

# DURABLE TRANSPORT INFRASTRUCTURES IN THE ATLANTIC AREA

NETWORK

ACCESSIBILITY & TRANSPORTS  
PROJECT 2008-1/049



[www.duratinet.org](http://www.duratinet.org)

## DURATINET

### NEWSLETTER

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ATLANTIC AREA Transnational Programme  
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ESPACE ATLANTIQUE Programme Transnational  
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# INTRODUCTION

The present newsletter reports mainly on the Network Launch Meetings -1st Partners Meeting and 1st Trans-national Workshop - that took place in Lisbon on 20-21 February 2009, hosted by the Laboratório Nacional de Engenharia Civil (LNEC), that is the Leader Institution of DURATINET Project.

LNEC is a state owned research and development (R&D) institution founded in 1946. It is located in Lisbon, Portugal.

It works in the various domains of civil engineering, giving it a unique multidisciplinary perspective in this field. The main goals of LNEC are to carry out innovative research and development and to contribute to the best practices in civil engineering.

LNEC also plays a key role in advising the Portuguese government in technical and scientific matters of civil engineering, as an unbiased and independent body.

The Laboratory has, at present, 630 staff, of which 44% hold a university degree and 25% are researchers with a PhD or equivalent qualification. It also has about 100 science research fellows with grants awarded by LNEC.

Around 50% of the LNEC's annual budget is funded from its own revenue through scientific and technology contracts, with the balance coming from the National Budget and other sources of income.



*This is the 2nd edition of the DURATINET Newsletter. The Newsletter is one of the ways developed in the project for communication and dissemination of information on project activities. The format of the newsletter is mainly designed for on-line download.*

## DURATINET PROJECT

### Context



**Project Leader**  
**LNEC, PT**

The implementation of the EU transport policy outlined in the 2001 White Paper “European transport policy for 2010” will lead to the construction of new transportation infrastructure and increase the need for the repair/rehabilitation of existing infrastructure in order to adapt them to the current transport policy requirements. This will have a major impact on owners and managers of port, highway and railway infrastructure in the Atlantic Area, both public and private, who will be faced with increasing maintenance costs for their structures as well as the high direct costs of the engineering work. This has a particular relevance to the Atlantic Area because of the aggressiveness of the environment in these regions to the materials in the structures.

High costs are usually associated with the maintenance and repair of existing structures, and experience shows that the failure of repairs is a frequent occurrence. The main causes of these failures are:

- ◆ Inadequate or lack of conformance to work specifications established by owners;
- ◆ Lack of knowledge of the cause or mechanism of materials deterioration;
- ◆ Use of inappropriate repair materials or systems; repair solutions adopted without consideration of the site specific damage and/or local environmental conditions.

The performance of repairs is critically dependent on site and installation conditions. Each repair case is different and it is difficult to generalise and to draw conclusions regarding the best solution. In fact, the maintenance and repair of structures embraces several technical domains including engineering and material science. Many specialists are needed to draw up an assessment and repair strategy. It is very important that everyone involved in a repair project has a minimum level of knowledge and experience.

Only the efficient transfer of knowledge and the promotion of appropriate training for all parties involved will change the tendency of repairs to fail and provide the expected service life.

Engineers should have knowledge of the design of new structures as well as the management, assessment and repair of existing structures if they are to understand the process for optimising structure maintenance leading to increased service life and reduced whole-life cost. They must understand the deterioration mechanisms and the appropriateness of repair techniques, both traditional and innovative, if they are to effectively mitigate against them. In addition, owners and managers should have a better perception of the maintenance problems of their structures, should know how to formulate their requirements, should understand how the requirements determine the success of the maintenance procedures and be able to identify the different strategies available and the implications of choosing a particular solution.

# DURATINET PROJECT

## Goals

The aim of the DURATINET project is to create a network of excellence to facilitate an efficient exchange and transfer of knowledge and to promote the durability, safety and sustainability of transport infrastructure in the Atlantic Area. The DURATINET project addresses the important economic issue of deterioration and repair which has an impact on the concrete and steel infrastructure the Atlantic Area due to the aggressiveness of the environment in these areas. By promoting the transfer of knowledge within the framework of structural durability the project encourages the adoption of trans-national strategies regarding both the measures intended to prevent the deterioration of structural materials and the optimisation of maintenance and repair/ rehabilitation activities. This will contribute to achieving more sustainable construction and will lead to lower costs and more environmentally friendly maintenance.

The DURATINET project objectives and planned activities have been devised to improve knowledge of the optimisation of the strategies for maintenance and repair of structures. The project targets infrastructure owners and managers as well as engineers involved with maintenance of road, railway and waterway infrastructure in the European Atlantic Area. DURATINET will help to improve awareness of how the decisions made in developing repair requirements, identifying repair solutions and ensuring quality in the implementation of the repair system will extend service life and reduce the whole-life costs of these important assets.

Identifying the need for innovation and research is a main objective of DURATINET and planned activities are expected to lead to the creation of the Atlantic Area Cluster "Green and Smart Materials". These needs are mainly focused on the development of new repair systems, on the application of environmentally friendly products and systems and on the promotion of sustainability including the use of recycled materials and by-products, the application of less intrusive repair systems and the use of maintenance strategies that avoid unnecessary demolition.

The dissemination activities are a key feature of the DURATINET project and will be carried out throughout the duration of the project and beyond. The communication strategy is based on two principles: the disclosure to the entire Atlantic Area (the top priority for the DURATINET project) and wider dissemination to the international community (essential for the success of DURATINET). The different technical knowledge and training needs of the various DURATINET stakeholders (owners, managers, engineers, consultants and repair contractors, material suppliers, researchers) is recognised: this requires an appropriate transfer of information and knowledge between the different groups.



DURATINET Project Partnership

## PROJECT COMMUNICATION AND DISSEMINATION ACTIONS

Project communication and dissemination of results are based on three main types of actions:

- Web-tools
- Events organisation and participation
- Publications

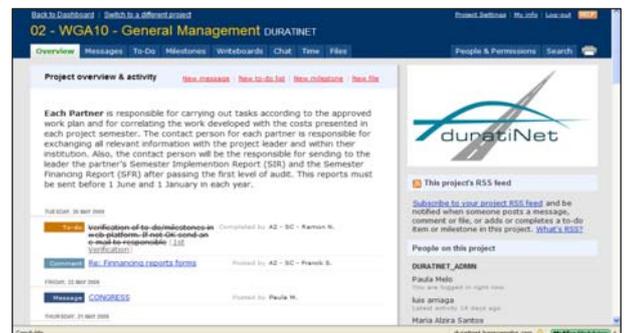
### Web-tools

- ◆ DURATINET website with public areas for dissemination of project information and for downloading short versions of web project publications
- ◆ Web-platform for communication with members
- ◆ DB-DURATI, a database collating information on the performance of materials in structures and repair materials



### Organisation of Events

- ◆ Trans-national semester workshops
- ◆ International congress
- ◆ Course on inspection/repair
- ◆ National meetings



**Participation in events** organised by other international teams for disseminating project activities

### Publications

- ◆ Guidelines on maintenance/ repair of concrete and steel transport infrastructures
- ◆ Technical reports
- ◆ Papers on Technical and Scientific Journals
- ◆ Newsletter
- ◆ Press releases & flyers

# WHAT ARE THE EXPECTED Project benefits?

**The main expected benefits of the DURATINET project are:**

**To improve the knowledge and understanding of the durability requirements of infrastructure and develop strategies for decision-making regarding maintenance and repair activities.**

The web versions of the handbooks on concrete and steel repair that are in preparation in the project will highlight the gaps in knowledge regarding the application of harmonised standards on the repair and protection and will assist in the development and implementation of new harmonised practices synthesised from the experience gained during the DURATINET project. Also, the creation of the DB-DURATI database will make an important contribution to the knowledge base of the performance of structural materials and of repair systems enabling a more reliable prediction of service life.

**To facilitate the use of the information and knowledge on the maintenance and repair of structures, supported by the different means of communication developed within the DURATINET project framework.**

The web-tools created for public communication will facilitate the sharing and use of knowledge obtained during the project on the various infrastructure management topics. Other actions created for project communication - in particular, the Semester Trans-national Workshops - will make an important contribution to the efficient dissemination of the project information to end-users, particularly among National and Regional infrastructure authorities.

**To contribute to the promotion of more durable, economic and sustainable construction**

The cooperation within the DURATINET consortium to create a new cluster on “Green and Smart Materials” is open to all those with interest in new research activities to support the development of eco-materials (using recycled materials or by-products) and in promoting the use of more environmentally friendly and smart materials and systems in the maintenance and repair of infrastructure. The dissemination of knowledge in this framework will be also a significant contribution to more sustainable construction.



# 1<sup>ST</sup> DURATINET PARTNERS MEETING



The DURATINET launch meeting was held on 20-21 February 2009. The 1<sup>st</sup> Partners Meeting was attended by 25 project members from the 5 European countries, representing 8 academic partners, 7 national or regional authorities in the area of management of transportation infrastructures, 1 contractor and 1 non-profit association for promoting knowledge in civil engineering.

This meeting was the first opportunity for all project partners to discuss in detail the planned activities, milestones and deliverables for the three years duration of the project, and to extensively debate the work plan for the first six months of the project activity.

The meeting had several sessions, one for the general discussions concerning project management and 6 technical sessions to discuss topics relating to each work group activity:

WG A2 - Maintenance decision tools and durability requirements for optimisation of repairs in transport infrastructure: requirements for repair optimisation and decision-making using of deterministic and probabilistic methodologies.

WG A3 - Maintenance and repair of concrete: requirements for durability, mechanisms and type of damages, inspection methods for in-situ evaluation, repair techniques (EN1504) and the approach to environment and cost factors.

WG A4 - Maintenance and protection of steel: mechanisms and type of damage, inspection methods, protection and repair systems for structural steel.

WG A5 - Quality control requirements and evaluation of the reliability of repair products and systems implications of the European standards on concrete and steel repair and protection to contractors and material suppliers, need for pre-normative activities related to standards and specifications on the performance of repairs.

WG A6 - The promotion of "Smart and Green Structural materials" in construction: green concrete incorporating by-products and recycled aggregates; corrosion resistant rebar steels; new stainless steel alloys for prestressing, smart structural materials with permanent monitoring, "nanostructured" coatings for steel protection; new developments and research areas on repair materials and more environmentally friendly systems for steel protection.

WG A7 - Evaluation of alternative repair products and systems in exposure trials and in existing structures; application of new repair systems and products; quality control testing for materials and in-situ testing; collecting durability data from structural materials; performance of repair materials from case studies on trial sites.

During these technical sessions, particular attention was paid to the detailed planning of activities in each work group, as well as to the project results and their deliverables and milestones. The discussions focussed on the best means for communication and dissemination of results, both within the project teams and to project target groups, end-users and other parties interested in this technical field.

The project consortium places particular importance on the transfer of knowledge and results to end-users. To facilitate this, a decision was taken to invite the most relevant bodies in the area of infrastructure maintenance and repair to be project key stakeholders.



# 1<sup>ST</sup> DURATINET TRANSNATIONAL WORKSHOP



1<sup>st</sup> Workshop  
Opening session

The 1<sup>st</sup> Trans-national Workshop, held on 20 February, was the first public event for the dissemination of project activities. Approximately 70 persons attended this workshop. This included many engineers involved in maintenance and repair of transport infrastructure and some representatives of Portuguese authorities for transportation infrastructure.

Representatives from the Portuguese authorities on road management, Estradas de Portugal - EPE, and on railways, REFER - EP, and a structural engineer with significant experience in repair and design of structures from A2P Consult also participated in the event. Consultants were invited to give their viewpoints on maintenance and repair of Portuguese transportation infrastructures, and to identify the key problem areas, as well as address technical questions which will be considered in the project.

The Workshop had two sessions. Session 1 was mainly devoted to presenting the DURATINET project, with an outline of the project objectives and a description of the planned activities and deliverables. This was delivered by the project leader and the work group leaders. Session 2 provided the Portuguese transport infrastructures authorities the opportunity to present their experiences and needs in the fielding relation to management, maintenance and repair of transport infrastructure.

DURATINET  
Project presentation





## Session 1: Project presentation

(Presented by DURATINET project leader and work group leaders)

DURATINET objectives, activities, end products and dissemination of results (M. Salta, LNEC, PT)

- *Maintenance and decision tools (Alan O'Connor, TCD, IR)*
- *Concrete maintenance and repair (M. Basher, QUB, UK)*
- *Steel maintenance and repair (F. Schoeffs, GeM, FR)*
- *Smart and green materials in structures (R. Nóvoa, UVigo, SP)*

## Session 2: Portuguese invited speakers

(Presented by two representatives from infrastructure management authorities and one structural engineer from Portugal)

- *Portuguese Highway Infrastructure Management (Luís Freire, EP-EPE, PT)*
- *Portuguese Railway Bridge Management (Hugo Patrício, REFER, EP, PT)*
- *Performance of concrete Bridges in Portugal (Julio Appleton, A2P consultant, PT)*

Relevant questions in the field of infrastructure maintenance were discussed by the workshop participants. The following conclusions pertinent to bridges in Portugal were summarised:

Although the maintenance policy has been almost nonexistent, concrete bridges have generally behaved quite well during their 50-year operation.

The main deterioration problems are as follows: reinforcement corrosion (due to inadequate cover which ranged widely); construction defects in the concrete; deficient construction details. Alkali-silica expansive reaction is also a relevant cause of deterioration in bridges.

Most bridges do not comply with the new seismic design requirements.

A general bridge deck rehabilitation cost represents 30% to 50 % of the cost of a new structure.

# " GREEN & SMART MATERIALS "

## Atlantic Area Cluster

The construction and maintenance of infrastructure can have very negative environmental impacts associated with the intensive use of natural resources (contributing to the depletion of resources and increasing environmental pollution) and with material production consumption (in particular, cement) responsible for the production of high emission levels of carbon dioxide. Owners and managers are faced with the significant challenge of managing infrastructure in a more sustainable way particularly in view of stringent targets for reducing environmental impacts and carbon dioxide production and for conserving natural resources.

Taking consideration of these important issues, one of the strategic activities of the DURATINET project is the creation of the Atlantic Area Cluster "Green and Smart Materials". This Cluster is intended as an effective way to encourage the development and intensive application of green "eco-materials" in civil engineering generally and particularly in the maintenance and repair of transportation infrastructure. The Cluster will raise awareness among the various stakeholders of the problems and potential solutions. It will focus on motivating the different stakeholders to develop and promote the more ecological structural and repair materials. This will include the use of "green" concrete through the utilisation of waste products and recycled aggregate, and the use of more environmentally friendly corrosion protection systems such as water-based coatings. The development of smart structural materials will be actively addressed: these include "nano-structured" materials with specific properties such as automatic detection of defects, self-repair, auto-cleaning.

The main topics to be addressed in this Cluster are:

- "Green" concrete
- Environmentally friendly repair materials
- Nano-coatings for corrosion protection of steel and concrete with innovative properties such as auto-cleaning
- Smart structural materials
- New structural alloys with increased corrosion performance
- New structural and repair materials using by-products and recycled materials
- Other innovation in terms of materials and procedures intended to promote sustainable construction.

Participation in this Cluster is open not only to researchers working in these fields but also to all stakeholders interested in knowing more about these new developments and opportunities. Suppliers of materials interested in developing new materials in this area are welcome to join this cluster. National authorities as the main end-users of this technology are particularly encouraged to participate. A form is available on the DURATINET website to enable interested individuals and companies to sign up.



## Next Project Meetings

### 2<sup>nd</sup> Trans-national Workshop & 2<sup>nd</sup> Partners Meeting

22-24 June 2009

QUB - Belfast, UK

### 3<sup>rd</sup> Trans-national Workshop & 3<sup>rd</sup> Partners Meeting

January 2010

BUniversity-Bordeaux, FR

## Next issue:

**NEWSLETTER Nr 03**

**January 2010**

More information about DURATINET can be obtained from the website [www.duratinet.org](http://www.duratinet.org)

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