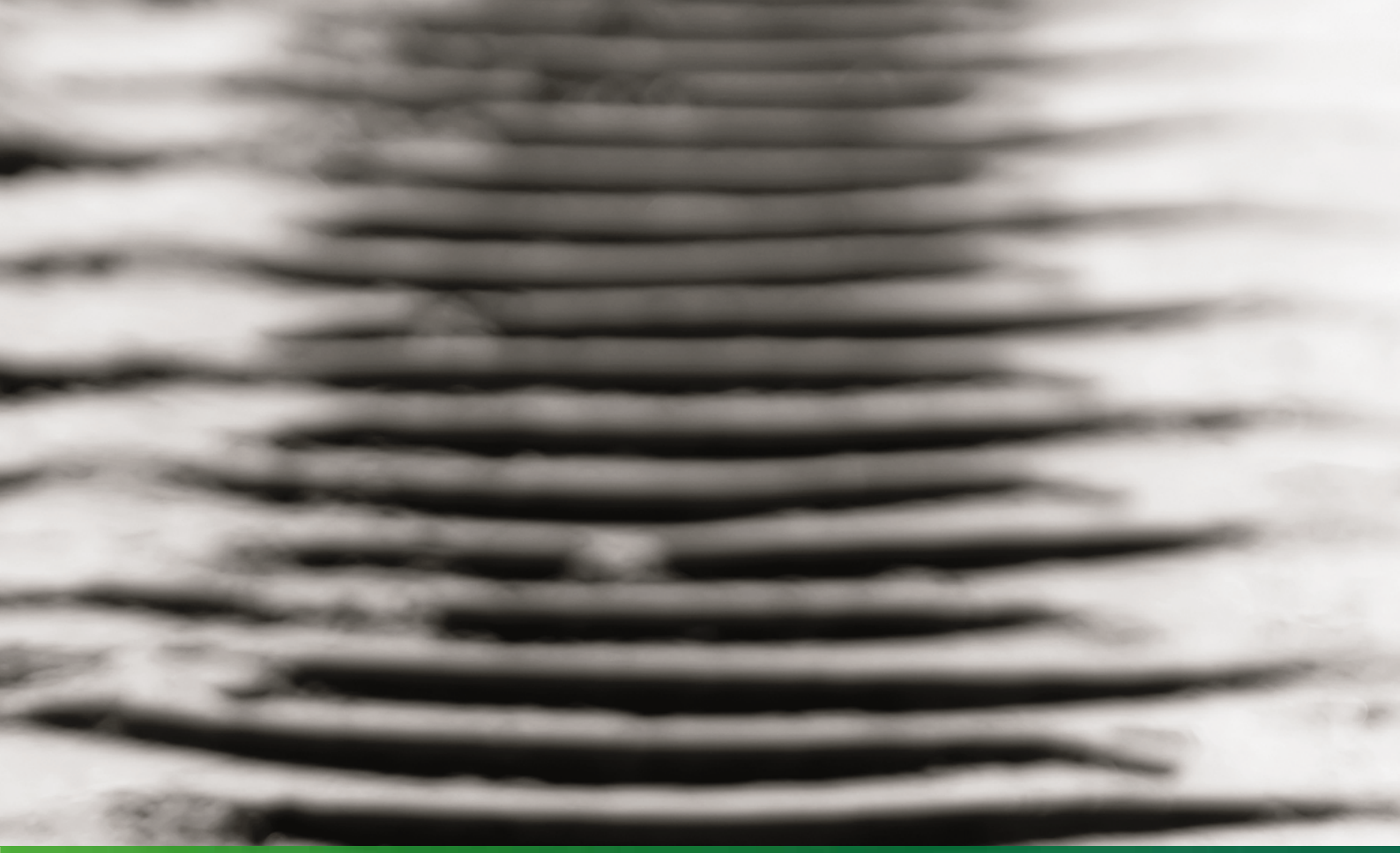


Environmental Issues Associated with Infrastructure Development

INTOSAI
Working Group
on Environmental
Auditing

This publication was prepared by the INTOSAI Working Group on Environmental Auditing (WGEA). The WGEA aims to encourage the use of audit mandates and audit methods in the field of environmental protection and sustainable development by Supreme Audit Institutions (SAIs). The WGEA has the mandate to

- help SAIs gain a better understanding of environmental auditing issues,
- facilitate exchange of information and experiences among SAIs, and
- publish guidelines and other informative materials.

ISBN 978-9949-9061-6-1 (PDF)

June 2013

FOREWORD & ACKNOWLEDGEMENTS

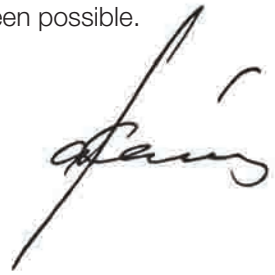
This document, Environmental Issues Associated with Infrastructure, has been produced by the INTOSAI Working Group on Environmental Auditing under its remit to provide guidance materials and conduct research studies on emerging topics in environmental auditing to help Supreme Audit Institutions design and carry out environmental audit work.

Around the world governments are involved in building new or replacement infrastructure and maintaining, modernising or decommissioning existing infrastructure. Infrastructure can significantly impact on its local environment and community and the wider environment and can involve significant use of raw materials in its construction. The operation of infrastructure also uses natural resources and can result in environmental impacts. Governments can reduce the environmental impacts from infrastructure and take the opportunity afforded by big infrastructure projects to build in measures to improve the environment and contribute to a more sustainable economy.

Through their audits Supreme Audit Institutions (SAIs) can hold their governments to account for the environmental impacts from infrastructure and identify ways in which the environmental costs can be minimised and the benefits maximised. This paper on Environmental Issues Associated with Infrastructure, is a resource to help audit practitioners identify the types of issues they can address in their audits – whether they are audits specifically focused on environmental impacts of a particular infrastructure development or a wider audit which seeks to address the environmental and sustainability issues alongside other issues, such as the efficiency and effectiveness of the programme. In order to be of use to all INTOSAI members, it is of a general character, providing:

- information on the environmental and sustainability impacts that can arise from infrastructure projects and programmes;
- explanation of tools that governments may use to address the environmental impacts; and
- examples of how SAIs have addressed environmental impacts of infrastructure in their audits.

The work to develop this paper was led by the United Kingdom National Audit Office. Many thanks go to the many individuals who contributed, including the SAIs that acted as members of the Sub-Committee for the project, providing ideas and comments on emerging drafts, and the SAIs that provided case studies. We would also like to thank the INTOSAI Working Group on Environmental Auditing and its Steering Committee members who also provided comments at different stages of the evolution of this paper. Without all these contributions this paper would not have been possible.



Alar Karis
Auditor General of Estonia
Chair of INTOSAI WGEA

TABLE OF CONTENTS

INTRODUCTION

1. Demands for investment in infrastructure come from the need to maintain, modernise, or replace existing infrastructure and for additional infrastructure to support new ways of working and living for an increasing population. Infrastructure is a catalyst for economic growth, it can support economic development particularly in developing countries, and it can contribute to a transition to a low carbon economy. These demands are leading to significant infrastructure development in both developing and developed countries, for example in the energy, transport, health, education and flood relief sectors.

2. The development of infrastructure involves significant investment in assets which last over a long period and often sits within wider-ranging plans for development. For example in the UK, the 15 year £17 billion Crossrail project is for a new train line across London, and is part of the wider London Thames Gateway programme, to regenerate east London.[1] New infrastructure development can bring significant environmental, economic and social benefits, including the opportunity to build in such a way as to meet the challenges posed by climate change. It can, however, also have significant costs on the environment, both in its construction, use and decommissioning or disposal. These impacts can be local or across a much wider area and the infrastructure investment may not always benefit the people who experience the impacts, for example where it increases water scarcity or interrupts the migration of species.

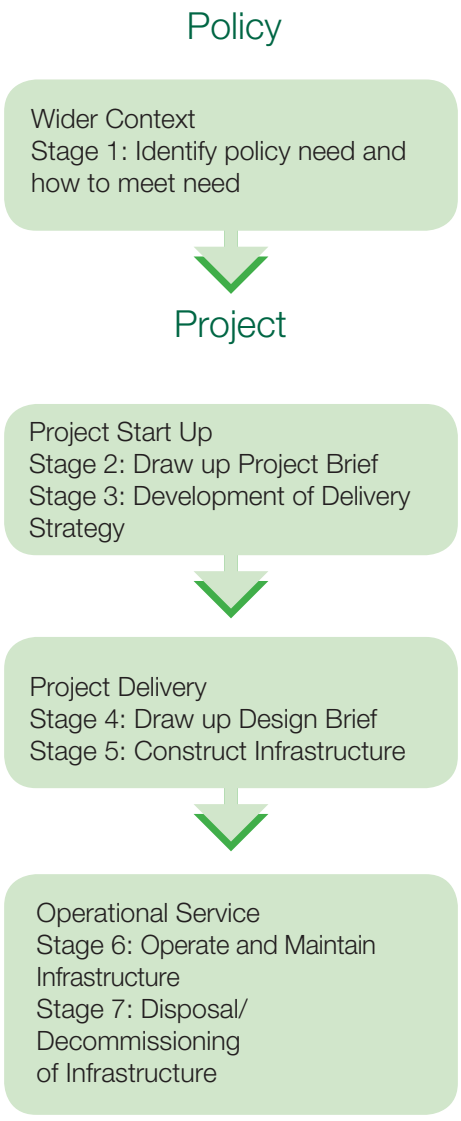
New infrastructure can bring significant economic benefits but may have environmental or social impacts.

[1] London Thames Gateway Delivery Plan http://www.communities.gov.uk/documents/regeneration/pdf/1427560.pdf

3. The aim of this research paper is to provide for Supreme Audit Institution auditors an overview of the common environmental and sustainability impacts associated with infrastructure, along with governance arrangements that Governments can put in place to manage them, in order to help the auditor design an audit in this topic area.

4. In some areas the private sector may deliver the infrastructure investment, to meet their own financial objectives. In other cases governments may incentivise the investment through market regulation; fund private sector delivery from tax receipts; or fund and manage the infrastructure projects directly itself. This research paper has identified seven key stages in the development and operation of infrastructure from initial proposals through to delivery, use, upgrade and decommissioning (Figure 1). Environmental and sustainability impacts occur at all of these stages. Governments can seek to minimise these environmental and social costs and maximise the potential benefits associated with infrastructure, whether it is in the private or public sectors, by setting regulatory requirements and standards. Where governments are directly involved in building projects or managing infrastructure, they are responsible for the initial policy decisions, project start up and subsequently for complying with regulations and best practice in the way they manage the infrastructure work.

Figure 1: Generic seven stage model of infrastructure development



Source: UK National Audit Office

5. This paper provides an overview of the relevant issues for auditors to consider in undertaking audits of government engagement in infrastructure projects. It covers:

- **the common environmental and sustainability impacts associated with infrastructure development, operation, use, upgrade and disposal (Part 1)**

Impacts on the environment and sustainability from infrastructure projects are wide-ranging and can be either adverse or positive. The paper presents some of the types of environmental and sustainability impacts that can be created during the lifecycle of infrastructure.

- **a generic model of seven key stages in an infrastructure project's lifecycle (Part 2)**

The paper presents the key steps within the seven stages in the infrastructure project lifecycle through which Governments and other infrastructure developers can influence the overall environmental and sustainability impact of the infrastructure.

- **governance structures through which environmental and sustainability impacts can be identified, managed and mitigated (Part 3)**

The paper presents a range of tools, structures and processes which Governments can use at different stages of the infrastructure lifecycle to address environmental and sustainability impacts.

- **how Supreme Audit Institutions can audit the environmental and sustainability impacts of infrastructure (Part 4)**

The paper sets out how SAIs can and have addressed environmental and sustainability impacts of infrastructure in their audits, drawing on case studies, which are presented fully in Appendix 1.

6. To prepare this paper, the project team reviewed infrastructure-related literature, developed and consulted upon a generic model of infrastructure development and related governance issues, reviewed INTOSAI materials and collected case study examples from INTOSAI members, and conducted workshop sessions with INTOSAI members to review and agree the elements which formed the report. A bibliography is provided in Appendix 2.

Water treatment works benefit the community but can impact on local ecology and water resources.

1.

ENVIRONMENTAL AND SUSTAINABILITY IMPACTS ARISING FROM INFRASTRUCTURE DEVELOPMENT

1.1 Governments have wide interest in the social and economic infrastructure of their country. This includes power stations and energy networks; roads, railways and airports; flood barriers and other flood protection measures; telecommunications systems; water collection, supply and treatment works; and waste management. All of these can be large structures individually or collectively and involve significant investment. They bring substantial benefits over a long period and for developing countries in particular can make an enormous difference to the productivity of the economy and the health and well-being of the population. However, they can also have wide-ranging environmental and sustainability impacts, which can be direct or indirect, short or long-term or cumulative, and reversible or irreversible. Infrastructure projects can involve work to mitigate significant adverse impacts, if the impacts are identified and considered at the appropriate stage, to enable the benefits from the infrastructure to be achieved with less detriment. Investment in large infrastructure projects can also provide an opportunity to enhance the surrounding and wider environment.

1.2 This section presents environmental and sustainability impacts that can be created during the construction, operation, upgrade and disposal/decommissioning of infrastructure. It does not seek to be an exhaustive list of every potential impact, and is not specific to any one type of infrastructure. Rather, it provides a means of highlighting the broad types of impacts, to provide a starting tool for auditors to consider the consequences of infrastructure development projects and the adequacy of planning assessments and delivery during the project lifecycle.

1.3 The impacts are presented in the following impact categories:

- Land: Impacts on landscape, soils and land use. (See 1.4)
- Ecology: Impacts on ecology, biodiversity, natural habitats of both flora and fauna. (See 1.5)
- Water resources and the water environment: Impacts on groundwater; surface water such as lakes, rivers, and streams; oceans and seas; glaciers and ice caps; wetlands and aquifers; rainwater and wastewater. These impacts also affect the water cycle. (See 1.6)
- Materials: Impacts embedded in the materials used during construction. (See 1.7)
- Energy, greenhouse gases and other emissions to air: Impacts arising from energy use during the construction process including operation and use of machinery; transportation; lighting and other electricity use. (See 1.8)
- Human environment: Impacts on the local community, local and non-local economy and the built historic environment e.g. heritage sites. (See 1.9)

LAND

1.4 New infrastructure typically involves land use change and the selection of the site and its proximity to human settlement will significantly affect its impact. Refurbishment, rebuilding or replacing previous infrastructure may also change the use of the land on which it sits and its impact. Land use impacts will be affected by whether the land is:

- of special consideration to the local community and indigenous population;
- on or near an area(s) of architectural significance;
- on land that is part of a nature conservation area, national park or other protected landscape, a site of particular cultural or scientific interest;
- in a forest (issue around deforestation);
- on a floodplain (resilience to flood risk);
- contaminated by hazardous material; or
- agricultural land.

Adverse impacts

- Removal of trees, and in particular disruption of forests, can reduce their sustainability and their ability to act as a "sink" for carbon dioxide emissions, and hence reduce their impact on global warming. It can all remove natural barriers to wind and weather which can add to soil erosion and impacts on other ecology.
- The construction and disposal of infrastructure can impact on the condition of the soil structure. For example the use of vehicles and heavy machinery may cause compaction of soils; land clearance may lead to soil erosion; and the infrastructure work may cause soil contamination with toxic materials.
- Buildings and hard landscaping reduce the capacity of the land to absorb rainwater and increase run-off, reducing the land's ability to store water or act as a flood plain and can impact on river flows and the sediment cycle.
- Once the infrastructure has been built it will impact on the visual amenity of the land and may act as a barrier in the use of the land by local communities. For example telecommunications pylons or wind turbines may tower over communities and may restrict access to the land upon which they are sited.
- The operation of the infrastructure may result in pollution and wastes contaminating land on and off-site, with heavy metals and organic pollutants transported from the site by wind or water and toxic materials potentially accumulating and contaminating land or water courses.

Infrastructure can impact on visual amenity of the land.

Positive Impacts

- The development can be used as an opportunity to investigate the archaeology of the site and the removal, restoration and conservation of items found.
- The land selected may have previously been contaminated and the infrastructure development can offer an opportunity to regenerate and reuse it.
- Upon upgrade or decommissioning the land may be cleaned up or remediated, to the level required for the future intended use of the land. For example, for agricultural use land remediation has to be of a very high level and it may need to be less well remediated for industrial use.

ECOLOGY

1.5 Infrastructure can significantly impact on the ecology and biodiversity on the chosen site and in surrounding areas. In addition to site based impacts, infrastructure can affect ecology through its impact on water courses (for example from dams) or the air (for example from wind turbines). Many impacts will be local to the site of the infrastructure but in some cases there may be impacts across a much wider area.

Adverse impacts

- Change in land-use as a result of infrastructure development will destroy existing habitats and affect the species that lived there.
- Degradation of the surrounding environment during construction, operation or decommissioning through noise, vibration and light pollution or waste (e.g. dust created during construction) may also disturb habitats and wildlife and can affect plant and fruit growth. For example, a power station may increase water temperature as a result of discharge of cooling water and this in turn may alter growth, metabolism, feeding habits, reproduction or migration of aquatic species.
- The use of land for infrastructure projects may hinder the movement of animals through habitat destruction or fragmentation. This can impact on species population dynamics e.g. distribution and abundance; and for rare species in extreme cases can result in species extinction. For example in Europe increased road infrastructure has been linked with the threat of extinction of hedgehogs[2].
- A construction project can introduce new predators, pests or other invasive species from other areas. For example non-native pests can be brought in by vehicles or workers and upset the ecological balance on site or in the surrounding area.
- Infrastructure development can also have offsite impacts on the ecology in surrounding areas. For example, displacement of populations of species from the site may increase pressure on surrounding areas, thereby reducing these sites' capacity to support the wildlife present. These areas may also, as a result, suffer a reduction in ecological quality so that the sites are no longer able to support the migration, dispersal or genetic exchange of wild species. Offsite impacts are especially important in cases where infrastructure development is taking place in close proximity to nature preservation areas.
- Infrastructure development can reduce the ability of the natural environment, its habitats and species to adapt to climate change.

Construction work can disturb habitats and wildlife.

Positive impacts

- Infrastructure development and disposal can present opportunities on the site to extend, improve or create new habitats for existing wildlife and plants. For example, the development can incorporate within its design the space needed for existing habitats, important species, buffer areas and landscape features – ensuring that the site retains its capacity to support the diversity, abundance, migration, dispersal and genetic exchange of wildlife. Another positive impact may be that some species are well adapted to built environments and thrive there. Some infrastructure that people rarely visit, such as power stations, may provide undisturbed land for animals and plants in their grounds.
- Features lost through development on site can be compensated for through:
  - providing habitat connectivity, to enable wildlife migration to continue;
  - re-creation, as nearby as possible, of features and landforms capable of maintaining the same ecological functions and with the same capacity to support the habitats and species lost or displaced and moving of affected species to the new site where possible;
  - restoration and enhancement of surrounding features unaffected by development or creation of new or additional buffer areas to reduce impacts.

---

[2] Ecological effects of roads, Andreas Seiler (2001)

WATER RESOURCES AND THE WATER ENVIRONMENT

1.6 Infrastructure can impact water resources (including water quality); flood risk; consumption of water during construction and operation; and water embodied in the materials used to build and maintain the infrastructure.

Adverse impacts

- Infrastructure construction and its use may add to increased demand for water and so add to pressure on water supplies in the local area. This may be of particular concern due to growing pressure on the quantity and quality of water supplies as a result of climate change. Pressures from water demand where there is scarcity can also impact communities away from the site of the infrastructure and this can be beyond national borders.

- Infrastructure construction, operation or decommissioning can lead to contamination/pollution of on-site groundwater and surface water altering its acidity, pH balance and salinity and impacting on aquatic plants, fish and animals. Contamination or pollution can arise through:
  - Leaks and spills from tanks, pipes, vehicles (e.g. sewage from a water treatment facility);
  - Accidents or spillage during storage or transport of raw materials, manufactured products and waste materials;
  - Storage of waste arising from the construction/operation of the infrastructure on or adjacent to the site;
  - Leaching of pollutants from the materials used to build or maintain the infrastructure;
  - Discharge of poor quality water after use in technological processes during infrastructure construction, operation or decommissioning;
  - Fly ash contaminating groundwater, for example from combustion of solid fuel such as wood, peat, coal in power stations.

- The operation of water management infrastructure over time can lead to wear and tear of the network of pipes and valves and result in water leaks. Burst pipes can disrupt water supply and lead to flooding of areas and properties and also waste a valuable natural resource. Leaking discharge pipes can spill untreated waste water.
- An infrastructure site may be vulnerable to flooding or change the flood risk to those downstream or adjacent to it.

Construction can contaminate groundwater or surface water.

Positive impacts

- There are opportunities with refurbishment, modernisation or construction of new infrastructure to minimise the consumption of water through the collection and utilisation of rainwater during construction and operation; the installation of water efficient equipment; and the re-use of grey water on site.
- The infrastructure itself can be part of the transformation to a lower carbon economy. The transportation of water for example is carbon intensive and new water infrastructure may be more energy efficient and reduce the carbon intensity of the economy.

[3] IEA Energy Technology Perspectives 2008: Scenarios and strategies to 2050

MATERIALS

1.7 Enormous amounts of materials and energy can be used in the construction and operation of an infrastructure project. Construction of infrastructure uses a significant volume of materials derived from natural resources, such as timber, concrete and steel. And rare natural resources are used in the manufacture of equipment. The sourcing, processing, manufacture, distribution, use and disposal of construction materials can have significant local and global environmental impacts.

Adverse impacts

- Many materials used in construction or the operation of infrastructure, such as coal or nuclear power stations, can be from unsustainable sources or damage the environment and create pollution during their extraction, for example stone or sand quarried or timber harvested unsustainably. For power stations, for example, coal mining can release methane, a potent greenhouse gas.
- Many materials are produced in an energy intensive process, in particular cement production for concrete releases about five per cent of global CO_2 emissions and steel accounts for 4 to 5 per cent[3]. As a result, large amounts of natural materials and energy can be embedded in the final infrastructure project.
- Some materials used to construct infrastructure are treated with chemicals which can result in toxic emissions such as polycyclic aromatic hydrocarbons, which represent air pollution and health hazards, for example in the pre-treatment of timber or treating railroad ties with creosote.
- The construction and disposal of infrastructure can create a large and complex waste stream, covering a wide array of materials some of which can be hazardous, such as polychlorinated biphenyl (PCB), asbestos or lead dust.

Materials used in construction can be from unsustainable sources.

Positive impacts

- Upgrade decisions can take account of the embedded materials and result in extending the life of existing assets rather than replacing them with new infrastructure or incorporating existing steel frames in new infrastructure.
- Designs for upgraded or new infrastructure can minimise the use of materials with higher environmental impact and use instead sustainable products, such as sustainably sourced wood instead of concrete.
- There are opportunities during construction to source materials that are re-used or recycled reducing waste from other sites that would otherwise need disposal.
- Refurbishment and/or rebuilding allows the removal of potentially harmful materials such as asbestos, and their replacement with safer, better-performing materials.

[3] IEA Energy Technology Perspectives 2008: Scenarios and strategies to 2050

ENERGY, GREENHOUSE GAS EMISSIONS AND OTHER EMISSIONS TO AIR

1.8 Energy is consumed and greenhouse gases are emitted during the transport to site of the construction material and the workers; the operation of heavy construction machinery; the operation and maintenance of the infrastructure; treatment of wastewater; and the operation of heavy machinery and the transport of waste material during the demolition of infrastructure.

Adverse impacts

- Transportation of staff and raw materials to and from infrastructure development sites results in emissions to air of carbon dioxide, carbon monoxide, nitrous oxides (NO_X), sulphur oxides (SO_X), dust, polyaromatic hydrocarbons (PAHs) and particulate matter (PM). These emissions contribute to climate change and have impacts on air quality which can result in both health and environmental impacts. Using materials from local resources and supplies can lower the transportation impacts. In some cases greenhouse gas emissions could be reduced through use of lower carbon means of transport, such as transportation by water.
- Energy used in construction and operation of infrastructure is often not from renewable sources and consumption of fossil fuels contributes to greenhouse gas emissions and other polluting emissions to air.
- Energy infrastructure, such as heating and electricity energy systems, can be inefficient with a lot of energy being lost along the way as it moves from the source to the end-user. Maintenance and refurbishment of energy infrastructure may be used to reduce this adverse impact, such as resulting in the improvement in combined heat and power systems.

Infrastructure can be part of the transformation to a low carbon economy.

Positive impacts

- The infrastructure itself can be part of the transformation to a lower carbon economy, for example if it is new energy infrastructure or rail transport to take freight off roads.
- Infrastructure design may incorporate energy-saving or energy generating features and can make them more efficient than the infrastructure services they replace.
- The design can include technology to reduce emissions and carbon capture and storage.
- Transportation arrangements for infrastructure development or operation can be used by other users to reduce third party energy use. For example bus services can be established for workers on site and also operate as public services.

HUMAN ENVIRONMENT

1.9 New infrastructure projects can affect the physical, cultural, social and economic factors in an area. The nature and scale of the impacts on the human environment will be substantially determined by the location of the infrastructure. Maintenance or modernisation of existing infrastructure to extend its operational life can maintain its social or economic benefits.

Adverse impacts

- Displacement of local populations, including indigenous populations, during construction may threaten the sustainability of community structures and cultures. Such displacement can happen in the immediate surrounds or across a wider area, for example if a dam reduces water flow and disrupts community life downstream.
- New infrastructure can involve the demolition of existing commercial properties to make way for it, which can mean the loss of jobs in the local economy.
- Construction may impact on archaeological and other heritage sites with architectural or historical importance.
- Once built, infrastructure can have negative impacts on the local community. For example, in addition to impacts on ecology and the water environment, a road generates traffic which can be a nuisance and hazard for the local community. New infrastructure development may also lead to reduced access to previously used green infrastructure.
- There can be health effects (real or potential, in the event of an incident) from infrastructure on the local community. For example this might include electromagnetic radiation from telecommunication pylons; sewage contamination from wastewater plants; radioactive leakage from nuclear plants.
- Decommissioning and disposal of infrastructure can be a burden on the economy if the funds for disposal have not been budgeted for adequately and if responsibility for disposal has not been appropriately assigned. Decommissioning of infrastructure may also impact on jobs and the local economy.

Infrastructure projects can benefit but also disadvantage communities.

- Construction, operation and disposal poses health and safety considerations for the workers. For disposal of infrastructure, specific issues of relevance are:
  - structural stability of buildings;
  - stability of earth slopes/retaining walls, hazards from voids;
  - hazardous materials either on site or remaining in buildings;
  - hazardous materials contained within the fabric of buildings;
  - redundant services ducts or pipes containing hazardous materials.

Positive impacts

- The infrastructure itself should deliver the benefits it is designed to achieve for the local community, such as new waste management infrastructure improving sanitation, health and the environment; flood defences protecting local communities and their livelihoods; and transport and telecommunications increasing the quality of life for people in remote areas as they become better connected to jobs, shops and other facilities.
- The developer of the infrastructure may pay tax or provide other support to the local community.
- Construction can strengthen the local economy through using local companies and local employees at all stages of the infrastructure lifecycle.
- New infrastructure may bring additional people, employment and tourism into the economy and the opportunity to invest in local services to support the increasing community, such as education, health care facilities and housing.
- The presence of infrastructure such as a railway or a power station may affect property prices (may be a positive or adverse effect).

2.

THE STAGES IN INFRASTRUCTURE DEVELOPMENT

2.1 Sustainability and environmental implications, as discussed in Part 1, should be considered throughout the lifecycle of an infrastructure project, to minimise the adverse impacts and maximise take-up of the opportunities for benefit. This section will develop further the generic infrastructure model presented in the introduction (Figure 1) to highlight the need for a continuous, iterative assessment of environmental impacts; to provide a tool for thinking practically about how to consider the impact on the environment at each stage; and how to integrate this into the decision-making process.

2.2 The model (Figure 2) is not based on any specific type of infrastructure project; rather it presents a generic model of the typical infrastructure development (and use) which could be applied in a variety of contexts. The model has been drawn together from a range of sources and simplified to produce a high-level representation of an infrastructure project's lifecycle. It should be noted that this approach is rarely linear and that there may be some reiteration of steps and overlapping of stages. Stages may start earlier and a significant setback in the operational phase could even mean going back to the beginning of the cycle.

STAGE 1: IDENTIFY POLICY NEED AND HOW TO MEET NEED

Identifying the need

2.3 The first step in an infrastructure development project is to identify clearly the policy or business need. This is achieved through: clarifying the current situation, level of service and demand met with existing infrastructure; assessing any future impacts on the level of services which can be provided with existing infrastructure; and assessing likely future demand, taking into account long-term changes in demand prompted by changes in society or the climate. Policy needs for infrastructure development can arise where there is a lack of capacity of a public service to meet current or future community needs; a low service level; or a risk of service level falling. Identifying policy need encourages full consideration of the range of options that are available to meet the need.

Setting out the options

2.4 Once a need for change in a public infrastructure service has been established, then the various options available to fulfil the need must be identified. The list of options identified and considered should include the "do nothing option"; the scope for improving output from existing infrastructure; the potential to reduce existing or future demand; and infrastructure upgrade; as well as new infrastructure solutions. This is important because all infrastructure solutions will involve environmental or sustainability costs and impacts and so these must be compared to the costs and benefits of other potential solutions.

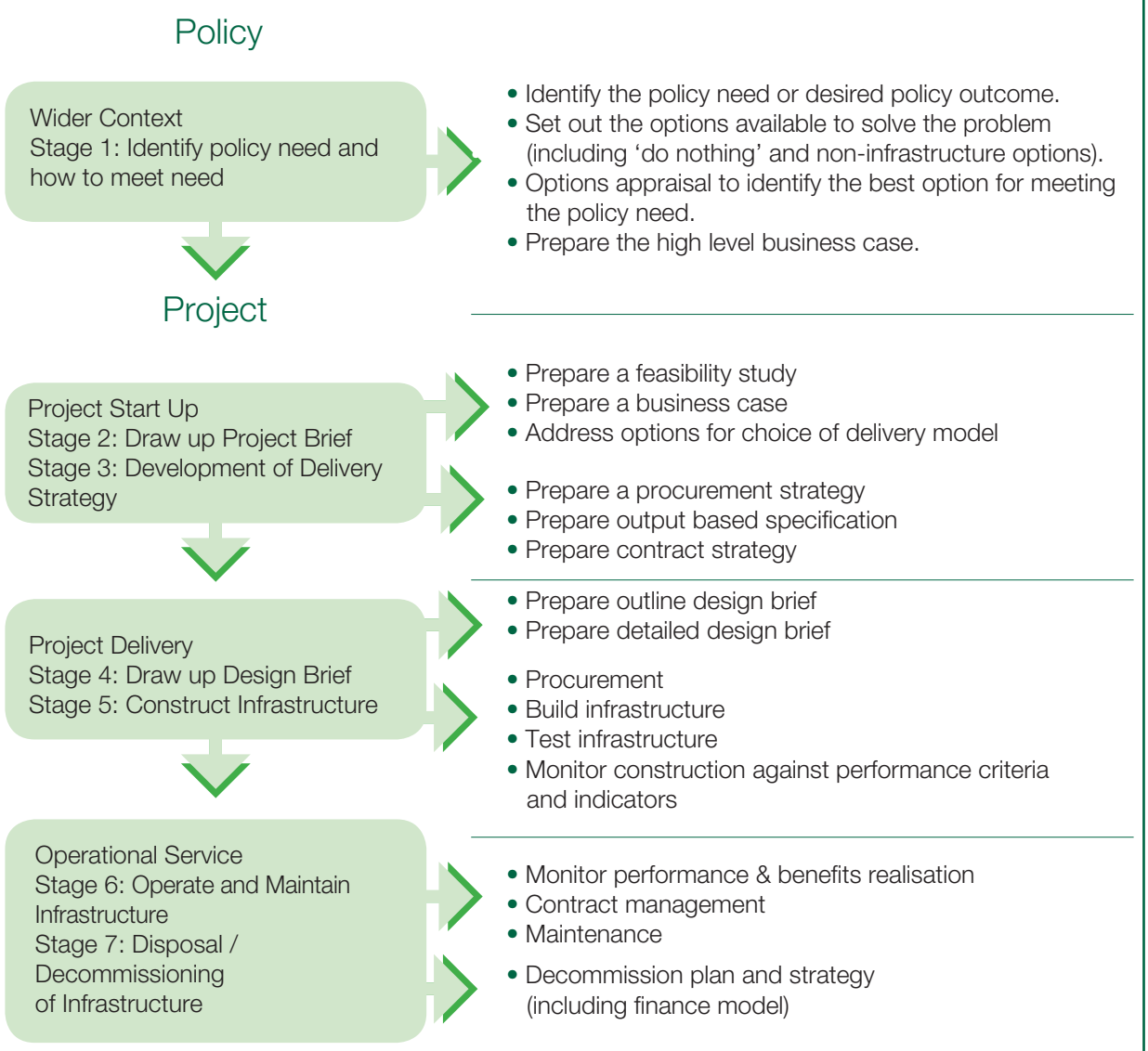
Options appraisal

2.5 Option appraisal is a technique for setting objectives, creating and reviewing options for meeting the objectives and analysing their relative costs and benefits. It assists in making decisions on whether to proceed with a project and in identifying the best option for delivering it. During this stage there should be an evaluation of the risks, as well as the costs and benefits of each option, including environmental and social costs. It should quantify costs and benefits where possible based on detailed environmental assessment, so that decisions on options available are taken based on robust information. Long-term issues such as climate change should be addressed in this analysis. Emissions associated with the use of the infrastructure will need to be in line with future emissions reduction requirements and the infrastructure will need to be resilient to future climate change and not inhibit adaptation in other sectors. A robust cost benefit analysis, considering the whole life of the project, is vital at this stage of the project.

High level business case

2.6 This sets out the high level rationale, that is the policy or business need, for the infrastructure and justifies the business option selected, based on the options appraisal undertaken.

Figure 2: Generic Model of Infrastructure Development



Source: UK National Audit Office

STAGE 2: DRAW UP PROJECT BRIEF

The project brief

2.7 To progress beyond the initial concept and develop a more detailed project definition, the Project Brief provides the formal basis for assessing whether the proposal is viable and achievable. This defines the infrastructure's objectives in outline and is a statement of the user requirements and other relevant technical, administrative and financial information. It must contain sufficient detail for an informed decision to go ahead or abandon the project. It is likely to include:

- Background to the infrastructure need
- Preferred option
- Main stakeholders, especially service users
- Benefits expected and how they will be measured
- Impacts of the development and how they will be avoided or mitigated
- Estimate of overall effort required and who will do it
- Outline of activities required
- Key milestones, including critical stages

Feasibility study

2.8 This examines the issues that will make the project feasible or unfeasible. It considers various aspects of the infrastructure project in enough detail to inform a final decision of whether to proceed or not. It indicates whether the infrastructure is practicable in engineering terms, confirms its possible costs and decides on the methods that should be adopted for design and construction. The following may be addressed in a feasibility study:

- Budget and scope of the project: Will the proposed project work at the desired budget?
- Site analysis: Is the site chosen suitable?
- What is the best strategy for developing the project on a given site?
- What other cost, planning, and design constraints might the project run into?

A feasibility study culminates with the preparation of a report which documents its findings and makes recommendations for proceeding with the next stage of infrastructure development. It is important at this stage to identify key environmental and sustainability impacts, in the short and long term, and how these will be addressed, and how they have already informed the scope, site chosen, strategy or design constraints.

Business case

2.9 This provides justification for undertaking a project, in terms of evaluating the benefit, cost and risk of alternative options and rationale for the preferred solution. This can involve putting values on the environmental costs and benefits identified at the feasibility stage.

Choice of delivery model

2.10 This involves determining the best way to deliver the policy object identified at the beginning. The potential options available to Governments include: direct delivery by central Government department; delegation of delivery to other public sector bodies, such as particular agencies or local authorities; outsourcing to the private sector through partnering with external contractor or Public Private Partnership; and using regulatory levers to require or incentivise private investment in the desired project.

2.11 In reality the choice of delivery model may be restricted for the provision of some infrastructure. For example the funding available from public funds may be limited, leading to decisions to make users pay. For infrastructure funded by users and provided within the market place a public private partnership may not be appropriate if the market is regulated. In an unregulated market the use of subsidies and other financial incentives can be a key part of the delivery model.

2.12 The choice of delivery model has lasting implications for the mechanisms available to Government to influence the design, construction and operation phases. It also affects the project's value for money. For example, if the government considers infrastructure should be user funded it may have limited levers to influence the specification for the infrastructure, or the government may decide to run the procurement for the infrastructure itself so that it retains control of the design and operational stages and the ability to manage the key risks including those to the environment. Alternatively, the government may consider it can achieve its objectives through regulation of the building and operation of the infrastructure.

2.13 The choice of delivery model may also introduce different risks and uncertainties. Those providing finance for a project, bank or bond financers or corporate business borrowers, may operate to their own objectives and drivers and apply different sustainability standards or seek to avoid risks.

2.14 The assessment of the delivery model should therefore include consideration of the environmental and sustainability impacts that will be created and then the levers the government wants to address them through the alternative delivery options, and this could influence the delivery model decisions taken. The choice of delivery model is then incorporated back into the feasibility study and business case.

STAGE 3: DEVELOPMENT OF DELIVERY STRATEGY

2.15 Refinement and expansion of the delivery strategy includes the preparation of procurement and contract strategies and the development of key infrastructure specifications. Certain aspects of this stage are likely to have been decided in high level terms by the choice of delivery model, as they are inherent to the delivery model. But at this stage the detailed delivery strategy will be developed further.

Procurement strategy

2.16 The procurement strategy identifies the best way of achieving the objectives of the project and value for money, taking account of the risks and constraints, leading to decisions about the funding mechanism and asset ownership for the project. The aim of a procurement strategy is to achieve the optimum balance of risk, control and funding for a particular project. Consideration of risks and their ownership should include environmental and social risks. For example in procuring the building of a power station with carbon capture and storage (CCS) it will need to be clear who would be responsible in the event of a leakage from the carbon storage, the operator or government.

Output-based specifications

2.17 The development of output-based specifications sets out the functional requirements of a project. Output-functional specifications help to:

- focus the procurer on what functions the facility needs to perform
- allow the provider the greatest opportunity to innovate and find ways of enhancing the function of the facility while reducing its whole-life costs, including environmental and sustainability costs.

Contract strategy

2.18 The contract strategy determines the level of integration of design, construction and ongoing maintenance for a given project, and should support the main project objectives in terms of risk allocation, delivery, incentivisation and so on.

STAGE 4: DRAW UP THE DESIGN BRIEF

2.19 If the delivery strategy involves setting of an output based specification this stage will be the responsibility of the contractor.

The design brief

2.20 This is a technical document which describes the functional and operational requirements of the infrastructure to be constructed. It defines all design requirements for the infrastructure and is the foundation on which the final design will be developed. It may include the following:

- Schematic drawings of the proposed infrastructure
- General specifications of the infrastructure and the performance criteria once complete
- Site information
- Any technical details which may affect the infrastructure development

The outline design brief

2.21 At the early stage the design requirements can be precise on the environmental or social requirements or be specified in outcome terms to enable the development of innovative designs.

Detailed or final design drawings

2.22 The detailed design is used for construction. It contains all the information necessary to build a particular type of infrastructure. This information can also be used to support the application for the various permits required before construction can begin. The detailed design shows what the finished work will look like, how materials and components will be integrated together and the dimensions and layout of the infrastructure.

STAGE 5: CONSTRUCTION

2.23 Construction involves the building or assembly of infrastructure and is the stage of the project in which environmental impacts are realised and mitigation measures implemented. Environmental outcomes can be affected by several factors at this stage. Poor construction or changes made to specifications or decisions can impact upon project and environmental outcomes. Similarly good project and contract management is important in ensuring that objectives are met.

2.24 If the construction is being carried out under contract, its delivery must be monitored against the design brief and contract. Its construction must be tested to ensure technology is installed correctly to deliver against operating performance criteria.

2.25 The commissioning and testing stage at the end of construction is a key stage for assessing delivery and operation of environmental features in the design, environmental controls and residual impacts. Those taking on the operation of the infrastructure need to understand how to operate it to achieve its design performance. This stage is particularly important if the infrastructure is one of a series, so lessons can be learned and built into design specifications for subsequent projects.

STAGE 6: OPERATE AND MAINTAIN INFRASTRUCTURE

2.26 Operation and use is the longest stage in the lifecycle of infrastructure and for some types of infrastructure this stage can have greater total environmental and sustainability impacts than the construction phase, so needs to be addressed in initial plans and business cases.The long-term operating and maintenance regime for infrastructure and its affordability can significantly affect its sustainability and environmental performance. If operation and maintenance costs and the funds required are not considered adequately from the outset of developing the infrastructure, the sustainability of the infrastructure and its environmental impacts can become more acute. Any changes to the infrastructure over this time period can enhance or impair environmental outcomes and therefore managing such changes is also critical.

STAGE 7: DISPOSAL / DECOMMISSIONING OF INFRASTRUCTURE

2.27 Infrastructure may have a long lifetime but is not permanent. The design life of infrastructure varies. But in developed countries much of the existing economic infrastructure, such as power stations or communications or transport networks which has been in place for over 50 years, is likely to be coming to the end of its design life and will need to be decommissioned and/or disposed of. This is particularly the case where the costs of maintaining the infrastructure are very high and the demand for the outputs has changed and so the economic case for maintaining them is very weak.

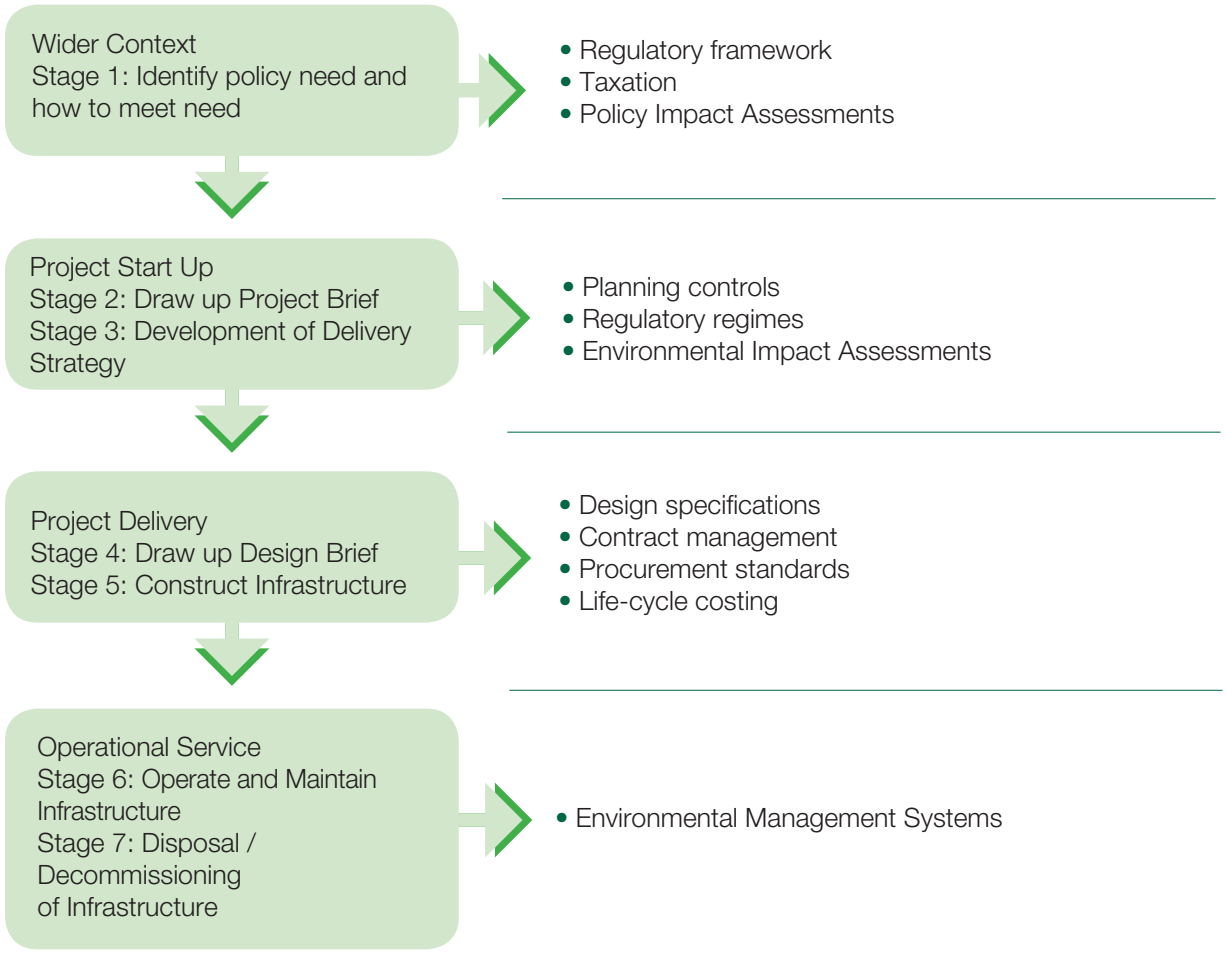
2.28 The decommissioning/disposal process can result in very long term environmental impacts as well as offering immense opportunities for ecological restoration, land reclamation or decontamination and the re-use of materials. The adverse impacts of infrastructure disposal, like construction, can be reduced by considering disposal at the design stage. For example the materials decommissioned and needing disposal can be reduced by designing into the infrastructure elements that can be re-used or recycled, for example re-use of a steel framework, or modification or alteration of the operations of the infrastructure system. It is also important at the planning stage to provide for the cost of decommissioning to ensure that there is funding available to complete it and realise the opportunities available from reclaiming the site.

3.

GOVERNANCE APPROACHES FOR MANAGING THE ENVIRONMENTAL IMPACTS OF INFRASTRUCTURE

3.1 This section examines a range of tools, structures and processes which when incorporated into the infrastructure lifecycle can help governments address environmental and sustainability considerations throughout a project. These tools and processes for addressing environmental and sustainability impacts may be embedded within wider project governance arrangements or be set out as additional requirements and complement standard processes. They are generic and apply to the governance of infrastructure projects of different types, from the building of roads to the building of dams or electricity network infrastructure. They can be used, to minimise or mitigate adverse environmental and sustainability impacts, or maximise take-up of the potential positive impacts, which occur across the lifecycle of infrastructure projects. For illustrative purposes Figure 3 maps the governance approaches discussed in this section to the model of infrastructure development established in Figure 2. But the timing of the use of the tools or processes is not fixed, and there may be value from their use at successive stages of the lifecycle of an infrastructure project.

Figure 3: Governance approaches for incorporating environmental and sustainability consideration, across the infrastructure development cycle



Source: UK National Audit Office

GOVERNMENTS' FRAMEWORKS FOR ADDRESSING POLICY IMPACTS

3.2 There are a wide range of international agreements, national and local governance structures which seek to control, incentivise or monitor the environmental and sustainability framework within which infrastructure projects are pursued. As governance structures, they do not operate at an individual project level, but are included here for completeness as they form key parameters in which a project must operate and inform project decision-making.

3.3 Governments have committed themselves to many international environmental and sustainability agreements and conventions which impact on the way they may address infrastructure projects. Key examples include the World Heritage Convention and Convention on Biological Diversity (Figure 4).

Figure 4: Key international conventions that shape governments' frameworks for considering infrastructure developments

TREATY	DESCRIPTION
Ramsar Convention on Wetlands, 1971, Iran	Provides an international framework for the conservation and use of wetlands and their resources; emphasizes wildfowl habitat.
Convention Concerning the Protection of the World Cultural and Natural Heritage, 1972, Paris	Sets up an international committee to protect historical and natural sites, requires an inventory of endangered world heritage sites. Recognizes that nature and culture are complementary.
Convention on Long-Range Transboundary Air Pollution, 1979, Geneva	Combats acidification on a broad regional basis and brings together research and policy. Has been extended by eight new protocols.
Convention on the Protection of the Ozone Layer, 1985, Vienna	Encourages research and cooperation; and sets a precedent for early response to environmental problems.
Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal, 1989, Basel	Encourages disposal of hazardous wastes within country of origin; and provides for waste reduction and disposal.
United Nations Framework Convention on Climate Change, 1992, New York and	Recognizes that global warming is a problem and sets an objective of stabilizing greenhouse gas emissions, requires regular inventories of such emissions, and places heaviest burden on industrialized countries.
Kyoto Protocol to the United Nations Framework on Climate Change, 1997, Kyoto	Sets targets on greenhouse gas emissions.
Convention on Biological Diversity, 1992, Rio de Janeiro	Regulates the conservation and sustainable use of biological diversity, the equitable sharing of genetic resource benefits, and appropriate transfer of relevant technologies.
Protocol on Pollutant Release and Transfer Registers to the Aarhus Convention, Kiev, 2003	The "Kiev Protocol" was the first legally binding international instrument on pollutant release and transfer registers. These registers are inventories of pollution from industrial sites and other sources such as agriculture and transport.

3.4 Governments address their international commitments and national priorities through supporting the adoption, incentivisation and enforcement of general and specific laws using regulatory regimes (including the planning regime), and administrative practices such as the requirement to undertake policy impact assessments. At a national and local level, these legal and administrative policy structures will influence decisions on infrastructure projects by setting the wider context and requirements over their construction, operation and disposal.

3.5 **Environmental taxes** or other forms of financial incentives and disincentives, such as subsidies (direct and indirect) and minimum price setting for inputs, can also be used as a tool to increase the cost of a more environmentally destructive activity to encourage use of less damaging options. Environmental taxes can be used for example to favour recycling and discourage investment in and use of landfill. Taxes or minimum prices can raise the cost of products to discourage their use, for example taxes raising the price of mined aggregates compared to use of other products or minimum carbon pricing. Development tax receipts can be reserved for spending to address the impacts of the development. Tax relief can also be used to encourage infrastructure to be built on previously used sites to support regeneration. The tax administration regime should include processes to ensure that the objectives of environmental taxes have been met: for example that waste has been properly diverted from landfill.

3.6 Governments can undertake and require other regional and local government entities to undertake **policy impact assessments** to make policymakers compare various options for achieving an objective by assessing its likely costs and benefits. Impact Assessments can include the economic impacts; social impacts; environmental impacts and sustainability impacts arising from a proposed policy, and should take account of the other policy structures and commitments in operation. They can involve public consultation to identify the range of likely social, economic and environmental impacts from the infrastructure development.

3.7 Consideration of the impacts of infrastructure development on the environment at an early stage of the policy process will ensure that sufficient time is available to assess where wider environmental impacts are significant and quantify and monetise where appropriate . This work[4] can feed into a **cost-benefit analysis** to integrate the environmental and sustainability considerations into the overall policy or project assessment and can identify potential policy impacts that can be mitigated. Appraisal can help identify any significant impacts that may fall disproportionately on future generations[5] and evaluate the benefit of the infrastructure proposal against the 'do nothing' option and non-infrastructure options.

PLANNING CONTROLS

3.8 The regulation of land-use change through planning laws (including land-use planning, zoning and transport system planning) enables governments to establish general principles for development and controls requiring individual applications and approvals for what is built and where and for major redevelopments. This can allow a government to make decisions on whether a proposed development should go ahead or not and the form it should take[6]. A country's planning regime can require explicit consideration of how the needs of the community are to be met in a sustainable manner before a planning approval is granted. This can allow the planning decision to weigh up long term needs, benefits to future generations and costs to the environment against short term social and economic benefits to enable development impacts and requirements to be considered over their whole lifecycle[7].

3.9 A planning regime can require that the environment in a proposed development area is not negatively affected by any proposed development, for example by setting **conditions** which must be met if planning approval is to be granted and conditions which apply following the approval to build. Planning conditions can be used to ensure that any development that takes place minimises its impact on the environment, is positive for the community and takes into account the needs of future generations. It can apply to the construction and operation of infrastructure. A list of examples of conditions for planning approval are included in Figure 5.

3.10 A planning system can also require complementary actions or payments to fund them. For example to obtain planning approval an infrastructure developer may be expected to provide or fund local community facilities, or green space development.

---

[4] http://www.defra.gov.uk/corporate/about/how/policy-guidance/env-impact-guide/
[5] http://www.defra.gov.uk/corporate/about/how/policy-guidance/sd-impact/
[6] http://www.planningportal.gov.uk/planning/planningsystem
[7] http://www.rtpi.org.uk/item/298/23/5/3

Figure 5: Examples of conditions to be met as part of a planning approval process

- Re-use of sites in areas that need regeneration to make them attractive places to live
- Is built where shops, services and employment can be provided locally, reducing the need to travel and boosting the local economy
- Avoids building over, or being close enough to cause damage to, certain sites - for example, areas of local landscape importance, conservation areas or sites of special interest to indigenous populations
- Ensures buildings are energy efficient and use renewable energy
- Ensures that groundwater is not over-exploited, for example by capturing and using rainwater and recycling mains water
- Provides adequate space for wildlife to flourish, by, for example, planting trees, creating more green corridors to link habitat, creating ponds and leaving areas wild and uncultivated.

Source: National Audit Office (2008) Planning for Homes: Speeding up planning applications for major housing developments in England, London.

ENVIRONMENTAL REGULATIONS

3.11 Environmental regulations can be used to impact directly on infrastructure development activity, its operation or decommissioning. Environmental regulation can involve the use of permits, licences, consents, notifications, registrations or exemptions of activities that may cause pollution or otherwise damage the environment. The impact of environmental regulation on infrastructure projects will vary according to the type of infrastructure and its use and operation:

- environmental **permits** may be required for the construction or operation of a regulated infrastructure facility, such as a water tre atment plant or waste handling plant.
- trade effluent **consents and agreements** may be required for operations or activities that discharge trade effluent into the public foul sewer
- water abstraction and impoundment **licences** may be required for infrastructure building or operations that take water from surface waters or groundwater, or obstruct them in any way
- waste carrier, broker and dealer **registration** may be required for the transport of waste
- operations that produce or move hazardous waste generally require hazardous waste **registrations**
- CO_2 **allowances** may be needed for proposed power stations or industrial infrastructure under carbon trading regimes.

3.12 As with planning consents, the permissions may be granted only where developers have met certain conditions and these conditions can continue to apply to the permissions. Examples of such conditions are given in Figure 6.[8]

Figure 6: Examples of conditions attached to environmental regulatory permissions

- Proof that the developer has the means available to provide the required standards of environmental protection;
- Equipment must be designed and installed to a suitable standard ;
- Use of a maintenance schedule for all equipment whose failure may lead to pollution, ensuring that it continues to operate effectively;
- Identification of potential accidents, and putting in place any necessary measures to minimise the chances of them happening and to minimise the effects of any accidents that do occur;
- Staff must be trained in pollution prevention and procedures for handling pollution incidents.

Source: National Audit Office (2008) Planning for Homes: Speeding up planning applications for major housing developments in England, London.

[8] http://www.businesslink.gov.uk/bdotg/action/detail?itemId=1080480220&r.l1=1079068363&r.l2=1086048470&r.l3=1080480296&r.s=sc&type=RESOURCES

ENVIRONMENTAL AND SUSTAINABILITY ASSESSMENTS

3.13 A large variety of specific assessment tools exist which can either focus specifically on, or look to integrate consideration of environmental, social and economic impacts into the decision-making process at a project level. These assessments provide an opportunity to understand and, where possible, quantify the impacts of different design and delivery options to allow informed assessments of projects. Governments can require the preparation of environmental impacts assessments as part of their planning regime.

Environmental Assessment

3.14 An Environmental Assessment is a process which ensures that the likely effects of a specific new development on the environment are fully understood and taken into account before the development is allowed to go ahead.[9] This enables environmental factors to be given due weight, along with economic or social factors, when planning applications are being considered. There are variations in the form of individual assessments (which may form a regulatory requirement) with some looking strategically across multiple projects to assess cumulative impacts coherently at a regional level and others focussing on a single project in isolation. Reference to technical standards such as the Best Available Technique (BAT) or Best Practicable Environmental Option (BPEO) can help to identify and assess the environmental impacts of a plan and identify opportunities to increase positive impacts. Conducting an environmental assessment is an iterative process which should be carried out alongside the development of the plan or programme.

3.15 The environmental assessment process may require a substantial and full consultation by the developer with bodies which have an interest in the likely environmental effects of the development proposal as well as the local community and indigenous population and other interested stakeholders. Consultation may identify adverse effects not otherwise identified and consider alternative approaches to mitigating impacts.

3.16 Whilst the various requirements for an environmental assessment differ from country to country, as determined by their legislation, they usually require collection of information to help planning authorities to make the appropriate decisions, including:

- Characteristics of projects, in particular: the size of the project; the accumulation effect with other projects; the use of natural resources; the production of waste; pollution and nuisances; and the risk of accidents.
- An outline of the main alternatives studied by the developer and an indication of the main reasons for the final choice, taking into account the environmental effects.
- A description of the aspects of the environment likely to be significantly affected by the proposed project, including, in particular, population, fauna, flora, soil, water, air, climatic factors, material assets, including the architectural and archaeological heritage, landscape and the inter-relationship between the above factors over the period of development and the lifetime of the infrastructure.
- A description of the likely significant effects of the proposed project on the environment resulting from: the existence of the project;
the use of natural resources; the emission of pollutants, the creation of nuisances and the elimination of waste.
- A description of the measures that will be used to prevent, reduce and where possible offset any significant adverse effects on the environment.[10]

Social or sustainability impact assessment

3.17 A social or sustainability impact assessment is an additional tool may be used to widen the scope of an environmental assessment to incorporate concepts of community, health and wellbeing, culture and the human environment. The broad format follows that of the environmental impact assessment and seeks to ensure affected parties are identified and engaged in the decision-making process and that the long-term sustainability considerations underpin the assessment process.[11] In some countries a broad impact assessment covering environmental, social and sustainability impacts is the prime assessment and there is no separate environmental assessment.

Life-Cycle Assessment

3.18 Key to the environmental and sustainability assessment is the consideration of costs and benefits across the whole life cycle of the project. From an infrastructure perspective, a **Life-Cycle Assessment** can include consideration of construction materials, air emissions, water effluents, climate change impacts, solid waste, and the consumption/depletion of energy and other resources and be used to help to ensure that a government's choices are environmentally sound, whether in the design, manufacture or use of a product or system. The assessment involves[12]:

---

[9] http://www.communities.gov.uk/documents/planningandbuilding/pdf/157989.pdf

[10] http://www.sea-info.net/content/main.asp?pid=230

[11] http://www.socialimpactassessment.com/documents/0303%20Vanclay%20IAPA%20V21N1%20SIA%20International%20Principles_1.pdf

[12] Royal Society of Chemistry, Environment, Health and Safety Committee Note on: Life Cycle Assessment, February 2010. http://www.rsc.org/images/LCA_20100215_tcm18-97943.pdf

- Compiling an inventory of the flows of energy and materials to and from the environment at each stage of development;
- Calculating and evaluating the relevant impacts, including the impacts embedded in materials used in construction and operation of the infrastructure;
- Interpreting the results to help make informed decisions; and assessing whether results are in line with project goals, identifying significant impacts and recommending methods for reducing the impacts, potentially increasing efficiency and productivity.

3.19 A life-cycle assessment approach allows governments to make informed choices over the long term and avoid short term decisions that lead to environmental degradation. It also encourages governments to avoid shifting problems from one life cycle stage to another, from one geographic region to another and from one environmental medium (air, water or soil) to another [13].

Cost-Benefit Analysis

3.20 Techniques exist to convert these identified impacts and remediation costs into monetary terms, so that they can be brought into a **Cost-Benefit Analysis.** This can be done in outline at the policy development stage and then updated and strengthened after full consideration of environmental and sustainability costs in the project start-up phase. At this stage the cost-benefit analysis can gauge which design/procurement option represents the best value for money, taking into account both financial and environmental impacts, for the user and for society as a whole. Techniques for monetising non-financial impacts are difficult to apply and in some cases controversial and research is still developing the techniques. The three main approaches which can be applied to environmental and social impacts are:

- Preference based approaches: these involve obtaining from representative samples of people the financial value they place on environmental and social goods (their "willingness to pay" for them) or how much they consider they would need to be compensated to accept negative impacts (their "willingness to accept" them);
- Damage costs: this involves identifying and valuing the costs which might arise from a failure to mitigate environmental or social impacts; and
- Abatement costs: this involves identifying the costs of avoiding impacts partially or completely.

3.21 These techniques for monetising non-financial impacts are usually developed for the purpose of the individual case, through a bespoke study. The values they arrive at are unlikely to be transferable to another appraisal.[14]

ENVIRONMENTAL AND SUSTAINABILITY INTEGRATION IN DESIGN AND PROCUREMENT

3.22 A key opportunity to incorporate environmental and sustainability considerations is in the design, procurement and construction processes. Decisions taken at this stage can minimise any adverse impacts identified in the earlier assessments as well as seeking to enhance potentially positive impacts.

3.23 The **design phase** gives the project sponsor opportunity to influence the environmental and sustainability performance of an infrastructure development. The design phase is key in identifying construction materials and methods that help achieve sustainability targets, in identifying Best Available Technique applicable to the infrastructure, and in designing in features to improve the infrastructure's operational performance[15]. The design can incorporate features which will encourage occupants to reduce the impact of their behaviour – that is to "nudge" them into better practices. Considerations for the design process may include:

- Enhancing biodiversity, for example through incorporating new and existing flora and fauna, creating habitat and generally enhancing the local environment through good design of structures;
- Incorporating energy saving features;
- Using, where possible, materials with low environmental impact e.g. materials that: 1) have low embodied energy; 2) can be sourced locally; 3) maximise the use of recycled products; and 4) have a long life and low maintenance requirements.
- Minimising waste both during construction, operation, maintenance and demolition. Consideration should be given to building into the design provisions for the segregation, storage and recycling of waste material during the operation stage;
- Incorporating water saving features both for consumption and discharge of wastewater; and incorporating grey water recycling and rainwater harvesting;

---

[13] US Environment Protection Agency, Lifecycle Assessment: Principles and Practice, May 2006 http://www.epa.gov/nrmrl/lcaccess/pdfs/600r06060.pdf

[14] National Audit *Office Appraisal and sustainable development* http://www.nao.org.uk/publications/1213/appraisal_and_sustainable_dev.aspx

[15] Office of Government Commerce, *Achieving Excellence in Construction*, 2007

- Taking into account the local climate to ensure that the infrastructure is robust to cope with future climate change and does not impede adaptation to climate change in other sectors, for example by affecting bio-diversity;
- Enhancing the historic or local environment through using local materials and traditions. Where appropriate, the design should focus on achieving a style, scale, proportion and quality in keeping with the surrounding area;
- Assessing the possible impact on the health and safety of the facility's occupants or those involved in construction when specifying materials or installing equipment;
- Consulting on the design with the local community and other relevant stakeholders; and
- Ensuring that the long term effect of climate change is considered and mechanisms are put in place and included in initial designs to address the potential impacts, for example of flooding or higher summer time temperatures. This applies to the infrastructure itself and the surrounding areas, natural environment and local communities.

3.24 In infrastructure projects **procurement** principles can apply to the project as a whole or to the purchase of goods or services within the project. Governments can use the procurement process to drive the efficiency of suppliers and their supply chains and to influence the delivery of the infrastructure and ensure that environmental and sustainability considerations are built into the construction and operation of the infrastructure (Figure 7). The most effective way to pursue environmental objectives through procurement is to consider them at the earliest stage of the procurement process; at the business case and when defining needs and specifications.

Figure 7: Addressing environmental and sustainability issues during the procurement process

- **Business case.** This is the stage at which there is most scope for considering environmental and sustainability impacts. A key step is considering the need to procure. Through effective demand management the need to procure may be avoided. Alternatively, the need can be defined in such a way as to minimise resources consumed.
- **Specification.** Considerations should be included where they are relevant to the subject matter of the contract. They include what the product consists of (e.g. cleaning services using products with low chemical content), how it performs its function (e.g. energy efficient light bulbs), and its suitability for responsible disposal (e.g. easily recyclable parts). Certain production processes can also be specified (e.g. electricity from renewable sources, timber from sustainably-managed forests).
- **Selection.** At this stage, the procurer should ask tenderers for relevant evidence of technical capability to deliver the environmental specifications.
- **Award.** All public contracts should be awarded on the basis of value for money on a whole-life cost basis, not lowest up-front price. They should be evaluated from the point of view of the procurer; wider costs or benefits to society should have already been considered and built in to the specification.
- **Contract and supplier management.** Contract conditions should be used to ensure suppliers provide appropriate information on their performance against environmental/sustainability requirements. Outside of formal conditions, there are often opportunities to work with suppliers and their own supply chain on a voluntary basis to raise awareness of environmental and sustainability objectives.

Source: NAO 'Addressing the environmental impacts of Government procurement', 2009[16]

3.25 The key stage in which environmental and sustainability issues are considered is when the project brief is developed into an output based specification in which the environmental and sustainability objectives are defined. Where appropriate, performance or functional specifications should be used and apply over the lifetime of the infrastructure and cover construction, operation and disposal.[17] Sustainability considerations should be used in the tender pre-qualification, evaluation and award process, in order to select the most suitable contractor. To be useful as criteria for selection of bidders and for monitoring the performance of the selected bidder, the tender criteria need to be well-defined and measurable. The evaluation methodology should test the compliance of the bids against the criteria and requirements set out in the specifications. Examples of ways in which environmental and sustainability considerations can be included in the infrastructure specifications are included in Figure 8.

16 http://www.nao.org.uk/publications/0809/addressing_sustainable_procure.aspx

17 Office of Government Commerce, Achieving Excellence in Construction, 2007

Figure 8: Examples of environmental infrastructure specifications in procurement contracts

- Setting out biodiversity standards that need to be met and how performance will be measured. This may include a requirement for a Biodiversity Management Plan.
- Setting targets for energy consumption during construction and in operation as well as how they will be monitored.
- Setting targets for water consumption both during construction and when the infrastructure is in operation.
- Setting targets for re-use and recycling and waste minimisation and reduction during the construction and operation of the infrastructure. This could also include a requirement that contractors provide a Waste Management Plan.
- Setting out requirements that the materials used will contribute to the sustainability and environmental performance of the infrastructure. E.g. re-use of materials; avoidance of environmentally damaging materials or those that are harmful to humans, flora and fauna.
- Setting out requirements on health and safety of the workers; targets for employment of local people; targets on equality and diversity (e.g. ethnic minorities; women; indigenous groups);
- Setting out provisions for consultation of the local community to identify their needs, views and opinions on design, construction and operating issues; and to address noise and nuisance.

Source: NAO

3.26 As with the impact assessments, it is important to make decisions about procurement by considering all the impacts of products and services throughout their lifecycle. **Life Cycle Assessment** (LCA) and **Whole-Life Costing**[18] provide tools to quantify and assess the consequences of products or services at all stages of an infrastructure project.[19]

3.27 **Contract management** is the phase of the procurement cycle in which a supplier delivers the required goods or services in accordance with a procuring authority's specification.[20] Public bodies responsible for projects funded by public-private partnership or with considerable outsourcing can set out in the contract the rights and responsibilities of the infrastructure developer and set in place mechanisms to monitor and hold them to account. The contract enables the contractor to monitor and report performance against the environmental criteria in the tender specification.[21] It is vital to establish effective contract management processes and resources in good time to drive excellent supplier performance throughout the contract. Furthermore, the contract should be drawn up in such a way so that it is responsive to change. There could be changes to policy requirements; funding availability or there may be changes in technology which can make a step change in performance possible and the public body sponsor will want to be able to take a share in the benefits arising.

3.28 Governments can set out guidance on voluntary **best practice** in sustainability and environmental considerations and there may also be professional best practice standards which can be used as criteria in infrastructure design and tender specifications. Governments may elect to make **official standards** which form mandatory specifications to ensure that sustainable outcomes are achieved[22]. There are many examples of international and national best practice standards, such as the EU Greening Public Procurement Standards (Figure 9), for sustainable forestry products (the Forest Stewardship Council certification), for building standards (in the UK, BREEAM assessments of the sustainability of building specifications), and health and safety standards for working environments.

18 Chartered Institute for Public Finance and Accounting http://www.cipfa.org/Policy-and-Guidance/Publications/W/Whole-Life-Costing

19 A product's life cycle is generally broken down into stages.: 1) Product design ; 2) Raw material extraction and processing; 3) Manufacturing of the product; 4) Packaging and distribution to the consumer; 5) Product use and maintenance; 6) End-of-life disposal

20 http://www.ogc.gov.uk/policy_and_standards_framework_contract_management_.asp

21 Thomas E. Glavinich, *Contractor's Guide to Green Building Construction: Management, Project Delivery, Documentation, and Risk Reduction*, 2008

22 http://sd.defra.gov.uk/advice/public/buying/

Figure 9: EU Greening Public Procurement Standards

The EU Commission has a set of Greening Public Procurement (GPP) standards which have been designed to help government buyers in member states procure sustainably. The Commission has developed 19 common GPP criteria. The priority sectors for implementing GPP were selected through a multi-criteria analysis including: scope for environmental improvement; public expenditure; potential impact on suppliers; potential for setting an example to private or corporate consumers; political sensitivity; existence of relevant and easy-to-use criteria; market availability and economic efficiency. The criteria are regularly updated. The GPP approach is to propose two types of criteria for each sector covered:

- The core criteria are those suitable for use by any contracting authority across the Member States and address the key environmental impacts. They are designed to be used with minimum additional verification effort or cost increases.
- The comprehensive criteria are for those who wish to purchase the best environmental products available on the market. These may require additional verification effort or a slight increase in cost compared to other products with the same functionality.

Source: European Commission http://ec.europa.eu/environment/gpp/what_en.htm

MECHANISMS FOR THE ONGOING MONITORING AND EVALUATION OF ENVIRONMENTAL AND SUSTAINABILITY IMPACTS

3.29 The assessment and monitoring of the impacts of an infrastructure project during its operation, maintenance and disposal should be an ongoing, iterative process to accommodate variations in its function, new standards or best practice, improved knowledge, changing impacts, such as those associated with climate change, and the infrastructure's contribution to changing policy objectives. The structures to ensure effective accountability against planned environmental and sustainability outcomes should be designed and embedded during the project start up stage to ensure appropriate monitoring of compliance and re-assessment of performance throughout the project lifecycle.

3.30 An infrastructure operator may commit to using an **environmental management system** (EMS) to routinely monitor its environmental performance and improve and control it. The International Organisation for Standardisation has developed an internationally accepted standard for implementing an effective EMS, known as ISO 14001[23]. To obtain ISO recognition for its EMS an organisation must:

- Formulate an environmental policy, which formally outlines its commitments to environmental management;
- Identify its significant environmental impacts – for example energy consumption, emissions to air, water pollution, waste, water consumption, resource consumption;
- Set measurable objectives to reduce its environmental impacts, with quantified targets in all significant impact areas;
- Review and report internally its environmental performance and carry out internal auditing where appropriate.

3.31 Infrastructure will inevitably deteriorate during the course of its lifecycle and changes in other factors, such as climate change, may impact on the infrastructure and its surroundings and its ability to fulfill its purpose. This will present decisions about when and whether to **maintain, refurbish or dispose** of it. The infrastructure owner or operator needs to monitor and assess routinely the performance of the infrastructure. The key structures and tools for this continual monitoring process should be identified and implemented during the design phase and be used to review options as the infrastructure ages.

3.32 During the use of infrastructure Government or other public environmental agencies will monitor continuing compliance with their regulatory requirements, including environmental permit conditions, and any evidence of emissions. In the event of environmental impacts increasing significantly regulators will need to consider enforcement action and whether they have powers to enforce closure and decommissioning.

[23] http://www.iso14000-iso14001-environmental-management.com/iso14001.htm

4.

HOW SAIs CAN AUDIT THE ENVIRONMENTAL AND SUSTAINABILITY IMPACTS OF INFRASTRUCTURE

4.1 Supreme audit institutions (SAIs) have differing mandates, which may include particular responsibilities to undertake and report compliance audits, of a public sector entity's compliance with the authority it has been given by the legislature; performance audits, of the economy, efficiency and effectiveness of programs, projects and activities; and environmental audits. The generic model of an infrastructure project's lifecycle presented in Part 2 together with the associated governance structures outlined in Part 3 demonstrate the wide array of potential areas for audit focus at both project and policy level. Such audits could be solely focused on the environmental and sustainability impacts of infrastructure or they could be of infrastructure investment, addressing its environmental and sustainability impacts alongside other issues associated with the efficiency or effectiveness of the project or programme.

4.2 The purpose of this section is to explore the approaches SAIs can take to examining how public bodies have responded to the environmental and sustainability challenges posed by the planning, construction, maintenance and decommissioning of infrastructure projects. It is informed by a number of case studies received from SAIs, for which detailed descriptions have been provided in Appendix 1. In particular this part explores audits of the environmental impacts of infrastructure through audits of:

- National infrastructure planning
- Infrastructure projects, programmes and portfolios at different stages of their lifecycle
- Operation of governance approaches to address environmental impacts
- Achievement of investment objectives

AUDITS OF THE NATIONAL APPROACH TO INFRASTRUCTURE PLANNING

4.3 SAIs may consider it beneficial to review their government's approach to prioritisation of national infrastructure investment. Governments may recognise that they can achieve a more rational approach to decisions on infrastructure investment by comparing the economic benefits and other impacts of major proposals and prioritising them. This may be considered more effective than decisions being taken within individual government ministries and allow the selection of priority developments which maximise economic growth or other national objectives, such as competitiveness. Audits may address the effectiveness of this prioritisation process, examining the evidence of the need for the investment and the identification and monetisation of the costs and benefits. Audits may address processes for mobilising resources from public expenditure and private sources and any barriers likely to affect delivery and government action to tackle them. For example:

- The Australian National Audit Office reviewed the work of Infrastructure Australia in undertaking the first National Infrastructure Audit and developing the first Infrastructure Priority List. The audit concluded that the published Prioritisation Methodology was sound, and combined monetised cost-benefit analysis of projects with analysis of an initiative's non-monetised effects, to determine the wider economic, environmental and social merits of an initiative. However the audit found that the Final Priority List included pipeline projects which were not justified according to their benefit cost ratio. (Appendix 1 Australia).

AUDITS OF INFRASTRUCTURE PROJECTS AND PROGRAMMES

4.4 SAIs may consider it appropriate to audit an individual infrastructure project because of the scale of investment involved and the benefits it is expected to bring or its impact on the economy or community. Audits may address the quality of decision taking on investment projects and very early stage review can assess the case for the investment before a final decision to proceed and to establish the likely impacts and consider the sufficiency of the benefits realization and impact mitigation arrangements.

For example:

- The US Government Accountability Office (GAO) carried out a study of **funding options** for establishing a clean water trust fund to support the increased investment needed for modernization and increasing the capacity of waste water treatment systems. The study focused on obtaining stakeholders' views on the issues that would need to be addressed in designing and establishing a clean water trust fund and looked at potential options that could generate about $10 billion in revenue to support a clean water trust fund. (Appendix 1 US (1))

- OAG Thailand audited the Bangkok Super Skywalk Project **prior to construction** of the second stage to review the sufficiency of the information available to support the Bangkok Metropolitan Administration's (BMA) decision to proceed with the project. The audit found that the BMA did not have a feasibility report for the project and had not undertaken an environmental impact assessment to clarify the benefits and the environmental impacts from construction. The BMA's consultation on the project had not covered all aspects of costs and benefits. The audit also found that the consultation was difficult and costly to respond to for the public, limiting its representativeness. Following the audit it was acknowledged that the evidence base for the project was not sufficient and that the project was not sustainable. Consequently,the BMA cancelled the second stage of the project. (Appendix 1 Thailand)

4.5 Audits may address projects at a later stage to provide accountability for the expenditure involved and the environmental impacts or benefits realized by the project; to identify lessons learned for the operation of the infrastructure or for the development of other infrastructure projects. The audit may address projects as a whole or particularly focus on how the projects have addressed their environmental impacts. Alternatively it may address a number of such projects. For example:

- The Estonia National Audit Office audited the state's management of district heating, within a wider study of the sustainability of the district heating supply. The audit found that heat losses from district heating networks were substantially higher than they should have been and hence the systems were not fully delivering the environmental advantages they should be achieving. The manner in which district heating prices were set by the Estonian Competition Authority had not been successful in ensuring sustainability and the good condition of the systems. The cost of renovation of the systems was not known and there was no development plan, nor was there any clarity over whether state financial support could be given to areas where investment is needed to address the poor condition of the heating systems. (Appendix 1, Estonia (1))

- The EU Court of Auditors undertook an audit of EU Structural Measures spending on water supply infrastructure **projects** and included a look at the management procedures in place as well as a review of the financial cost/benefit analyses carried out and the completed projects. The audit found that whilst structural spending has contributed to improving the supply of water for domestic use, better results could have been achieved at a lower cost by improving the forecasting of future demand and by delivering better planning to ensure that the complementary infrastructure required for the entry into operation of the projects is available on time. (Appendix 1 ECA)

- The Brazilian Court of Audit (TCU) reviewed its audits of infrastructure from 2004 to 2009. The review identified the main types of non-compliance with environmental regulations that the audits had found. More than half of the environmental findings were from failure to obtain an environmental permit. One third of the environmental findings were in audits related to highways schemes and one third related to urban infrastructure, buildings and dams. The review concluded that the inclusion of environmental checks in the audits of infrastructure had contributed to improvements in environmental management. (Appendix 1, Brazil (1))

4.6 Audits may be one-off or part of a series addressing the infrastructure development over an extended period. For example:

- The UK National Audit Office has undertaken a series of studies on the Preparations for the London 2012 Olympics from the initial bid through to readiness for the Games in 2012. The audits have examined the project at **multiple stages** of the infrastructure lifecycle as the project has progressed. The reports have addressed plans to deliver the project's commitment to achieving long term, sustainable regeneration alongside wider consideration of cost and progress against plans. Later in the project the audit included a focus on the sustainable use for the sites and the legacy from the games. The series of studies has allowed audit recommendations to feed into the start-up and construction phases of the project and has enabled close monitoring of progress against the original plans and objectives. (Appendix 1 United Kingdom (1))

- The Estonia National Audit Office reviewed national road maintenance in 2006 and followed this up with a further review in 2012. The study assessed whether road performance had improved, including its compliance with environmental requirements. It found that costs had increased more than the relevant price index and there was still evidence of poor maintenance, particularly in the winter. (Appendix 1 Estonia (2))

AUDITS OF THE OPERATION OF PROCESSES TO ADDRESS ENVIRONMENTAL IMPACTS OF INFRASTRUCTURE

4.7 SAIs may undertake audits of compliance with and effectiveness of laws and regulations and other **governance frameworks** such as those outlined in Part 3. Audits can address compliance and enforcement of laws and regulations for individual infrastructure projects or for a wider sample of projects, to identify where there is scope for improvement in the administration of the regulations. For example:

- The Brazilian Court of Audit examined the performance of the federal environment agency (IBAMA) in carrying out Environmental Impact Assessments. It found IBAMA's monitoring was focussed only on whether conditions and mitigation measures defined in the environmental license were in place. It did not verify the effectiveness of those actions and whether the goals of the environmental licensing were being achieved. The audit recommended that IBAMA should establish a systematic monitoring system to ensure compliance with the conditions and mitigation measures of the license throughout the infrastructure's lifecycle. The study also covered performance considerations by investigating the relative importance given to environmental and social impacts, recommending improvements in environmental impact assessment methodology, procedures and technical criteria. This combination highlights the importance of both the initial implementation of governance structures, such as a regulatory regime, and the continuing monitoring of the implementation of conditions and mitigation measures throughout the subsequent lifecycle stages. (Appendix 1 Brazil (2))

- The Brazilian Court of Audit subsequently carried out a study of two major infrastructure projects which were issued environmental permits to evaluate whether they had been compliant in mitigating the environmental impacts in accordance with the conditions of their licenses. (Appendix 1 Brazil (3))

- The US Government Accountability Office carried out a study of the time taken to complete highway projects. This examined the many factors contributing to the length of time taken to complete highways investment projects and the effectiveness of provisions to expedite it, including streamlining of some elements of the environmental review process. The study found that although environmental reviews were a significant contributor to the time taken to complete projects, States' Departments for Transport did not wish to seek to speed up the process by taking responsibility for environmental review decisions from the Federal Highway Administration, which they considered had the staff and expertise to take informed decisions on environmental impacts. (Appendix 1 United States (2))

4.8 Audits can also address organisations' **compliance** with good practice **governance tools** in their infrastructure projects in order to identify whether reliance on such voluntary approaches can be effective and identify any barriers to their effectiveness. For example:

- The US Government Accountability Office (GAO) carried out a survey across major airports to identify trends in their consideration of environmental impacts in planning decisions, following environmentally sustainable standards and implementing Environmental Management Systems. The audit found that almost all airports were taking some action to address their environmental impacts and the larger airports were taking a wider range of actions. Airports were moving towards more holistic consideration of their environmental impacts, including using Environmental Management Systems. (Appendix 1 United States (3))

- The UK National Audit Office undertook a study of central government organisations' compliance with administratively required governance structures and standards for procurement and contract management to ensure sustainable construction and refurbishment of the government estate. The study found that standards were not being met and central government organisations were not carrying out environmental assessments. The study recommended that accountability should be clarified, with more outcome based performance targets and better reporting and more use of Whole-Life Costing. (Appendix 1 United Kingdom (2))

AUDITS OF INFRASTRUCTURE PROJECTS' CONTRIBUTION TO ACHIEVEMENT OF ENVIRONMENTAL OBJECTIVES

4.9 SAIs can undertake audits of performance in meeting environmental objectives, which address infrastructure projects' achievements alongside the results from other policy tools to deliver the intended outcome. For example:

- The New Zealand Audit Office audited a sample of Local Authorities to examine whether they were effectively managing supplies of drinking water to meet the likely future demand. This examined and compared the use of a range of governance tools employed in forecasting demand for drinking water, developing management and risk strategies, as well as the governance arrangements for the delivery of water. The study reported that some Local Authorities were using unsatisfactory methods for demand forecasting and so there was uncertainty over their infrastructure needs. The Local Authorities considered they faced a challenge in meeting forecast demand, including the ability to fund necessary infrastructure upgrades. The report concluded that none of the local authorities had a fully integrated approach to dealing with sustainable development and supplying drinking water. (Appendix 1 New Zealand)

- The Estonia National Audit Office audited the development of waste water treatment in rural areas with the support of the Cohesion Fund. The audit covered 63 local authorities and evaluated the preparation, instigation and financial stability of the waste water treatment systems developed. The key finding was that the state would not achieve its commitment to improve waste water treatment systems to achieve sound drinking water and waste water quality by 2010. The audit found some Local Authorities were not involved in the necessary water supply and sewerage projects and some did not have the development plans needed to inform such projects. Poor financial analysis and planning against tight time pressures to submit plans contributed to delays in launching the projects. (Appendix 1 Estonia (3))

APPENDIX I

CASE STUDIES

AUSTRALIA

Conduct by Infrastructure Australia of the First National Infrastructure Audit and Development of the Infrastructure Priority List

July 2010; 2010/2011 report number 2; Australian National Audit Office, available in English at http://www.anao.gov.au/~/media/Uploads/Documents/2010%2011_audit_report_02.pdf

Infrastructure Australia was established to work with the States and Territories to identify and achieve the most effective outcomes for nationally significant infrastructure. Its objectives are to increase the economic standard of living for Australians; environmental sustainability and reduced greenhouse gas emissions; and better social outcomes, quality of life and reduced social disadvantage in cities and regions.

The audit objectives

To assess the effectiveness of Infrastructure Australia's conduct of the first National Infrastructure Audit and development of the Infrastructure Priority List.

The scope of the audit

Infrastructure Australia's methodology and process for reviewing infrastructure submissions; the conduct of the Infrastructure Australia's first National Infrastructure Audit; the formulation of Interim and Final Infrastructure Priority Lists; and the provision of advice and recommendations to the Government.

Conclusions of the audit

- The published National Infrastructure Audit framework was sound.
- Infrastructure Australia's methodology provided a robust framework for the development of the Interim and Final Infrastructure Priority Lists.
- The reasons for shortlisting the particular projects which appeared on the Interim Priority List were not fully documented
- Proponents of projects included on the Interim Priority List were given an opportunity to provide further and better information in support of their projects, but this process was unsuccessful in significantly improving the material available to inform the development of the Final Priority List.
- The Final Priority List contained both 'priority' projects and 'pipeline' projects. The priority projects met the criteria set out in the published Prioritisation Methodology but the pipeline projects did not demonstrably satisfy the tests, including that the primary driver of the Priority List be a project's benefit cost ratio.

The SAI's key recommendations

- Infrastructure Australia should promote greater transparency over the development of future Infrastructure Priority Lists by maintaining records that clearly outline when decisions are taken to include projects on the List, and the reasons for their inclusion.
- future prioritisation processes should include information in the published guidance on the different criteria that will be applied to discriminate between priority projects that are ready to proceed and those that exhibit potential but require further development before being considered for possible funding.
- when reporting the results of future infrastructure project prioritisation processes, Infrastructure Australia should provide clear advice on: the relative priority of projects recommended for funding consideration having regard to the results of its appraisal of their economic merits and other factors; the level and form of Commonwealth funding it recommends for priority projects that are ready to proceed; and any other projects it would support being considered for planning and/or design work funding.

Responses of the government to the audit

- Infrastructure Australia welcomed the involvement of the Australian National Audit Office and agreed, or agreed with qualification, to each of the recommendations.

BRAZIL (1)

Evaluation of environmental monitoring carried out by the Brazilian Court of Audit in the federal infrastructure works.

May, 2010; Brazilian Court of Audit, Judgment N° 968/2010
Plenary; available in Portuguese at www.tcu.gov.br

The audit objectives

- Each year, an audit report is sent to the National Congress regarding the execution of the infrastructure works covered by the Federal Budget. This annual audit report is based on information from audits of public works conducted by the Brazilian Court of Audit. These individual audits verify the compliance with the conditions defined in environmental permits, among other aspects.

- Thus, this study consolidated and analysed the environmental findings in audits of public works from 2004 to 2009 in order to evaluate compliance with environmental licensing.

The scope of the audit

The scope of this study is to present the environmental situation of federal public enterprises verified in audits of public works under the responsibility of the Court of Audit. The infrastructure works of greater importance audited by the Court of Audit are usually those that cause significant environmental impact on national or regional levels. The federal environment agency, the Brazilian Institute of Environment and Renewable Natural Resources – IBAMA, is responsible for issuing the environmental licenses.

The environmental and sustainability issues within scope of the audit

- Is there a tendency for greater attention to environmental requirements in federal infrastructure works?

- What are the most frequent irregularities in the works audited by the Court of Audit?

- Do any federal government agency or entity stand out in the number of environmental findings?

Conclusions of the audit

- The environmental findings were mainly related to the lack of licensing or improper licensing. More than half of the audits (54.1%) found no environmental permit in place. Approximately one third of these environmental findings came from deployment, duplication, restoration and maintenance of highways and another third from works of urban infrastructure, buildings and dams.

- The National Department of Works Against Droughts was responsible for 22 environmental findings in 51 of its works inspected by the Brazilian Court of Audit between 2004 and 2009.

- The National Department of Transport Infrastructure accounted for 45% of the audits between 2004 and 2009 and was responsible for 43% of the environmental findings. Irregularities related to the environment were identified in about 15% of its inspected works. Between 2005 and 2008 the National Department of Infrastructure was the federal entity that received the most fines ($ 8.6 million), infraction notices, embargoes and other sanctions applied by IBAMA for failure to fulfil standards of environmental licensing. It was concluded that it would be opportune to carry out further work to assess the Department's environmental management of public works.

- It was concluded that the audits of infrastructure works and their consideration of environmental aspects played an important role in achieving improvement in environmental management.

BRAZIL (2)

Audit of the Process of Environmental Impact Assessment of Public Works in Brazil.

July 2009; Brazilian Court of Audit, Judgment N° 2.212/2009 –Plenary; available in Portuguese at www.tcu.gov.br

The audit objectives

- Provide an analysis of the process of the federal environmental impact assessment of public works.

The scope of the audit

Environmental impact assessments of large infrastructure projects, under the responsibility of the Brazilian Institute of Environment and Renewable Natural Resources (IBAMA) between 2004 and 2009.

The environmental and sustainability issues within scope of the audit

- Whether IBAMA's Department of Environmental Licensing performs a continuous assessment of environmental impacts for each project.

- Whether the Environmental Impact Assessments carried out by IBAMA use criteria and indicators that characterise the actual and potential benefits from the process.

- Whether the steps involved in the Assessment of Environmental Impacts are standardised in order to improve its analysis.

Conclusions of the audit

- IBAMA's procedures for Assessment of Environmental Impacts were very focused on the examination of formal requirements, with less attention to the environmental and social effects of a given project or the effectiveness of the proposed mitigation measures.

- once the project was licensed, IBAMA's action was limited in verifying whether mitigation measures were implemented as expected and if those measures achieved their goals of environmental protection.

- a lack of formal methodologies, indicators and criteria hindered significantly the generation of good-quality federal EIAs.

The SAI recommended:

- Develop standards and specific rules for the procedures, technical criteria and methodologies adopted in the federal Environmental Impact Assessment process;

- Establish systematic monitoring of the effective implementation of mitigation measures as prerequisite for issuing operational licenses;

- Study the feasibility of creating a consolidated report with the ex post evaluation of mitigated and unmitigated impacts, good practices observed and environmental benefits of the process of EIA, based on the environmental performance of the developments authorized by IBAMA.

BRAZIL (3)

Evaluation of the process of Environmental Impact Assessment in Federal Government´s infrastructure works - Case Study.

Not published

The audit objectives

To evaluate if the post-decision monitoring process for federal government infrastructure works ensures environmental impacts are properly mitigated and / or compensated for during installation and operation; and to evaluate the efficiency and effectiveness of the mitigation measures.

The scope of the audit

Evaluation of whether mitigation measures were effective in mitigating impacts, in accordance with conditions defined in the environmental licence, for two large infrastructure projects.

The environmental and sustainability issues within scope of the audit

- Were the measures implemented by developers effective in mitigating the environmental impacts in accordance with the conditions of the environmental licenses issued by t he Brazilian Institute of Environment and Renewable Natural Resources (IBAMA).

- Did the developers' environmental management observe the principles for monitoring and good international practices after the license was issued?

Conclusions of the audit

The lack of a post-decision monitoring process does not allow the identification of what measures can be adopted to ensure that the objectives of EIA are achieved with the least environmental impact and lowest cost.

IBAMA has a low capacity for organizational learning, because of its rotation of technicians in its Environmental Board Authorization team and a lack of internal mechanisms for capturing the knowledge gained in the monitoring phase.

There is no evaluation of effectiveness of the environmental programs implemented during the construction phase. Thus, there is no feedback that will allow future mitigation measures and future EIAs to incorporate what may have been successful or unsuccessful in the construction of transportation infrastructure works.

IBAMA's analysis of monitoring reports should include an assessment of the effectiveness of mitigation measures and of the environmental programs as well as the verification of compliance with the conditions of the environmental license. To achieve this, IBAMA should request from the developer a consolidated report on the implementation of environmental programs, in order to highlight experiences, good practices that could be replicated and programs whose results fell short of what was expected.

IBAMA should also determine that mitigation measures have clearly defined goals and targets, with measurable indicators that can be used to evaluate the effectiveness of each environmental program.

ESTONIA (1)

The state's actions in ensuring the sustainability of heating supply

Full report available in English: www.riigikontroll.ee

The audit objectives

Sixty percent of Estonia's population uses district heating: heat, which is generated in boiler plants or power stations and distributed to consumers via heat networks. The objective of the audit was to assess whether the state has organised the activities in the heating supply sector (first and foremost district heating) to ensure secure, reliable, effective heating supply meeting environmental requirements and the needs of consumers.

The scope of the audit

- the activities of the Ministry of the Economic Affairs and Communications in regulating district heating, identifying the need for investments and support and organising price formation and monitoring;
- the activities of the Estonian Competition Authority in approving the price of district heating and organising monitoring;
- the activities of the Environmental Investment Centre of the Ministry of Finance in assessing applications for support measures and adopting financing decisions.

The environmental and sustainability issues within scope of the audit

- The management of investment in the system and associated efficiency of the production and distribution of heat.
- The regulation of the price of heat with the aim of ensuring a sustainable supply of heat for customers in the future, including the assessment of the need for investment.

Conclusions of the audit

The Ministry of Economic Affairs and Communications has paid insufficient attention to the sustainability of the nation's heating supplies:

- The state and many local authorities lack a broad understanding of their heating supply situation (i.e. length and condition of heat networks), and in particular of district heating. A national heating supply development plan has not been drafted.
- Many consumers are forced to use district heating even where it is more expensive and less efficient than other alternatives (such as local boiler plants, heating pumps etc.).

Conclusions relating to environmental and sustainability findings

- The price setting process has not ensured a sustainable supply of heat for consumers in the future. Therefore it is not always guaranteed that the companies are investing in a way that will make production and distribution of district heating more efficient.
- It is not known how much money must be invested to renovate the district heating systems and whether district heating companies are willing and able to make such investment by themselves.
- In the process of assessment of applications for support very little attention was paid to the sustainability of district heating regions and projects. This might have led to support for projects which are unable to sustain themselves in future.

Responses of the government to the audit

The audit was published in 2007. The ministries and authorities admitted most of the problems related with heating supply in Estonia. Estonian Competition Authority agreed with the audit recommendations, but did not admit most of the problems related with the price regulation. However, the Authority has started to fix up their price regulation processes.

ESTONIA (2)

Road maintenance and supervision of road maintenance

February 2012
Summary report available in English: www.riigikontroll.ee

The audit objectives

There are 16,500 kilometres of state roads in Estonia. Every year 4 to 6.5 per cent of state roads are renovated or repaired. In addition to road construction and renovation, the roads, bridges and supporting infrastructure have to be maintained constantly to keep them in good condition to ensure traffic safety and enable the roads to be used in the wintertime. The state spends about 45 million euros a year on the maintenance of national roads.

The scope of the audit

The Ministry of Economic Affairs and the Communications and Road Administration's oversight of contracts for maintenance of the roads and whether the roads have been maintained economically and in accordance with the requirements, to ensure their safety and maintain their sustainability in the long-term. Bridges and overpasses are expensive infrastructure and their maintenance is important for extending their lifetime.

The environmental and sustainability issues within scope of the audit

Road maintenance has to be performed in accordance with environmental requirements. The maintenance of roads involves the use of chlorides for melting ice and pesticides for weed control. There are no legal limits on the use of chlorides; but pesticide use is regulated within water regulations.

Conclusions of the audit

The Roads Administration has not improved the organisation of the maintenance of the roads since the previous audit and the increase in the cost of roads maintenance from 2006-2009 was 8 per cent higher than the relevant price index. Costs have increased because of an increase in the volume of repair works ordered from road maintenance companies and limited competition to keep costs down. But some maintenance works have not been completed and therefore there is a risk that some bridges and overpasses are not in good condition.

The goal of road maintenance is not unambiguously clear, the government has not set technology requirements for maintenance works and contracts with road maintenance companies do not establish what maintenance works should comprise.

The most serious maintenance problems appear in the winter. Main roads are maintained but many side roads are not cleared of snow. Many maintenance problems are also evident in the summer, with the maintenance of many bridges not carried out and gravel roads allowed to become full of holes or uneven. Road maintenance companies have also not generally addressed responsibilities for limiting their pesticide use.

The Road Administration's supervision of maintenance contracts is inadequate. Roads are not inspected often enough or closely enough.

Responses of the government to the audit

The Minister of Economic Affairs and Communications has concluded that the government should review the principles for the organisation of road maintenance, in cooperation with the Roads Administration.

ESTONIA (3)

Development of waste water treatment in rural areas with the support of the Cohesion Fund's projects

Published in 2010 - summary available in English: www.riigikontroll.ee

The audit objectives

The National Audit Office examined the work of state agencies and local authorities in launching the first water management projects financed through the Cohesion Fund during the 2004-2006 programme period of the European Union.

The scope of the audit

The audit covered 63 local authorities and 7 regions of water companies. Three projects (the Western islands, the Matsalu ecological reserve and the Emajõgi and Võhandu Rivers) were audited in terms of the success of their preparation and instigation and financial sustainability of their water management systems.

Financial sustainability of water infrastructure development projects was considered a crucial success factor. The amortisation time for pipelines is 30 years after what they need to be recovered. So the water price has to cover management costs and ensure funds for future renovation works.

Conclusions of the audit

- Too little funding was planned for the improvement of water management systems.

- There were problems with the involvement of local authorities in instigating projects. The Ministry of the Environment currently had no power to oblige local authorities to instigate projects, where they had no interest to do so. Some local authorities were poorly prepared for their involvement in projects, lacking, amongst other things, a public water supply and sewerage system development plan.

- There were shortcomings projects' financial analysis and their technological solutions. Poor funding applications and confusion in assessing environmental impact led to delays in launching projects.

- Delays in projects caused a sharp rise in building costs leading to projects needing to seek additional state financing. During the project duration, the cost of building tenders for the environmental sector had gone up by an average of 1.8 times.

- The organisation of waste water treatment in rural areas, with support from the EU Cohesion Fund, would not guarantee the sustainability of the sector, as not all costs had been taken into consideration in determining the price of water and sewerage services.

Responses of the government to the audit

- Although the Minister of the Environment considered it important to compensate for the rise in the prices of water management caused by increasing construction prices, the Minister found it difficult to develop common principles for subsidy, because the capacity of the local authorities was very different.

- The Minister of the Environment confirmed that a legislative amendment had been initiated to resolve the problems associated with the establishment of water prices.

- The role of approving the price of water supply and sewerage services was transferred from local authorities to the Estonian Competition Authority in 2010.

- In 2010 the Environmental Information Centre used environmental monitoring data to conclude that the efficiency of wastewater treatment in Estonia had improved. Wastewater to be treated passed biological or more stringent treatment systems and the latter had brought about decrease in the pollution load for organic matter as well as for phosphorus and nitrogen.

UNITED STATES (1)

Clean Water Infrastructure: A Variety of Issues Need to Be Considered When Designing a Clean Water Trust Fund (GAO-09-657)

May, 2009 Report available in English at: www.gao.gov/new.itema/d09657

The audit objectives

GAO was asked to (1) obtain stakeholders' views on the issues that would need to be addressed in designing and establishing a clean water trust fund and (2) identify and describe potential options that could generate about $10 billion in revenue to support a clean water trust fund.

The scope of the audit

To identify issues that need to be addressed in designing and establishing a clean water trust fund and funding options for such a fund, GAO reviewed past legislative proposals and industry position papers and interviewed more than 50 different stakeholders with knowledge of a variety of wastewater infrastructure issues, including individuals and groups from the wastewater industry, industry associations, and federal, state, and local governments. GAO also administered a questionnaire to 28 national organizations representing the wastewater and drinking water industries, state and local governments, engineers, and environmental groups to obtain their views on the issues that need to be addressed in designing and establishing a trust fund as well as their views on the potential funding options that could be used for this fund. GAO received 22 responses, for a response rate of 79 percent. To estimate the revenue that the options identified could potentially generate, GAO used the most recent government data available to estimate the value of products or activities that could be subject to a federal tax and applied a range of tax rates to these values based on current or past taxation policies. In addition, GAO interviewed federal and state officials to identify the challenges likely to be associated with implementing the funding options identified.

Conclusions of the audit

GAO did not make any recommendations. While this report identified a number of funding options, GAO did not endorse any option and did not have a position on whether or not a trust fund should be established.

Responses of the government to the audit

The audit did not make any recommendations for federal action as a result of this work. A draft of the report was provided to the U.S. Environmental Protection Agency and the Internal Revenue Service for review and comment. Neither agency provided written comments. The Environmental Protection Agency provided technical comments, which were incorporated as appropriate.

UNITED STATES (2)

Highway Projects: Some Federal and State practices to expedite completion show promise (GAO-12-593)

June 2012 Report available in English at: http://www.gao.gov/assets/600/591420

The audit objectives

This report addressed the following objectives:

- To review the process associated with completing highway projects and Federal provisions to help expedite the process

The scope of the audit

The audit addressed:

- the process for planning, designing and constructing federally funded highway projects and factors affecting their time to completion;
- State departments' views on the benefits and challenges of initiatives to expedite highway projects;
- practices implemented by State departments of transport and the Federal Highway Administration to expedite highways projects.

Environmental and sustainability issues within scope of the audit:

The audit described the requirements for projects with a significant environmental impact to prepare an environmental impact statement and for projects with less significant impacts to prepare an environmental assessment.

Conclusions of the audit

The study found that it took on average 83 months to prepare and sign off an Environmental Impact Statement in 2009 and 69 months in 2010.

At preliminary design stage there are over 40 environmental laws which must be addressed as well as applicable state laws and for more complex projects the completion of preliminary designs and environmental reviews contribute to the time taken to complete the project.

States' Departments for Transport did not wish to seek to speed up the process by taking responsibility for environmental review decisions from the Federal Highway Administration, which they considered had the staff and expertise to take informed decisions on environmental impacts. But the GAO concluded the provisions for this delegation should be retained to give state Departments for Transport the opportunity to choose to take it up in future.

Responses of the government to the audit

The audit did not make any recommendations for federal action as a result of this work. However, a draft of this report was provided to the U.S. Department of Transportation (DOT) for review and comment.

UNITED STATES (3)

Aviation and the Environment: Systematically Addressing Environmental Impacts and Community Concerns Can Help Airports Reduce Project Delays (GAO-10-50)

September 2010 Report available in English at: http://www.gao.gov/new.items/d1050

The audit objectives

This report addressed:

- actions taken by airports to reduce the environmental impacts of their operations and development;
- the extent to which airports believe that environmental issues have or will delay capital projects or operational changes; and
- the strategies airports can adopt to mitigate delays in implementing capital projects and operational changes and address environmental issues.

The scope of the audit

A Web-based survey of officials from the 150 busiest U.S. airports. Interviews with officials from 10 airports that had been identified as needing additional capacity, having community involvement in environmental issues,being in areas which were not achieving pollution targets.

Interviews with officials from the federal, state, and local agencies responsible for oversight of airport operations and environmental issues, as well as representatives from a range of special interest groups. Literature review to determine leading practices in stakeholder and community involvement in environmental issues, including previous audit reports and reports by other relevant governmental bodies.

Environmental and sustainability issues within scope of the audit

The survey of airport officials included questions about the actions they take to reduce or control noise problems, water pollution, airport emissions and other environmental problems, and about the factors that help or hinder their airports in doing so. The survey also contained questions about the environmental impacts associated with the development and operations of airports and the actions airports are taking to balance these concerns.

Conclusions of the audit

Almost all of the airports surveyed took some actions to address environmental impacts in four key areas: reducing noise levels, controlling water pollution, reducing emissions, and using environmentally sustainable practices. Airports were moving toward a more holistic approach to environmental management.

Less than half of the surveyed airports believe that addressing environmental issues somewhat or greatly delayed a development project (35 percent) or operational change (42 percent) at their airport over the last 5 years, even though the vast majority had undertaken a capital development project or operational change during this time period.

A number of airports have adopted strategies to systematically address environmental impacts and community concerns, and are integrating environmental considerations into their planning process. Some airports are also working with the federal government to streamline the federal environmental review process. If airports could align their Environmental Management System (EMS) with the federal environmental review process they could improve the quality of their environmental analyses and decision making. Effective community outreach can help airports better anticipate and deal with community opposition

Responses of the government to the audit

The audit did not make any recommendations for federal action as a result of this work. However, a draft of this report was provided to the U.S. Department of Transportation (DOT) and the U.S. Environmental Protection Agency for review and comment.

UNITED KINGDOM (1)

- Preparations for the London 2012 Olympic and Paralympic Games - Risk assessment and management, February 2007
- Preparations for the London 2012 Olympic and Paralympic Games: Progress Report, June 2008, February 2010 and February 2011

Reports available in English at www.nao.org.uk

The audit objectives

To audit the government's preparations for hosting the London 2012 Olympic and Paralympic Games.

The scope of the audit

It considers the progress that has been made since July 2005 when the International Olympic Committee chose London as the host city for 2012.

The environmental and sustainability issues within scope of the audit

It considers the risks, challenges and progress in relation to planning for a lasting legacy, the prospect of which formed a key element of the Olympic bid. The legacy is viewed in terms of the venues that will remain after 2012, the regeneration of the local area, and also the wider benefits of the Games.

Key environmental and sustainability conclusions of the audit

February 2007: Work is ongoing to finalise proposals for the legacy use and ownership of the venues, and to develop plans for delivering and measuring the wider benefits of the Games.

The SAI recommended action should be taken to manage risk, including:

- developing robust business plans for the Olympic venues with a clear focus on whole-life costs;
- agreeing who will be responsible for each facility during the transition phase after the Games;
- identifying, and where possible quantifying, the key legacy benefits that it is realistic to expect from the Games, so that it will be clear whether they have been achieved.

June 2008: The Olympic Delivery Authority has established a dedicated team to implement its sustainability strategy and has established quantified and measurable targets. A requirement has been placed on every contractor to plan for how it will minimize environmental impacts and a system developed for monitoring and managing suppliers' performance against targets for sustainable development.

The SAI recommended the Government Olympic Executive's evaluation framework for assessing the impact of the Games should include baselines for measuring whether the expected legacy benefits are achieved.

February 2010: During 2009 the Olympic Park Legacy Company was formed to take responsibility for delivering a positive legacy from the Olympic Park.

The SAI recommended the Legacy Company should set out a clear plan for mitigating the costs of maintaining assets after the Games. Securing long term legacy usage should remain the priority.

February 2011: The Government Olympic Executive is accountable for the success of the legacy, but a range of delivery bodies outside the direct control of the Executive are accountable for individual projects.

The SAI recommended the Government Olympic Executive's evaluation framework should set out how the effects of the Games will be separated out from business as usual activities.

Responses of the government to the audit

The Olympic Executive has, as recommended by the Committee of Public Accounts in July 2008, set in train work to evaluate the legacy. A consortium of consultants and academics will examine the costs and benefits of the 18 programmes that comprise the legacy portfolio, with an interim report due in 2012.

UNITED KINGDOM (2)

Building for the future: Sustainable construction and refurbishment on the government estate

April 2007 Report available in English at www.nao.org.uk

The audit objectives

To audit government performance in meeting targets to make their new buildings and major refurbishments more sustainable.

The scope of the audit

- the extent to which departments and agencies are meeting the standards set for sustainable construction and refurbishment on the government estate;

- how departments and agencies evaluate value for money when designing and specifying sustainable buildings; and

- whether buildings on the government estate which were designed to be sustainable have delivered the expected benefits.

We appointed engineering and management consultants to assist us in this work.

Conclusions of the audit

The government has set sustainability standards for the construction and refurbishment of buildings on the government estate, but these are not being met. Departments are failing to carry out environmental assessments and achieve the target ratings.

Various barriers are hindering progress towards more sustainable buildings. These include, in particular:

- the fragmentation of policy responsibility among government bodies for improving sustainable construction and the absence of a coherent approach to monitoring progress and ensuring compliance;

- the lack of sufficient knowledge and expertise in sustainable procurement among those departmental staff responsible for them;

- the widespread perception of a conflict between sustainability and value for money – partly because project teams are failing to assess the long-term costs and benefits of more sustainable approaches; and

- the failure to specify expected benefits and undertake rigorous reviews to evaluate performance against them and the consequent lack of robust data to inform business appraisals for new projects.

The SAI's key recommendations

- The government should establish a clear understanding on the division of policy responsibilities for sustainable construction in the public sector, in such a way as to ensure clear accountability for this area of policy.

- The government should specify their requirements for environmental performance in terms of outcome base performance targets – including carbon emissions and energy and water

- The government needs to better monitor and report on progress to help understand and hold departments to account for environmental performance. Completed projects should be evaluated to assess whether they delivered the specified level of performance.

- The government needs to take full account of the government's environmental targets - and the wider social and economic impacts which sustainable buildings can bring - when assessing value for money, with clearer guidance on the use of whole life costing.

Responses of the government to the audit

The government established the Centre of Expertise in Sustainable Procurement (CESP) in 2008 to provide leadership focusing on environmental sustainability across government.

NEW ZEALAND

Local authorities: planning to meet the forecast demand for drinking water

February 2010 Report available in English at: www.oag.govt.nz

The audit objectives

Many parts of New Zealand are experiencing increasing demand for water, which puts pressure on water sources and the capacity of the infrastructure (that is, the pipes and water treatment plants). Local authorities are responsible for the supply of drinking water and ensuring there is adequate infrastructure and strategies in place to meet the needs of their communities.

The audit examined whether a representative sample of eight local authorities were effectively managing their supplies of drinking water to meet the likely future demand for it.

The scope of the audit

The audit looked at the forecasts the local authorities used to identify the likely future demand for drinking water, and the strategies they were using to make sure they could meet that demand. We appointed engineering and management consultants to assist us in this work.

Conclusions of the audit

Only two of the eight local authorities reviewed were managing their drinking water supplies effectively and all eight local authorities had identified challenges to meeting the forecast demand for drinking water.

Six of the local authorities used a demand forecasting method that would be considered the minimum in terms of industry standards. Their ability to prepare reliable forecasts for drinking water demand was limited by the quality of their information, particularly water use data. Few of the eight local authorities explicitly addressed uncertainty in their forecasts. There were few examples of forecast verification or peer review.

Key environmental and sustainability conclusions of the audit

While most of the local authorities were clearly taking sustainable development into account, the actions they had chosen were partial rather than comprehensive. None of the local authorities had a fully integrated approach to dealing with sustainable development and supplying drinking water.

All eight local authorities had assessed what they needed to do to meet the country's drinking water standards. Their assessments informed the changes they were making and their increased capital expenditure for supplying drinking water. Five of the smaller local authorities need to upgrade their infrastructure, especially those that had previously received poor water quality grades.

The SAI recommended local authorities should

- use accurate and up-to-date information to prepare water demand forecasts to reduce the risk of under- or over-investing in water supply infrastructure;
- improve the efficiency of supplies by minimising water that is unaccounted for, to reduce the demand on existing water sources and the risk of over-investing in water supply infrastructure;
- participate in an independent benchmarking programme to measure efficiency in drinking water supply;
- prepare comprehensive demand management plans that integrate supply and demand strategies;
- carry out rigorous evaluations of the costs and benefits of supply and demand strategy options, to choose the most cost-effective and sustainable options.

Responses to the audit

The SAI provided individual, detailed reports to each of the local authorities audited. Several began making improvements as a result of those reports.

The report was well received by the wider local government sector and has been used by local authorities to improve their water supply management and future planning. **The SAI will conduct a follow up in 2011/12.**

RUSSIAN FEDERATION

Audit of the efficiency of the federal property and budget funds allocated in 2008 - 2009 to territorial administrations and subordinated establishments of Federal Agency on supervision in the nature management sphere in the Far Eastern Federal District for protection of the environment and nature management during preparation for the Asian Pacific Economic Cooperation forum

The audit objectives

Audit of the public funds usage allocated for carrying out Nature protection actions during the preparation for the APEC forum.

The scope of the audit

Efficiency of the public funds usage directed on carrying out the nature protection actions within the preparation framework for APEC forum.

Conclusions of the audit

Audit materials are directed to the Federal Assembly of the Russian Federation. Representations of the Accounts Chamber of the Russian Federation are directed to the Ministry of natural resources and ecology of the Russian Federation and Federal Agency of supervision in the nature management sphere.

Responses of the government to the audit

A special interdepartmental commission on the assessment of the observance of the nature protection legislation of the Russian Federation at building of objects of APEC 2012 summit is now functioning.

Constant control over the public funds usage is carried out by the territorial bodies and subordinated establishments.

THAILAND

Bangkok Super Skywalk Projects: Preventive Environmental Audit

Year 2011

The audit objectives

OAG Thailand selected the Bangkok Super Skywalk Projects to review the cost effectiveness of the project which was expected to cost Bt 10 billion (USD 334 million); and to consider its future environmental impact.

The scope of the audit

OAG reviewed BMA Super Skywalk Projects management plan in order to assess the feasibility of the project and environmental impact from the first day of declaration project to 10 August 2011.

The environmental and sustainability issues within scope of the audit

Under sustainable development, OAG concerns about environmental degradation from public construction especially mega projects. Therefore, preventive environmental audit of OAG focuses on sufficient information for decision making before initiating project.

Key environmental and sustainability conclusions of the audit

There was insufficient and imperfect information for decision making on the project investment.

There was inadequate consultation to obtain public opinion on the project.

Conclusions relating to environmental and sustainability findings

Under preventive environmental audit, the auditors focus on the sufficiency of information for decision making for initiating a project. As audit criteria, indispensible documents for mega project should be comprised of Feasibility study, Environmental Impact Assessment (EIA report), and Stakeholders' participation. Likewise, these documents could reflect the transparency of project before initiation.

The SAI found that BMA did not have a feasibility report and Environmental Impact Assessment. BMA could not clarify the groups that would benefit from or be disadvantaged by this project. In addition, BMA did not study the environmental impact from construction. Meanwhile, BMA conducted the opinion survey in order to support the project; therefore the survey did not cover all aspects of the project that might affect the environment and surrounding areas, and the cost and worthiness of the project. Furthermore, several channels to receive public opinion were too complicated and costly to respondents. Hence, there was a low response rate from people living in Bangkok.

Responses of the government to the audit

BMA decided to cancel the second phase of the Super Skywalk project.

EUROPEAN COURT OF AUDITORS

Is EU structural measures spending on the supply of water for domestic consumption used to the best effect?

Special Report No 9/2010
http://eca.europa.eu/portal/pls/portal/docs/1/7902724.PDF

The audit objectives

The main objective of the audit was to assess whether EU spending on water supply is used to best effect.

The scope of the audit

- the most appropriate solutions were adopted to meet the needs of the areas concerned;
- the co-financed projects were successful in improving the water supply;
- the objectives have been achieved at the lowest cost to the EU budget.

The audit assessed directly the performance of the investments both in terms of outputs and results. The audit was based on a direct review of 29 projects — 11 approved by the Commission and 18 approved by the managing authorities in the Member States.

Conclusions of the audit

The Court found that, whilst structural measures spending has contributed to improving the supply of water for domestic use, better results could have been achieved at a lower cost. In particular:

- forecasts of future water needs did not take into account downward trends in water demand nor all resources already available;
- measurable improvements have been achieved in terms of increased available volume of water, better water quality, and higher network yield and service continuity; however, some projects were not operational because of missing complementary infrastructure and monitoring of achievements was of variable quality;
- all projects have experienced cost increases and delays when measured by the two main efficiency parameters (capacity utilisation rate and non- invoiced water) and insufficient consideration was paid by the Commission and the Member States' managing the ability of the projects to generate revenues.

The European Court of Audit recommended to the Commission and Member States they should:

To identify better solutions: (a) Improve their ex-ante analysis and forecasts of future needs by taking into account recent and accurate data and their inventory and review of all available water; (b) Pay greater attention to the alternative to the supply side solution.

To achieve the programme aims: (a) Ensure from the planning stage, that the complementary infrastructure required for projects to enter into operation will be available on time; (b)Set up better monitoring tools to assess project achievements.

To control costs: (a) pay more attention, during the planning phase, to factors which often cause delays, (b) Improve the quality of the ex ante analysis of the projects and take their results into account when determining the size of new infrastructures; (c) Systematically analyse the pros and cons of building infrastructure in stages, to make better use of the capacity built and develop it according to the evolution of needs.

Responses of the EU Commission to the audit

The Commission welcomed the Court's conclusion that structural measures spending has contributed to improving supply of water for domestic use. The Commission agreed that there is scope for improvement, though noting that it is difficult to achieve a perfect match between ex-ante demand and savings forecasts and actual outcome.

The Commission considered that managing authorities have an important role in ensuring projects meet these performance standards. The Jaspers facility was set up for the programming period 2007-2013 to strengthen capacity in the new Member States.

BIBLIOGRAPHY

Blundell T, 2011, Growth rate in early and late litters of the European hedgehog,

Brazilian Court of Audit , 2009, Audit on the Process of Environmental Impact Assessment of Public Works in Brazil, Information

Brazilian Court of Audit , 2010, Evaluation of environmental monitoring carried out by TCU in the federal infrastructure works

Brazilian Court of Audit, Evaluation of the process of Environmental Impact Assessment in Federal Government´s infrastructure works - Case Study

Communities and Local Government, 2000, Environmental impact assessment: guide to procedures

Defra, 2011, guidance for policy makers: Wider Environmental and Sustainable Development Impact Tests

Estonian Audit Office, 2007, The state's actions in ensuring the sustainability of heating supply

Estonian Audit Office, 2010, Development of waste water treatment in rural areas with the support of the Cohesion Fund's projects

EU, 2001, DIRECTIVE 2001/42/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 27 June 2001 on the assessment of the effects of certain plans and programmes on the environment

European Court of Auditors, 2010, Is EU structural measures spending on the supply of water for domestic consumption used to the best effect?

GAO, 2009, Clean Water Infrastructure: A Variety of Issues Need to Be Considered When Designing a Clean Water Trust Fund (GAO-09-657)

GAO, 2010, Aviation and the Environment: Systematically Addressing Environmental Impacts and Community Concerns Can Help Airports Reduce Project Delays (GAO-10-50)

Glavinich T E, 2008, Contractor's Guide to Green Building Construction: Management, Project Delivery, Documentation, and Risk Reduction

National Audit Office, 2008, Planning for Homes: Speeding up planning applications for major housing developments in England, London.

NAO, 2009, Addressing the environmental impacts of Government procurement

NAO, 2007, Building for the future: Sustainable construction and refurbishment on the government estate

NAO, 2007, Preparations for the London 2012 Olympic and Paralympic Games - Risk assessment and management,

NAO. 2008, 2010 and 2011, Preparations for the London 2012 Olympic and Paralympic Games: Progress Report

New Zealand Audit Office, 2010, Local authorities: planning to meet the forecast demand for drinking water.

OAG Thailand, 2011, Bangkok Super Skywalk Projects: Preventive Environmental Audit

Office of Government Commerce, 2007, Achieving Excellence in Construction

OGC, 2010, policy and standards framework – best practice guidance: contract management framework

Royal Society of Chemistry, 2001, Environment, Health and Safety Committee Note on: Life Cycle Assessment

Seiler A, 2001, Ecological effects of roads, Andreas

Russian Federation, 2009, Audit of the federal property and budget funds usage allocated in 2008 - 2009 to territorial administrations and subordinated establishments of Federal Agency on supervision in the nature management sphere in the Far Eastern Federal District, an estimation of efficiency of the performance by them control and supervision functions in sphere of protection of the environment and nature management during preparation for the Asian Pacific Economical Cooperation forum.

Smith R, 2011, The vision: sustainable planning – The Royal Town Planning Institute

US Environment Protection Agency, 2006, Lifecycle Assessment: Principles and Practice

Thames Gateway, 2007, The Thames Gateway Delivery Plan

Vanclay F, 2003, SIA principles: International Principles For Social Impact, Assessment Frank Vanclay

Business Link website: environmental permits and licences page http://www.businesslink.gov.uk/bdotg/action/detail?itemId=1080480220&r.l1=1079068363&r.l2=1086048470&r.l3=1080480296&r.s=sc&type=RESOURCES

Defra Government Buying Standards http://sd.defra.gov.uk/advice/public/buying/

Environmental Management Guide http://www.iso14000-iso14001-environmental-management.com/iso14001.htm

Planning Portal website http://www.planningportal.gov.uk/planning/planningsystem

www.environmental-auditing.org