The Burren, County Clare

A Story of Water, Ice and Stone

Dr. Ronán Hennessy
Burren Geopark Geologist
“The Burren” - a landscape...

... born in water
... shaped by water and ice
... known as a place of stone
... called “An Bhoireann” in Irish
The Burren and Cliffs of Moher Aspirant Geopark
Western Ireland

**Geological Landscape** – *Burren = “Place of Stone”*

**Archaeological landscape** ~ *6000 years of settlement*

**Unique flora** – *Arctic/alpine & Mediterranean flowers*

**Farming landscape** – *living landscape*

**Cultural landscape** – *Irish music – food – literature*
Location of the Burren on the Northern Periphery of Europe
Galway Granite
Devonian
~ 400 million years old

Carboniferous Limestone
~ 335 million years old

Carboniferous Shale & Siltstone
~ 320 - 300 million years old

Old Red Sandstone
Devonian
~ 360 million years old
Geology Maps and Cross-sections created by the NEED project In the Burren
Uplift and folding - Variscan Orogeny

Moher sandstones formed

Early Burren erosion

Glaciation

Burren Limestones formed

Giant’s causeway

Modern Burren erosion
Rocks of the Burren region

**Pink-White**

Granite

*(Ordovician – Devonian)*

488 – 360 million years ago

**Grey:**

Carboniferous Limestone

359 - 326 Million years ago

**Yellow-Brown:**

Carboniferous Shale/
Sandstone/Siltstones

326 - 313 Million years ago

**Brown-red**

Old Red Sandstone *(Devonian)*

416 – 360 million years
Carboniferous Limestone
~ 330 million years old

Carboniferous Shale
~ 325 million years old

Carboniferous Siltstone
~ 318 million years old

Location of NEED Meeting Field Trip – Day 1
"a country where there is not enough water to drown a man, wood enough to hang one, nor earth enough to bury him......

and yet their cattle are very fat; for the grass growing in turfs of earth, of two or three foot square, that lie between the rocks, which are of limestone, is very sweet and nourishing."

1651
National Census Data 2006 - Population approx. 8000 in region
The Burren and Cliffs of Moher Aspirant Geopark
The Burren

Carboniferous Limestones ~ 330 Ma

Fossiliferous limestones

100km coastline - Cliffs > 200m - Underwater Caves

Glacial landscape – erratics – drumlins – striae

Karst landscape - caves – karren – no surface water – mushroom stones – “turloughs”
Outdoor activities at natural geological features

The Burren is one of Ireland’s most popular caving locations
Art in the Landscape? Natural geological features

Mushroom Stone

Folded strata in Burren National Park

Rillenkarren

Limestone karst features
Examples of coastal erosion along the Atlantic coast of the Burren
The Cliffs of Moher – 8km of cliffs standing over 200m above the sea
The Cliffs of Moher

- sea-stacks
- sea-arches
- sea-caves
- Collapsing cliff faces
The Cliffs of Moher Visitor Centre

> 750,000 annual visitors

Exhibition Centre – *Atlantic Edge*

210 metres above sea-level

International Area of

*Sea-bird Conservation*
Karst Limestone Pavement at Doolin Pier – Day One Field Trip
Karst Limestone Pavement at Murroughtoohy – Day Four NEED Field Trip
NEED Adult evening course field trip
March 2010
Turloughs – Disappearing Lakes – Day Three NEED Field Trip
Introductory Caving Expedition as part of NEED education events during May 2010

Poulfnagollum – 16 km cave
Pol an Ionain – The Great 7m Stalactite – located north of Doolin
"Clare Shale Cliffs south of Doolin Pier"
Limestone and Granite Glacial Erratics at Doolin Pier
Glacial Striae (Ice Scratches) and Glacial Till
And field trip visit during NEED adult course March 2010
Direction of Movement of Ice Sheets – map shows NEED Learning Centres and Environments

Hillshade Terrain Map of the Burren and North Clare

- Ballyvaughan
- Burren Outdoor Education Centre
- Burren National Park
- Cliffs of Moher
- Ennistymon
- Doolin
- Kilfenora
- Corofin
- Kinvara
- Burrenbos
Evidence of 1755 Tsunami after Lisbon Earthquake on north coast of the Burren
Tsunami Travel Time Maps for 1755 Tsunami & 2004 December Tsunami
Palaeogeography during the Carboniferous
Black Head

Cliffs of Moher
Azores - Gibraltar Transform Fault
- boundary between the African (Nubian) and Eurasian continental plates

“Suggested Magnitude = 9”

- Haiti = 7
- Indian Ocean Earthquake = 9
  (2nd largest ever recorded)
Welcome to the Burren

Fáilte go dtí An Bhoireann
Welcome to the Burren…. At last!

While you are with us we want you to

• Meet our partners; see NEED in action
• Create networks between businesses; make friends and contacts
• Discuss models for developing and promoting educational tourism services
WP 5 : Key Aims

• Increased environmental awareness amongst both the visitors to Geosites and the local tourism service suppliers is considered as one of the key-factors for sustainable development.

• A positive attitude about the nature is important in influencing the learning results of educational programmes.

• Businesses and locals need better skills in geo-based knowledge

• To serve demanding quality orientated educational tourists, tourism services should be providing quality educational programmes on valuable Natura 2000 sites.
Actions

- **Action 23**: Brochures and homepages introducing sustainable development in connection of geo-sites

- **Action 24**: Public awareness actions; spreading information about the NPP/NEED-project for environmental education

- **Action 25**: Social benefits gained through environmental education
  - Social capital gained survey
  - Customer demand and satisfactory survey

- **Action 26**: Models for organising business oriented services for environmental education

- **Action 27**: Reporting about the working and the results of WP 5

- **Action 28**: International conference for partners: Theme “NPP/NEED for local skills and support in Educational Tourism”
Activity to date: Action 23

Finland
• Planning for the brochures and homepages is going on.

Iceland
• The Icelandic NEED webpage (www.need.is) is up and running and updated regularly with news and information about the project. Brochures and posters in Icelandic about the project have also been made and distributed around the target area.

Norway
• Planning the website together with Ireland has started. Started on planning a map/brochures with all the study modules marked for use of the locals and the local enterprises.

Ireland
• Developed the international NEED website GEONEED.org. Website will be launched at the WP5 international conference.
• Preparing a generic fold-up A4 double sided leaflet (Z-Card) with information on the NEED project on one side and summary of the modules and learning environments for each partner country on other side.
• Developing information poster for local visitor centres, schools and information hubs.
• Current information on NEED available in project website and on partner individual web sites.
Action 24

**Finland**
- One public awareness action was arranged when opening the geo-cultural trail in Rantasalmi.

**Iceland**
- The NEED project was introduced at several conferences and meetings in Iceland during the reporting period. The West region partners held a meeting about Geo-parks. North region partners held a conference about Geo-tourism where tour operators from the whole country participated. Work has started on the development of a policy for sustainable tourism for the Region of Vatnajökull tourism cluster in the South area. This will be followed by work for the tourism cluster in the West region, Peace and Primeval Elements, which was established in fall 2009.

**Norway**
- Planning activities has started.

**Ireland**
- Presented NEED project at 9 public meetings, 24 local National Schools and 4 Secondary Schools.
- Regular updates of NEED provided for several committees involved with the management and operation of the Burren Connect Project (Local Authority, Geological Survey of Ireland, LEADER, tourism bodies, conservation bodies, educational bodies and local/regional development groups).
- Organised and ran a week long programme of geo-educational and promotional events in May 2009 (Burren Rocks!)
- Introduced NEED study modules and learning tools to schools and local partners
- Ran a 6 week adult evening course in Geology for local businesses.
- Information on NEED circulated to 425 schools in the region and to 20 ecotourism businesses in the Burren
- Developing information poster for local visitor centres, schools and information hubs.
- NEED advertised in 2009 and 2010 in Burren Insight Magazine
- NEED promoted in national scientific and local publications and on local radio
Action 25

Finland
• Customer demand and satisfaction survey is carried out.
• A survey of the social capital gain through the environmental education process is planned.

Iceland
• Preparation for the survey has started in Iceland.

Norway
• Planning activities has started.

Ireland
• Adapted Finnish customer demand and satisfaction to measure demand and influence of NEED project on the social benefits of environmental education. Sent to 20 businesses, 12 responded
• Conducted face to face and telephone interviews on social benefits gained audit with staff of a selection of educational businesses in the Burren.
Finland
• Information about different models concerning environmental education and tourism has been collected.

Iceland
• Partners in South region, including several SMEs, have made a coalition about developing bird tourism and for this purpose made a map and an information brochure about bird watching opportunities in the region. A similar map/brochure about geo-sites in the south area will be developed in early 2010.

Norway
• Planning activities has started.

Ireland:
• Developed and ran an evening adult education course aimed at tourism businesses with Burren Outdoor Education Centre in February and March.
• Organising information seminar in November for local businesses on potentials for building on NEED to further develop and market environmental educational activities and business opportunities.
• Using the Burren Ecotourism Network of 20 SME’s to develop model of collaboration and development of services.
• Use this international conference to discuss models for environmental education tourism and to develop international business networks.
Irish NEED Partners

- National and Secondary Schools
- Geological Survey of Ireland
- Farm Tours Co-Op
- Burren Trust
- Burren Outdoor Education Centre
- Cliffs of Moher Visitor Centre
- National University Galway
- Burren Centre Kilfenora
- Clare County Council (Burren Connect)
- Burrenbeo Trust
- Burrenbeo Co-Op
- National and Secondary Schools
- Geological Survey of Ireland
- Farm Tours Co-Op
- Burren Trust
- Burren Outdoor Education Centre
- Cliffs of Moher Visitor Centre
- National University Galway
- Burren Centre Kilfenora
- Clare County Council (Burren Connect)
The Burren Ecotourism Network
A Model for NEED?
SLÁINTE
Linking environment, community and tourism to conserve the Burren
Action 20: Schools Survey

• 425 Primary and Secondary Schools in region
• 65 responses
• Incentive: €150 voucher to visit any of the Local Partner visitor centre/service of choice
• Winner Kilcreest National School, Co. Galway
First preference choice for teacher training methods in Geology

- Outdoor excursions led by experts: 25
- Guided tours: 10
- Geological samples and materials: 7
- Multimedia presentations: 1
- Geological training days: 6
- Visits to geological sites: 3
- Fairs and exhibitions: 3
- Long-term in-service training: 3
- Expert lectures: 2
- Internet courses: 4
Teachers suggestions for Teacher Training

- School packs with CD-Rom explaining features and processes
- Expert mentoring, especially for local areas
- Teaching material in Irish
- Learn how to use outdoor environments
- Online resources
- Field guides
- Experts to visit schools to provide workshops
- Show how to use materials in classrooms
- Free tours to learning environments
Preferred learning environments (1st preference) for general environmental education

- Outdoor / nature education sites
- Nature trails (incl. related learning materials)
- Laboratory or other specialized learning environment
- Visitors centres
- Home environment
- National Parks
- Classroom or auditorium
- Museums, exhibitions
- The Internet

The chart shows the distribution of preferences with the highest being outdoor/nature education sites at 27% and the lowest being museums, exhibitions and the internet with 0% preference.
First preference choice for learning environments for geological education

- Mines, quarries, sandpits
- Geological monuments
- Outdoor / nature education sites
- Visitor centres
- Mines, quarries, sandpits
- The Internet
- Visitor centres
- Home environment
- Nature trails (incl. related learning materials)
- Laboratory or other specialized learning environment
- National Parks
- Classroom or auditorium

0 5 10 15 20 25
Teachers suggestions

- Primary work must be done in classroom
- Outdoor teaching is really beneficial
- Field investigations, where teachers are trained to know what to do
- Resource pack for classroom teaching
Burren education services already visited

- Burren National Park
- Cliffs of Moher Visitor Experience
- Burren Outdoor Education Centre
- Burren Centre, Kilfenora
- Burrenbeo Ecobeo Programme
- None of the above
Feedback on visit

What they liked
• Interactive experiences
• Experienced guide
• Team building exercises
• Structure
• Practical
• Resources available
• Experiential learning
• Fun and excitement
• Pre visit packs

What could be improved
• Facilities
• More guides
• More outdoor activities and experiential learning
• More pre-visit resource packs
• Age appropriate work sheets
Burren education sites students would like to visit

- Burren National Park
- Cliffs of Moher Visitor Experience
- Burren Outdoor Education Centre
- Burren Centre, Kilfenora
- Burrenbeo Ecobeo Programme
- Farm Heritage Tours
Reasons for not visiting

- Lack of facilities
- Cost
- Distance
- Time
- Lack of knowledge of service available
- Lack of expert personnel
- Too local for some
- Doesn’t fit curriculum
- Not proactive enough in attracting schools
- No physical activity
How often would you like to visit educational sites

- Less often than once in a school year
- Once in a school year
- 2-3 times in a school year
Preferred length of visit

1 - 2 hours
half a day
one day
more than 1 day
Prefered geological themes

- Elements of geology
- Landscape
- Natural Hazards
- Geological materials and their sustainable use
- Climate change
OTHER THEMES/Suggestions

• Historic Themes & relate to human interactions with the Burren Area
• Using the Local Environment to teach the above topics
• Link with An Taisce - How the Green School Projects/Themes linked with geographical education
• Identifying Rock types, minerals, formation of …., location of……
• Testing the different rock types for authenticity
• Tectonic theory is a difficult concept to teach & to understand
• Geological education specific to our region
• Rock types of different areas, properties of rocks
• River study and coastal study
Results of Action 25
Social Capital Gain in the NEED network
Census 2006 Main employment sectors in the Burren

Some background details of business sector in the Burren

- Agriculture (crops, animals, mixed) 12%
- Forestry, fishing & mining 1%
- Market gardening 1%
- Food Production / Processing 1%
- Tourism 13%
- Other production/manufacturing 8%
- Retail 11%
- Public Sector & Health 16%
- Transport 3%
- Construction 13%
- Other 21%
Census 2006 Working in tourism (living in the Burren)

- Hotels, 132, 21%
- Other Accommodation, 72, 12%
- Restaurants, 84, 14%
- Bars, 125, 21%
- Catering, 18, 3%
- Travel Agencies & Tour Operators, 51, 9%
- Cultural entertainment, 39, 7%
- Physical well being activities, 7, 1%
- Sporting activities, 46, 8%
- Publishing, printing, media, 21, 4%
Environmental services/attractions in the Burren

- 11 Visitor Centres
- Burren National Park
- 9 Burren Information Points
- 2 Educational Centres
- A network of walking trails
- A network of National Monuments
- Viewing points and car parks
- Ecotourism Network of 20 Businesses
The objective of the survey

- To assess the capacity and interest amongst local businesses for developing networks and exchange of information

- To assess the capacity and interest amongst local businesses for developing environmental services to schools and visitors
The survey focused on the businesses involved in environmental and educational services

Questionnaires were sent to 25 businesses
12 responses were received.
### Profile of Businesses who responded to the survey

<table>
<thead>
<tr>
<th>Business</th>
<th>Established</th>
<th>Service</th>
<th>Customer No's 2009</th>
<th>Part-Time Staff</th>
<th>Full Time Staff</th>
</tr>
</thead>
<tbody>
<tr>
<td>Roadside Tavern</td>
<td>1893</td>
<td>Bar/Food/Entertainment</td>
<td>3,000</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Burren National Park</td>
<td>1991</td>
<td>Conservation/walks</td>
<td>300</td>
<td>8</td>
<td>2</td>
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<tr>
<td>Heart of the Burren Walks</td>
<td>2002</td>
<td>Guided Walks</td>
<td>5,000</td>
<td></td>
<td>1</td>
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<tr>
<td>Kilfenora Hostel</td>
<td>2005</td>
<td>Accommodation</td>
<td>2,370</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Burren Painting Centre</td>
<td>1974</td>
<td>Painting Holidays</td>
<td>200</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Farm Heritage Tours Co-Op</td>
<td>2010</td>
<td>Farm Tours</td>
<td>0</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td>Doolin Language Centre</td>
<td>2009</td>
<td>Language Tuition</td>
<td>20</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Burren Outdoor Education Centre</td>
<td>1985</td>
<td>Outdoor Education</td>
<td>8,000</td>
<td>14</td>
<td>6</td>
</tr>
<tr>
<td>Corofin Camping &amp; Hostel</td>
<td>1990</td>
<td>Accommodation</td>
<td></td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>BurrenbeoTrust</td>
<td>2008</td>
<td>Information &amp; Education</td>
<td>4,000</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Burren Centre Kilfenora</td>
<td>1975</td>
<td>Visitor Centre</td>
<td>50,000</td>
<td>11</td>
<td>5</td>
</tr>
<tr>
<td>Cliffs of Moher Visitor Experience</td>
<td>2007</td>
<td>Visitor Centre</td>
<td>763,000</td>
<td>7</td>
<td>23</td>
</tr>
</tbody>
</table>
Collaboration with other businesses and organisations

- Key Companies and NGOs
- Other companies working in the Burren
- Other organisations working in the Burren

Voluntary co-operation
Negotiations and exchange of information
How do you keep in contact?

- Phone: 7
- Letters: 2
- Email: 9
- Visiting Each Other: 6
All 12 businesses have a permanent office or base

None of the 12 businesses reported a sub-contract arrangement
Knowledge in the following areas:

- The geology of the area
- Computer skills
- The culture of the Burren
- Language skills
- Cooperation with other companies
Does your business aim to enhance the following?

Environment Protection

Education

Culture

Nature Hobbies

Health

tourism

Local traditions
9 out of 12 businesses provide services to schools

11 out of 12 are interested in providing services in the future
Do you think schools could benefit from the following?

- Your business’s economic activity?
- The aims of your business in general?
- The development of the National Park?
- Employment in the region?
- The quantity of the visitors to the area?
- The wellbeing of the people living in the area?
- Demand for tourism services in the area?
- Increases in the price of your services?
Do you want to develop your business in a sustainable way?

- Energy Saving: 16
- Landscape Management: 6
- Water Management: 12
- Transportation: 18
- Service: 2
- Info & Guiding: 16
- Waste Management: 9
- Use of Local Products: 9
10 out of 12 businesses would like more information on Geology in order to serve their customers better
How important is collaboration between the following organisations?

- Companies
- Educational/visitor Centres and companies
- Companies and NGOs
- Educational/visitor Centres and NGOs

- Very important
- Quite important
- Hard to say
Which are the 3 most important factors that bring tourists to the area?

1. Peace and quite
2. Being in nature
3. Local culture
4. Geological attraction
5. Architecture/building traffic
6. The National Park
7. Educational activities
8. Hotels/guest houses/foods
9. Exhibitions
10. Outdoor activities
11. The landscape
12. Good location
13. Festivals and other cultural activities
14. The quality of the service
15. The People

Options:
- Peace and quite
- Being in nature
- Local culture
- Geological attraction
- Architecture/building traffic
- The National Park
- Educational activities
- Hotels/guest houses/foods
- Exhibitions
- Outdoor activities
- The landscape
- Good location
- Festivals and other cultural activities
- The quality of the service
- The People
All 12 businesses use internet on a daily basis
Visitor/Customer Profile

We interviewed businesses directly involved in educational tourism:

- Cliffs of Moher Visitor Experience
- Burren Centre, Kilfenora
- Burrenbeo Trust
- Burren Outdoor Education Centre,
- Burren National Park
- Heart of Burren Walks
The following are guesstimates of the main customer groups in 2009

- Heart of Burren Walks
- School Groups, 15%
- Coach Tours, 5%
- Family Groups, 15%
- Special Interest Groups, 5%
- Individual Adults, 50%
National Park

Individual Adults, 50%

School Groups, 25%

Special Interest Groups, 25%
Burren Centre, Kilfenora

- Coach Tours, 70%
- School Groups, 8%
- Family Groups, 10%
- Individual Adults, 7%
- Special Interest Groups, 5%
Cliffs of Moher Visitor Experience

- Coach Tours, 30%
- Individual Adults, 45%
- Family Groups, 15%
- School Groups, 5%
- Special Interest Groups, 5%
Burren Outdoor Education Centre

School Groups, 80%

Special Interest Groups, 10%

Family Groups, 5%

Individual Adults, 5%
Burrenbeo Trust

School Groups, 20%

Individual Adults, 80%
Customer Satisfaction Surveys

Yes, 3
No, 4
Favoured ways of learning about the landscape

- Outdoor Educational activities
- Education Programme
- Exhibitions
- Publications
- Lectures
- Guided Walk
<table>
<thead>
<tr>
<th>Willingness to pay</th>
<th>Per Person</th>
</tr>
</thead>
<tbody>
<tr>
<td>Guided Walk</td>
<td>€5-€20</td>
</tr>
<tr>
<td>Outdoor Educational activities</td>
<td>€80</td>
</tr>
<tr>
<td>Education Programme</td>
<td>€4-€25</td>
</tr>
<tr>
<td>Exhibition</td>
<td>€5</td>
</tr>
</tbody>
</table>
Frequency of Service

- On Request: 29%
- Daily: 28%
- Weekly: 14%
- Monthly: 29%
- On Request: 29%
All businesses wished to expand their services:

- School Groups
- Ecotourism Packages
- Guided Walks catering to various groups
  - Interactive exhibits
  - Special needs access
  - Improved interpretation
- Better facilities
- Outdoor activities
Social Benefit provided by service

- Increasing environmental awareness
- Increasing cultural awareness and respect
- Providing additional educational resources in the region
- Providing employment in the region
- Encouraging the development of ancillary or complimentary services
- Encouraging visitors to stay longer in the region
- Networking with other businesses

Yes
No

Has potential to
Can you identify areas where additional information or education would help improve the service?

- Evening courses
- Field trips
- Training of guides
- Easy to use leaflets and field guides
  - More interactive exhibits
    - Better maps
    - Better signage
- More interpretative media
- Leave No Trace training
What we learned

• Only certain types of businesses are interested in environmental education. This is a small percent of the overall tourism business sector in the Burren.
• There is a variation in the visitor profiles, services offered and charges between businesses
• There is a reluctance to increase charges
• There is a willingness to develop educational/interpretative services
• There is a demand for better training and educational materials to increase knowledge of the landscape
• Networking between a variety of service providers is increasing slowly (this has been encouraged and nurtured through an ecotourism network pilot programme over the past 2 years, otherwise would happen even more slowly, if at all)
• The need for a framework or model within which networking is actively supported is obvious.