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ADVANCED  
General Certificate of Education  
2010

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## **Geography**

Assessment Unit A2 2

*assessing*

Physical Geography and Decision Making

[AG221]

TUESDAY 25 MAY, AFTERNOON

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**RESOURCE  
BOOKLET**

## **Section A:**

### **Physical Geography**

#### **Option A: Fluvial and Coastal Environments**

- Resource 1** Newspaper article on the future of Dawlish, South Devon
- Resource 2A** Flood event at the Water of Leith, Edinburgh
- Resource 2B** Water of Leith flood prevention proposals
- Resource 2C** News release: October 2007
- Resource 2D** Residential development along the Water of Leith, Edinburgh
- Resource 2E** Redeveloped warehouses now in commercial and residential use along the Water of Leith, Edinburgh

#### **Option B: The Nature and Sustainability of Tropical Ecosystems**

- Resource 3** Cross section of low latitude atmospheric circulation
- Resource 4A** Newspaper article on the impact of palm oil production
- Resource 4B** Profile of an oxisol

#### **Option C: The Dynamic Earth**

- Resource 5** Geology of the ocean floor of the South Atlantic
- Resource 6** Newspaper article on the China earthquake, May 2008

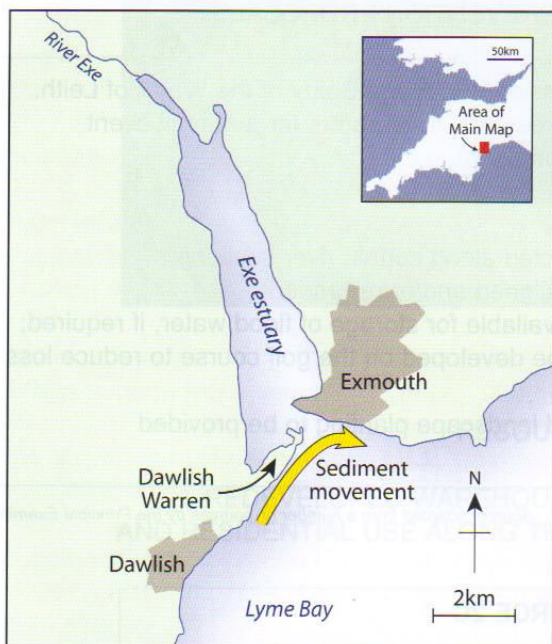
## RESOURCE 1

### NEWSPAPER ARTICLE ON THE FUTURE OF DAWLISH, SOUTH DEVON

#### Can we have our beach back?

The people of Dawlish were justly proud of their golden sands, an attraction that has been enticing visitors to the resort for decades.

Hoteliers and other businesses now fear that they are about to fall on hard times, as the groynes have decayed and the sea has washed away the sand to leave an expanse of rocks and gravel. To rub salt into the wounds, sand from the beach is now enriching the fortunes of Exmouth, a rival resort across the Exe Estuary.



In Exmouth, there is sympathy but little enthusiasm to spend money on solving the problem. A member of Exmouth town council admitted that the resort had acquired a lot more sand than it once had, but attributed this to "forces of nature".

Hoteliers and councillors in Dawlish are demanding that the sand be returned from Exmouth before its absence affects tourism, which is vital to the small town's economy. Some residents of Dawlish believe that the local authority is at fault for allowing ancient timber beach groynes to rot. The local council wants the Environment Agency to build sea defences, but this has been ruled on grounds of cost for at least five years.

Natural England, the Government's countryside watchdog, wants to allow the coast at Dawlish to return to a natural state. This could, however, lead to further erosion of the beach and Dawlish Warren (a sandy spit extending into the Exe Estuary). Mike Baker, of the Environment Agency, has said: "The sand spit is a barrier that prevents waves penetrating the estuary during storms and may help to protect waterside properties from flooding. It is also thought that the spit provides essential protection to the two railway lines that run along each side of the estuary shore. With sea levels forecast to rise over the coming decades, these flood risks could increase significantly."

A contingency fund of £500 000 has been put aside to pay for replenishing the sand but this money cannot be spent until further research on sediment movements along this area of the coastline has been carried out. Even then, neighbouring Exmouth is unlikely to welcome any sand removal from their beach. There is, however, a plentiful supply of sand newly dredged from other sites.

Source: adapted from an article in *The Times*, 10 January 2008, by S. de Bruxelles

## RESOURCE 2A

### FLOOD EVENT AT THE WATER OF LEITH, EDINBURGH

The Water of Leith (a river flowing through the city of Edinburgh) is prone to flooding. For example, on 26 April 2000, 112 mm of rain fell in a 48 hour period producing the highest flows ever recorded along this river. More than 750 properties, including three care homes for the elderly and a number of businesses, were flooded.

*Source: adapted from a number of sources by the Principal Examiner*

## RESOURCE 2B

### WATER OF LEITH FLOOD PREVENTION PROPOSALS

In November 2000, Edinburgh Council commissioned a Flood Study of the Water of Leith. The study modelled the effects of rainfall and resultant floodwaters for a rainfall event greater than that which was experienced in April 2000.

The following proposals were made:

- flood embankments and walls to be constructed along certain river sections;
- some sections of existing channel to be re-aligned and/or re-graded;
- areas of a nearby golf course to be made available for storage of flood water, if required;
- ponds, ditches and small wetland areas to be developed on the golf course to reduce loss of aquatic habitats;
- fish and mammal ledges, nesting boxes and landscape planting to be provided throughout.

*Source: adapted from a number of sources by the Principal Examiner*

## RESOURCE 2C

### NEWS RELEASE: OCTOBER 2007

An initial grant of £4.4 million to the City of Edinburgh Council towards the preliminary costs of developing the Water of Leith Flood Prevention Scheme was announced today. The scheme, which must meet required technical, environmental and economic criteria, will cost £30 million, and attracts 80 per cent grant funding from the Scottish Government. This initial grant will contribute to feasibility studies, preparation of an Environmental Impact Assessment and hydrological modelling.

*Source: adapted from <http://ccci.scot.nhs.uk/News/Releases>*

**RESOURCE 2D**

**RESIDENTIAL DEVELOPMENT ALONG THE WATER OF LEITH, EDINBURGH**



Source: Principal Examiner

**RESOURCE 2E**

**REDEVELOPED WAREHOUSES NOW IN COMMERCIAL AND RESIDENTIAL USE ALONG THE WATER OF LEITH, EDINBURGH**

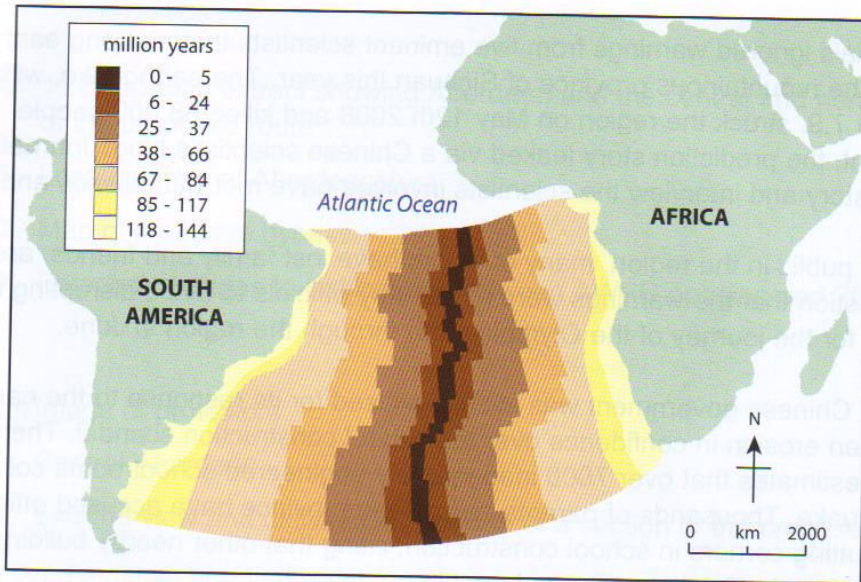


Source: Principal Examiner

These pages contains resources for Optional Unit B which we have not studied.

## RESOURCE 5

### GEOLOGY OF THE OCEAN FLOOR OF THE SOUTH ATLANTIC



## RESOURCE 6

### NEWSPAPER ARTICLE ON THE CHINA EARTHQUAKE, MAY 2008

Chinese officials ignored warnings from five eminent scientists that a strong earthquake would strike the mountainous province of Sichuan this year. The earthquake, with a Richter scale force of 7.9, struck the region on May 12th 2008 and killed 68 000 people. Two weeks after the event, the prediction story leaked via a Chinese scientist's blog. Journalists trying to verify the story and interview the scientists involved have met with silence and denial.

The Chinese public in the region, many of whom have lost family and friends, are enraged by the suggestion that the warnings were ignored by officials to avoid disrupting the preparations for the journey of the Olympic torch through the region in June.

Although the Chinese government was initially praised for its response to the earthquake, there has been erosion in confidence over the school construction scandal. The central government estimates that over 7000 inadequately engineered schoolrooms collapsed in the earthquake. Thousands of parents around the province have accused officials and builders of cutting corners in school construction, citing that other nearby buildings suffered little damage. Local officials have urged people not to protest and censors have discouraged stories of poorly-built schools from being published in the media.

The first earthquake prediction was given almost two years previously in an academic journal. Four seismologists calculated that stress along the 1000 km long Sichuan-Tibet fault suggested an earthquake above 6.7 would occur in 2008. They suggested the government should organise and train local people and disaster teams and set up an emergency headquarters. It appears nothing was done.

The second forecast from a retired expert came two weeks before the event when it was predicted that an earthquake above 7 on the Richter scale would occur within 10 days of May 8th 2008. A copy of this report was forwarded to the state earthquake bureau in Beijing on April 30th. Again, it seems nothing was done. Access to the scientist's blog that revealed the story has been blocked by web censors.

#### **Time line**

- September 2006 – four scientists predict an earthquake of at least 6.7 in the region in 2008
- April 27th 2008 – retired expert warns of an event over 7 within 10 days of 8th May
- May 12th 2008 – earthquake of 7.9 hits the region

*Source: adapted from an article by Michael Sheridan. Sunday Times 1/6/2008*



## Section B

### Decision Making

#### Maps

- Resource 7A** 1:50 000 map extract showing Aberdeen and the central and northern sections of the proposed route
- Resource 7B** Location map of Aberdeenshire
- Resource 7C** Map of proposed bypass
- Resource 7D** Forecast changes to traffic flows between AWPR opening and 2012

#### Images

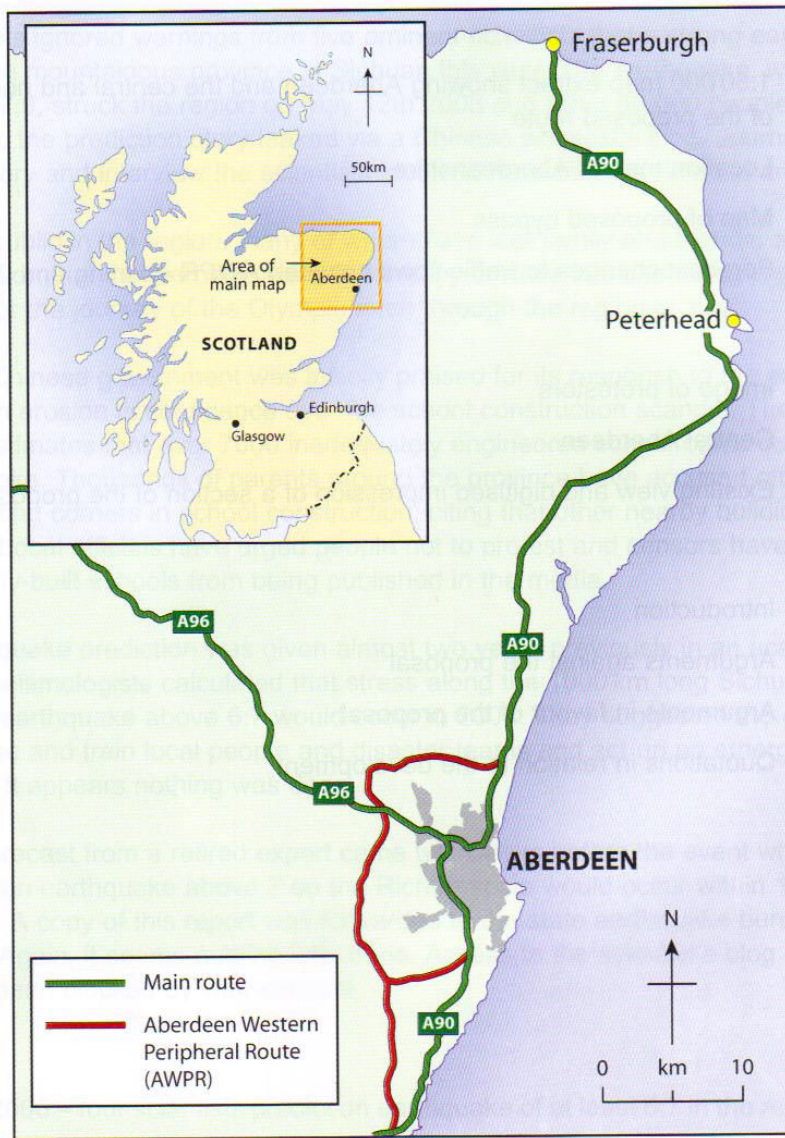
- Resource 7E** Image of protestors
- Resource 7F** Central Aberdeen
- Resource 7G** Existing view and digitised impression of a section of the proposed route (A–B)

#### Text

- Resource 7H** Introduction
- Resource 7I** Arguments against the proposal
- Resource 7J** Arguments in favour of the proposal
- Resource 7K** Quotations in relation to the development

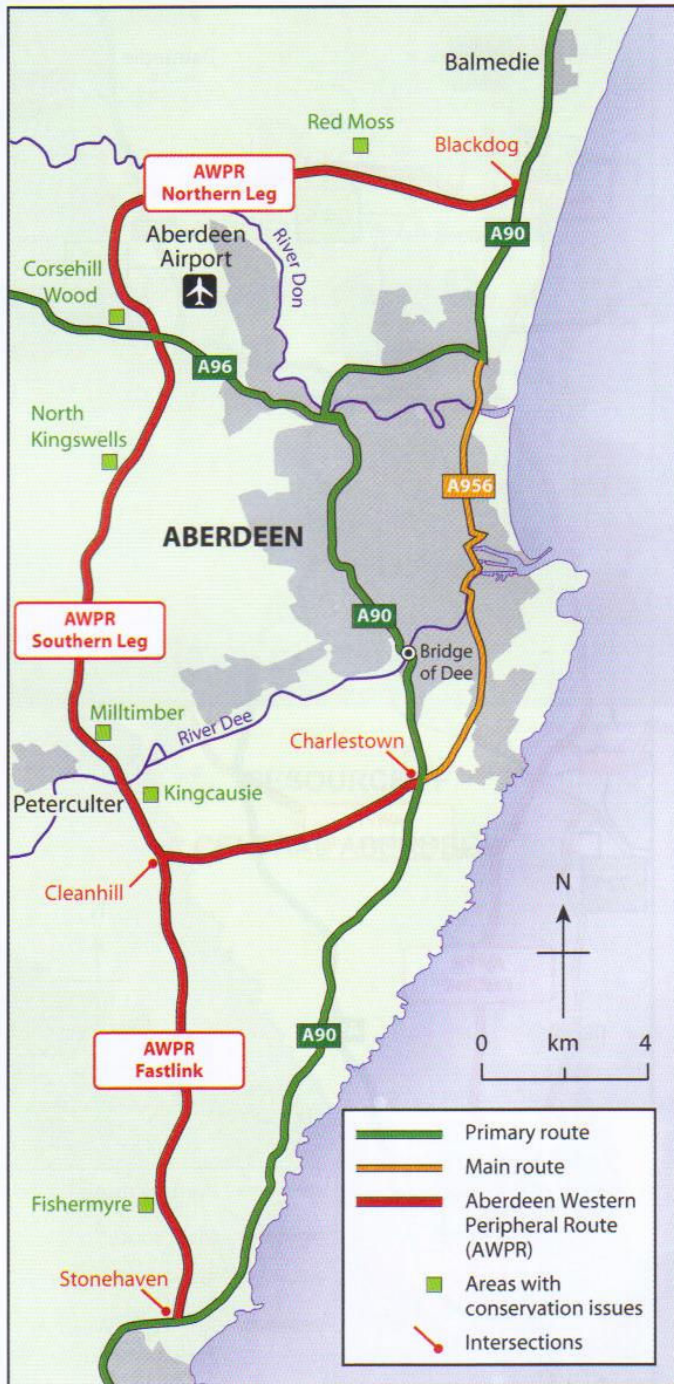
# RESOURCE 7B

## LOCATION MAP OF ABERDEENSHIRE



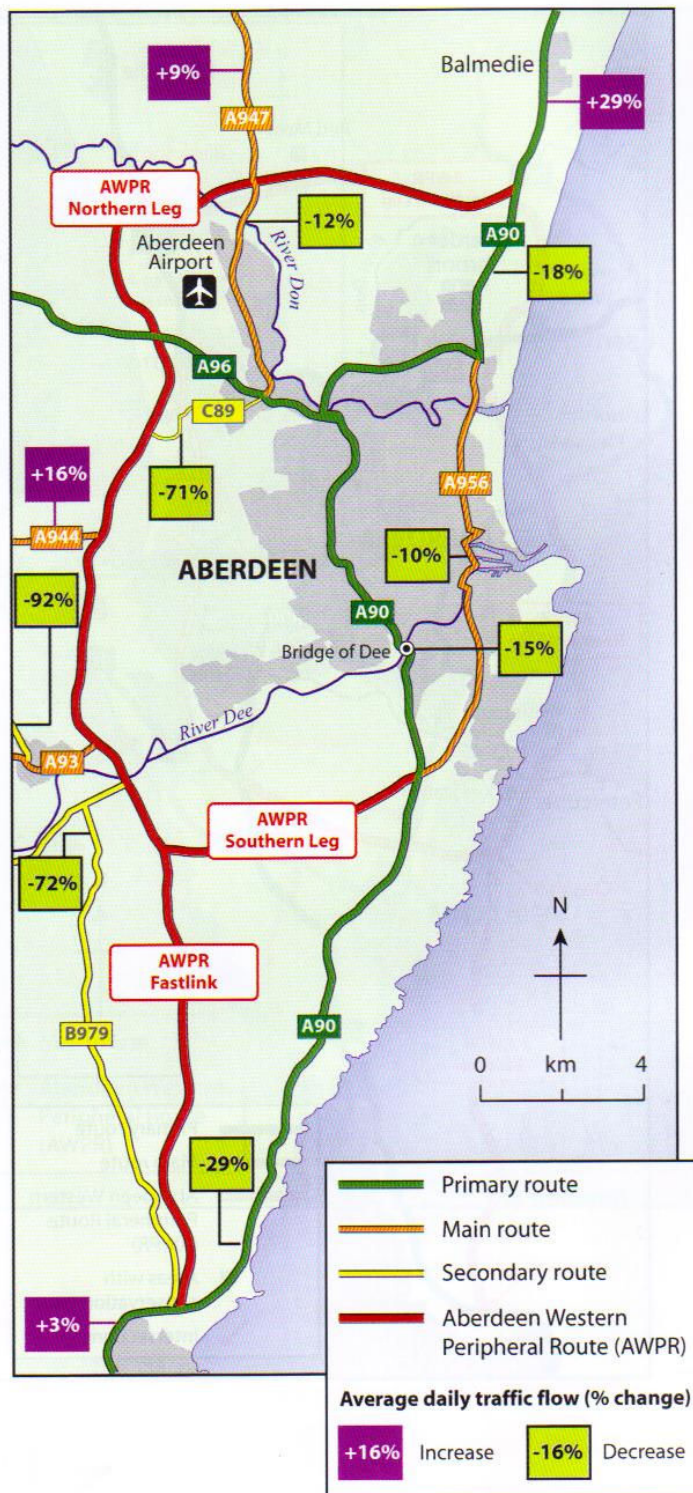
# RESOURCE 7C

## MAP OF PROPOSED BYPASS



## RESOURCE 7D

### FORECAST CHANGES TO TRAFFIC FLOWS BETWEEN AWPR OPENING AND 2012



RESOURCE 7E

IMAGE OF PROTESTORS



Source: James MacKenzie, Road Sense

RESOURCE 7F

CENTRAL ABERDEEN



Source: Principal Examiner

**RESOURCE 7G**

**EXISTING VIEW AND DIGITISED IMPRESSION  
OF A SECTION OF THE PROPOSED ROUTE (A-B)**



Existing view

Source: EIS statement



Artist's impression

Source: EIS statement A

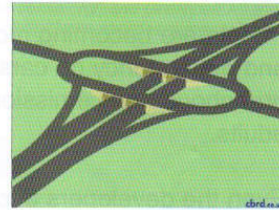
## RESOURCE 7H

### INTRODUCTION

The main route linking North East Scotland to the rest of the UK is the A90 (Resource 7B) which passes through the city of Aberdeen and is also used for local traffic. This leads to heavy congestion and slow journey times across the city. It is argued that the existing roads and junctions in the area are very congested and will not be able to accommodate the future traffic flows anticipated.

A Modern Transport System (MTS) was developed to address these concerns. The MTS is key to having effective transport management throughout the whole region of Aberdeenshire.

The MTS proposals include giving buses priority in some places, the provision of Park and Ride facilities and improving the road and rail networks. The key road improvement to deliver the MTS is said to be the Aberdeen Western Peripheral Route (AWPR). The AWPR will be a dual carriageway with two lanes in each direction. Where other roads cross, the junctions will be "grade separated" similar to those on motorways so that the flow of traffic on the AWPR will not be disrupted.



The route (Resource 7C), running to the West of Aberdeen, is made up of three sections:

- Northern Leg (Blackdog to North Kingswells)
- Southern Leg (North Kingswells to Cleanhill)
- Fastlink (Cleanhill to Stonehaven)

Following considerations of all the possible routes, the route of the AWPR was finally decided in 2005. This will allow traffic to bypass Aberdeen and let local traffic flow more easily within the city. At present, the main roads through Aberdeen are badly congested and other minor roads in and around the city are also heavily used by motorists trying to escape congestion elsewhere. It is anticipated that the AWPR will address these problems by funnelling most of the non-local traffic onto the new bypass (see Table 1 and Resource 7D).

	Number of vehicles crossing the Bridge of Dee	
	without AWPR	with AWPR
<b>2005</b>	30,100	—
<b>2012</b>	34,300	29,200
<b>2027</b>	35,600	30,300

**Table 1:** Forecast changes to average daily traffic flows at Bridge of Dee (GR: 943051)

This improved transport efficiency will in turn help the local and regional economy and employment. The estimated cost of the AWPR is between £295 million and £395 million but the project has a very high benefit to cost ratio (BCR) producing five times more benefit over time compared to the current cost of construction. Most of this cost will be met by the Scottish Government but with the northern and southern legs being part funded (19%) by the local councils. The cost of maintaining the route will be met entirely by the Scottish Government.

## RESOURCE 7I

### ARGUMENTS AGAINST THE PROPOSAL

The AWPR will cause major problems in the area. The experience of other bypasses, such as the Newbury bypass in England, is that they attract more traffic.

This four-lane motorway-style road will attract industrial parks, housing estates, and out-of-town shopping centres. The proposed route runs through the Aberdeen and Aberdeenshire Greenbelt, which would be entirely contrary to the aims of the government's own policies on Nature Conservation. The River Dee, with Special Area of Conservation (SAC) status, is a most sensitive habitat for fauna and flora, as well as a natural habitat for people to enjoy. The proposed project would be highly damaging to this vulnerable environment.

People are becoming more and more aware of the negative aspects of increased car use and dependency on cars. There are problems arising from air pollution such as increased greenhouse gas emissions, respiratory problems in children and increased heart disease in adults.

Even the developers accept that the proposed scheme will produce a 9% increase in carbon dioxide emissions by 2026. This is no way to address climate change. Instead we should be prioritising sustainable travel options.

Overdependence on car transport also excludes many individuals who have limited access to vehicles, such as the poor and/or the elderly. Shopping facilities and workspaces may move to the edge of the city and this will have a negative impact on non-car owners.

The AWPR is being promoted to the local people as a way to reduce congestion within Aberdeen. However, the city council is considering building other roads in the area which will have the effect of *increasing* traffic in the city.

The money would be better spent on developing alternative transport opportunities which are sustainable and have the additional benefits of reducing pollution and improving the health of the population.

There is little evidence to suggest why a four-lane motorway-style road is required. The land set aside for the AWPR could be used for better purposes, such as the enhancement of the Greenbelt. In fact it will utterly destroy the Greenbelt around Aberdeen bringing devastation to Kingcausie (Grid Reference (GR): 8600), the Dee valley (GR: 8701) and the countryside between Milltimber (GR: 8501) and Kingswells (GR: 8607). It will also appear totally out of character in the sensitive landscape within which it is being placed. Furthermore, there is no evidence that the bypass is in the best interest of the local people. Nor will it have a positive impact on tourism or on the population decline of the region.



The proposed road construction will destroy 70 hectares of forest and over 500 hectares of agricultural land. A total of 77 farms would be significantly damaged and six would be no longer viable as farms if the road was built. For many species, the road will act as a barrier around Aberdeen reducing biodiversity in the area. One protected species, red squirrel, would disappear from a number of woods including Corsehilf Wood (Grid ref: 8511). The developers themselves admit that the number of red squirrels likely to be killed on the road is 'of major significance'.

Wetlands, scarce habitats in Aberdeenshire, including Red Moss, a SAC (GR: 9115) and Fishermyre (Resource 7C) may also be damaged.

While the developers accept that 1865 residents will be annoyed by the noise of the traffic on the proposed road, they put forward no measures to reduce this.

*Source: adapted from a range of resources including Roadsense (<http://www.road-sense.org/>) and Greenbelt Alliance (<http://www.aberdeengreenbelt.org/>)*

## RESOURCE 7J

### ARGUMENTS IN FAVOUR OF THE PROPOSAL

The AWPR will reduce congestion enormously. In the first year 41 000 vehicles per day are forecast to be attracted to the road, reducing traffic in the places which currently are most congested (Resource 7D).

Traffic on many minor roads, which are now being used as shortcuts by commuters, will also be reduced. The AWPR will link with Park & Ride facilities, both existing and planned, and freight depots for trucks, helping to provide a more integrated transport system. Rail travellers, pedestrians and cyclists will all be helped by the development and access to Aberdeen Airport will be improved. The improved transport network will link the main employment areas in the region to the population and to other transport links. As a result, the workforce will be more efficient and employment opportunities will increase. New firms will be attracted and existing businesses will be more likely to remain and to thrive as a result of the improved infrastructure, and reduced costs and times of journeys. Sites at the edge of Aberdeen have not been attractive to industry because of poor transport links but will now become viable. The reduction in traffic in Aberdeen's historic city centre (Resource 7F) will help to protect its world famous granite buildings. Improved access to the north of Aberdeen will help to revitalise the economies of towns such as Peterhead and Fraserburgh.

The route of the AWPR has been chosen to avoid or reduce negative impacts, where possible. However, in any such scheme some damage is inevitable. It is accepted that there will be an adverse impact on the quality of air along the route, but the levels will be within permitted European Union air quality standards. Air quality will be improved elsewhere, particularly in central Aberdeen. Where farms have been divided by the road, bridges or underpasses will be provided to allow access to the fields.

Developments of this sort threaten water quality as drainage from the road would contain contaminants. Nineteen sets of Sustainable Drainage Systems (SUDS) ponds are planned to address this. A system of bridges, culverts and underpasses will help wildlife, such as badgers and otters, to cross the AWPR safely. In addition, about 15 hectares of land will be planted to create or replace wildlife habitats.

Local people will find that the AWPR increases their mobility. While there could be a dispersal of houses and businesses and more car travel, careful planning will ensure that this does not happen. Alternatives to car travel will be encouraged to grow and eventually reverse the growth of car travel. This will ensure that the benefits that the AWPR provides are not eroded by subsequent traffic growth.

Road Safety will be improved by the development. It is estimated that, by 2027, there will be between 60 and 70 fewer accidents each year.

Six hundred jobs are forecast to be created as a direct result of the building of the road. Five years after completion it is estimated that 3120 additional long term jobs will have been created. In other parts of Scotland, economic growth resulting from this project is predicted to create a further 630 jobs. It is forecast that, for 30 years after completion, there will be additional income of £105 million from investment in new businesses.

The AWPR will boost the economy of North East Scotland by encouraging key industries such as the oil and gas industry, retailing and tourism. Freight will have a guaranteed link from all over North East Scotland to markets in the south. Reduced congestion and journey times will benefit businesses by cutting fuel and driver costs. It is estimated that the combined impact of increased sales and reduced costs across the economy of North East Scotland will generate more than £4.25 billion additional income to the region.

Key Industrial Sectors	Change to sales	Change to costs
Oil and Gas	No change	-2%
Food manufacturing	+1%	-5%
Retailing	+5%	-1.7%
Tourism	+5.6%	-2.5%

**Table 2:** Forecast changes to economy of Aberdeen area five years after opening of road

*Source: adapted from a range of resources including Regional Transport Strategy 2021 Finalised Strategy and Aberdeen Western Peripheral Route Environmental Statement 2007, Aberdeen Western Peripheral Route website (<http://www.awpr.org>)*

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## RESOURCE 7K

### QUOTATIONS IN RELATION TO THE DEVELOPMENT

**Shona Baird**, member of Green Party:

"The environmental issues they are looking at are 'should we go around this bog' or 'can we avoid this forest', they are not looking at the real issue of climate change."

**Bryan Greig**, Managing Director, local transport firm:

"My company is involved in haulage and transports goods all over the UK. Taking a load [through] Aberdeen adds over an hour to a journey ... I would regard Aberdeen as the worst bottleneck in the country. In comparison ... taking a lorry through London is easier ... the AWPR is urgently needed."

**Tavish Scott**, Transport Minister Scottish Parliament:

"The AWPR ... will ensure that, not only will the people of Aberdeen and Aberdeenshire benefit from a new bypass, but also that the transport needs of the whole region are met for the future ... As well as cutting congestion and reducing pollution, it will provide a significant boost to the local economy and bring welcome benefits to businesses in the area."

**Henry Irvine Fortescue**, Road Sense:

"The AWPR as proposed won't work and is a huge black hole for taxpayers' money. It will damage the local environment, increase greenhouse gas emissions, and it will cost Aberdeen city taxpayers a small fortune for no benefit."