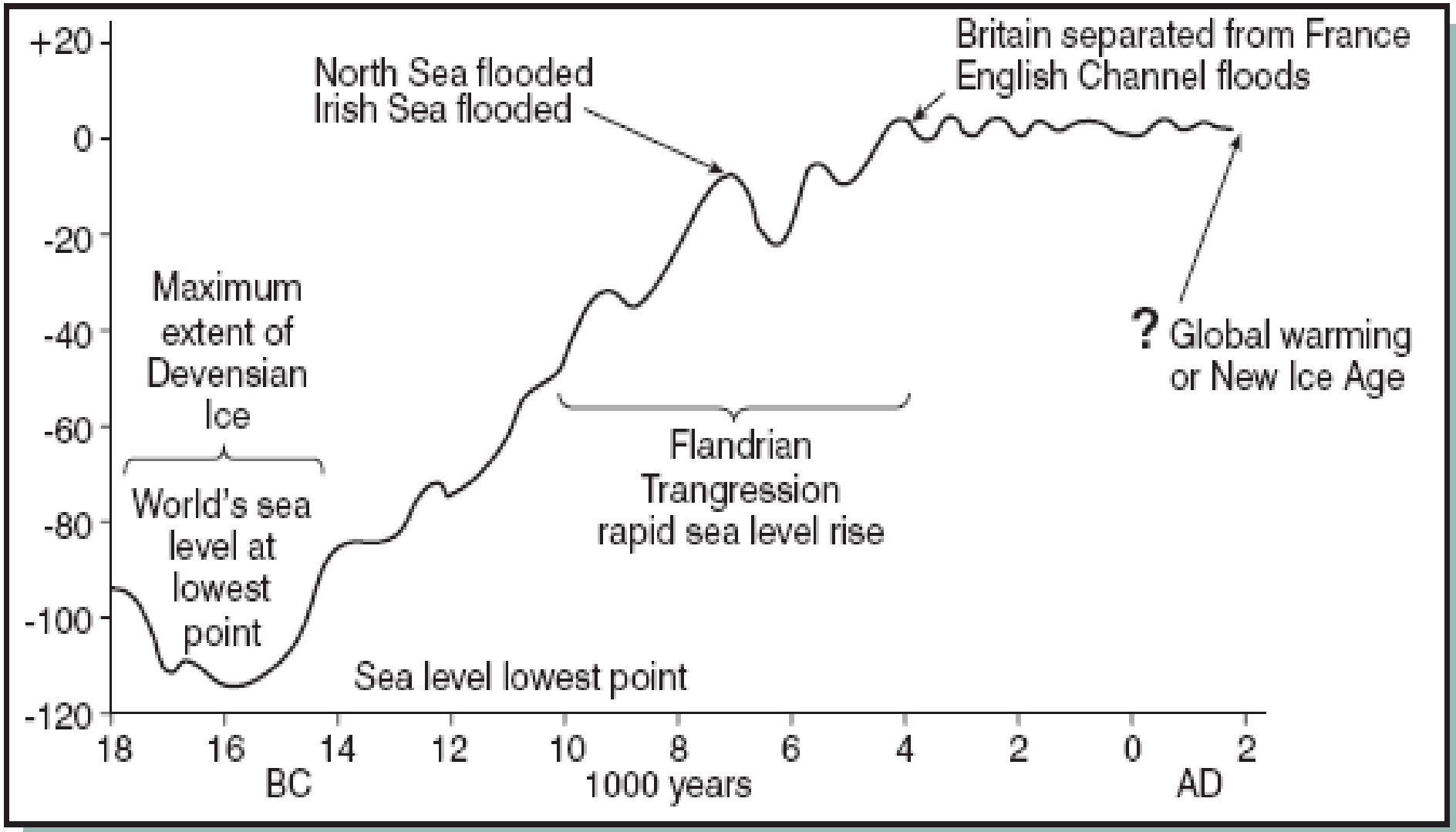
Submergent & Emergent Landforms

Why does sea level change?



Eustatic change

- The change in the amount of water in the sea.
  - During an Ice Age there is less water in the ocean as much precipitation falls as snow and joins the ice on the land. Therefore sea level falls.
- When ice melts then the volume of the water begins to increase and so sea levels rise. This can happen quite quickly.

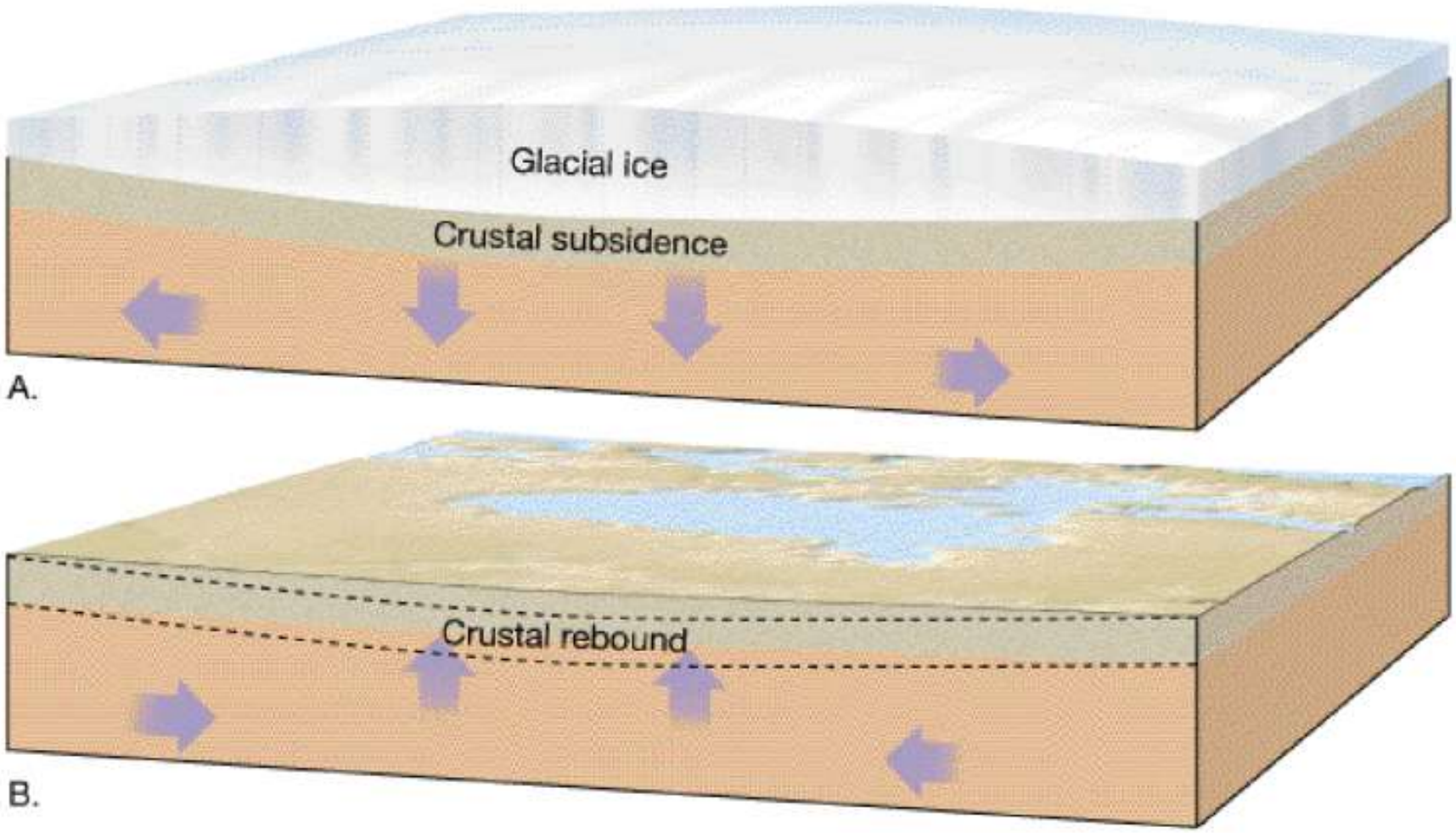
Eustatic change

- Global warming is increasing sea levels.
  - This is due to thermal expansion as water gets warmer
- It is also due to melting of **freshwater ice** sheets, e.g. Greenland. Melting of **sea ice** will not increase sea levels

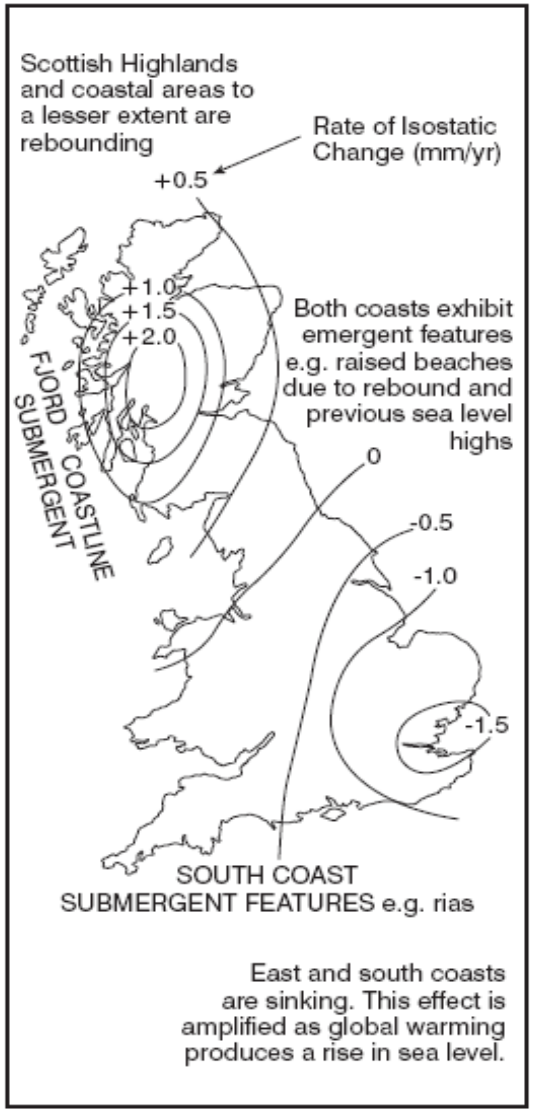
Isostatic change

- Isostatic change occurs much more slowly than eustatic change.
- When large ice sheets cover the land it weighs down the land and actually makes it sink.
- When the ice melts the land begins to rise as the weight is removed.
  - This is called **isostatic readjustment.**

Isostatic change



Isostatic change in Britain



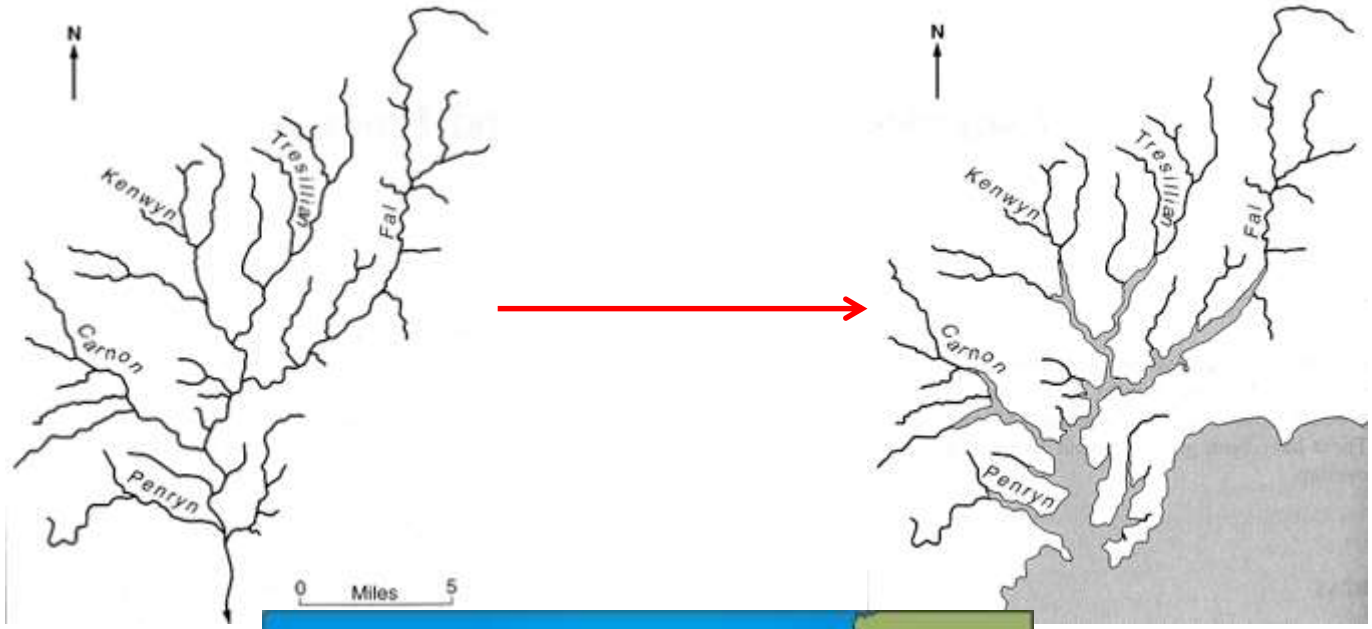
Landforms

Submergent	Emergent
Ria	Raised beach
Fjord	Relict cliff

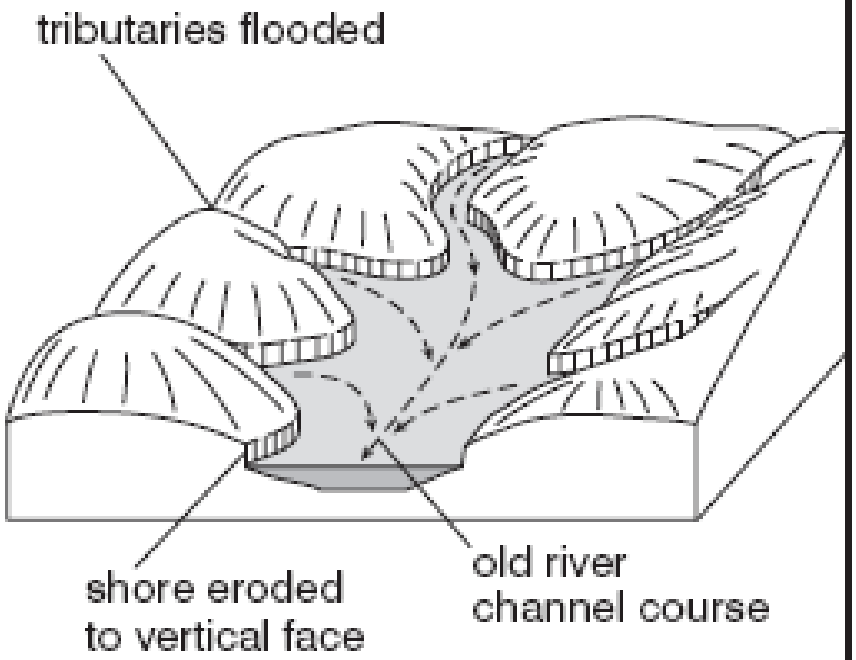
- Submergent coastline – one which has a rising sea level
- Emergent coastline – one which has a falling sea level

Ria

This is a drowned river valley. As sea levels rise they flood the river valleys, leaving only the high land visible.



Ria

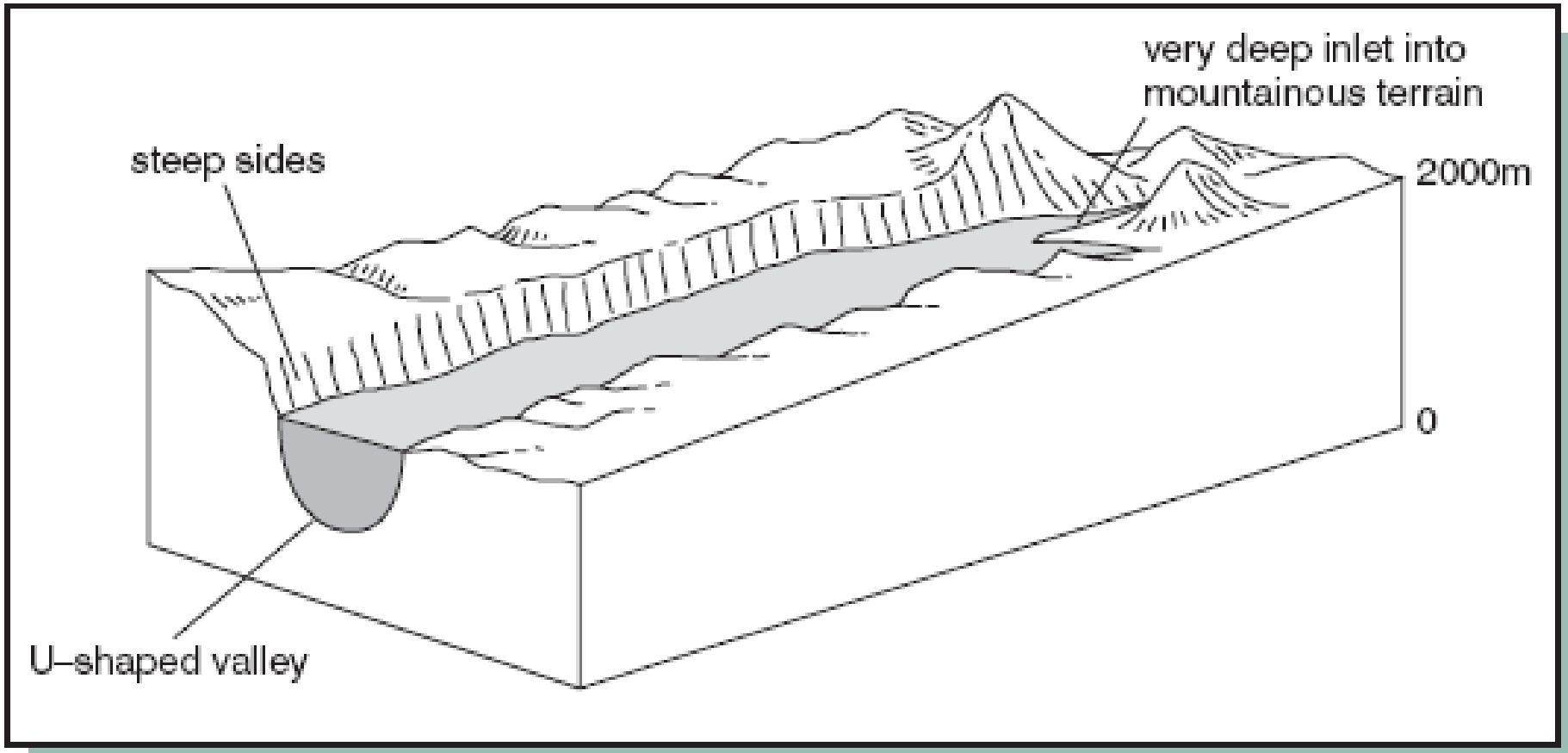


Rias have a long section and cross profile typical of a river valley and usually a dendritic system of drainage.

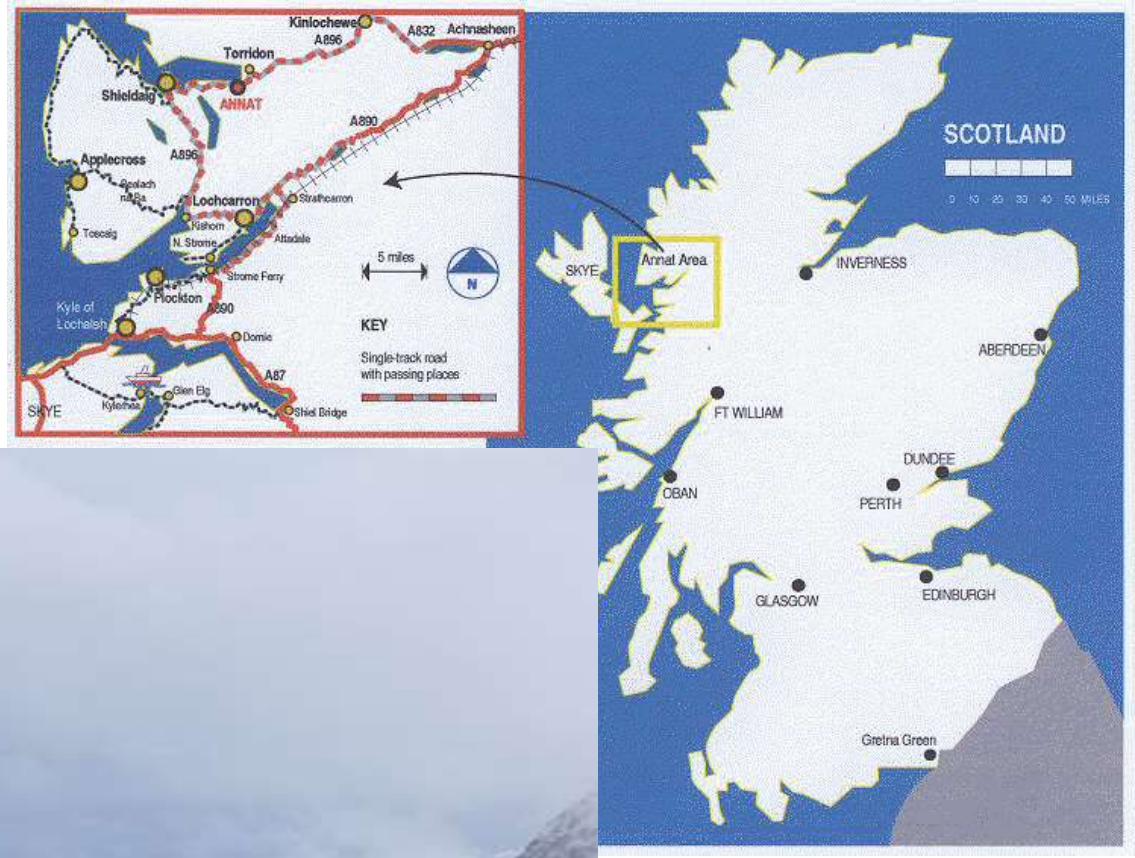
Fjord

This is a drowned glacial valley. As sea levels rise, U-shaped valleys left by glaciers are submerged.

Figure 7: Fjord coastline, e.g. Loch Torridon, west coast of Scotland



Fjord


Kinlochewe
A896
A832
Achnasheen
Torridon
Shieldaig
ANNAT
A890
Applecross
A896
Lochcarron
Strathcarron
Kishorn
N. Strome
Attadale
Toscaig
Strome Ferry
Plockton
Kyle of Lochalsh
A890
Dornie
A87
Glen Elg
Kyleakin
SKYE
Shiel Bridge
5 miles
N
KEY
Single-track road with passing places
SCOTLAND
0 10 20 30 40 50 MILES
SKYE
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INVERNESS
ABERDEEN
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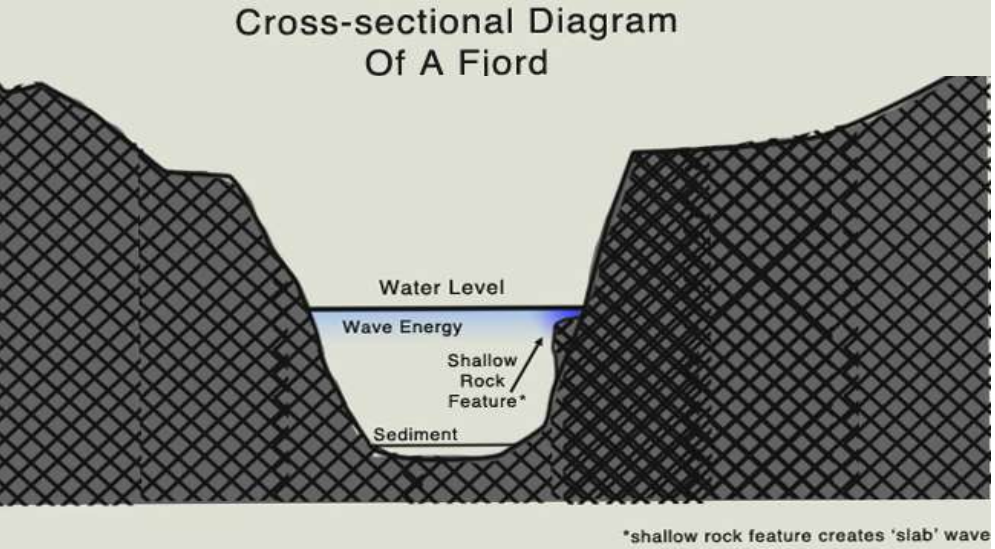
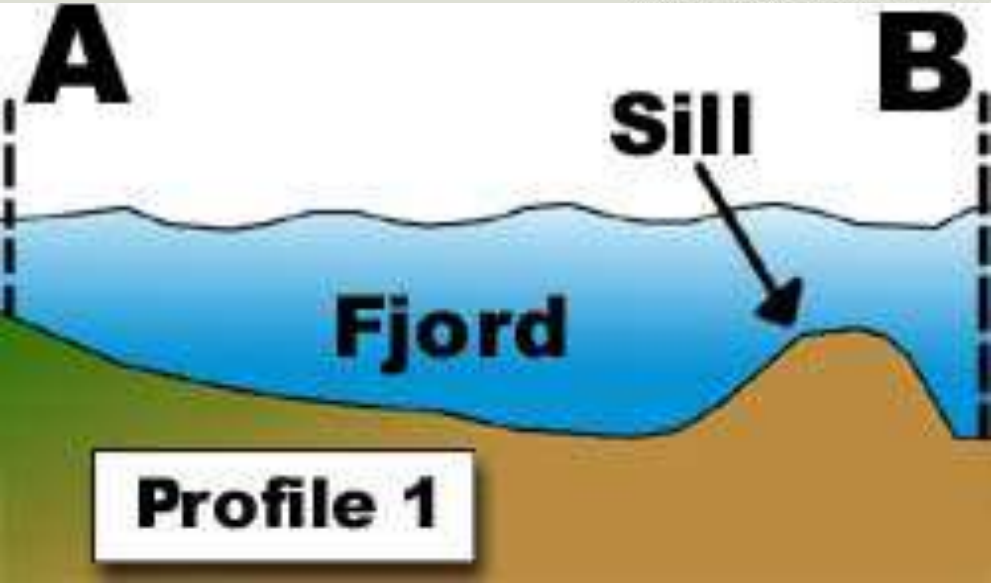
DUNDEE
OBAN
PERTH
GLASGOW
EDINBURGH
Gretna Green

Fjord





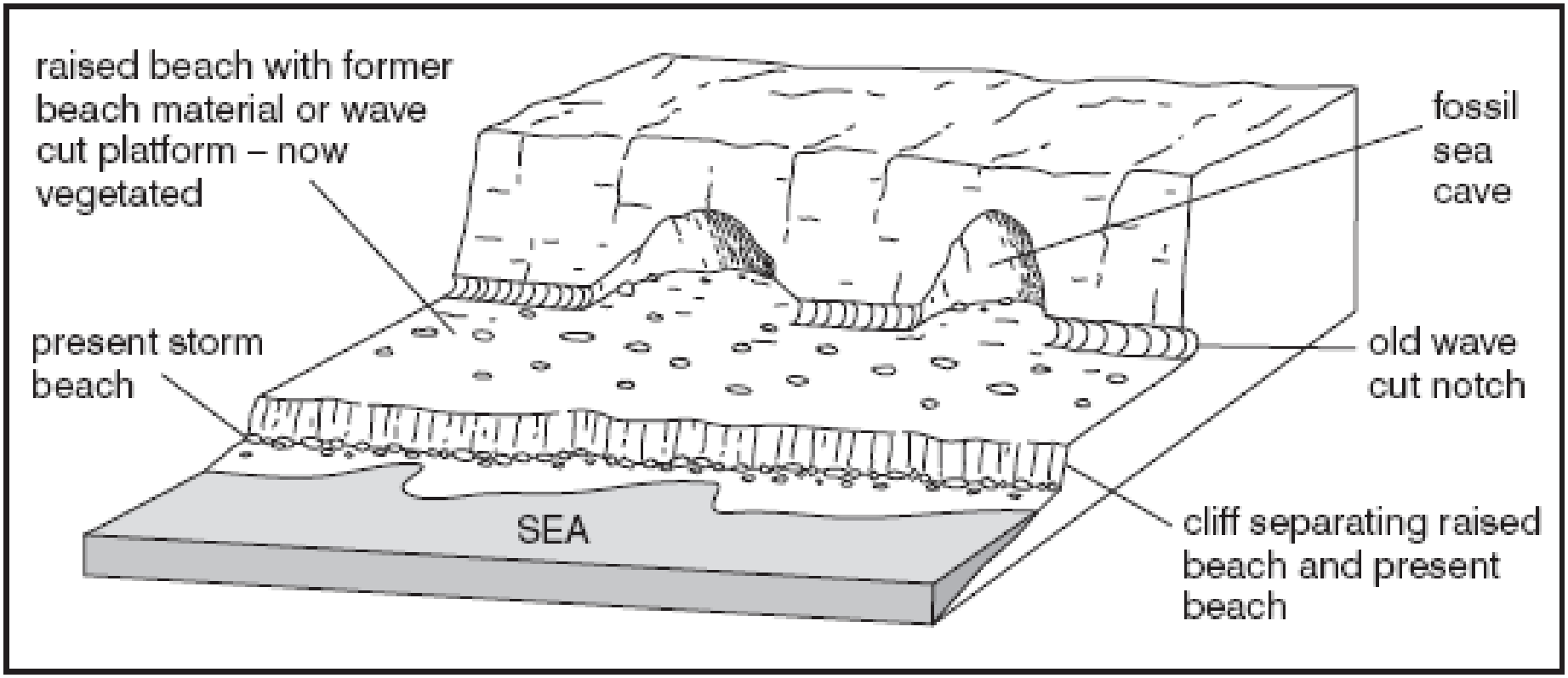
- Fjords have steep valley sides and are fairly straight and narrow.
- They have a u-shaped cross-section with hanging valleys on either side.
- At the mouth they have a shallower section called a threshold.
- This is thought to be due to reduced glacial erosion as the glacier came into contact with the sea.

Raised Beaches

Areas of former wave-cut platforms and their beaches which are at a higher level than the present sea level.

Raised Beaches

- Raised beaches are common in Scotland.
- The Isle of Arran is a good example.



Relict cliffs

An old cliff displaying features such as caves, arches and stacks.

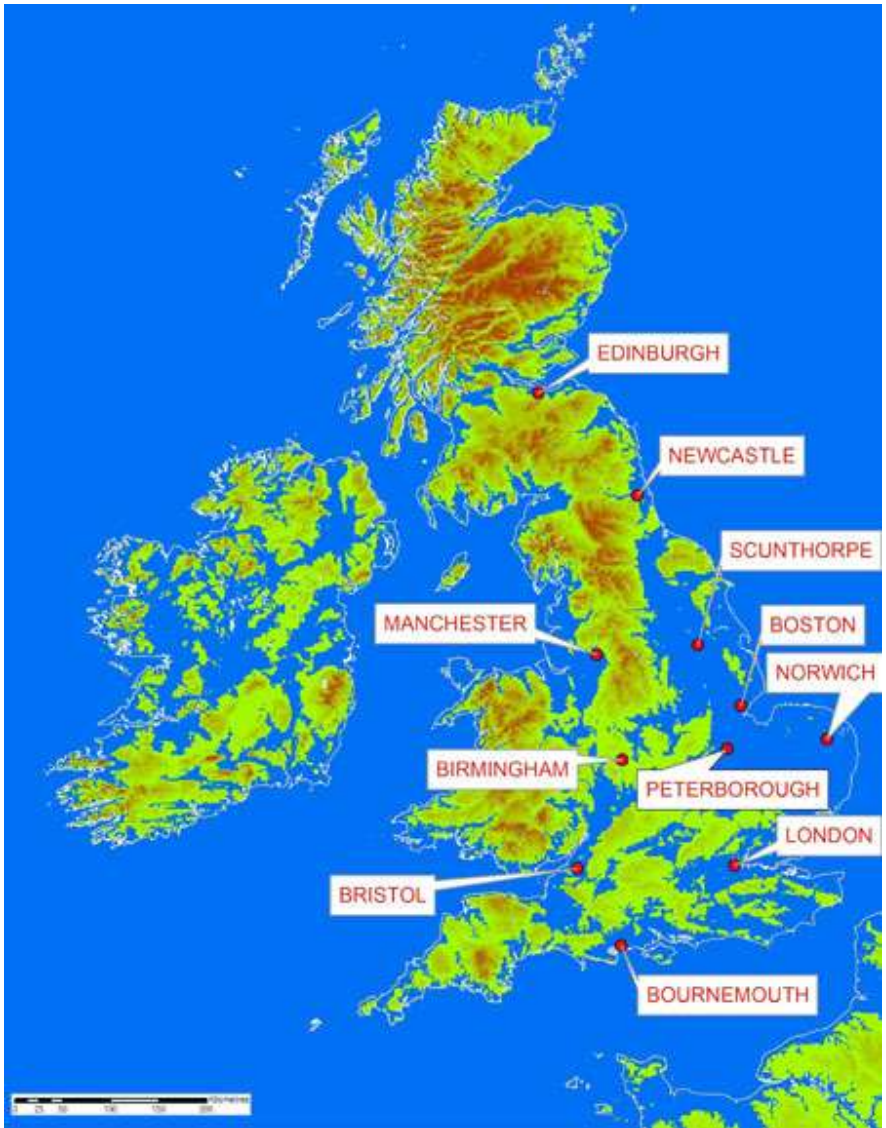
Impacts of present and predicted sea level rise

- Rising sea level has been happening quite slowly in recent millenia – 1-2mm per year
- Rate has increased recently to 4-5mm per year
- Future predictions are uncertain: between 0.3 and 0.5m increase by 2090

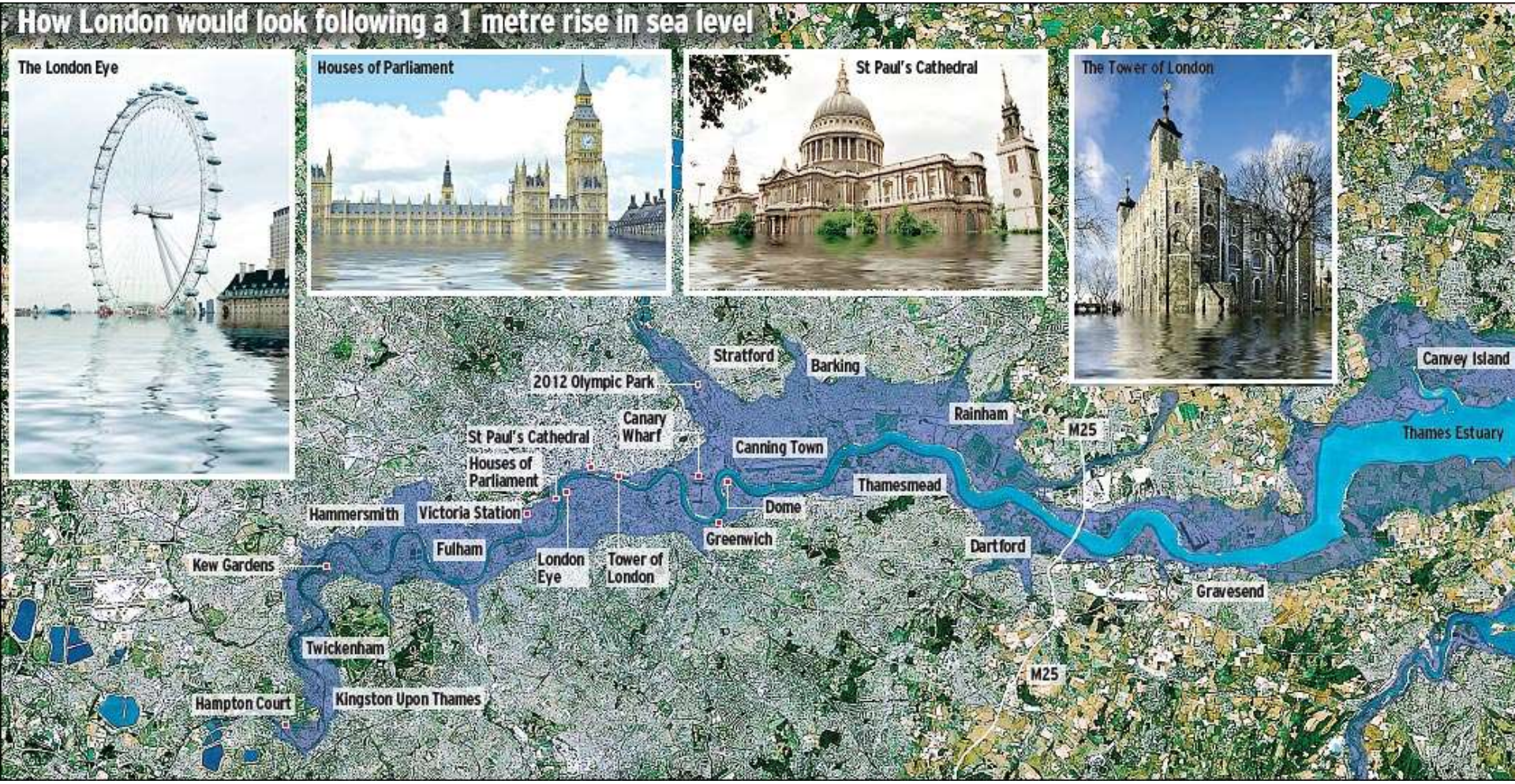
Impacts of present and predicted sea level rise

- Coastal flooding – particularly low-lying areas and increased erosion, e.g. Holderness.
- Southeast Britain is at greatest risk of flooding due to combined eustatic change and subsidence.
- Key areas: London, Hull, Middlesborough
- Major road and rail links and power stations.

Impacts of present and predicted sea level rise on UK settlements



Impacts of present and predicted sea level rise on London



Impacts of present and predicted sea level rise on fresh water sources

- Impact on underground water resources.
- Intrusion of salt water beneath the land could contaminate freshwater stores
- Abstraction points would have to be moved upstream/inland.

Environmental impacts of present and predicted sea level rise

- Coastal habitats threatened – wetlands and salt marsh
- Ecosystems can adjust but depends how fast the sea level rise is.
- Also, coastal squeeze may occur in salt marsh.

Socio-economic impacts of present and predicted sea level rise

- More developments are occurring on at risk areas.
- Insurance is expensive – which may dissuade people from moving into these areas