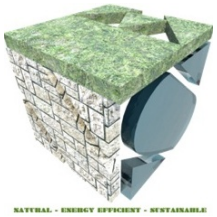

Natural - Energy Efficient - Sustainable

NEES

Evidence for the All Party Parliamentary Group for Excellence in the Built Environment Inquiry into Sustainable Construction and the Green Deal

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Northern Periphery Programme 2007–2013

Innovatively investing in Europe's Northern Periphery for a sustainable and prosperous future

European Union
European Regional Development Fund

Disclaimer

The views expressed in this submission are those of its authors and should not be be taken to represent the views of the European Regional Development Fund, Northern Periphery Programme or any other associated organisation or companies.

Executive Summary

The paper has been prepared on behalf of the ERDF INTERREG IVB transnational NPP funded NEES (Natural - Energy Efficient - Sustainable) project. The NEES consortium is concerned with the issues relating to sustainable construction and energy efficiency in the northern periphery of Europe.

This submission decribes a number of best practice examples and barriers identified by NEES partners within their own regions. The barriers include:

- Geographical dispersion of the sustainable building industries hinders the sharing of knowledge, expertise and contacts;
- Lack of maintenance of the physical, intellectual and educational sustainable building infrastructures;
- Serious deficiency in traditional and sustainable building skills poses serious problems for maintenance, retro-fitting and new build;
- Lack of conclusive data makes it difficult to accurately compare the whole life carbon costs of different materials;
- High levels of both physical and human capital have been invested in energy intensive construction methods which has resulted in little interest in sustainable alternatives.

This submission makes a number of suggestions to help alleviate the barriers identified:

- Fund the development of regional knowledge exchange hubs to help manage support for the sustainable construction industries;
- Encourage new education initiatives and awareness raising activities around both the benefits of using sustainable materials and the demand for skilled employees;
- Update building regulations to place a higher emphasis on sustainability in conjunction with energy efficiency;
- Develop the supply of locally-sourced sustainable materials and encourage consumers to select them so as to minimise the (potentially significant) carbon costs of transportation.

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Chapter 1

Introduction and Background

1.1 Introduction

This submission is based on the experiences of a transnational team of experts working in the northern periphery of Europe. They are members of the European Regional Development Fund (ERDF) INTERREG IVB Northern Periphery Programme (NPP), Natural- Energy Efficiency - Sustainable (NEES) project (Appendix 1).

1.2 Background

The triple helix NEES project team are based in the Republic of Ireland, Northern Ireland, Scotland, Sweden and Greenland (Appendix 2). The team are supported by a transnational panel of experts.

The aim of the NEES project is to explore the challenges and opportunities that adopting sustainable building techniques offers to the various regions of the NPP area. To achieve this NEES is involved in identifying 'best practice' and using pilot projects to demonstrate the viability and benefits of the techniques. The transferability of the 'best practice' is also being evaluated. Given the importance attached to knowledge transfer by the NPP, NEES is also involved in developing dissemination and training modules.

Chapter 2

Best Practice

2.1 Identifying 'best practice'

'Best practice' is identified by using both the expert knowledge within the consortium and by proactively seeking expressions of interest from companies within the NPP region to take part in the pilot projects. Expressions of interest in involvement in the pilot studies are assessed by an independent expert panel using specific criteria which include; resource efficiency, environment and health, sustainability, enterprise and scalability.

2.2 Pilot 'best practice' projects

The first NEES call for Best Practice resulted in six examples of what the experts termed 'best practice' being identified. The projects identified are:

- An architectural practice which specialises in timber design. They use locally sourced and produced timber, (organic and reused) as well as an organic, pre-painted timber cladding, natural paints and hemp.
- A SME manufacturing and assembling highly ecological houses. They supply recyclable and biodegradable products, processed and manufactured within the NPP region, with an expected lifespan of 60 years.
- A company specialising in green roofing and living walls. Their materials are fully recyclable or biodegradable and expected to last a minimum of 30 years.
- A company specialising in cob and salvaged timber construction and associated training.

- A cellulose fibre insulation company. The insulation derives from locally sourced , highly recyclable and biodegradable, recycled paper that has an expected lifespan the same as the building.
- A business who provides a design, consultancy and planting service for constructed wetlands. The solutions the company offer are both natural and biodegradable.

The examples share common attributes. Wherever possible the materials used are natural, recyclable, biodegradable, environmentally friendly, healthy, sustainable, energy efficient and sourced locally. They demonstrate a significant level of enterprise and possess the potential for future expansion, thus creating jobs and contributing to the local economy.

2.3 Identified examples of Best Practice

This section outline examples of best practice which have been identified by the project partners in their regions (further details can be supplied).

2.3.1 Scotland

The Galson Business Centre on the Isle of Lewis is seen as nearly 'carbon neutral'. It uses a Scottish-sourced timber frame free of chemical preservatives and organic painted timber cladding insulated using hemp. Natural paints are used throughout the building. Flooring is a mixture of Scottish linoleum and good quality hardwood. The building has high levels of insulation, thermal-bridge-free detailing and a high level of airtightness. Any heat needed is delivered from an under floor system fed by a ground source heat pump, powered by a wind turbine. Inspired by older vernacular buildings, the building uses a clipped and hipped roof form to reduce heat loss and strain from the strong winds. The building was designed using the principles of 'Design for Deconstruction'.

Historic Scotland has found that natural stone is a low carbon building material compared to other construction materials used in the UK. The main carbon impacts associated with stone come from the processing of the stone, transport to site and the volume of waste. The quarrying and processing of local sandstone and granite has a relatively low level of energy intensity. In addition, for stone used to maintain buildings, the different physical properties of using stones from different deposits to the original can result in serious damage to the building as it weathers.

2.3.2 Northern Ireland

In Carnlough, eleven houses were constructed using timber frame, hempcrete walls, PV panels and mechanical ventilation heat recovery systems. To insulate the houses the primary material used was sheep's wool along with cellulose in certain positions.

2.3.3 Ireland

In Sligo, a house has been constructed using monolithic cob (earth) walls for the south and west elevations and insulated timber-frame with straw bale infill on the north and east sides. The roof is insulated with a combination of salvaged insulation and wood-fibre. The windows on the north and north-west elevations and the roof-lights are triple-glazed. The house is naturally ventilated and uses a range of natural materials including local stone, lime mortar, LECA, locally salvaged slate and hemp-lime render. The embodied energy of the building is virtually zero as the cob was sourced on site and was used as a building material in its raw state. All of the timber used in the house is from locally sourced windfall trees or reclaimed from local demolitions and recycling yards.

In Westport a house is being constructed using a range of natural materials and is designed to comply with the energy demands of the Passive House Standard. It is of timber frame construction with cellulose infill insulation and fibre board panels. To comply with the Passive House energy standard, the house incorporates features such as a mechanical heat recovery ventilation system, triple glazed (timber) windows, 'super'-insulation (using natural materials where possible) to achieve fabric U-values of $< 0.15 w/m^2 K$, air-tight construction to achieve an air permeability of less than 0.6 air changes per hour and the inclusion of solar panels for water heating..

2.3.4 Sweden

In Sweden many companies are experimenting with sustainable construct. For example, Lindbäcks bygg industrially produce blocks of flats from locally sourced timber. Älvsbacka Strand in Skellefteå is an example of such a construction. The block of apartments was built using a high-tech method of timber construction from locally sourced wood. The method is suited to the Nordic conditions, with a newly developed weather-protection technology that allows construction to take place even in extreme weather conditions. The method of manufacturing the timber frame itself saves 270 tonnes of carbon dioxide compared to conventional concrete frames.

Villa Dario, a two storey villa, is considered 'best practice' though some of the materials used cannot be considered to be natural and sustainable. It is built in a V formation facing south in order to use the sun's heat. The foundation consists of a 400 mm thick layer of foam and the walls have a layer of 370 mm of pine wood fibres. This results in low permeability to air and high heat storage capacity. A 500 mm thick layer of locally sourced, loose pine-wood fibres was placed in the ceiling.

2.3.5 Greenland

The timber based low energy house in Sisimiut illustrates the problems of extreme climate. It is difficult to construct a fully sustainable building in Greenland due to the harsh climate. The building is equipped with a solar collector that supplies heat to the domestic hot water system and delivers auxiliary heat to rooms in the building. Triple glazed windows were also installed along with ventilation with heat recovery capacity.

Chapter 3

Barriers

3.1 Key issues

The keys issues identified relate to:

- lack of knowledge transfer;
- inadequate planning regulations and building regulations aimed only at insulation neglecting the role of mass;
- lack of locally available materials;
- lack of support from Enterprise Boards and other development bodies for SME's working with these technologies;
- lack of organisational and business skills on the part of SME's that are working with these technologies;
- transportation costs to acquire sustainable building materials;
- lack of accreditation for some materials (e.g. NSAI Agrement certification for Ireland) that will allow SME's to market them or to secure Government funding for their installation;
- inability to accurately calculate and justify the business case for the use of sustainable low carbon materials in buildings.

3.2 Knowledge transfer

Given the heavy investment in training, technology and research relating to standard methods, such as concrete based products, there is a general bias to using these methods.

Many traditional crafts and trade skills needed for alternative methods have declined and the capacity to train new craftspeople is being lost. The existing crafts and skills are widely dispersed making sharing of knowledge and expertise difficult.

3.3 Lack of information

Uncertainties over the figures for embodied carbon for the end of life phase of the lifecycle of traditional building materials, especially makes it is difficult to compare and justify the business case for the use of alternative sustainable building materials.

3.4 Supply issues

In many remote areas, such as Greenland, all building materials have to be imported and this causes a substantial environmental impact through the high carbon energy consumed by transportation.

3.5 Thermal mass

There is evidence that properly insulated and high mass construction could provide significant heating benefit and, in a warming climate additional cooling load reduction. While the effect is larger in the warmer parts of the UK (i.e. Southern England) than in the northern periphery, future proofing for climate change would greatly benefit from a combination of high thermal mass and insulation requirements.

Chapter 4

Recommendations

4.1 Knowledge transfer

Knowledge transfer is extremely important but is being hindered by the geographical dispersion of the remaining traditional building industries and those involved in sustainable building. At present there is a lack of independent, reliable advice available. One potential solution is to fund the development of regional knowledge exchange hubs through which to manage support for the sustainable construction industry. Alternatively, agencies that currently support regional development and small enterprises could be encouraged to provide appropriate technical, business and financial support. In addition the development of certifiable educational programmes in sustainable construction will help stimulate interest, raise standards and increase the capacity.

4.2 Policy changes

Updated building regulations are needed which place a higher emphasis on sustainability in conjunction with energy efficiency. Furthermore, to maximise its potential, the UK needs to provide a stable investment environment for sustainable construction such as tax or rate relief.

4.3 Locally sourced materials

Transport of materials over long distances can have high carbon footprints. There is a need to develop the supply of locally-sourced sustainable materials and encourage consumers to select them so as to minimise this carbon

costs. Despite transport costs of alternatives, high quality sustainable local materials may well be more expensive and whether there are fiscal methods to address this needs to be investigated.

4.4 Conclusion

The countries in the NPP region generally face opportunities and challenges similar to those in Northern Ireland and can provide suitable examples of best practice. NEES has pre-existing links in these regions meaning they can help facilitate the transfer of knowledge to Northern Ireland. The Ulster Business School will be happy to keep the APPG informed of activities within the NPP regions.

Appendix A

The NEES Project

The NEES project is made up of 7 social enterprises, academic and research agencies in Europe's Northern Periphery, comprising the Republic of Ireland, Northern Ireland, Scotland, Sweden and Greenland. The project is funded by the Northern Periphery Programme for its three year duration. In Ireland, grants for retrofitting existing homes (under the Warmer Homes and Greener Homes Schemes for example), is limited to energy-intensive industrial and petrochemical products, and no single technology for retrofit of existing walls based on the use of natural materials has been approved for subsidy.

The NEES Project aims to fill the technology gap that is evident in the region with respect to development of renewable natural products and services based on natural processes which support energy efficiency and sustainability in existing dwellings. There has been considerable research, development and promotion of renewable energy technologies generally, both through the NPP and by other European Programmes. This is understandable and important, particularly given the possibility of commercialisation of new environmental technologies. There has also been considerable commercial development of high-tech solutions for energy efficiency, including chemical and industrially manufactured products and processes, nanotechnology, the use of IT in smart buildings and smart grids, etc.

However, there is a notable lack of projects funded by these programmes whose objective is to identify, promote and develop the expertise and resources of the region in terms of renewable products and services based on natural processes, that can achieve similar aims, particularly those based on local agricultural and forestry products, both primary and secondary, and bioclimatic design and local energy reduction services. This limitation has important consequences for sustainability, in that the products and processes that are subsidised are usually manufactured outside of the region, though energy intensive processes, with a high environmental impact, and have to

be transported in from other regions.

Little use is made of local products, and the materials used rarely promote new skills or the development of the local economy (other than in a limited role). The building sector is thus made dependent on imports when it does not have to be, as there are potentially viable products available locally that could be delivered by local services. Examples of the types of products available are timber from renewable forests, hemp and lime, straw bales for walls, and recycled paper.

Examples of services that could help reduce energy use are bioclimatic design, energy assessments, smart metering and local behaviour change training. These products and services are less capital intensive, are locally based, consume less finite materials in their production, are more reusable and produce less waste. Those involved in their production and installation are usually found locally, and their development is often based on traditional skills and local resources. If developed these products and services could provide much needed training and employment opportunities, and the possibility of new green enterprises. These products are by their nature linked to diversification of agricultural production and development of new and innovative services, and their promotion could have an associated positive effect on agricultural diversification and on biodiversity on the one hand, and on new and innovative professional services on the other. They would also provide an opportunity for local SME's involved in construction and installation to exchange and network in the identification and development of these products and services.

The main aim of the NEES Project corresponds to Priority 1 of the Northern Periphery Programme, which is the development and marketing of the products and services that will promote competitiveness by increasing and developing the capacity for innovation and networking in rural and peripheral areas. This Project focuses on two priority themes a) promoting co-operation and exchange of best practises between SME's on how to address and reach markets with existing and new products, and b) promoting linkages between the producers and services providers and the regional R&D institutions to increase capacity for innovation, facilitate the design of innovation systems and strengthen competitiveness. The Project also aims to promote these products and processes at a transnational level, by facilitating the exchange, transfer and adaptation of these products and services between regions, and adapting them on the basis of transnational exchange. The Project also contributes to Priority 2, by working to improve sustainable development in peripheral regions.

At the same time energy efficiency and sustainable development are two of the European Union's main priorities, as reflected in the Energy Performance

of Buildings Directive, the Energy Services Directive and the Eco Design of Energy Using Products Directive, and the requirement for National Energy Efficiency Action Plans.

This limitation has consequences for sustainability, including the fact that such products are usually manufactured outside of the region, though energy-intensive industrial processes, with a considerable environmental impact. They have then to be transported from other regions. Little use is made of local products, especially agricultural products and by-products that could achieve a similar effect. The production or installation of these materials rarely promotes new skills locally, or the development of the local economy, other than in a limited sales or installation role. The building and refurbishment sector has become dependent on these imports, when there are potentially viable products available locally that could be developed and delivered locally.

Examples of the types of products available are:

- Timber from renewable forests,
- Hemp and lime,
- Straw
- Recycled Newspaper

Examples of services that could help reduce energy use are:

- Timber frame design
- Bioclimatic design,
- Energy and sustainability assessments
- Local behaviour change training.

These products and services are:

- Less capital intensive,
- More locally based,
- Consume less rare and finite materials in production,
- More reusable,
- Less polluting waste,

- Require less transport

The skills required in their production are usually found locally, and their installation is often based on traditional skills and local resources. If properly identified and developed these products and services could provide much needed jobs and training opportunities, and new green enterprises.

These products are by their nature linked to diversification of agricultural production, so could have a positive effect on agricultural diversification and on biodiversity on the one hand, and on new and on diversification of rural economies on the other. Energy efficiency and sustainable development are two of the European Union's main priorities, as reflected in the Energy Performance of Buildings Directive (EPBD), the Energy Services Directive (ESD) and the Eco Design of Energy Using Products Directive (Up), and the requirement for all Member States to National Energy Efficiency Action Plans.

The availability of naturally based products and services is also an important consideration in the development of a sustainable economy and green procurement policy. Procurement by public bodies constitutes 16% of all purchases, even more in some countries (e.g. 30% in UK). An excellent example of the NEES approach in practice is the recent Drumalla House project in Carnlough, Co. Antrim, Northern Ireland, developed by the Oaklee Homes Group. The aim of this project was to design and build a new social housing development of 11 homes, to achieve Level 4 of The Code for Sustainable Homes (CSH) using renewable materials as an alternative to traditional forms of construction. This project was a pilot project under Northern Ireland's Department of Energy and Climate Change's Renewable Construction Demonstrator Programme.

The project will also assess the validity of this alternative building type in terms of feasibility for future developments, along with examining energy consumption and also considering tenant attitudes. The fabric of the scheme uses timber frame construction with a hempcrete (formed from the hemp plant in combination with hydraulic lime) outer skin in place of concrete. The CO2 absorbed in the growing of hemp more than offsets the CO2 produced in the manufacture of the binder, and use of the product will have reduced the embodied carbon dioxide in the construction of the houses by almost 40%.

Appendix B

NEES Partnerships

Role	Company	Country
Lead Partner	University College Cork	Republic of Ireland
Project Partners	Umea University	Sweden
	Glasgow Caledonian University	Scotland
	University of Ulster	Northern Ireland
	ARTEK	Greenland
	Northside Enterprise Centre	Republic of Ireland
	Claremorris Irish Centre for Housing	Republic of Ireland
	South Kerry Development Partnership Ltd	Republic of Ireland
Associate Partners	Anú Green Limited	Republic of Ireland
	CEC-Design	Sweden
	Cluid Housing Association	Republic of Ireland
	Ethos. Ltd	Republic of Ireland
	First Class Insulation	Republic of Ireland
	Historic Scotland	Scotland
	International Hemp Building Association	Republic of Ireland
	Irvine Housing Association Ltd	Scotland
	MAF Arkitektkontor AB Sweden	
	Municipality of Jokkmokk	Sweden
	Municipality of Sermersooq	Greenland
	Oaklee Homes Group	Northern Ireland
	Rachel Bevan Architects	Northern Ireland
	RAMBØLL	Greenland
	SysPro Systems for Progress Limited	Republic of Ireland
	Theil 1	Republic of Ireland
	Tyréns AB	Sweden

Appendix C

The Northern Periphery Programme

The Northern Periphery Programme 2007-2013 aims to help peripheral and remote communities on the northern margins of Europe to develop their economic, social and environmental potential. The success of the programme will be built on joint projects creating innovative products and services for the benefit of the programme partner countries and Europe as a whole.

The diverse regions of the Northern Periphery Programme area share common features such as harsh climate conditions, sparseness of population and remoteness. Transnational cooperation provides excellent opportunities for finding new ways to address shared challenges and explore new opportunities. The Northern Periphery Programme 2007-2013 (NPP) is part of the European Commission's Territorial Cooperation Objective.

C.1 Programme Area

The Northern Periphery Programme 2007-2013 covers a vast area. It encompasses the EU member states of Finland, Ireland, Northern Ireland, United Kingdom and Sweden and Non-EU member states Faeroe Islands, Greenland, Iceland and Norway.

To be considered eligible for funding, a project must concentrate on issues that require transnational cooperation and that are of relevance to the characteristics of the programme area. The regions of the Northern Periphery share many features. Sparseness of population, rurality, insularity, harsh climate and peripherality are common across the programme area.

Project partners should be located within this programme area, although exceptions can be made under specific circumstances.

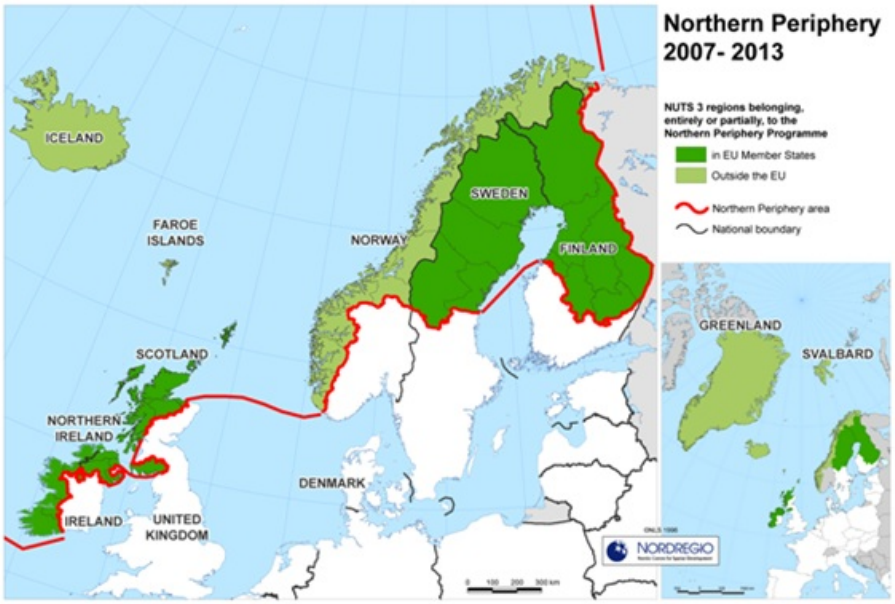

Figure C.1: The NPP Region

C.2 Priorities

The vision and objectives of the NPP 2007-2013 translate into two programme priorities, which have been developed in response to the distinct characteristics of the programme area and take into account the Lisbon and Gothenburg Agendas. Each project that applies for funding must address one of the priorities for transnational cooperation. NPP 2007-2013 Priorities:

- Promoting innovation and competitiveness in remote and peripheral areas
- Innovation, networks and competitiveness
- Accessibility
- Sustainable development of natural and community resources
- Environment as an asset in the periphery
- Urban-rural development and promotion of heritage

There is a third priority related to programme management; Technical Assistance.

Each of the 2 priorities contains two main objectives. To assist with project development, a list of broad themes and some potential project ideas are listed. The list of project ideas is only indicative. Click on the individual objectives to find more information.

C.3 Funding

Between 2007 and 2013, the Programme will allocate 45 million euro to projects, of which 35.115 million euro in European funding (ERDF) will be available to partners in Member States (Finland, Ireland, Northern Ireland, Scotland, Sweden) and 10.155 million euro for partners in the Non Member States (Faroe Islands, Greenland, Iceland, Norway).

A percentage of 60% of the funding is available for projects applying under Priority 1 and 40% for projects under Priority 2. Financing for the programme consists of European Regional Development Fund (ERDF) funding for the Member States, ERDF equivalent funding from the Non Member States and match funding. The Euro is used for all transactions in the programme.

In general, partners located in Member States may apply a 60% ERDF grant rate and partners located in Non-Member States may apply a 50% ERDF equivalent grant rate. In exceptional circumstances the Programme Monitoring Committee (PMC) may approve a grant rate of up to 75%.

Appendix D

Cohesion Funding and INTERREG

Cohesion funding is aimed at helping all regions to build up research and innovation capacity, to stimulate and support innovations in the social area, and to exchange good practice through trans-national and inter-regional co-operation. Cohesion funding tends to be delivered through regional programmes aimed at addressing issues identified in that region. EU policy is such that once the capacity of regional actors has been successfully developed to a sufficient level, they might compete successfully in European framework programmes. In turn the cohesion funding might support needs previously identified under FP7 instruments.

Within cohesion funds one of the principle instruments is the INTERREG programme. It involves cooperation of organisations on either side of a regional border. Its management is decentralised and is the responsibility of steering committees which consist of representatives of authorities responsible for cohesion policy in the relevant Member States. This approach, in part, addresses some of the issues raised in the 'top down'/'bottom up' debate on regional development (c.f. Crescenzi and Rodriguez-Pose, 2011). In particular, INTEREG measures must, not only, demonstrate a positive impact on development on either side of the border, but their design and, possibly, their implementation must be carried out on a common cross-border basis.

In this paper the case evidence is based on an INTERREG IVB project that is part of the Northern Periphery Programme (NPP). The aim of the NPP is to help peripheral and remote communities on the northern margins of Europe to develop their economic, social and environmental potential. The diverse regions of the Northern Periphery Programme area share common features such as harsh climate conditions, sparseness of population and remoteness. The programme area is shown in figure 2 and covers a vast

area: the EU Member States of Finland, Ireland, Northern Ireland, United Kingdom and Sweden and Non EU Member States Faroe Islands, Greenland, Iceland and Norway.

Within the NPP two priorities have been defined based on the visions and objectives of the IV B Programme for the period 2007-2013. Each project that applies for funding must address one of the two sub themes in each priority:

- Promoting innovation and competitiveness in remote and peripheral areas
- Innovation, networks and competitiveness
- Accessibility
- Sustainable development of natural and community resources
- Environment as an asset in the periphery
- Urban-rural development and promotion of heritage

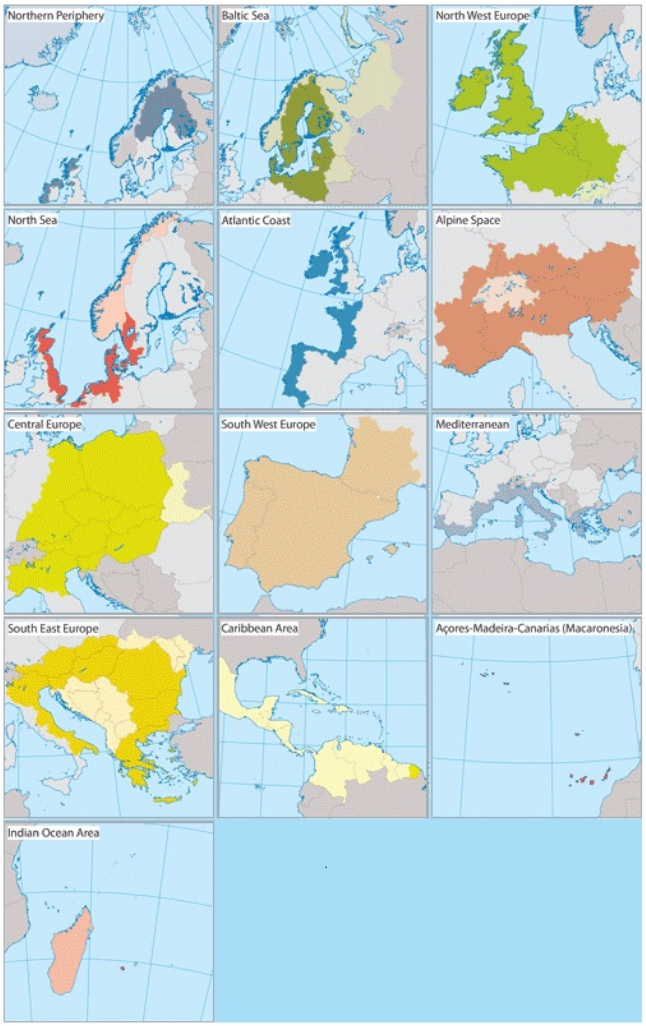

Figure D.1: INTERREG IVB Regions