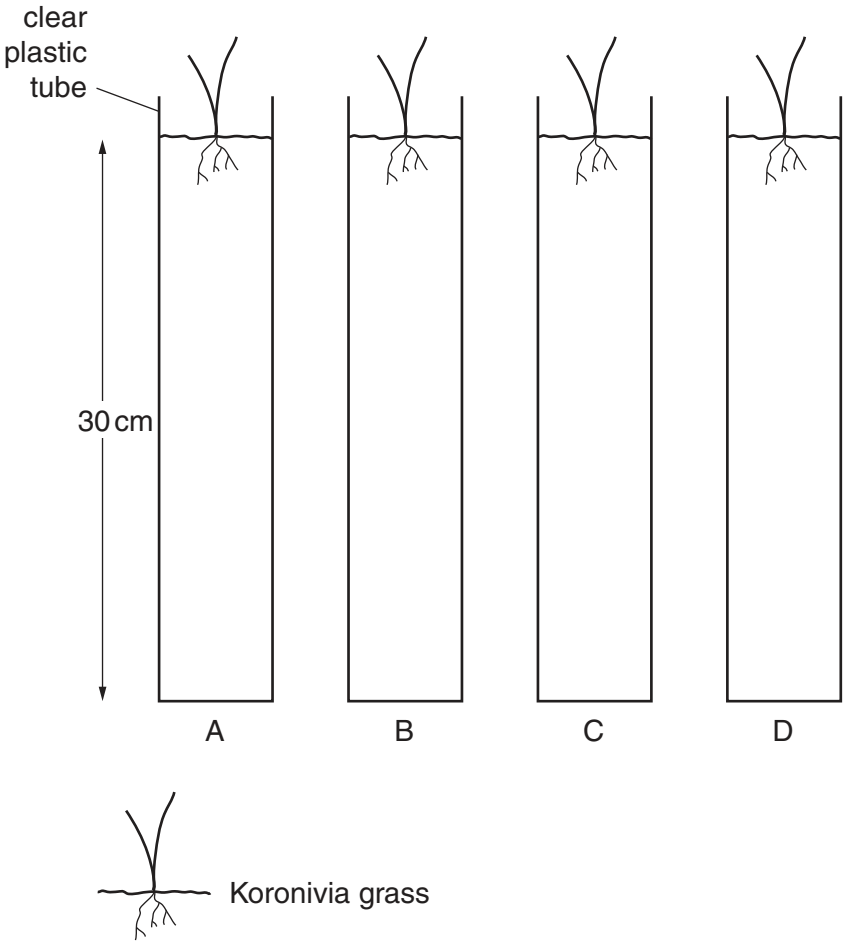
..... [2]

2 The Tabasco area has many large oil fields. The soils are damaged by many small scale oil spills which kill tropical grass species. Oil is biodegradable in soil.

(a) (i) What does the term biodegradable mean?

..... [1]

Soil samples were placed in tubes and Koronivia grass was planted in the tubes.
Koronivia grass is eaten in tropical regions by cattle and goats.
Plant growth was measured for 24 days.
Fig. 2.1 shows the tubes and the results.



	increase in length of grass / cm			
days after planting	tube A control soil	tube B polluted soil	tube C polluted soil	tube D polluted soil
0	0	0	0	0
4	3	2	1	2
8	8	5	6	6
12	15	15	16	14
16	24	28	29	27
20	36	40	42	41
24	48	54	56	53

Fig. 2.1

The average rate of growth over the 24 days was calculated for the grass plants in tubes A and B.

tube	rate of growth in centimetres per day
A	2.0
B	2.25
C	.....
D	.....

(ii) Calculate the average rate of growth for grass plants in tubes C and D during the 24 days. [2]

(iii) When the results from tube A are compared with those from tubes B, C and D what do the values shown in Fig. 2.1 show between

days 0–12, ...

.....

days 13–24? .....

..... [3]

(iv) Suggest a reason for the different growth rates between tube A and the other three tubes.

..... [1]

(b) Some local farmers held a meeting to discuss how to use their oil-polluted land. They proposed three different plans.

Plan A
Leave the polluted soil alone. Start grazing cattle and goats immediately. Sell the meat in local markets.

Plan B
Do not farm the polluted soil for the first three years. Then start grazing cattle and goats immediately. Sell the meat in local markets.

Plan C
Plant Koronivia grass in polluted soil and wait one year. In the second year start grazing a small number of cattle and goats.

(i) Suggest why Plan A will not help the farmers make a living.

.....

.....

..... [2]

(ii) Explain why carrying out Plan B would be better for the farmers and the local people than Plan A.

.....

.....

..... [2]

(iii) Suggest reasons why the farmers actually carried out Plan C.

.....

.....

..... [2]

(c) The oil extracted from the Tabasco area contains sulfur. Some is lost as sulfur dioxide into the air. The area around an existing factory, that discharges sulfur dioxide from its vents, is shown in Fig. 2.2.

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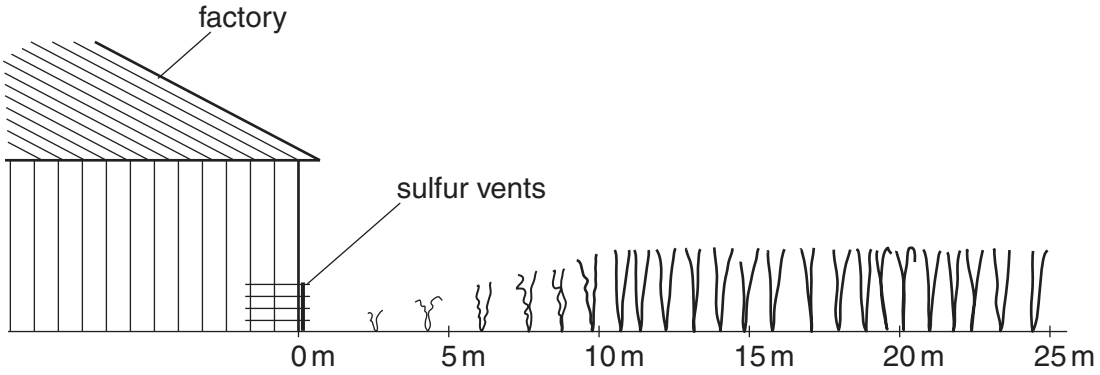

Fig. 2.2

(i) Does sulfur dioxide alter plant growth? Describe the evidence shown in Fig. 2.2.

.....

.....

..... [2]

(ii) When sulfur dioxide is added to water in the air it forms an acid.

Name the acid formed.

..... [1]

(iii) Describe the effects of this acid on the vegetation and soil.

.....

.....

..... [2]

3 Bluefin tuna are an important source of income for the Mexican fishing village shown on page 2.

- bluefin tuna fish are caught using long lines with hooks
- the fish from the Gulf of Mexico and the Sea of Cortez are exported
- the fish migrate thousands of miles each year
- they return to the Gulf of Mexico to spawn between April and June every year

(a) To find out if fishing for bluefin tuna is sustainable, all the fishermen from the village agreed to have their catches recorded every year for five years. The results are shown in Table 3.1.

Table 3.1

year	tonnes of bluefin tuna caught
2005	50
2006	46
2007	41
2008	34
2009	30

(i) Calculate the percentage decrease in the bluefin tuna catch between 2005 and 2009.

.....[1]

(ii) Suggest **two** reasons for the decrease in fish caught as shown in Table 3.1.

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.....[2]

(iii) The fishermen recorded the total weight of the bluefin tuna they caught. Suggest **two other** characteristics they could have recorded.

.....

.....[2]

(iv) Draw a table that could be used, for a period of one week, to record the weight of fish caught and the two other characteristics you have identified in part **(iii)**.

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[3]

(b) To find out more about fishing activities some students started writing a questionnaire to collect more information.

Complete the questionnaire by adding three more questions.

fishing questionnaire

Q1 Which fish species do you catch?

bluefin tuna ☐ yellowfin tuna ☐ marlin ☐ dorado ☐

Q2 How many years have you been fishing?

0–1 yr ☐ 2–5 yrs ☐ 6–10 yrs ☐ 11+ yrs ☐

Q3 .....

.....

Q4 .....

.....

Q5 .....

.....[4]

(c) **(i)** Some fishermen in Mexico catch small, wild bluefin tuna alive and place them in sea cages. The tuna are fed with sardines until they grow big enough to sell. Suggest **one** reason why this might not be a sustainable activity.

.....[1]

(ii) All species of tuna are part of a food chain.

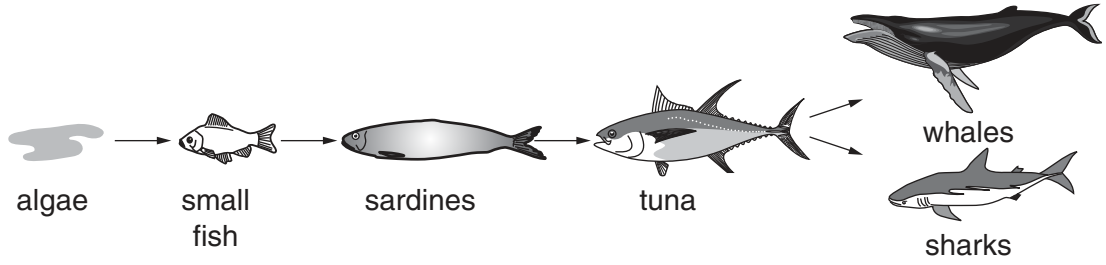

Fig. 3.1

Suggest likely effects on the food chain, shown in Fig. 3.1, if tuna species become rare due to overfishing.

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..... [2]

(d) Some sports fishermen are willing to pay millions of pesos to catch large fish such as tuna and marlin. If the fish stocks collapse local fishermen cannot earn money either from catching fish or taking sports fishermen to sea.

Suggest plans for sustainable sports fishing and sustainable fishing for food.

sports fishing .....

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fishing for food .....

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[6]

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