



North East Cambridge Area Action Plan

Proposed Submission

Smart Infrastructure Topic Paper: Environmental Monitoring

Greater Cambridge Planning Service

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Introduction

North East Cambridge provides a major opportunity to deliver sustainable development and to create a low carbon place. There is an opportunity for new digital tools to be used in both the planning and monitoring of the development.

Advances in sensing technology and communications have significantly lowered the cost of collecting information (also see Digital Infrastructure Topic Paper). This is often referred to as the 'Internet of things' and is the idea that things can be connected to the internet with the information they produce being brought together and stored. This allows for intelligence and understanding to be drawn from the information collected. In the pre-application phase data can be collected to inform the modelling and planning of developments, during construction the impact of the development process can be measured and upon completion the success of the development measured (movement etc.). This will allow for early interventions if systems within the development aren't performing as expected or if impacts are less than anticipated allow for the acceleration of the development timeline. This intelligence can then be presented in ways that advance our understanding of performance via dashboards graphs and visualisations.

North East Cambridge will be an opportunity to use innovative new methods of modelling such as 'Digital Twins' which bring a number of systems (transport, energy etc.) into a single environment, monitor impacts in real time and help engage residents and local communities. This work could draw on the expertise in the Centre for Smart Infrastructure and Digital Built Britain at the University of Cambridge, and the use of third party suppliers such as Vu.City or Sensat.

Information can be gathered from sensors in real-time (as it is happening), near real-time (with some delay) or can be historic where data is not time critical. To help with the collection, processing and discovery of data, a data architecture will be needed, and this could either be at a city scale such as the Intelligent City Platform developed by the Smart Cambridge programme or a site wide platform.

The preferred approach contained herein is aimed at supporting the emerging Area Action Plan in its ambitions to:

- Minimise vehicle use to and within the site – as detailed in the trip budget proposed in the transport evidence and the internalisation of trips topic paper – to maximise the take-up of non-car modes including walking, cycling, micro mobility, bus, and rail use, and promote an appropriate mix of land uses that encourage trips to be retained on-site where possible.
- Monitor the environmental impact to better understanding the impact of the NEC development
- Understand and support the better use and management of water
- Support the mitigation of adverse air and noise impact issues as detailed in the Environmental Health Topic Paper
- Monitor the impact of the construction phase
- Utilise low-tech green solutions coupled with high tech and smart city technology
- Measure the success of the AAP based on the delivery of development outcomes within the Plan's timeframe
- Support the transition to zero carbon and embed climate change resilience, responding to issues such as water resource availability and energy generation and use
- Create a supporting data layer and data tools that can support decision makers; to enable planners, developers, and communities to understand the impacts of the development on areas such as energy, waste, movement air quality etc.

Key Documents

- [Future of Planning – State of the Art Innovations \(2016\) Future Cities Catapult](#)
- [Digital Planning Manifesto – RTPi and the Connected Places Catapult](#)
- [Smarter Infrastructure Planning RTPi](#)
- [Transport and Health JSNA 2015 \(Air Pollution\)](#)
- [Assessing Environmental Impacts – Guidance](#)

NEC Evidence and Topic Papers

- Transport Topic Paper (2021)
- Smart Infrastructure Topic Paper: Future Mobility (2021)
- Smart Infrastructure: Digital Infrastructure (2021)
- Health Facilities & Wellbeing Topic Paper (2021)
- Environmental Health Topic Paper (2021)
- Climate Change, Energy, Water and Sustainable Design and Construction Topic Paper (2021)
- Community Safety Topic Paper (2021)
- Anti-Poverty and Inequality Topic Paper (2021)
- Internalisation Topic Paper (2021)

National Planning Policy Framework (2021)

The National Planning Policy Framework¹ (NPPF) has a presumption in favour of sustainable development for both plan-making and decision-taking. The NPPF has a requirement for developments which generate significant amounts of movement to be supported by a Transport Assessment or Transport Statement and Travel Plan.

The NPPF requires the planning system to actively manage patterns of growth through directing significant development to locations which are or can be made sustainable, namely areas that limit the need to travel and/or offer a genuine choice

¹ [National Planning Policy Framework](#)

of transport modes. This can help to reduce congestion and emissions and improve air quality and public health.

Paragraph 104 sets out that transport issues should be considered from the earliest stages of plan-making and development proposals and that opportunities from existing or proposed transport infrastructure, and changing transport technology and usage, are realised. Also that;

- opportunities to promote walking, cycling and public transport use are identified and pursued
- the environmental impacts of traffic and transport infrastructure are identified, assessed, and taken into account – including appropriate opportunities for avoiding and mitigating any adverse effects, and for net environmental gains

Paragraph 109 states that development should only be prevented or refused on highways grounds if there would be an unacceptable impact on highway safety, or the residual cumulative impacts on the road network would be severe.

Paragraph 113 states all developments that will generate significant amounts of movement should be required to provide a travel plan, and the application should be supported by a transport statement or transport assessment so that the likely impacts of the proposal can be assessed.

Section 14 of the NPPF considers the role of planning in dealing with climate change and flood risk, noting the role of the planning system in supporting the transition to a low carbon future in a changing climate. Planning should help to shape places in ways that contribute to radical reductions in greenhouse gas emissions, minimise vulnerability and improve resilience, and support renewable and low carbon energy and associated infrastructure. Footnote 48 of paragraph 149 goes on to note that planning policies should be in line with the objectives and provision of the Climate Change Act 2008.

The Climate Change Act 2008 was amended in August 2019 to set a legally binding target for the UK to become net zero by 2050.

One of the aims of the NPPF is an environmental objective – to contribute to protecting and enhancing our natural, built, and historic environment; including making effective use of land, helping to improve biodiversity, using natural resources prudently, minimising waste and pollution, and mitigating and adapting to climate change, including moving to a low carbon economy.

The NPPF also sets out the need for an Environmental impact assessment: A procedure to be followed for certain types of project to ensure that decisions are made in full knowledge of any likely significant effects

Cambridgeshire County Council Vision

The County Council has a vision to make the county ‘a great place to call home’ with three priority outcomes:

- A good quality of life for everyone – by nurturing healthy communities that can access resources, connect with others, and become sustainable. Improve social and economic equality and encourage people to choose healthy lifestyles.
- Thriving places for people to live – by investing in the environmental, infrastructure and services and building supportive, resilient communities that are great places to live.
- The best start for Cambridgeshire’s children.

Cambridgeshire and Peterborough Combined Authority (CPCA)

The devolution deal for Cambridgeshire and Peterborough sets out key ambitions for the combined authority. As the CPCA is now the local transport authority with strategic transport powers it has prepared a local transport plan which sets out its aims and objectives. The plan supports the CPCA’s non statutory spatial framework which looks to align essential infrastructure, housing, and job growth. The plan

brings together the local transport plans prepared by Cambridgeshire County Council and Peterborough City Council, supporting the objectives set out for the TSCSC.

The Transport Strategy for Cambridge and South Cambridgeshire (TSCSC)

The TSCSC² (2014) ensures that local councils plan together for sustainable growth and continued economic prosperity in the area.

It supports the Cambridge and South Cambridgeshire Local Plans (2018) and takes account of future levels of growth in the area. Approximately 44,000 new jobs and 33,500 new homes will be created in the Greater Cambridge area by 2031. The strategy provides a plan to address the rising population and increase in demand on our travel network by shifting people from cars to other means of travel including cycling, walking and public transport. It details the transport infrastructure and services necessary to deliver this growth.

The County Council has declared a Climate Emergency and has developed a climate change and environment strategy which was to go to full council in March 2020 for adoption but has been postponed due to Covid-19. It sets out a vision to deliver net zero carbon by 2050. Transport is a priority area of the strategy and the county will manage its highways to prioritise walking, cycling and public transport and support the uptake of electric vehicles. This will minimise carbon emissions and improve air quality. These strategy aims have been embedded into the Combined Authority's local transport plan.

Joint Municipal Waste Strategy³ (Cambridgeshire and Peterborough)

The Councils:

- are committed to increasing recycling in order to maximise use of finite resources thereby minimising energy use and waste disposal.
- want to develop services that bring about reductions in carbon emissions.

² [Cambridge City and South Cambs Transport Strategy](#)

³ [Joint Municipal Waste Strategy](#)

- support the waste hierarchy and understands the need to emphasise waste prevention and reuse.

Cambridgeshire Flood Risk Management Strategy⁴

The flood risk management strategy looks to Improve flood prediction, warning, and post flood recovery. If flooding is a potential risk thought needs to be given about how sensors and data can predict and warn of flooding events.

Cambridgeshire Flood and Water SPD

The Supplementary Planning Document (SPD) forms part of each of the Cambridgeshire Local Planning Authority's (LPAs) suite of planning documents. This SPD has been developed by Cambridgeshire County Council (as Lead Local Flood Authority (LLFA)) in conjunction with LPAs within Cambridgeshire, and other relevant stakeholders, to support the implementation of flood risk and water related policies in the Local Plans. It provides guidance on the implementation of flood and water related policies in each authority's respective local plan.

Cambridge City Council Corporate Vision

The city council has a vision to lead a unified city 'one Cambridge fair for all'
Cambridge - caring for the planet: A city that takes robust action to tackle the local and global threat of climate change, both internally and in partnership with local organisations and residents, and to minimise its environmental impact by cutting carbon, waste, and pollution.

This vision is delivered through a number of policies, plans and strategies.

Cambridge City Council Air Quality Action Plan 2018-2023

⁴[Cambridgeshire Flood Risk Management Strategy](#)

This sets out priorities for maintain and improving air quality. The actions fall into three main categories:

- Reducing local traffic emissions as quickly as possible to meet national objectives.
- Maintaining pollutant levels below national objectives.
- Improving public health by reducing population exposure to air pollutants.

Proposals include:

- lowering emissions from taxis, by increasing the number of electric and hybrid vehicles through incentives and installing more charging points.
- reducing bus and coach emissions, by working with partners to invest in more environmentally friendly vehicles.
- reducing HGV emissions in the city centre, by promoting 'greener' methods for making deliveries of goods, such as by cycle.
- using planning policies to improve access to sustainable modes of transport.
- educating people about the health impacts of poor air quality and encouraging 'greener' lifestyles.

Cambridge City Council Climate Change Strategy 2016-2021

Sets out a number of key objectives including 'reducing emissions from transport by promoting sustainable transport, reducing car travel and traffic congestion and encouraging behaviour change'. This will be achieved through the city's partnership within the Greater Cambridge Partnership which is investing City Deal funding to make improvements to public transport and cycling infrastructure with the aim of tackling congestion, reducing journey times, reducing greenhouse gas emissions, and improving air quality and promoting low emission buses and taxis. The City Council have declared a climate emergency with an ambition to be carbon neutral by 2050.

The strategy sets out a number of key areas where monitoring will be important:

- Reducing energy consumption and emissions by promoting energy efficiency measures, sustainable construction, renewable energy sources, and behaviour change
- Reducing emissions from transport by promoting sustainable transport, reducing car travel and traffic congestion, and encouraging behaviour change
- Reducing consumption of resources, increasing recycling, and reducing waste

Cambridge City Council Local Plan (2018)

The local plan sets out the way we will meet the development needs of Cambridge to 2031. Over that time the city has plans to grow significantly; supporting the nationally important economic contribution the city makes and the factors that are inseparable from that success, seen in the exceptional quality of life and place that Cambridge benefits from. The vision for the local plan sets out a number of relevant strategic objectives, including:

- contribute to the vision of Cambridge as an environmentally sustainable city, where it is easy for people to make a transition to a low carbon lifestyle. This means making best use of energy (including community energy projects), water and other natural resources, securing radical reductions in carbon emissions, minimising environmental impact and being capable of adapting to the impacts of climate change;
- be highly water efficient, contribute to overall flood risk reduction through water sensitive urban design, and help to improve the quality of the River Cam and other water features in the city;
- be located to help minimise the distance people need to travel, and be designed to make it easy for everyone to move around the city and access jobs and services by sustainable modes of transport;
- ensure appropriate and timely provision of environmentally sustainable forms of infrastructure to support the demands of the city, including digital and cultural infrastructure; and
- promote a safe and healthy environment, minimising the impacts of development and ensuring quality of life and place.

The following policy areas support the delivery of the vision and relevant to this topic paper including:

Policy 5: Strategic transport infrastructure - Development proposals must be consistent with and contribute to the implementation of the transport strategies and priorities set out in the Cambridgeshire Local Transport Plan (LTP) and the Transport Strategy for Cambridge and South Cambridgeshire (TSCSC).

Policy 15: Cambridge Northern Fringe East and new railway Station Area of Major Change - Designates the NEC as an area of major change.

Policy 28: Carbon reduction, community energy networks, sustainable design and construction, and water use - Monitoring will be integral to;

- carbon reduction
- water management
- site waste management

All new development will be required to meet the following minimum standards of sustainable construction, carbon reduction and water efficiency as set out in the plan.

Policy 31: Integrated water management and the water cycle

Policy 32: Flood risk

Policy 35: Protection of human health and quality of life from noise and vibration – noise and vibration can be managed through the use of on-site sensors, support monitoring of the noise impact assessment.

Policy 36: Air quality, odour, and dust - monitoring will support:

- there is no adverse effect on air quality in an air quality management area (AQMA);
- pollution levels within the AQMA will not have a significant adverse effect on the proposed use/users;

- the development will not lead to the declaration of a new AQMA;

Policy 80: Supporting sustainable access to development -

Development will be supported where it demonstrates that prioritisation of access is by walking, cycling and public transport, and is accessible for all.

Policy 81: Mitigating the transport impact of development – measuring and understanding the impact on movement both within and outside of the developments area.

Policy 82: Parking management - New developments will be favoured where they take a holistic, early, and design-led approach to the management of parking.

South Cambridgeshire District Council Business Plan

South Cambridgeshire has a vision to put the heart into Cambridgeshire by:

- Helping businesses to grow - Helping to ensure people's homes are close to their jobs and can be accessed by walking, cycling, and using public transport
- Building homes that are truly affordable to live in - Working with partners to provide alternatives to private car travel through new and improved walking, cycling and public transport routes
- Being green to our core - Installing new air quality monitors so that we can track, maintain, and improve air quality, installing electric vehicle charging points at Council offices and incentivising taxi operators and drivers to make the move to electric vehicles
- Putting our customers at the centre of everything we do

South Cambridgeshire has declared a climate emergency with an ambition to be zero carbon by 2050. The Business Plan 2019-24 includes a broad and far-reaching programme consisting of 14 high level actions on zero carbon.

South Cambridgeshire Local Plan 2018

The South Cambridgeshire Local Plan sets out the planning policies and land allocations to guide the future development to meet the needs of the district up to 2031. It includes policies on a wide range of topics such as housing, employment, services and facilities, and the natural environment. The policies relevant to this topic paper are:

Policy S/2: Objectives of the Local Plan

- To protect the character of South Cambridgeshire, including its built and natural heritage.
- To deliver new developments that are high quality and well-designed with distinctive character that reflects their location, and which responds robustly to the challenges of climate change.
- To maximise potential for journeys to be undertaken by sustainable modes of transport including walking, cycling, bus and train.

Policy SS/4: Cambridge Northern Fringe East and Cambridge North railway station

- a. Take into account existing site conditions and environmental and safety constraints;
- b. Demonstrate that environmental and health impacts (including odour) from the Cambridge Water Recycling Centre can be acceptably mitigated for occupants;
- c. Ensure that appropriate access and linkages, including for pedestrians and cyclists, are planned for in a high quality and comprehensive manner;

Policy CC/1: Mitigation and Adaptation to Climate Change

Planning permission will only be granted for proposals that demonstrate and embed the principles of climate change mitigation and adaptation into the development.

Policy CC/2: Renewable and Low Carbon Energy Generation

Policy CC/3: Renewable and Low Carbon Energy in New Developments

Policy CC/4: Water Efficiency - All new residential developments must achieve as a minimum water efficiency equivalent to 110 litres per person per day and non-residential development demonstrates BREEAM standard for 2 credits.

Policy CC/6: Construction Methods

Policy CC/7: Water Quality

Policy CC/8: Sustainable Drainage Systems

Policy CC/9: Managing Flood Risk

Policy SC/10: Noise Pollution - Conditions may be attached to any planning permission to ensure adequate attenuation of noise emissions or to control the noise at source.

Policy SC/12: Air Quality - Development will not be permitted where it would adversely affect air quality in an Air Quality Management Area (AQMA); or lead to the declaration of a new AQMA through causing a significant deterioration in local air quality by increasing pollutant levels either directly or indirectly; or if it would expose future occupiers to unacceptable pollutant levels. Larger development proposals that require a Transport Assessment and a Travel Plan as set out in Policy TI/2 will be required to produce a site based Low Emission Strategy. This will be a condition of any planning permission given for any proposed development which may result in the deterioration of local air quality and will be required to ensure the implementation of suitable mitigation measures.

Policy TI/2: Planning for Sustainable Travel - Developers will be required to demonstrate they will make adequate provision to mitigate the likely impacts (including cumulative impacts) of their proposal including environmental impacts (such as noise and pollution) and impact on amenity and health. Travel Plans must have measurable outputs, be related to the aims and objectives in the Local Transport Plan and provide monitoring and enforcement arrangements. Planning obligations may be an appropriate means of securing the provision of some or all of a Travel Plan, including the requirement for an annual monitoring and progress

report. Submission of area-wide Travel Plans will be considered in appropriate situations.

Policy TI/3: Parking Provision

The Council will encourage innovative solutions to car parking, including shared spaces where the location and patterns of use permit, and incorporation of measures such as car clubs and electric charging points.

Policy TI/10: Broadband

Policy SC/2: Health Impact Assessment

New development will have a positive impact on the health and wellbeing of new and existing residents.

Policy SC/4: Meeting Community Needs

Policy HQ/1: Design principles

Policy SC/2: Health Impact Assessment

Greater Cambridge Sustainable Design & Construction SPD

This supplementary planning document sets out the standards required to meet the visions, objectives and policies of the Cambridge and South Cambridgeshire Local Plans as sustainably as possible. It comes at a critical time in the approach to climate change and the environmental crisis by both local and national government, and after Parliament revised the 2008 Climate Change Act to bring carbon reductions to 100% by 2050, a target that both local authorities recognised earlier in the year.

Applicable to schemes across Cambridge and South Cambridgeshire, it is recommended that consideration of the following issues should be included within the Sustainability Statement: The integration of smart technologies.

Environment Monitoring Opportunities and Key Issues

Sensors

Sensors allow the monitoring of changes in environmental conditions such as air quality, water levels, noise and vibration, movement (vehicles, cyclists, or pedestrians) and parking this information can then be analysed creating intelligence. The ubiquity of connectivity (mobile, fibre, and low-power wide area networks), increased battery life, and the ability to put intelligence into devices (at the edge) has made it cheaper and easier to deploy devices into the environment. The Smart Cambridge programme has been trialling sensors to measure movement, air quality as well as noise. The information collected has then been analysed and visualised using the Intelligent City Platform built by the University of Cambridge. This will need to ensure that all data collected will be in line with General Data Protection Regulation (GDPR) complying with industry standards, and council statutory duties.

Opportunities

- To create a network of sensors which help the developers/promoters and planners to understand whether the development is meeting the expected environment standards, thresholds and/or targets. e.g., trip budgets, car parking, air quality, noise etc.
- To take a strategic approach to sensing which reduces the cost of deployment and operation
- To use innovative new sensing products that build on the NEC ambitions to be an innovative new development.

Risks

- Sensor market is still maturing and there is no certification process for sensors which carries a risk that the data produced is of insufficient quality. The sensor strategy should be developed in partnership with relevant specialists.

Data

The information produced by sensors 'data' will need to be stored somewhere ready for processing and analysis. NEC will need to either develop a data infrastructure of its own which will need to be interoperable with other data infrastructure or may have opportunity to use a wider city platform. Thought needs to be given to the data standards and schemas that are used so data be combined with other similar data sets. Particularly where cameras are used (movement data) there needs to be thought given to privacy aspects of how data is collected and used, and the governance process needs to ensure that data is used in an ethical manner.

Data is only of use if intelligence is drawn from it. There have been significant advances in the intelligence that can be drawn from data. Advanced modelling techniques can help developers and planners understand the impact of the development. The development of 'digital twins' which bring a number of systems into one environment (air quality, transport, energy etc.) can bring understanding to the interrelationship between different systems. This will be particularly important in helping to meet carbon targets. NEC is an opportunity to explore how digital twins can support development and is an area of significant interest to the University of Cambridge through the Centre for Smart Infrastructure and Digital Built Britain. Digital Twins can be 3D environments which link the physical form to data collected and can help engage residents.

For decision makers tools such as visualisations and dashboards can give a view of the environmental performance of the development as well as movement. This can support a more agile decision and planning approach. An example of this may be where development is generating far fewer trips than anticipated and so future phases can be brought forward at pace, or if movement thresholds are going to be missed interventions can be brought forward to address the issues.

Opportunities

- To gain a granular near real-time understanding of the development, to support decision makers.

- Present information at the right temporal scale in a way that engages communities, members, planners, and developers.
- Support the development in achieving targets around waste reduction, movement (particularly reducing vehicle trips), air quality, noise, vibration, and water usage as well as energy and carbon impacts.
- Support innovation by making data available for third parties to build products that support the development, subject to appropriate data protection. Open data also helps to engage the community and local residents.
- By aggregating and sharing data across a number of developments and the city there may be savings to be made in the commissioning and collecting of data.

Risks

- Data needs to be collected in a transparent and ethical manner. There is a risk that if a proper governance framework isn't in place residents/communities will object.
- Sensors aren't of the appropriate quality and that the information collected is poor affecting decision making.

Communications

To get the information from sensors to the data infrastructure the NEC development will need to develop a suitable communications infrastructure (see the digital infrastructure topic paper). Most sensors can use a Low Power Wide Area Network (LPWAN) (standards such as Long Range (LoRa) protocol, wide area network (WAN), or internet of things providers SIGFOX or narrow band (NB) internet of things (IoT), for sensors that send back small packets of information. Because they are low power it increases the battery life of sensors to 10/15 years. Image based and more sophisticated sensors are likely to need 4G/5G mobile communications or if available fibre.

Opportunities

- Ubiquitous mobile and LPWAN can make the deployment for sensors relatively cheap and easy
- Can support innovation across the development

Risks

- Poor communications can impact the ability to collect data.

Preferred Approach

That NEC become a testbed for Sensor and Data innovations

- NEC should embrace the opportunity to develop sensor networks embedded into the development which supports the meeting of high environmental standards.
- Create a testbed that supports the testing and trialling of innovative new solutions.
- Develop a framework for sensing and data that allows the system to flex and adapt as new technologies are developed.

NEC should use new data tools such as 'Digital Twins' dashboards and visualisations to

- Support decision making processes
- Engage residents, businesses, and local communities
- Better manage any on/off street parking that is available
- 'Manage the kerb' for deliveries and drop-off/pick-ups

Develop a framework for data collection and handling

- Develop an ethical and governance framework to build trust in data collection
- Ensure using common standards and schemas for data collection which support interoperability and makes sure data is measurable
- Develop an approach to data infrastructure for the development/city
- Work with partners and domain experts to develop architecture, standards, and cybersecurity

Management and operations hub

- An operations hub within NEC could be developed to help streamline the framework and dashboards and be integrated with other information activities
- It would need full support of all public authorities in Greater Cambridgeshire
- It could operate similar to Dijon metropole, which collates to and responds to information in real time, something of increased importance given the impacts of climate emergency

Support 3rd party innovation

- Open communications networks and open data can support business innovation, particularly in the building management, mobility, and environmental spaces.

Embed the collection and use of data across topic areas

- Ensure that data collection/monitoring are embedded into other topic areas (energy, water management, mobility, etc.)

Governance

Different governance structures for NEC should be explored to support the implementation and future management of these initiatives.

Reasons for preferred approach

A) Embedding innovation in NEC

Ensure that North East Cambridge can support an ecosystem of innovation by providing opportunities for public, private, and third sector organisations to access data to establish new services and assets that can benefit the community in a transparent way.

B) Carbon reduction

Harnessing new technologies to monitor environmental performance can provide actionable insights for resource efficiency gains to support carbon reduction.

C) Understand environmental performance including energy consumption waste, water, pollution etc.

Providing a framework for residents, visitors, workers, and the public sector to understand the environmental performance will be key to enabling the councils in meeting their climate emergency targets.

D) Support the reduction in vehicle trips

New ways to collect information could support the delivery of the trip budget target by providing opportunities to understand highway impacts in real time.

E) Minimise the impacts of pollution – air and noise

Data collection and dispersal can provide opportunities to manage any environmental health issues at North East Cambridge.

F) Manage the construction phase to minimise the impact on surrounding communities

Opportunities to ensure that construction can be considerate to existing and surrounding tenants and that contractors fulfil their obligations to work in an environmentally responsible manner.