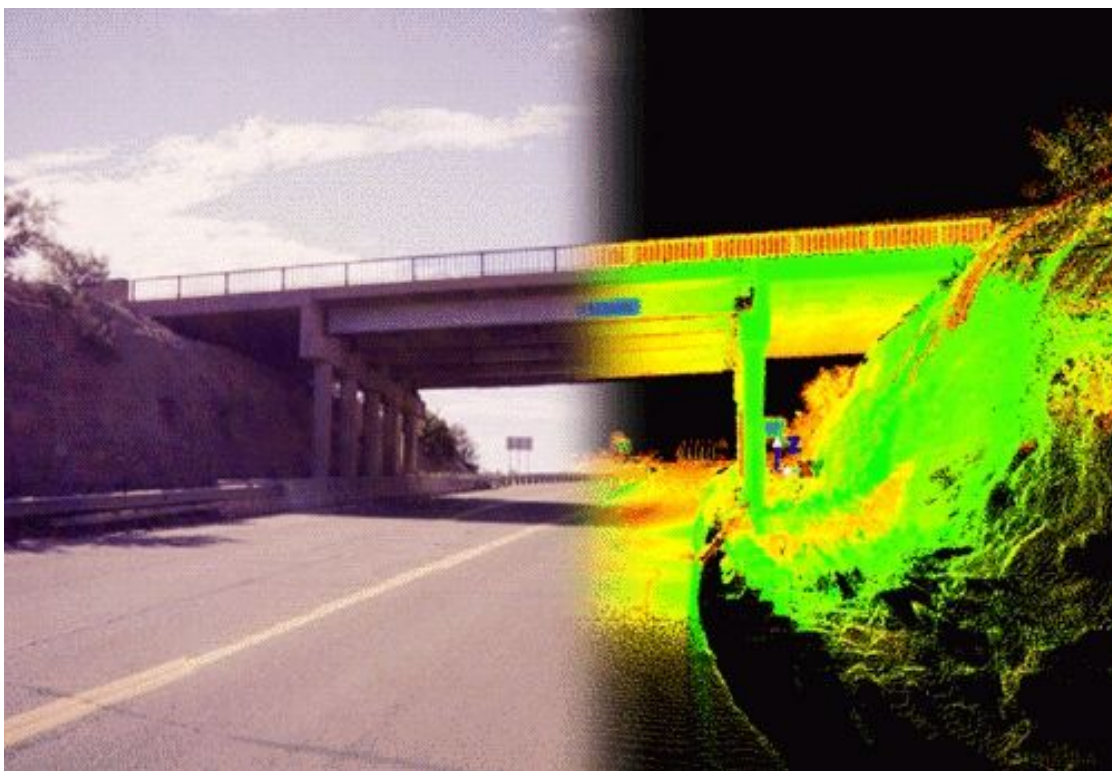


National Roads Authority

NRA Strategy for Research and Development



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EXECUTIVE SUMMARY

The primary function of the National Roads Authority under the terms of the Roads Act, 1993, is to secure the provision of a safe and efficient network of national roads. For this purpose, the Authority has overall responsibility for planning and supervision of construction and maintenance works on these roads. According to the Roads Act, the remit of the Authority includes any training, research and testing activities necessary for the execution of its functions, which include project planning, construction, maintenance and operations.

The Authority recognises the value of research and the important role it plays to help achieve its strategic objectives. Accordingly, a Research Strategy was initiated in 2007 to ensure that all research activities are carried out in a coordinated way. The aim of this Research Strategy is to promote practical measures that will contribute to cost reducing and/or quality enhancing innovation in regard to the Authority's functions. This initiative is managed by a full-time Research Manager whose function is to coordinate all the research activities across the different areas associated with the provision and operation of road infrastructure.

This document presents the principles behind the NRA Research Strategy and provides the basis for the on-going research activities within the NRA. The strategy provides for both short-term commercial research and technical consultancy services in response to the business needs of the Authority, as well as for longer-term fundamental or "blue skies" research projects at PhD or post-doctoral level. The Research Strategy supports the overall goals of the NRA as outlined in the Statement of Strategy 2007.

A programme of research programme is developed for the NRA on an annual basis in line with the framework outlined in this document and in response to current research needs as identified by individual NRA staff members and other stakeholders. This annual Research Programme reflects changes in priorities and new areas of interest. A key element of the Research Programme will be an implementation plan to ensure that the research results are implemented in a practical and timely way.

1. Introduction

The NRA was formally established as an independent statutory body under the Roads Act, 1993, with effect from 1 January 1994. The Authority's primary function under the Act is to secure the provision of a safe and efficient network of national roads. For this purpose, it has overall responsibility for planning and supervision of construction and maintenance works on these roads. Delivery of the national roads element of the National Development Plan 2007-2013 launched in January, 2007, by Government represents a major element of the Authority's responsibility.

The remit of the NRA encompasses training, research and testing as cited in Section 19 (1) (f) of the Roads Act, 1993, viz: "The Authority may, in relation to national roads or proposed national roads, carry out, arrange to have carried out or assist the carrying out of, training, research or testing activities in relation to any of its functions". Unlike many counterpart road administrations in Europe and the rest of the world, the NRA does not have any internal research capability and as a consequence procures research services from external organisations as and when required. In 2007, the NRA Board initiated a Research Strategy to ensure that all of its research activities were carried out in a coordinated way. This strategy has the overall objective of promoting practical measures that will contribute to reducing costs, enhancing quality and/or encouraging innovation in regard to the Authority's functions, which include project planning, construction, maintenance and operations. In all of these functions, consideration must be given to efficiency, economy, quality, safety and the environment.

This document presents the principles behind the Research Strategy and provides the basis for the ongoing research activities within the NRA. The strategy provides for both short-term commercial research and technical consultancy services in response to the business needs of the Authority, as well as for longer-term fundamental or "blue skies" research projects at PhD or post-doctoral level. This longer-term research is vital as road infrastructure is a valuable asset with a very long service life. Effective management requires looking well ahead at potential advancements in order to anticipate and exploit technological developments in good time.

The Research Programme is developed on an annual basis in line with the strategy outlined here and in response to current research needs as identified by individual NRA staff members and other stakeholders. The programme is closely aligned to the Authority's overall strategic goals as outlined in the Statement of Strategy (NRA 2007). The annual Research Programme will reflect changes in priorities and new areas of interest. A key element of each research project will be an implementation plan to ensure that the research results are disseminated and implemented in a practical and timely way.

2. Development of research strategy

2.1. Background

The Authority's Statement of Strategy (NRA 2007) describes the mission, strategic goals, objectives and output of the NRA, along with the business environment in which these are carried out. The mission statement is:

Contribute to improving people's quality of life and to economic competitiveness by developing, maintaining and operating the national road network in a safe, cost effective and sustainable manner.

The Statement of Strategy was developed on the basis of the road infrastructure requirements presented in Transport 21 (DoT 2006), which outlines a €34.4 billion national transport investment programme to be implemented over the 10-year period 2006-15. This programme is intended to be an integrated solution to Ireland's current and evolving road and public transport needs. Transport 21 was itself devised from the National Spatial Strategy (GoI 2002) and successive National Development Plans (NDPs), the latest of which (GoI 2007) sets out a programme of investment in Irish infrastructure totalling some €184 billion over seven years.

These strategic documents reaffirm the four basic objectives of infrastructure development in Ireland:

- to continue sustainable national economic and employment growth
- to strengthen and improve Ireland's international competitiveness
- to foster balanced Regional Development
- to promote Social Inclusion.

The Statement of Strategy was used to develop a robust research policy to assist in the identification and delivery of a defined programme of research. Thus the Research Strategy provides a framework which is closely linked to the strategic goals of the NRA and is used to put in place and to develop an appropriate organisational structure, with sufficient resources to achieve its aims. This is essential for the development of policy, effective delivery of the NRA's objectives and the credibility of the NRA. Historically, the standards used in Ireland depended heavily on research and development carried out elsewhere, particularly in the UK but more recently in the EU. This reliance on overseas research has served fairly well in the past - conditions in Ireland are not vastly different from those in neighbouring countries - but there are many situations where UK and EU practice may not be entirely applicable. The NRA research programme focuses on this research deficit to ensure that the uniquely Irish conditions are taken into account. Access to good quality, up-to-date and reliable information is key to effective policy-making, the setting of strategic objectives, and the implementation of effective standards and practices.

2.2. Need for research

Transport 21 is the capital investment framework through which the transport system in Ireland will be developed over the period 2006 to 2015. This framework addresses the major issues of past investment backlogs and continuing growth in transport demand. The projects and programmes that make up Transport 21 aim to tackle the following five challenges:

- Increase accessibility;
- Ensure sustainability;
- Expand capacity;
- Increase use; and
- Enhance quality.

To face and overcome these challenges, the NRA has adopted the following strategic objectives:

- Continue to develop the network of national roads
- Improve the general public's quality of life
- Contribute to sustainable development
- Be an efficient, flexible and quality-driven organisation committed to achieving excellence in our work.

To ensure the success of the NRA in carrying out these objectives, it is vital that a research strategy is put in place so that state-of-the-art materials, techniques and procedures are used and implemented to create a modern, efficient infrastructure. The world is constantly changing: not only are developments in science and technology occurring very rapidly, the demands placed on the road infrastructure are continuously being modified in response to the changing needs and preferences of the travelling public and business. As a major client, the Authority must be able to plan and procure road development projects in a way that encourages innovation. It must be able to engage designers and contractors, and assess and challenge engineering solutions from a knowledgeable standpoint, understanding both the technical detail and the economic, environmental and social implications. There is therefore a real need to invest in research and development so that the infrastructure is able to meet current and future requirements to the satisfaction of all stakeholders.

The benefits of research to the Authority include the following:

- It provides an effective mechanism for maintaining up-to-date standards and specifications;
- It enables procedures to be developed for the efficient and cost-effective management of a very valuable national asset;
- It ensures that state-of-art materials and methods are identified and used;
- It facilitates the professional development of NRA staff and helps them to stay abreast of current advances in science and technology.

Formal research is one of the key ways in which the Authority can inform operational policy and set standards. It is vital that a well-founded research strategy is in place with clear objectives and effective dissemination. Figure 1 illustrates the research process and how it

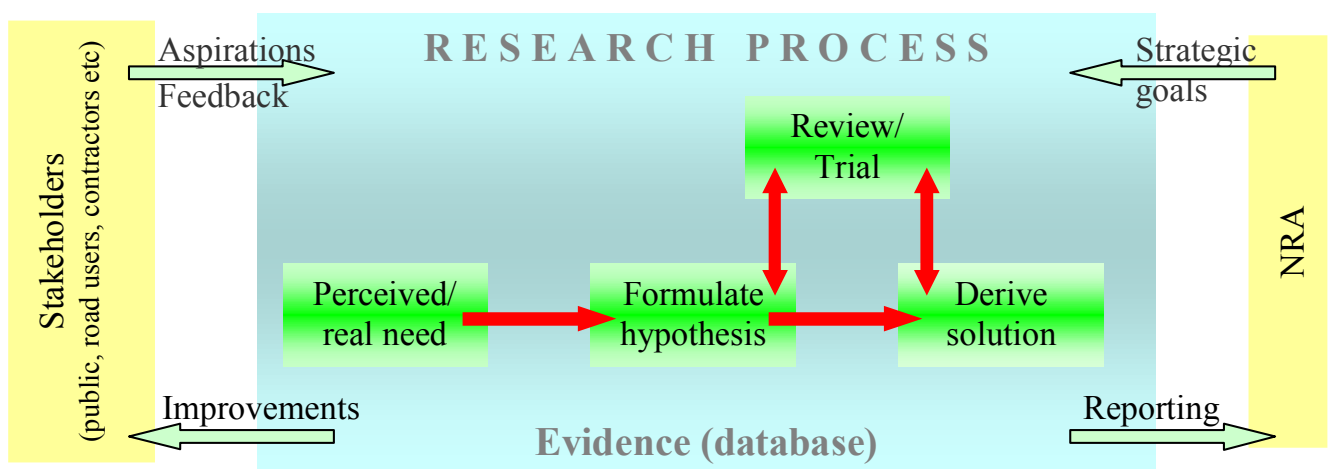


Figure 1. Strategic approach to research (adapted from UK DfT).

provides the link between the stakeholders' requirements (whether they be perceived or real) and the NRA's strategic objectives. This is based on UK Highways Agency's approach to research, which is seen as the process to provide the evidence base on which to implement policies and set standards. This approach derives from the principle of using statistical and research evidence and analysis in the development of policies and solutions.

2.3. Objectives

The over-riding aim of the Research Programme is to enable the NRA to carry out its mandate of providing and operating the national road system in a more efficient and effective way. The particular objectives are devised in line the high-level strategic goals of the Authority as outline in the Statement of Strategy. Emphasis is placed on what is likely to be the NRA's needs, ensuring that state-of-the-art techniques are used, filling knowledge gaps where they exist, and implementing the research conclusions in a timely and effective way. The Research Programme will cover the general areas of expertise of the Authority including planning, construction, maintenance and operations.

NRA staff members who have a need for, or an interest in, research activities contribute to this ongoing strategy by identifying the key priorities areas of research. They assist in developing the particular research topics included in the annual programme and act as technical advisors in the various research projects commissioned.

The research commissioned by the Authority will generally focus on short-term goals driven by current business plan targets, but it is important that the longer-term fundamental research is not neglected. The opportunity is taken to engage with stakeholders, allowing them to shape the Research Programme at an early stage of the Research Programme cycle. The mechanisms for this include publicising research activities on the NRA website, presentation of the research programme at various local and national seminars and conferences, and informal contacts with various organisations and industry (eg, Department of Transport, Road safety authority, Environmental Protection Agency, etc). This enables the NRA to respond more effectively to current needs. The research outputs are used:

- To provide and/or improve standards, specifications and procedures
- To identify and encourage innovation
- To assist in the professional development of staff.

3. Management of research at NRA

3.1. General

The Authority is committed to setting up and maintaining a research and development budget, which will be used to fund an ongoing Research Programme in line with the strategy outlined in this document. The Research Programme is formulated on an annual basis and provides for short-term business oriented projects in response to specific needs as well as longer-term fundamental research. The programme covers all aspects of the Authority's interests. The research budget is managed by the NRA Research Manager with technical advice and management provided by experts from within the Authority.

3.2. Policy themes

The Transport 21 and National Development Plans discussed above have been used to develop a number of broad "policy themes" for the development of a research strategy to

assist the NRA in achieving its strategic goals. These themes focus on the requirements to strive for better efficiency, sustainability and safety across all spheres of activity of the Authority and relate to materials, standards and procedures within the context of road construction, maintenance and operation. The policy themes are:

1. Materials

Development of new construction materials; more efficient use of existing materials; conservation of scarce or natural materials; use of recycled materials, durability, repair and maintenance

2. Standards and specifications

Maintain up-to-date standards; develop new standards and specifications based on new developments; encourage innovation

3. Environment/Sustainable construction

Consideration of environmental issues; effects of climate change; ways of reducing energy consumption; conservation of natural resources; alternative energy sources; “green” solutions; consideration of energy consumption in the wider sense such as junction layout, etc; understanding the effects of vehicle technologies and alternative fuels; improved durability of roads and bridges; development of better monitoring and inspections methods and procedures as part of a sustainable asset management system

4. Safety

Contribution of infrastructure to casualties and fatalities; improved safety of road users; improved skid resistance; interaction between road; vehicle and driver; understanding driver behaviour; improved structural safety; development of passive safety; risks associated with traffic induced noise and air pollution; incident management

5. Value for money

Improved global competitiveness; procurement methods; risk identification and allocation; more effective asset management procedures; making better use of existing infrastructure; targeted maintenance regimes; improved traffic modelling and planning

6. Transportation and land use

Traffic growth predictions; Land take-up at grade separated junctions; influencing driver behaviour; development of traffic models; intelligent transport systems; integrated transport systems; inter-modal studies

7. Heritage

Consider impact of roads on society; methods for archaeological investigations; other social issues.

These policy themes provide a framework within which the Authority’s research activities are carried out. They provide the basis for the development of the Annual Research Programme, the primary aim of which is to provide assistance to NRA staff in providing and operating the national road system in a more efficient and effective way.

3.3. Internal organisation

The Authority’s Research Programme is the direct responsibility of the NRA Research Manager who manages the Research Programme on a day-to-day basis. The Research Manager is supported on a part-time basis by specialist staff operating in the various areas of activity within the Authority who provide technical advice and management.

3.3.1. *Research Manager*

This is a full-time position dedicated to managing the Research Programme. The Research Manager reports to the Head of Engineering Operations and, as the research remit develops, to the Chief Executive and the NRA Board. The role of the Research Manager includes:

- Develop the Research Strategy for the Authority
- Identify and prioritise topics for inclusion in Annual Research Programme (with NRA Specialists and stakeholders)
- Manage the performance and delivery of research projects with technical advice from NRA Specialists
- Develop relationship with key stakeholders
- Develop relationship with research providers (universities, consultants, etc)
- Communicate research activities to Board and across NRA and key stakeholders
- Maintain contact with EU and national research initiatives; participate in international organisations such as FEHRL and CEDR.

3.3.2. *Research Mentors*

For the Research Programme to be fully embedded into the Authority's core activities and for the research to be effectively disseminated into codes, standards and practices, it is essential that there be clear linkage between the Research Programme and those personnel responsible for standards and particular areas of specialisation within the Authority. Failure to adequately integrate the programme of NRA sponsored research and technical consultancy into the different elements of the Authority's core activities would significantly diminish the benefits of such a programme.

In order to achieve the necessary linkage between research and core activities, an internal network of specialist Research Mentors has been set up. The primary functions of the Research Mentors include:

- Maintain familiarity with worldwide trends in research in their area of specialisation,
- Maintain awareness of recent research publications in published journals, at conferences etc,
- Identify research priorities within their area of responsibility
- Collaborate with the Research Manager in respect of research and consultancy projects, including review and commentary on draft reports and assessment of service provider performance
- Ensure the implementation and effective dissemination of research results through the Authority's standards and publications.

The following internal network of Mentors is proposed:

- Archaeology - Ronan Swan, James Eogan
- Bridge technology - John Iliff, Liam Duffy
- Structures and Eurocodes - Fergal Cahill
- Economics - Michael Kennedy, Fergal Trace
- Environment - Vincent O'Malley, Christian Nea
- NRA standards – Tim Ahern, Helen Hughes
- Pavement technology - Geraldine Walsh, Tom Casey
- Planning and land use - Tara Spain, Martin Fagan

- Safety - Harry Cullen
- ITS – David Laoide-Kemp, Conor Fitzgerald
- Network Operations - Pat Maher
- Geotechnics - Michael Nolan, , Kevin O'Rourke
- High level objectives - Fred Barry, Hugh Creegan

This list covers most of the key areas of current interest to the Authority. It will however be supplemented to meet demands, and external Mentors may be added if appropriate, e.g. behavioural sciences.

3.4. Research management

The management of the research commissioned by the Authority will be guided by the following principles:

- Well-organised targeted annual Research Programme with a clear statement of expected outputs and benefits.
- Identification and selection process to ensure that the research projects are aligned to the Authority' objectives.
- Individual project prioritised on the basis of current needs and available funds.
- Research will generally be procured on a competitive basis to ensure transparency and value for money.
- Research will focus on solutions to short-term goals driven by current business needs but will not neglect fundamental research aimed at longer-term benefits.
- Individual research projects will incorporate a dissemination plan to ensure that the conclusions and outputs are relevant to the Authority and are implemented in an effective and timely fashion.

A Value Management process will be adopted in formulating the annual Research Programme. This is a style of management dedicated to motivating people, developing skills and promoting synergies and innovation with the aim of maximising overall performance. The first stage of the process is to identify general research themes and topics by NRA staff with input and advice from external stakeholders where appropriate. The themes and topics will then be evaluated against the policy themes and strategic objectives of the Authority as outlined in this document. On the basis of this evaluation, topics will be selected for possible inclusion in the Programme. To ensure that the selection is carried out equitably and represent both the needs of the authority and good value for money, an Expert Group will over see the process. This Expert Group consists of 4/5 senior NRA staff members with experience in research projects and an in-depth knowledge of the operations of the Authority. A project brief is prepared for the selected topics, giving the background to the problem being investigated, outlining the objectives of the project, and presenting what the Authority expects to gain from the project. This helps to focus the project on the high-level strategic goals of the Authority and assists in determining how and from which organisation the research can be commissioned. The topics are then be prioritised and ranked on the basis of the current needs and the funds available. The higher-ranked projects will be selected and approval sought for including them in the annual Research Programme. A preliminary Research Programme is devised prior to each financial year in order to define budgets and timescales for new and ongoing projects. The Fellowship projects will generally be commissioned to start in October each year (the start of the academic year). Other project may come on-line at various times in the year depending on particular requirements and priorities.

3.5. Procurement

Procurement of research projects is generally made through the normal NRA procurement procedures. Preferred suppliers of research services are selected on the basis of an open competition which will be advertised on the NRA website, in national and international journals and in the European Journal, as appropriate. Competition between potential suppliers, based on both quality and cost of the proposals ensures best value for money. The procurement system for the Research Fellowship Programme is described in more details in Section 4.

In some cases it may be appropriate to use a different procurement process. Examples are:

- If the project is a continuation of previous work and continuity of personnel is necessary, it may be appropriate to commission a particular institute or individual to carry out the work
- Collaboration projects, where the Authority is a co-funder or where the Authority is providing “top-up” funds to an existing project.

In these cases approval for the proposed procurement method is sought from the Chief Executive.

3.6. Budget

The Research Programme has been built up since its inception in 2007 in order to allow the Authority to develop its competencies in the procurement, administration, publication/ dissemination and implementation of research results. The research budget for the period 2007-2012 is as follows:

2007:	€ 130,000 (actual)
2008:	€ 510,000 (actual)
2009:	€ 972,000 (actual)
2010:	€1,400,000 (planned)
2011:	€1,750,000 (planned)
2012:	€2,000,000 (planned)

The budget is reviewed on an annual basis. Additional areas of research needs become apparent from time to time and new research areas are added to the programme as the need arises. The current target is to increase research expenditure to €2.0m per annum.

3.7. Communication

A communication system has been developed within the Authority to facilitate the exchange of information relating to research activities. The communication system is based on the research network described in Section 3.3.2. The purpose is to collect research needs and ideas, evaluate proposals, prioritise the projects, provide effective technical management, and disseminate results of the Research Programme.

The research network has been devised to maintain both a top-down and bottom-up approach. With the top-down approach, potential projects will be developed from the high-level strategic goals of the Authority. Using the bottom-up approach, the technical specialists of the Authority will identify research projects to solve particular problems or assist in carrying out processes in a more effective way. In both cases, the high-level goals will underpin and justify the research activities.

Communication is necessary in order to inform all stakeholders (member of the public, universities, institutes, consultants, contractors and other interested bodies) of the Authority's Research Strategy and the evidence and reasoning that underpin this strategy. Use of NRA website will be made to publicise the Research Programme and to make the research results available. Promotion of the research outputs is also maintained through journal publications, presentations at seminars and conferences.

Communication of the research activities is co-ordinated by the Research Manager with assistance from the Research Mentors in the different technical areas. Use is made of the NRA intranet to facilitate the flow of information throughout the Authority. Updates are prepared every six months and presented to NRA Board for comments and approval. The updates are also disseminated among all NRA staff through the NRA Newsboard, an internal NRA web-based information system.

3.8. Performance indicators

It is difficult to gauge the quality of research as it is often many years before the results are implemented through standards and the benefits are finally realised. High quality research can only be guaranteed if a high calibre research team is employed. In the selection process, emphasis will be placed on the track record of the research team and the relevance of the research outputs to the Authority's goals. Value for money will be ensured by competition and transparency in the evaluation and selection process.

Close management of each individual project will be the responsibility of the Research Manager and the Project Mentor. Progress of the Research Programme will be monitored by the Audit Committee of the NRA Board. Performance is will be measured by reporting the following:

- Number of projects commissioned
- Number of projects delivered
- Number of reports and papers published
- Quality of research and research outputs
- Implementation of research outputs.

4. NRA Research Fellowship programme

4.1. Introduction

The Authority is committed to the development of longer-term research. To facilitate this, the Authority decided at Board level to support a Research Fellowship Programme as an integral part of its ongoing research strategy. The Programme enables universities and institutes to apply for financial support for PhD and post-doctoral programmes covering subjects that are relevant to the aims of the NRA. The Call for Proposals is specific to research topics identified by the NRA, although other topics outside those specified may be submitted for consideration. PhD programmes are normally three years while post-doctoral programmes can be one to three years in duration.

The Call is publicised annually in national newspapers, technical journals and the NRA website. The Call includes a technical specification for particular research topics identified by NRA staff. The Call for Proposals is made each March/April with a project start date of

October. The first call was initiated in April 2007. Projects commissioned through the Research Fellowship Programme are described in Section 5.1.

4.2. Form of submission

Submissions are accepted from suitable qualified full-time academic staff in third levels universities and institutes. Individuals from industry interested in the Call are encouraged to team up with academic partners in order to participate in the Fellowship Programme. The application must be made in conjunction with a third level institution with a proven track record in the selected area and a detailed knowledge of the particular conditions existing in Ireland. The Fellowship projects are supervised by appropriate experts in the host university/institute and National Roads Authority personnel. PhD Fellowships are generally of three-year duration and Post-Doctoral Fellowships are offered for one to three years in duration, subject to satisfactory progress being made. Submissions are made on a standard form devised by the NRA and include the following:

- Description of project including objectives, justification, work plan and timescale;
- Methodology;
- Expected outcomes;
- Breakdown on funding;
- CVs of relevant staff (main applicant, supervisor, student, etc).

The application must be made in conjunction with a third level institution that has relevant experience and a proven track record in the selected area(s). Each Fellowship is supervised by appropriate experts in the post university/institute and by relevant National Roads Authority personnel, where appropriate.

Submissions can include costs directly associated with setting up the project. An annual budget for each Fellowship comprising fixed stipend plus other acceptable costs is provided as part of the application. Other acceptable costs include:

- Student fees
- Equipment required to carry out the project
- Travel and subsistence for presentation of research results
- Conference fees (subject to the approval of the NRA)
- Overhead expenses incurred by the university/institute.

Consideration is given to commissioning up to five new Fellowship projects each year.

4.3. Evaluation and selection

Fellowships are awarded to the academic institution following NRA evaluation of the applications. Applications are reviewed and assessed under the following headings:

- (a) Track record of supervisors
- (b) Quality of applications
- (c) Relevance of application to goals identified in topic descriptions
- (d) Value for money

Project costs are considered in relation to the available NRA budget.

The assessment of the projects is co-ordinated by the NRA Research Manager with input also provided by the Expert Group described in Section 3.4. Technical evaluation will be carried out by appropriate NRA staff: external review may also be carried out at the discretion of the NRA. On the basis of this review, the submissions are ranked and selected for inclusion in the annual research programme.

Following the selection process, an initial meeting with the first ranked project team is held to discuss the details of the project, clarify the project objectives and agree the project costs and timescales. The NRA may invite other interested parties to the meeting if appropriate. Following the meeting, the research proposal will be revised, as necessary. Projects will only be included in the programme if they conform to NRA requirements in terms of quality, cost and timescale. The NRA may wish to re-assess the original submissions if this is felt appropriate.

5. Commercial research

In addition to the long-term research commissioned under the Research Fellowship Programme, the Authority also commissions shorter term research projects in response to immediate business requirements. In these cases, the research needs are identified by the specialists within the NRA as outlined in Section 3. The topics are categorised to determine whether it is appropriate to carry out the research through a PhD/post-doctoral programme or whether it would be more appropriate to commission the research through a more commercial mechanism. This decision is based on a number of factors including the need for academic input, degree of innovation, when the output is required, and the need for the practical experience of consultants and contractors in the project. If appropriate, the research will be procured through the NRA Research Fellowship Programme (see Section 5). Otherwise the invitation to tender is directed towards commercial organisations and research institutions.

Short-term projects, where the work is expected to be completed within a number of weeks or months, are generally commissioned by inviting tenders from universities, commercial research organisations and consultancies as appropriate. This can be achieved either through an open call published on the NRA website, eTenders (a website designed as a central facility for all Irish public sector contracting authorities to advertise procurement opportunities and award notices), and in newspapers and journals. Alternatively a restricted call, whereby preselected firms are asked to provide a tender, can be used. Such projects are expected to be completed within two years. Longer-term projects are more likely to be commissioned through the NRA Research Fellowship Programme (see Section 5). Major projects are tendered through the European Journal in line with European regulations. In all cases, the tender invitation includes the format and content of the submission and a fully costed proposal with a schedule of deliverables is requested. Proposals submitted in response to the call are reviewed according to defined evaluation criteria, which will be included in the project brief. The evaluation will be carried out by the Research Manager and Project Mentor: the Expert Group (see Section 3.4) will oversee this process to ensure the evaluation is carried out fairly and consistently. These procedures have been developed in order to ensure that high quality research is obtained representing good value for money for the NRA.

6. Collaborative research

There is considerable benefit to be gained from collaborative research whereby access to a large project or specialist expertise can be gained for a relatively small financial contribution.

It also provides a very effective means of knowledge transfer and the opportunity to tap into a high quality research and leading-edge science and technology. Methods of collaboration include:

- Participation in co-funded projects at universities and third level institutions
- Collaboration with National bodies which sponsor research activities in Ireland such as SFI (Science Foundation Ireland), IRCSET (Irish Research Council for Science, Engineering and Technology), etc.
- Involvement in European working groups and committees such as FEHRL (Federation of European National Highway Research Laboratories), CEDR (Conference of European Directors of Roads) and ERTRAC (European Road Transport Research Advisory Council).
- Opportunities through EU funded research (eg, 7th Framework Programme).
- Jointly funded projects such as those initiated by ERA-NET (European Research Arena Network) ROAD and similar organisations.

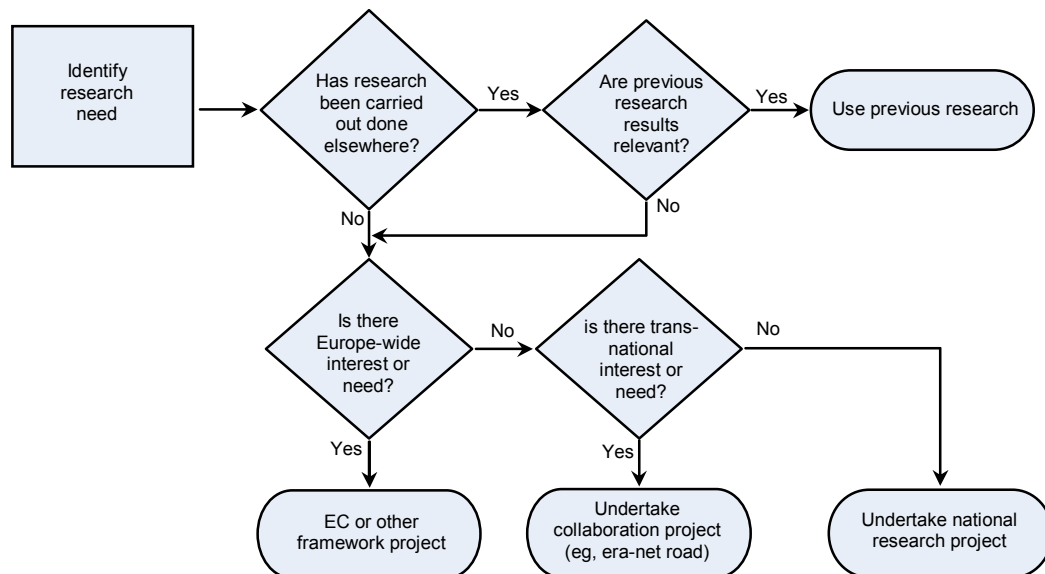
The Authority keeps close contact with these organisations and maintains membership of a number of EU organisations including CEDR, FEHRL, ERA-NET ROAD, ERTRAC and PIARC to ensure that it is aware of international research activity in road transport and of the opportunities provided by collaboration with other organisations. These organisations are described in more detail in Section 7. The Research Manager, as part of his job description, maintains a network of contacts at both national and international level to ensure that the Authority is kept aware of the opportunities provided by such collaboration projects.

Collaboration is a very effective means of obtaining research and one which is to be encouraged as it presents much greater value for money by avoiding repetition and duplication. The advantages of collaboration include:

- Application of international best practice
- Reduced duplication of research
- Improved quality of research
- Increased competition and shorter timescales
- Wider choice of suppliers
- Exchange of knowledge with European partners
- Better value for money.

The decision-making process to identify collaboration opportunities is illustrated in Figure 2.

**Figure 2: Four step approach to collaborative research
(adopted from ERA-NET ROAD).**



7. Other research activities

7.1. European participation

7.1.1. CEDR

The NRA is a member of the Conference of European Road Directors (CEDR), an organisation which brings together the road directors of 25 European countries. The aim of CEDR is to contribute to future developments of road engineering as part of an integrated transport system under the social, economical and environmental aspects of sustainability and to promote co-operation between the national road administrations. The website www.cedr.fr contains a full description of the structure and activities of CEDR.



CEDR recognises the importance of research in the development of sustainable transport and has established a Technical Group (TG) to monitor European research activities and to advise the CEDR Board on issues relating to research. TG Research responsibilities include dissemination of research results as well as influencing EU Research Programmes that support CEDR members in current and future situations. The NRA Research Manager is an active member of TG Research and the various initiatives that the group initiates.

7.1.2. ERTRAC

The European Road Transport Research Advisory Council (ERTRAC) is a European Technology Platform the members of which include industry, users, EU and national bodies, and



research providers. It was established to mobilise all stakeholders, develop a shared vision, and ensure timely, co-ordinated and efficient application of research resources to meet the continuing challenges of road transport and European competitiveness. The NRA became a member of the ERTRAC Plenary group in 2008. The ERTRAC website is www.ertrac.org.

7.1.3. ERA-NET ROAD

ERA-NET ROAD (ENR) is one of a number of European Research Arenas (ERAs), the purpose of which is to encourage better co-operation of research



and trans-national co-ordination across Europe. ENR is a three year project funded by the EU through the 7th Framework Programme and its membership includes the road authorities of Austria, Belgium, Denmark, Finland, France, Germany, Hungary, Ireland, Lithuania, Netherlands, Norway, Poland, Slovenia, Sweden, Switzerland, United Kingdom, with CEDR (Conference of European Directors of Roads) as an Associate Partner. The main objective of ERA-NET ROAD is to achieve trans-national research programmes which are strategically planned and which are financed through the pooling of national research funds. The first of these joint research programmes, “Getting to grips with Climate Change”, was developed and launched in May 2008 and a second programme “Safety at the heart of road design” was initiated in 2009. A third programme on asset management will start in 2010 and other possible research programmes are being developed by the ERA-NET ROAD team. The website www.eranetroad.org contains more details of the objectives and activities of ERA-NET ROAD.

7.1.4. FEHRL

The Forum of European National Highway Research Laboratories (FEHRL) is an association of national institutes involved in transport and road engineering research. It was formed in 1989 and has a permanent



Secretariat based in Brussels. It is governed by a General Assembly made up of the Directors of each of the national institutes. Currently it provides a coordinated structure for the interests of the twenty-nine national research and technical centres from the member states in the European Union, the EFTA countries and the rest of Europe.

The purpose of FEHRL is to encourage collaborative research between European laboratories and institutes in the field of highway infrastructure, leading to the provision of relevant knowledge and advice to governments, the European Commission, the road industry and road users. More details of its activities can be found on its website www.fehrl.org. As Ireland does not have a national research institute, the NRA was invited to become a member of FEHRL so that the interests of Ireland were represented. This is appropriate as the NRA now has a formal research strategy and it is important that its research programme takes on board what is happening internationally. To encourage wider Irish involvement in EU-funded projects, an Irish FEHRL Group has been proposed. This currently includes UCD and TCD, as these universities have historically had a significant involvement in EU projects. This Group can be expanded to include other organisations as required.

The benefits to the NRA are:

- Through FEHRL the NRA can influence EU policy on research themes

- The NRA can encourage Irish universities and organisations to be involved in EU-funded research projects
- The NRA can influence the direction of research projects through the direct involvement of FEHRL in these projects; this will ensure that Irish interests are taken into account
- The NRA can get access to the research results and can be involved in the dissemination process.

7.1.5. *Transport Research Arena (TRA)*

Transport Research Arena (TRA) is a forum to bring together the various stakeholders with an interest in transport research, including transport authorities, consultants, contractors, car manufacturers, fuel producers and researchers. TRA provides an opportunity for all parties involved to meet and to present, exchange and disseminate the results obtained in research and development and is strongly supported by CEDR, ERTRAC and European Commission. The TRA theme is “greener, smarter and safer”.



The first TRA conference was held in Goteborg in June 2006 with the second in Ljubljana in April 2008. The third TRA conference will take place in Brussels in June 2010. The National Roads Authority Ireland is an active participant in TRA. See website www.traconference.eu.

7.1.6. *Other EU organisations*

The National Roads Authority is also involved, directly or through CEDR, with other research bodies including:

- ECTP: European Construction Technology Platform
- JTRC: ECMT/OECD's Joint Transport Research Centre
- FERSI: Forum of European Road Safety Research Institutes
- ECTRI: European Conference of Transport Research Institutes

The list of roads related research topics being undertaken across Europe by these and other EU organisations is very extensive. It is in the NRA's interest, as well as those of the country as a whole, to maintain contact with these groups: this ensures that the Irish perspective is considered in the various research initiatives and they the NRA has the tools to build and operate the road network safely and reliably.

7.2. **Other national and international organisations**

7.2.1. *Bridge Owners Forum*

The membership of the Bridge Owners Forum (BOF) consists of organisations responsible for managing and maintaining the national bridge infrastructure. It was originally confined to the major bridge owners in the UK (Highways Agency, London Underground, Network Rail, British Waterways, National Assembly for Wales, Transport Scotland, Department of Regional Development for Northern Ireland, etc) but the NRA was invited to participate because of its common interest in bridge engineering problems and solutions. The BOF Forum meets three times a year to discuss and promote co-operation, collaboration and partnership amongst bridge owners. One of the purposes of the BOF is to identify research needs and commissions research projects relating to bridges. Membership provides the Authority with access to the conclusions of this research. See www.bridgeforum.org for more details.

7.2.2. World Road association (PIARC)

The Authority is a member of the World Road Association (PIARC). PIARC, a non-political, non-profit making association established in 1909, brings together the road administrations of over 100 governments and has members - individuals, companies, authorities and organisations - in over 140 countries. It was granted consultative status to the Economic and Social Council of United Nations in 1970. The PIARC website, www.piarc.org, provides details of all of its activities and links to the national PIARC associations.

7.2.3. Other

The Authority keeps close contact with a number other national and international bodies that have an interest in promoting the technologies relating to road infrastructure and operations. This includes Engineers Ireland, Science Foundation Ireland (SFI), the Irish Research Council for Science, Engineering and Technology (IRCSET), the Institution of Civil Engineers (ICE) and the Institution of Structural Engineers (IStructE) in the UK.

8. Current research programme

The NRA research initiative has been in place since 2007 and a portfolio of research projects are now in place covering a number of technical areas. These projects are listed in Table 1 and broadly summarised in the following sections. More details of the individual projects in terms of background, benefits to the NRA and outputs can be found in the profiles available on-line in the research pages of the NRA website.

8.1. Research Fellowship programme

The NRA Research Fellowship Programme is in its third year and there is now a significant portfolio of projects being carried out at universities, technical colleges and research institutes: this includes two projects outside the country, one at UUJ in Northern Ireland and at TRL/Open University in England. There is considerable interest by the Irish universities and other third level institutes in this programme as can be seen from the number of submissions received in response to the annual call and the range of projects listed in Table 1.

TABLE 1: Current research projects

POLICY THEMES (see Section 3.2)				1: Materials	2: Standards and specifications	3: Environment sustainability	4: Safety	5: Value for money	6: Transportation and land use	7: Heritage
	start	end	Contractor							
CURRENT FELLOWSHIP PROJECTS:										
6050: Development of cold mix materials	Oct-07	Sep-10	UCD	✓	*	*		*		
6259: Assessment of bat mitigation measures	Oct-07	Sep-10	UCC			✓				*
6269: Design approach for improving rampart roads	Oct-07	Sep-10	TCD		✓		*	*		
6270: Analysis road drainage systems	Dec-07	Nov-10	TCD		✓	*		*		
6914: Development of pavement cost models	Dec-08	Nov-11	TRL			*		✓		*
6907: Impacts of river crossings	Dec-08	Nov-11	UCD		*	✓				*
6904: Archaeology: Quantifying woodland usage	Dec-08	Nov-11	TCD							✓
6902: Automated assessment of delineation and signage	Dec-08	Nov-11	ITB				✓	*		
6911: Assessment of masonry arch bridges	Dec-08	Nov-11	UCD		✓	*	*	*		
NFP011: Impact of road drainage on groundwater	Oct-09	Sep-11	TCD		*	✓		*		
NFP012: Friction characteristics of road pavements	Oct-09	Sep-12	UUJ		*			✓		
NFP013: Assessment of ecological mitigation measures	Jan-10	Dec-12	UCC			✓		*		
NFP014: Development of a bridge life-cycle cost model	Oct-09	Sep-12	TCD				✓	*		
NFP015: Optimisation of earthworks on road schemes	Jan-10	Dec-12	TCD					✓	*	
OTHER PROJECTS:										
6274: Development of strategic noise maps	Jan-08	Dec-10	TCD			✓				
SRO3: Getting to grips with Climate Change	Oct-08	Sep-11	ERA-NET			✓				
SRO1: Safety at the heart of road design	May-09	Apr-12	ERA-NET				✓			
SRO4: Effective asset management meeting future challenges	May-10	Dec-12	ERA-NET				✓			
Probabilistic analysis of concrete bridges	Dec-08	Nov-11	IRCSET	✓	*					
Durable transport infrastructure in the Atlantic Area (DURATINET)	Jan-01	Dec-10	TCD		✓			*		
Energy conservation in road pavement design (ECRPD)	Jan-07	Jan-10	Waterford CC			✓				
Saturation Ageing Tensile Stiffness test (SATS) for asphalt durability	Jun-09	May-10	TRL		✓	*				
Development of automated bridge inspection	Sep-09	Dec-10	BoF		✓					
Use of non-metallic reinforcement for bridge decks	Sep-09	Dec-10	BoF	✓		*				
Training of bridge inspectors	Jan-10	Dec-10	BoF		✓		*			

The universities now see the NRA Fellowship programme as a significant source of research funding for topics relating to roads that are not funded through the normal third level research funding mechanisms.

There are currently 14 Fellowship projects running, 12 of which are 3-year PhD programme and two are post-doctoral projects. Of the 14 projects, 12 are in Ireland (UCD, TCD, UCC, ITB) and two are in the UK (one with TRL/Open University in England and one at UUJ in Northern Ireland). These projects cover a wide range of topics and include all of the technical areas of interest to the NRA. This is illustrated in Table 1 which includes the policy themes to which each project is related. More details of all the Fellowship projects (description, outputs and benefits to the NRA) are publically available on the Research pages of the NRA website.

8.2. Commercial research projects

A small number of other projects, either newly commissioned or ongoing, have also been incorporated into the Research Programme. These projects were devised to provide solutions to particular problems encountered by NRA staff. One example is the requirement imposed by the European Commission on the NRA to produce strategic noise maps for the National Road network by June 2012. To meet this deadline, achieve this deadline, more advanced methods of measuring and predicting noise produced by traffic are required. These are being developed through a three-year research project with TCD. Another project is investigating the use of the Saturation Ageing Tensile Stiffness (SATS) test and assessing its suitability as a test for measuring the durability of bituminous mixes with Irish aggregates for incorporation into the NRA's Specification for Road Works.

8.3. Collaboration projects

The NRA, as part of its ongoing research programme, is involved in a number of collaborative research projects: these are projects which are partly funded by the NRA and partly by other funding partners. In all cases, the NRA has been involved in the process of specifying the research so that benefits to the NRA are clearly defined. This mechanism for procuring research is very effective in that it provides a mechanism for deriving the benefit a large research project a relatively small financial contribution.

8.3.1. ERA-NET ROAD

The NRA is an active member of ERA-NET ROAD and is currently joint-funding three research programmes in collaboration projects with a number of other European national road administrations. These are:

- Road owners getting to grips with climate change
- Safety at the heart of road design
- Effective asset management meeting future challenges

The first two programmes are up and running. In the Climate Change programme, four projects have been commissioned relating to different aspects of climate change and its effects on the management of national road networks. The projects are:

- **SWAMP**: Storm water prevention - Methods to predict damage from the water stream in and near road pavements in lowland areas
- **RIMAROCC**: Risk management for roads in a changing climate

- **P2R2C2:** Pavement performance and remediation requirements following climate change
- **IRWIN:** Improved local road winter index to assess maintenance needs and adaptation costs in climate change scenarios

The Road Safety programme began in September 2009 and five projects have been commissioned as follows:

- **SPACE:** Speed adaption control by self-explaining roads
- **IRDES:** Improving roadside design to forgive human errors
- **EuRSI:** European road safety inspection
- **RISMET:** Road infrastructure safety management evaluation tools
- **ERASER:** Evaluations to realise a common approach to self-explaining European roads

The Asset Management programme is currently being arranged with a Call for Proposals planned for January 2010. It is expected that 5-15 project will be commissioned over the course of 2010.

8.3.2. *Bridge Owners Forum*

The membership of the Bridge Owners Forum (BOF) consists of organisations responsible for managing and maintaining the national bridge infrastructure. It was originally confined to the major bridge owners in the UK (Highways Agency, London Underground, Network Rail, British Waterways, National Assembly for Wales, Transport Scotland, Department of Regional Development for Northern Ireland, etc) but the NRA was invited to participate because of its common interest in bridge engineering problems and solutions. The BOF Forum meets three times a year to discuss and promote co-operation, collaboration and partnership amongst bridge owners. One of the purposes of the BOF is to identify research needs and commissions research projects relating to bridges. Membership provides the Authority with access to the conclusions of this research.

8.4. **Other EU projects**

The NRA is active in two EU funded projects:

- Energy Conservation in Road Pavement Design (ECRPD) which is examining the energy requirements for the construction and operation of roads, and
- Durable Transport Infrastructure in the Atlantic Area (DURATINET) which aims to promote the durability, safety and sustainability of transport infrastructure.

9. **Conclusion**

This document presents the principles behind the NRA Research Strategy and provides the basis for the ongoing research activities within the NRA. The NRA's approach to research can be summarised as follows:

- Ongoing Research Strategy developed in response to business needs
- Well-organised, well-targeted annual Research Programme
- Research topics identified by NRA staff and stakeholders

- Value management process to ensure that the topics are aligned to the Authority's high-level objectives
- Research procured by competitive process to ensure transparency and value for money
- Clear statement of the benefits of carrying out the research and what the Authority expects to gain from the research
- Dissemination plan to ensure results are implemented in a timely and effective way.

10. References

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