
CEDR Transnational Road Research Programme Call 2013: Ageing Infrastructure Management - Understanding Risk Factors

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Re-Gen Risk Assessment of Ageing Infrastructure

Quality Assurance Plan

Deliverable No. D1.1
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Roughan & O Donovan Innovative Solutions (ROD-IS), Ireland
Gavin and Doherty Geosolutions Ltd. (GDG), Ireland
Slovenian National Building and Civil Engineering Institute (ZAG), Slovenia
Institut Français des Sciences et Technologies des Transports de L'aménagement et
des Réseaux (IFSTTAR), France
Rambøll Denmark A/S, Denmark
Delft University of Technology, Netherlands



**CEDR Call 2013: Transnational Road Research
Programme
Re-Gen
Risk Assessment of Ageing Infrastructure**

Quality Assurance Plan

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Executive summary

This report describes the measures in place to communicate, to all parties, the specifications for planning, implementation and assessment procedures to be adopted in order to achieve the objectives of Re-Gen with a high standard of quality.

The Management Structure within the project is described with particular reference to the role of the Quality Assurance Committee (QAC), who is responsible for overseeing the quality assurance process. This committee is comprised of one member from each of the partners.

The Quality Assurance Process to be implemented by the QAC is described in detail and considers Quality Management, Training, Review and Auditing and Risk Management.

A project review form is provided, the purpose of which is to enable the project team to monitor progress, identify any issues from an early stage and ensure steps are taken to correct these issues.

1 Introduction

The aim of the Re-Gen project is to provide risk management and decision tools which may be employed by infrastructure owners/managers in optimizing the lifecycle performance of (i) their already built infrastructure and (ii) future construction. In this regard the research objectives of the project are twofold;

1. To produce a State of the Art Report focused on consideration of;
 - (a) Asset performance and deterioration,
 - (b) Prediction of traffic growth,
 - (c) Fore sighting work on developing scenarios for the future and
 - (d) Climate change prediction.

2. To detail the development of a risk based methodology for prioritisation of maintenance actions from the perspectives of;
 - (a) Safety;
 - (b) Operation;
 - (c) Finance;
 - (d) Commercial and
 - (e) Reputation.and to demonstrate its use in a software tool (**European Road Infrastructure Risk Evaluation - EIRE**).

In order to ensure that these objectives are achieved to a high standard of quality, a Quality Assurance Plan (QAP) is required to communicate, to all parties, the specifications for planning, implementation and assessment procedures to be adopted in undertaking the research.

2 Scope

This QAP documents the planning, implementation, and assessment procedures for the Re-Gen project, describing the quality assurance procedures and other technical activities that will be implemented to ensure that the output of Re-Gen or the tasks to be performed will meet the projects goals. The document covers procedures that will take place to ensure the quality of all activities within the Re-Gen project and is applicable through the entire life cycle of the Re-Gen project, from inception to completion.

3 Management Structure

3.1 Consortium Overview

To deliver the complete scope of works, a well balanced, experienced multi-disciplinary, multi-national consortium has been formed, combining a strong academic and industry presence. The Re-Gen project consists of six partners as shown in Table 1, each providing the complementary expertise to deliver the entire technical remit of the project. Further information on the Re-Gen partners can be found in Appendix II of the Consultant Submission Document of the Research Services Agreement (RSA).

Table 1: Re-Gen Partners

Partner No.	Partner Name	Country
1	Roughan & O' Donovan Innovative Solutions (ROD-IS)	Ireland
2	Gavin & Doherty Geosolutions Ltd.(GDG)	Ireland
3	The Slovenian National Building and Civil Engineering Institute (ZAG)	Slovenia
4	The French institute of science and technology for transport, development and networks (IFSTTAR)	France
5	Rambøll	Denmark
6	Delft University of Technology (TU-Delft)	Netherlands

In order to ensure that the project results are consistent with the expected outcomes according to its objectives, Re-Gen has a clear organisation structure with defined roles and responsibilities. The project is coordinated by Partner No. 1, ROD-IS, who will oversee the management and administration of the project according to the research services agreement and the decisions of the Programme Executive Board (PEB). The work is divided into five work packages (WP) with each WP being led by the most suitable partner for the specific focus of the work package, Table 2. Each WP leader will have scientific management duties concerning the progress of their Work Packages.

Table 2: Re-Gen Work Packages

WP No.	WP Title	WP Leader
1	Management & Dissemination	ROD-IS
2	Modelling Vulnerability Considering Climate Change	GDG
3	Traffic Effect Forecasting	ROD-IS
4	Risk Profiling	TU-Delft
5	Risk Management & Decision Tools	IFSTTAR

3.2 Quality Assurance Committee

3.2.1 Overview

All partners play an important role in ensuring Quality Assurance is achieved and each partner will adhere to their own organisations quality assurance procedures and internal Quality Management Systems (QMS) during the project. A Quality Assurance Committee (QAC), an internal group within the project, consisting of one person from each partner organisation has been assembled to oversee the quality assurance process. The committee is chaired by Prof. Alan O' Connor of ROD-IS, acting as Quality Assurance Manager, who will oversee the implementation of the quality assurance procedures within the project team. Table 3 provides contact details of the personnel who sit on the QAC and who are responsible for Quality Assurance within their respective organisations.

Table 3: Quality Assurance Committee

Partner Name	Contact Person	E-mail
ROD-IS	Prof. Alan O Connor	Alan.oconnor@rod.ie
GDG	Dr. Paul Doherty	pdoherty@gdgeo.com
ZAG	Aleš Žnidarič	ales.znidaric@zag.si
IFSTTAR	Dr. André Orcési	andre.orcesi@ifsttar.fr
Rambøll	Dr. Claus Pedersen	CLP@Rambøll.dk
TU-Delft	Prof. dr. ir. Pieter van Gelder	P.H.A.J.M.vanGelder@tudelft.nl

3.2.2 Roles and Responsibilities

An overview of the general role of the QAC is provided in Figure 1. The quality assurance committee, consisting of one representative from each partner, is responsible for ensuring the quality control process is carried out within each partner organisation.

Figure 1: QAC Role

The QAC has approved the QA Plan and will maintain it throughout the duration of the project. Within each organisation the representative from the QAC, Table 3, will manage the process internally. They ensure all research is carried out with due consideration of quality, and that QA activities such as reviews/audits, training and risk management are performed. Quality assurance is seen as a dynamic process and updating of the plan and corresponding processes will be performed throughout the life cycle of the project.

In particular, the person representing each partner on the QAC will have the following responsibilities;

- Establishing and maintaining research standards;
- Responding to technical queries;
- Staff training and mentoring;
- Maintaining familiarity with the project and providing input and suggestions as required;
- Signing off on deliverables and milestones;
- Performing quality assurance reviews on all aspects of the project.
- Ensuring the compliance of the project with practical industrial and technical constraints;
- Ensuring the technical and scientific quality of the work;
- Validating reports and approving the technical parts of the web site.

4 Quality Assurance Process

4.1 Quality Management

Quality Management Systems (QMS) detail the organizational structure, policies, procedures, processes and resources needed to implement quality management. Quality Assurance refers to administrative and procedural activities implemented in a quality system so that the requirements and goals of the service can be achieved. However, the QA process is governed by the quality management systems in place.

In order to ensure a systematic and reliable quality in the service which we provide, the consortium has put in place appropriate resources and procedures. While undertaking the work, each individual partner will adhere to their own QMS and the Quality Assurance process considers that the work under each partners QMS will function accordingly. Given the possible varying nature of the partner organisations QMS, each partner has provided a brief overview of their QMS in Annex A.

4.2 Training

It is recognised that training is an ongoing process and all participants in Re-Gen are encouraged to take part in training and development activities which can enhance the quality of the research. Individual partners training reviews will seek to enhance the technical development of their own staff and will form part of their own QMS systems. This will, in itself, help to ensure the quality of the output in Re-Gen. In ROD-IS, for example, the training requirements of staff are identified at training and development reviews with individual senior members of staff nominated by the Directors to act as mentors. Training received in the previous cycle is reviewed and requirements and targets identified for the forthcoming cycle. A record of staff training and development reviews is kept by administration in individual training and development files and on the company's IT network.

Equally, members of the Quality Assurance Committee will engage with their own members of staff to ensure quality processes are maintained. It is imperative for all staff to be familiar with the QMS operated by their own organisation.

4.3 Review and Auditing

4.3.1 Overview

Quality Assurance reviews are in-house reviews conducted to verify that all research is performed and documented in conformance with the procedures and standards mandated by the QA plan. The QA reviews serve two purposes. The primary purpose of QA reviews is to provide redundancy via a second set of experienced eyes on the deliverables and milestones. The second purpose is to monitor the effectiveness of the QA plan. If the QA plan is working properly and project staff are following the procedures and utilizing the resources provided therein then problems, mistakes, errors and omissions caught during the review should be minor. While the QA manager is usually the one who will perform the reviews, other experienced personnel can likewise perform the task.

As results are built in a collaborative manner, the Re-Gen project requires procedures for ensuring a sustained high quality of its results. High quality of results is a key success factor for the acceptance of results by all stakeholders. At work package level, all tasks are

associated with deliverables and milestones, and successful completion of the project requires successful completion of all the deliverables and milestones in accordance with the descriptions and timelines as outlined in the RSA.

At project level, as coordinators, ROD-IS has overall responsibility for establishing and maintaining the quality of the research undertaken. The partner responsible for the deliverable or milestones ensures that these are consistent with the requisite standard for publication. The partner responsible for each task associated with a deliverable and milestone are responsible for ensuring the quality of that task in accordance with their own Quality Assurance procedures.

An overview of the timelines for reviewing the project and the output of the project is provided in the Review Schedule in Annex C. A more detailed description is described in the following sections.

4.3.2 Project Review

A Project Review was undertaken at the kick off meeting held on the 22nd and 23rd May 2014 in the offices of Roughan & O' Donovan in Dublin, and subsequently at a consortium meeting on the 8th July 2014 at Rambøll in Denmark. Subsequent reviews will be undertaken at future consortium meetings. There is also scope for reviews to be carried out during individual work package meetings.

The extent of the Project Review includes/may include, but is not limited to, the following:

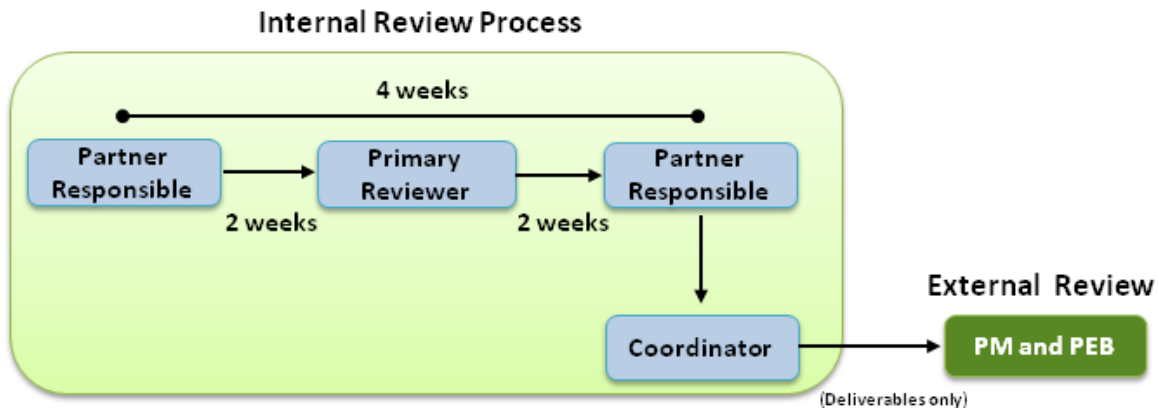
- A review of the actions required by any previous Project Review;
- Services to be carried out in accordance with the RSA and in consideration of any changes thereto (pre-agreed by the PEB);
- Complaints and feedback;
- Issues raised at PEB meetings;
- Issues raised at meetings with other partners;
- Project-specific data and subsequent changes thereto;
- Delegation of responsibilities within the Project Staff;
- Project programme and resources, including the ability to meet target dates;
- Current and predicted performance against project budget;
- A review of regulatory and statutory requirements;
- Project methodology;
- Output verification and on-going project validation (i.e. deliverables and milestones);
- Outstanding corrective actions arising from internal or external quality audits;
- Submittals to the PM and PEB.

A Project Review Form is attached in Annex B. These forms will be completed by the coordinator after each project review is carried out and circulated to the partners. Partners/personnel will be identified as being responsible for ensuring that action is taken on matters arising from the Project Reviews.

4.3.3 Deliverable & Milestone Review

Re-Gen has defined a peer-review process for ensuring a sustained quality of its results. A basic overview of the review process is shown in Figure 2, with a more detailed description provided in the following paragraphs.

Figure 2: Review Process Overview



1. All deliverables have been assigned to a primary internal reviewer representing different partners, Table 4. The primary reviewer's task is to ensure that the overall technical quality and presentation reflects a high standard. Due to the small size of the consortium and the interaction between work packages the primary reviewer will more than likely be involved in the drafting of the respective deliverable, however this is beneficial to the deliverable as they will be involved in its production.
2. Each deliverable has a due date, which is stated in the list of deliverables, as per the RSA. The internal deadline for each deliverable draft is four weeks before the delivery date at which time the document is sent to the internal reviewer who will review the document. This procedure ensures that enough time is available to address reviewers' comments, which are returned to the original author within two calendar weeks.
3. The content must reflect the description as provided in the RSA. Internal reviewers will ensure that the use of language is correct and the document is free of typographical errors and the formatting is proper and consistent throughout the document.
4. The final deliverable is then submitted to the Coordinator for issue to the PEB Project Manager. It should be noted that there is a requirement for the author and reviewer to copy the coordinator on all correspondence in relation to the review process. In this way the coordinator can monitor the process as it progresses.
5. While Milestones do not have to be submitted to the Project Manager for approval, a report on the successful completion of a milestone will be produced by the partner responsible and submitted to the coordinator. The review process is similar to the one adopted for the deliverables. The report will be subject to an internal review by another partner in the consortium. Table 5 shows the list of milestones, the partners responsible and the primary reviewer. The internal deadline for the draft of the milestone report is four calendar weeks before the due date, at which time the internal reviewer will be sent the report for review. The internal reviewer is required to return comments within two calendar weeks to allow sufficient time for the original author to finalise the report.

Table 4: Partner Responsibilities-Deliverables

WP No.	Deliverable No.	Deliverable Title	Partner Responsible	Primary Reviewer
1	D1.1	Quality Assurance Plan	ROD-IS	GDG
1	D1.2	RE-GEN Project Website	ZAG	All
1	D1.3	Report on enhanced dissemination activities including roadshow and surgeries	ROD-IS	Rambøll
2	D2.1	Report of Climate Change predictions (including key Variables)	GDG	Tu-Delft
2	D2.2	Register of Critical Infrastructure Elements	Tu-Delft	ROD-IS
2	D2.3	Ranked list of models for different Damage Processes	GDG	Rambøll
3	D3.1	Guidelines on collecting WIM data and forecasting of traffic load effects on bridges	ZAG	ROD-IS
3	D3.2a ¹	Review of the most critical existing structures under growing traffic	ROD-IS	GDG
3	D3.2b ¹	Advice for precise assessment	IFSTTAR	GDG
4	D4.1	Report on the Literature Review on risk frameworks and definition of road infrastructure failure	Tu-Delft	ROD-IS
4	D4.2	Report on risk optimization in road infrastructure elements	Tu-Delft	IFSTTAR
5	D5.1	Risk Analysis software tool	IFSTTAR	Rambøll
5	D5.2	Final report on optimisation of management strategies under different traffic, climate change and financial scenarios.	IFSTTAR	Tu-Delft

Note ¹: Deliverable will be issued as one report (D3.2). Split shown here for reviewing purposes only.

Table 5: Partner Responsibilities-Milestones

WP No.	Milestone No.	Milestone Title	Partner Responsible	Primary Reviewer
1	M1.1	Project management Plan (PMP): Including Quality Plan and Communications Plan.	ROD-IS	All
1	M1.2	Completion of one roadshow and 6 surgeries, one in each of the funding countries.	ROD-IS	All
2	M2.1	Infrastructure Surveys Completed.	GDG	ROD-IS
3	M2.2	Final report sent to WP4 for implementation in Risk Framework.	GDG	Tu-Delft
3	M3.1	Reliable WIM traffic data information samples from partner countries collected.	ZAG	ROD-IS & Rambøll

Table 5: Partner Responsibilities-Milestones

WP No.	Milestone No.	Milestone Title	Partner Responsible	Primary Reviewer
4	M4.1	Probability and consequence models for road infrastructure element failure complete.	Tu-Delft	IFSTTAR
5	M5.1	Literature review of existing management strategies.	IFSTTAR	ROD-IS & Rambøll
5	M5.2	Proposition of a multi-criteria optimization framework for critical infrastructure elements that integrates risk profiles (for infrastructures) and economic aspects.	IFSTTAR	Tu-Delft
5	M5.3	Determination of optimal management strategies of infrastructures under different projected traffic forecasts, scenarios of climate change, and financial constraints.	IFSTTAR	Tu-Delft

4.3.4 Problem Reporting and Corrective Actions

The project review form in Annex B requires a description of any problems arising from the project review, the corrective actions proposed and the partner responsible for the action. As reporting problems and corrective actions will form an integral part of the Project Review process, any problem areas will be identified quickly and rectified appropriately.

It is important to note that problem reporting and corrective actions will not be limited to the project reviews and will be considered an ongoing process. It is also important that the coordinator is made aware of any problems that arise as the project progresses.

4.3.5 Quality Assurance Measures

The primary quality assurance measures adopted will consist of;

- (a) Regular project reviews - At least 2 no. project reviews per year of the project coinciding with the consortium meetings. Further project reviews are possible if considered necessary by the project Coordinator;
- (b) Minutes will be produced following all meetings (for consortium meetings, individual work package meetings, meetings with the PEB etc);
- (c) Analysis of PEB feedback;
- (d) Successful completion of deliverables on time - Table 6 shows the deliverables and their respective delivery date as per the RSA;
- (e) Successful completion of milestones on time - Table 7 shows the milestones and their respective delivery date as per the RSA.

Table 6: Deliverables

Deliverable No.	Deliverable Title	Due Date
D1.1	Quality Assurance Plan	06/2014
D1.2	RE-GEN Project Website	06/2014
D1.3	Report on enhanced dissemination activities including roadshow and surgeries	03/2016
D2.1	Report of Climate Change predictions (including key Variables)	06/2014
D2.2	Register of Critical Infrastructure Elements	03/2015
D2.3	Ranked list of models for different Damage Processes	06/2015
D3.1	Guidelines on collecting WIM data and forecasting of traffic load effects on bridges	03/2015
D3.2a ¹	Review of the most critical existing structures under growing traffic	06/2015
D3.2b ¹	Advice for precise assessment	06/2015
D4.1	Report on the Literature Review on risk frameworks and definition of road infrastructure failure	01/2015
D4.2	Report on risk optimization in road infrastructure elements	12/2015
D5.1	Risk Analysis software tool	02/2016
D5.2	Final report on optimisation of management strategies under different traffic, climate change and financial scenarios.	03/2016

Note ¹: Deliverable will be issued as one report (D3.2). Split shown here for reviewing purposes only.

Table 7: Milestones

Milestone No.	Milestone Title	Due Date
M1.1	Project management Plan (PMP): Including Quality Plan and Communications Plan.	07/2014
M1.2	Completion of one roadshow and 6 surgeries, one in each of the funding countries.	11/2015
M2.1	Infrastructure Surveys Completed.	12/2014
M2.2	Final report sent to WP4 for implementation in Risk Framework.	06/2015
M3.1	Reliable WIM traffic data information samples from partner countries collected.	12/2014
M4.1	Probability and consequence models for road infrastructure element failure complete.	05/2015
M5.1	Literature review of existing management strategies.	08/2014
M5.2	Proposition of a multi-criteria optimization framework for critical infrastructure elements that integrates risk profiles (for infrastructures) and economic aspects.	04/2015
M5.3	Determination of optimal management strategies of infrastructures under different projected traffic forecasts, scenarios of climate change, and financial constraints.	07/2015

4.4 Risk Management

This section describes how risks to the quality assurance will be identified, prioritized, and managed during the execution of this plan.

It is important that all partners make the coordinator aware of any risks which may affect the quality assurance plan. The following is a list of risks to the quality assurance plan which must be avoided.

- (a) Late delivery of Milestone
It will be necessary for all WP leaders to advise of any issues in relation to milestone completion allowing sufficient time for corrective action to take place to avoid milestones being missed.
- (b) Late delivery of Deliverables
It will be necessary for all WP leaders to advise of any issues in relation to deliverable completion allowing sufficient time for corrective action to take place to avoid deliverables being delayed.
- (c) Overspending
Mis-management of the budget could lead to partners being under resourced and unable to provide sufficient resources to complete work at the required level of quality. ROD-IS, as coordinators will manage the overall budget against work completed.
- (d) Meeting of Objectives
It is important that the project achieves its original objectives. Various problems such as technological problems, lack of communication etc. may all hinder the quality assurance process.
- (e) Loss of critical partners
Various circumstances such as dropout, bankruptcy, health issues etc. may lead to the loss of critical partners. The consortium is built with some redundancy concerning the skills of core partners. Thus, it is possible to compensate for certain losses. Moreover issues can be balanced by re-allocating resources to partners with the capability to replace lost resources. For the case of a loss of a critical skill, project management will maintain a list of replacement partners from the consortium's network that can be called in to the project by means of emergency subcontracting or by joining the project.
- (f) No consensus on important matters
To prevent the consequences of the consortium not being able to reach a consensus, the consortium should strictly follow the decision making procedures defined in the consortium agreement.

5 Reference Documents

Re-Gen Consortium Agreement;
RE-Gen Research Services Agreement;
I.S. EN ISO 9001: 2008: Quality management systems - Requirements;
ISO 14001 Environment Management System (EMS);
OHSAS 18001 Occupational Health and Safety Management;
SIST ISO 9001 Quality management systems. Requirements;
SIST EN ISO/IEC 17020 General criteria for the operation of various types of bodies performing inspection;
SIST EN ISO/IEC 17025 General requirements for the competence of testing and calibration laboratories;
SIST EN ISO/IEC 17021 Conformity assessment - Requirements for bodies providing audit and certification of management systems (ISO/IEC 17021:2011);

SIST EN ISO/IEC 17043 Conformity assessment - General requirements for proficiency testing (ISO/CASCO 17043:2010);
SIST EN ISO/IEC 17065.

6 Product Standards

Matlab is R2013b (8.2.0.701)
Midas civil 2013 version 3.1

7 Conclusions

This report describes the measures in place to ensure the objectives of the Re-Gen project are achieved to the highest standard of quality.

The Management Structure within the project is discussed, along with the role of the Quality Assurance Committee (QAC), which comprises of one person from each partner organisation. The QAC will oversee the quality assurance process, which is implemented through the principles of Quality Management, Training, Review and Auditing and Risk Management.

A project review form is provided to enable the project team to monitor project progress and identify problem if they arise.

8 Acknowledgement

The research presented in this report/paper/deliverable was carried out as part of the CEDR Transnational Road Research Programme Call 2013. The funding for the research was provided by the national road administrations of Denmark, Germany, Ireland, Netherlands, UK, and Slovenia.

Annex A: Overview of Partner Quality Management Systems

ROD-IS

ROD-IS has adopted the quality policies and procedures of our parent company, Roughan & O Donovan (ROD). We recognize that the consistent achievement of design/research quality and a reliable quality of service require good design office management. We have developed our management procedures so as to ensure that a consistent and reliable service is offered to our clients. At the core of our procedures is clear identification of responsibilities, regular reviews, and maintaining regular communication with the client and other project members.

The ROD Quality Management System has been developed in accordance with I.S.EN ISO 9001:2000, updated for ISO 9001:2008 and is based on well tried and proven practices of the company. The aim of the QMS is to ensure that a high quality, consistent and reliable service is provided to clients that satisfy their specified requirements. It provides us with the over-arching framework which defines and controls the various technical, management and commercial processes necessary to ensure best practice project delivery and economic advantage to our Clients. It is robust yet sufficiently flexible to cater for all types of schemes and is audited on a regular frequency, driving a programme of continuous improvement.

In order to ensure a systematic and reliable quality in the service which we provide, we have put in place appropriate resources and procedures. These include:-

- A highly skilled and highly motivated workforce;
- CPD Training Scheme accredited by Institution of Engineers of Ireland;
- ISO 9001 Quality Management System accredited by NSAI;
- ISO 14001 Environmental Management System accredited by NSAI;
- Membership of Professional and Technical Support Organisations;
- Technical Support Systems (Computer and IT Resources).

We also operate a web-based project tracking system, which allows on-line monitoring of project costs. We also have extensive resources of computer software, reference library, and on-line reference sources to ensure the availability of up-to-date information and to generally assist our work.

Project reviews take place at intervals pre-set according to the complexity of the project but always before critical project stages (e.g. deliverable dates, milestone dates). The progress is reviewed, and the adequacy of allocated staff resources to meet the program is also reviewed.

Key aspects of our processes ensure;

- that close contact is maintained with the Clients;
- that the services provided are in compliance with the requirements of the company QMS and allow for continued improvements within both a project and the overall system;
- systematic review and verification of project output is undertaken and preventive and corrective action carried out.

GDG

Project Management System and Procedures

Our project management system and procedures are outlined in our Quality Policy and our Procedures Manual. Specific procedures relevant to this project are listed below (with the details of each procedure available on request in the form of the Procedures manual):

- Project Setup Procedures
- Document Control Procedures
- Communication Procedures
- Review Procedures

To maintain consistency on this project and to ensure reliable record keeping, the following project specific templates will also be generated: Project Control Form; Report Template; Meeting Agenda; Minutes of Meetings.

Project Control Form and Online Cost/Resource Management: All key information about the project will be outlined on a project control form which will include the client details, research objectives, details of the brief, the project costs, timelines and resourcing allocation. This information is then also fed into our online SAGE based project administration tool that allows live tracking of project activities, resources committed, budget allocations, etc. At the outset of this project, all information regarding the objectives and our scope of work will be laid out in bullet point format within a dedicated Project Control Form. The cost information will be tracked online in SAGE and upon project completion an automatic report will be generated comparing our performance to the original schedule. This is used to constantly update our activities and improve our service delivery.

Quality Procedures

GDG have developed a formal Integrated Management System, which covers Environmental Management, Health & Safety, and Quality Management. These management systems have been audited by NSAI and have received accreditation for ISO 9001, ISO 14001 and OHSAS 18001. All works carried out will be completed in accordance with our proven Quality Management System, which is updated every six months in line with our evolving procedures. A copy of the GDG Quality Manual is available on request.

Integrated Management System

QUALITY ENVIRONMENT HEALTH & SAFETY
ISO 9001 ISO 14001 OHSAS 18001

GDG Quality Policy:

The Gavin and Doherty Geosolutions Quality Management System has been developed in accordance with ISO 9001:2008, and is based on tried and tested practices of the company. GDG are committed to complying with all relevant requirements and continually improving the effectiveness of the Quality Management System. At GDG our aim is to provide an innovative, cost effective and reliable service designed to meet and exceed our clients' requirements. We strive to attain the highest possible standards and are consistently looking to pioneer and develop new technologies and techniques while ensuring that all relevant design codes and practices are met and exceeded. Our staff members are highly qualified, driven individuals who are committed to their Continuous Professional Development (CPD). We are dedicated equally to both our clients and our staff in order to produce high quality unambiguous designs in a productive safe working environment. We understand the importance of clear concise communication and our staff remains in close contact with clients until project completion. This ensures minimum disruption due to project changes while also ensuring the client's needs are fulfilled. Open communication is emphasised between staff to promote innovation and to maintain high standards.

ZAG

The purpose and aim of the quality management system, described in the ZAG Quality Manual, is to achieve and maintain on a permanent basis a defined level of quality of services. The quality management system has been defined in a way to prevent occurrence of the problems and if they do occur, to mitigate their effect.

The Institute's quality management system:

- ensures that customer requirements are met and enhanced,
- provides a definition of the Institute's Quality Policy and quality aims,
- provides a definition of the processes which are needed for the quality management system and their application throughout the Institute,
- provides a basis for the systematization of the Institute's internal regulations, procedures and instructions,
- provides an overview of how the Institute is organized, and how the basic responsibilities and authorisations of its staff are defined, i.e. an overview of the system which should enable the implementation of the Institute's Quality Policy and quality aims,
- provides a basis for the performance of internal audits and management reviews, by means of which the efficiency and degree of implementation of the Institute's quality management system can be evaluated,
- ensures that all organizational and technical activities are efficiently planned, controlled and managed,
- ensures that all the requirements of contracts concluded between individual accreditation bodies and the Institute are fulfilled.

On the basis of the established Quality Policy and quality aims, efficient organization and clear definition of processes, employees' responsibilities and delegated powers, the management of the Institute defines the principles by means of which it is possible to control technical, administrative and human factors which significantly affect quality of the Institute's services and which enable satisfactory operation of the quality management system.

The quality management system is designed in lines with the following standards:

SIST ISO 9001	Quality management systems. Requirements
SIST EN ISO/IEC 17020	General criteria for the operation of various types of bodies performing inspection
SIST EN ISO/IEC 17025	General requirements for the competence of testing and calibration laboratories
SIST EN ISO/IEC 17021	Conformity assessment - Requirements for bodies providing audit and certification of management systems (ISO/IEC 17021:2011)
SIST EN ISO/IEC 17043	Conformity assessment - General requirements for proficiency testing (ISO/CASCO 17043:2010)
SIST EN ISO/IEC 17065	Conformity assessment - Requirements for bodies certifying products, processes and services

IFSTTAR

The DQMN (Délégation à la Qualité, la Métrologie et la Normalisation) manages the Quality Plan defined by the management team.

Quality Background : Ifsttar was established in 2011, gathering two major Public French Research Institute in the field of Transport and Civil Engineering : INRETS (Institut National de Recherche sur les Transports et leur Sécurité) and LCPC (Laboratoire Central des Ponts et Chaussées). The DQMN includes the Quality Management System formerly developed by LCPC. Ifsttar is a founding member of the RNE (Réseau National d'Essais), established in 1979, in order to deliver quality labels for tests labs.

The RNE has been associated for about 20 years with the BNM (Bureau National de Métrologie) to constitute the French National Accreditation Body named COFRAC.

General policy: In accordance with ISO recommendations, the Quality Management System (QMS) of Ifsttar integrates well tried and proven practices. Quality reviews are regularly organized and results are presented to the COMEX (Executiv Committee - COMité EXécutif), in order to check the capability of all research units and services to take into account procedures or others documents which DQMN want to include or exclude of the current QMS.

Current organization and skills: The DQMN reports to the General Director of Ifsttar. Its purpose combines the contractor's satisfaction and successful innovation transfer.

To develop and realize the Quality Plan, DQMN integrates two fulltime quality experts and some others internal resources:

- A dedicated team takes care of metrology with two sub-teams located in Nantes and Marne La Vallée. This team covers all measurement procedures,
 - A free access data base including all documents of the Quality Management System of the Institute,
 - Internal trained auditors dispatched in all sites of the Institute,
 - A network of Quality Representatives dispatched in all research units and all services (named COQ : COrrespondants Qualité),
 - OPTIMU, a software to survey measurements equipment's,
- Seniors Researchers and Engineers of Ifsttar are sometimes members of different kinds of standardization committees (as BSNR, AFNOR, ISO, CEN). DQMN also coordinates their works.

Ifsttar defines, organizes and proceeds to required tests for Certification Works mainly for Civil Engineering products. The DQMN organizes and surveys these activities.

DQMN sometimes surveys evaluation and the qualification works required before the transfer of major innovations developed by Ifsttar's researchers.

RAMBØLL

Brief description of Rambøll's Quality Management System

It is the objective of Rambøll DK to focus on the needs, requirements and expectations of the individual client, and to target our Quality Management System (Q-system) to various types of tasks and projects.

Rambøll DK's Q-system comprises policies, responsibilities and directives for quality management, Corporate Social Responsibility (CSR), and environmental- and working environment management. Consulting is supported by the Q-system certified according to DS/EN ISO 9001 on quality management and, where applicable, conforming to DS/EN ISO 14001 on environmental management, OHSAS 18001 on working environment management and Guideline for Business Integrity Management from the international consulting federation FIDIC.

In addition to the directives, the Q-system consists of the sub-systems for the Management Process and the Project Process including procedures and tools.

RAMBØLL DENMARK'S QUALITY OBJECTIVE AND POLICY

The quality objective of Rambøll is to understand the needs, requirements and expectations of the customer and on this basis provide consultancy services in an ethical and social manner. The objective will be implemented through the following quality policy:

The customer experiences collaboration in an atmosphere of trust and open-mindedness in such a way that requirements and expectations are honoured. Customer surveys ensure follow-up on this.

Rambøll provides qualified consultancy services based on professional knowledge at the forefront of its field. Through recruitment, challenging tasks and training opportunities, Rambøll maintains a quality-conscious and motivated staff with the professional and contextual skills necessary for the assignments undertaken by the company, and follows up by employee satisfaction survey

Project risks are assessed prior to submission of tenders. The result of this assessment forms the basis for initiation of specific activities within quality, environment, working environment or Corporate Responsibility.

To ensure that the agreement on quality, environmental and working environmental issues complies with the customer's requirements, a dialogue with the customer is established regarding these issues.

Rambøll commits itself to work for a continual improvement of the Project Process and the Management Process in the quality management system, the Q-system.

The consultancy services are supported by a quality management system that complies with the requirements of DS/EN ISO 9001 on quality management and, where applicable, with DS/EN ISO 14001 on environmental management, OHSAS 18001 on working environment management and Guideline for Business Integrity Management from FIDIC, the International Federation of Consulting Engineers.

TU-Delft

Delft University of Technology, also known as TU-Delft, is the largest and oldest Dutch public technical university, located in Delft, Netherlands. With eight faculties and numerous research institutes it hosts over 19,000 students (undergraduate and postgraduate), more than 3,300 scientists and more than 2,200 people in the support and management staff.

TU-Delft is governed by the executive board, controlled and advised by student council, workers council, board of professors, board of doctorates, assistant staff office, committee for the application of the allocation model, operational committee, advisory council for quality and accreditation, deans of each TU-Delft faculty, and directors of TU-Delft research centers, research schools and research institutes.

The Executive Board is chaired academically by the Rector Magnificus. The Executive Board is accountable to the Supervisory Board, appointed by the Minister of Education, Culture and Science. One of the many tasks of executive board is the approval of management regulations. The Board of Professors advises in the matter of academic quality, deciding on the selection of guest lecturers, research fellows as well as revising proposals submitted for royal honors for professors. The Board of Doctorates appoints supervisors for PhD students, forms promotion committees, determines promotional code, and confers PhD and doctorate Honoris Causa degrees. The Committee for the application of the allocation model reports to the Executive Board regarding allocation model. Further, it controls output data supplied to the Executive Board. Operational committee is composed of members of the executive board and the deans. The committee collaborates on the issues of general importance, related in part to the specific interests of the faculties, and strengthens the unity of the university overall.

TU-Delft uses several tools for maintaining a high quality of information and resources, such as TIM and Basware.

TIM, for hours registration, is being audited by an external accountant (PWC). Each year, during the audit for the Dutch Ministry of Education, Culture and Science, a review is conducted.

Basware, for invoice administration, is being audited by PWC and KPMG.

These tools are administrated in an account system, each project has its own code on which all costs are kept.

Management information is available at any given moment. Project leaders receive at least once a month an overview of all costs.

Annex B: Project Review Form

PROJECT REVIEW FORM

Date		Review No.	
Present		Circulation	

Project Review Notes	Action
1. Actions from last review	
2. Brief and changes	
3. Feedback	
4. Issues raised by Project Manager/PEB	
5. Project specific data	
6. Delegation of responsibilities	
7. Programme and resources	
8. Project budget	
9. Regulatory/Statutory Requirements	
10. Project Methodology	
11. Verification	
12. Validation	
13. Outstanding Corrective actions	

Project Review Notes	Action
14. Submissions to Client	
15. Shared Knowledge – Identification of Issues and Distribution List	

Problem Reporting	Corrective Action	Action

Signed:	Date:	Role:
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Annex C: Review Schedule

Del. No.	Deliverable Title (Partner Responsible)	2014												2015												2016		
		Apr 1	May 2	Jun 3	Jul 4	Aug 5	Sep 6	Oct 7	Nov 8	Dec 9	Jan 10	Feb 11	Mar 12	Apr 13	May 14	Jun 15	Jul 16	Aug 17	Sep 18	Oct 19	Nov 20	Dec 21	Jan 22	Feb 23	Mar 24			
WP1	Management & Dissemination																											
D1.1	Quality Assurance Plan (ROD-IS)																											
D1.2	RE-GEN Project Website (ZAG)																											
D1.3	Report on enhanced dissemination activities including roadshow and surgeries (ROD-IS)																											
M1.1	Project management Plan (PMP): Including Quality Plan and Communications Plan (ROD-IS)																											
M1.2	Completion of one roadshow and 6 surgeries, one in each of the funding countries (ROD-IS)																											
WP2	Modelling Vulnerability Considering Climate Change																											
D2.1	Report of Climate Change predictions (Including key Variables) (GDG)																											
D2.2	Register of Critical Infrastructure Elements (Tu-Delft)																											
D2.3	Ranked list of models for different Damage Processes (GDG)																											
M2.1	Infrastructure Surveys Completed (GDG)																											
M2.2	Final report sent to WP4 for implementation in Risk Framework (GDG)																											
WP3	Traffic Effect Forecasting																											
D3.1	Guidelines on collecting Wim WIM data and forecasting of traffic load effects on bridges (ZAG)																											
D3.2a	Review of the most critical existing structures under growing traffic (ROD-IS)																											
D3.2b	Advice for precise assessment (IFSTTAR)																											
M3.1	Reliable WIM traffic data information samples from partner countries collected (ZAG)																											
WP4	Risk Profiling																											
D4.1	Report on the Literature Review on risk frameworks and definition of road infrastructure failure (Tu-Delft)																											
D4.2	Report on risk optimization in road infrastructure elements (Tu-Delft)																											
M4.1	Probability and consequence models for road infrastructure element failure complete (Tu-Delft)																											
WP5	Risk Management & Decision Tools																											
D5.1	Risk Analysis software tool (IFSTTAR)																											
D5.2	Final report on optimisation of management strategies under different traffic, climate change and financial scenarios (IFSTTAR)																											
M5.1	Literature review of existing management strategies (IFSTTAR)																											
M5.2	Proposition of a multi-criteria optimization framework for critical infrastructure elements that integrates risk profiles (for infrastructures) and economic aspects (IFSTTAR)																											
M5.3	Determination of optimal management strategies of infrastructures under different projected traffic forecasts, scenarios of climate change, and financial constraints (IFSTTAR)																											

Legend:

▲ Deliverable due date P ▲ Deliverable review date and primary reviewer ◆ Milestone due date P ◆ Milestone review date and primary reviewer ◆ Project Review (coinciding with consortium Meetings)

PALL: All Partners P1: ROD-IS P2: GDG P3: ZAG P4: IFSTTAR P5: Rambøll P6: Tu-Delft

Work Package Duration

Note:

- 1. A period of 4 calendar weeks is considered between the Deliverable/Milestone due date and the Deliverable/Milestone Review date.
- 2. Comments to be returned by primary reviewer within 2 calendar weeks of the Deliverable/Milestone due date.
- 3. D3.2a and D3.2b will form one deliverable - the deliverable is only split for review purposes.