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YORK CITY ENVIRONMENT OBSERVATORY

HARNESS A POWERFUL NEW
ENVIRONMENTAL DATA RESOURCE
DESIGNED TO HELP DECISION-MAKERS
IMPROVE THE HEALTH AND WELL-BEING
OF THE COMMUNITY

BIG CITIES, BIG DATA, BIG OPPORTUNITIES

By 2050, 66% of the world's population will live in cities, and it has long been recognised that the totality of this urban environment – made up of a complex combination of natural, built, cultural and social factors – has a powerful impact on the health and well-being of individual citizens as well as the economic prosperity of cities themselves.

Sometimes that impact can be positive, other times negative, so it is vital that we find ways to better understand the links between cause and effect. That way we can make the right decisions on how to use, interact with, design and manage this total environment to derive the greatest possible benefits and avoid any unwanted consequences.

Making the right decisions means asking the right questions and basing our responses on the strongest possible evidence. In the era of big data, our ability to gather, access and analyse such evidence is greater than ever before. And that represents an opportunity.

PROVING GROUND

It was to realise the transformative potential of evidence-based decision-making that the York City Environment Observatory (YCEO) was established in June 2016. Funded as part of the Urban Living Partnership by the UK Research Councils and Innovate UK – and with the city of York as our proving ground – our aim was to determine what kind of questions need answering, what data we need in order to answer them, whether that data exists or needs gathering, how to build an appropriately robust analytical framework, and how to allow decision-makers – from members of the public through to national policy-makers – to mine the data to find the evidence they need.

Now that we have reached the end of our 18-month pilot phase, I am delighted to say that we have made excellent progress on all of these fronts – particularly in the development of the conceptual, organisational, and technological frameworks necessary to support evidence-based decision-making. In fact we are poised to build on this further through the development of YorDecision – our purpose-built decision-support tool.

We're excited about what could happen next – both in York and further afield – and we are seeking new partnerships, support and investment to help us make it a reality. I look forward to sharing our vision with you.

Professor Alistair Boxall
Environment Department
University of York

"York requires a strong, wide-ranging evidence base for city planning, delivery of services, and the future shape and direction of the city's makeup and assets. The initial phase of the YCEO has brought together city stakeholders and over 500 new datasets to understand these challenges, and we hope that its future iterations will utilise this information to help decision-makers meet future challenges."

Ian Cunningham, Business Intelligence, City of York Council

OUR MULTIDISCIPLINARY TEAM

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One of the strengths of the YCEO is that it is a true collaboration between experts in different disciplines and organisation types – academic, governmental, third sector and commercial. This gives us a breadth and depth of expertise, and a ready-made network that can help us deliver on all of our aims. Our team is led jointly by the University of York and the City of York Council.

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One reason that the YCEO won its original funding was that the University has a strong research and innovation base in environmental and urban research, in the history of the built and natural environments, in health and well-being and in digital creativity. It is rated tenth out of 155 higher education institutions for the impact of its research. Recent projects include the €3.5M European Commission-funded interdisciplinary project CAPACITIE (Cutting-Edge Approaches for Pollution Assessment in Cities) led by Professor Boxall.

The University also has unique relationships with influential organisations in the translation of science into policy. For example, the Environment Department is home to the York centre of the Stockholm Environment Institute, which was recently ranked as the world's most influential think tank on environmental policy.

The University's interdisciplinary YCEO research team includes environmental scientists, social scientists and experts in electronic engineering, sociology, social psychology, health economics and policy, public understanding of the past, and acoustic technology.

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It made sense to establish the YCEO in York because the city is a pioneer in the capture of valuable environmental data. With one of the most extensive air quality monitoring networks outside London and a drive to fit the city with cutting-edge technologies to monitor pollution levels, the city has the capability in time to provide the YCEO with high resolution data on factors such as air, water and noise. Equally crucial was the city's Open Data Platform initiative (www.yorkopendata.org), which has acted as a key contributor to the YCEO's digital infrastructure. The expertise of the council's Business Intelligence Hub has been vital to making the YCEO a success.

OTHER TEAM MEMBERS

Other vital YCEO players include SimOmics, YorkMetrics and the British Geological Survey as well as collaborating organisations such as the Rivers Trust, Arup and the Centre for Sustainable Healthcare. We have also worked with a broad array of additional partners including Forest Research, AECOM, Science City York, Natural England, PerkinElmer, The Woodland Trust, the Environment Agency, IBM UK, Public Health England, York Minster, Invisible Visible and Tang Hall Big Local.

YORK AND BEYOND

There were compelling reasons to establish our first City Environment Observatory in York. Firstly, the city is the right size for this kind of environmental monitoring – large enough to be sufficiently complex and small enough to make it a feasible testing ground. And secondly the City of York Council was already a leader in the field of open data – with rich archives of historical data – and remains so today. These factors continue to strengthen the case for supporting the next phases of the YCEO. We aim to build on our initial proof of concept to make York a true exemplar city for this kind of City Environment Observatory, before applying the principles of this success to other cities and communities in the UK and beyond.

"The exciting range and scope of the YCEO brings together interdisciplinary expertise and innovation within the Urban Living context, drawing on all seven of the University's broad cross-cutting Research Themes: Creativity; Culture and Communication; Health and Wellbeing; Environmental Sustainability and Resilience; Justice and Equality; Risk, Evidence and Decision-making; Technologies for the Future."

Professor Deborah Smith OBE, Pro-Vice-Chancellor for Research, University of York
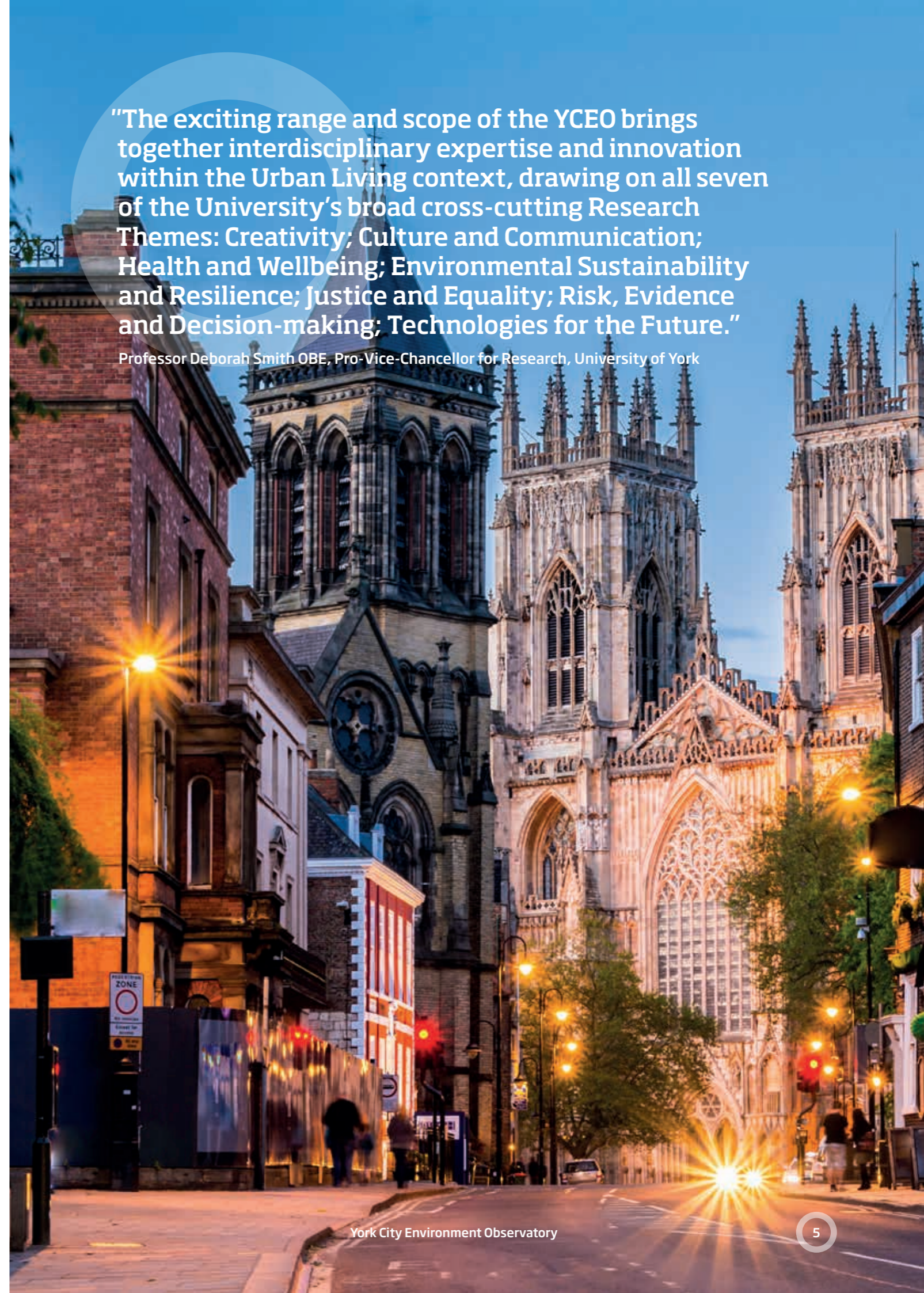
OUR ACHIEVEMENTS SO FAR

The work that we have carried out during the 18-month pilot phase of the YCEO has fallen into four categories: consultation; data source development; data audit; and the design of an analytical framework that will form the basis of YorDecision – our planned decision-support tool.

CONSULTATION

DATA SOURCE DEVELOPMENT

DESIGN OF YORDECISION DECISION-SUPPORT TOOL

DATA AUDIT
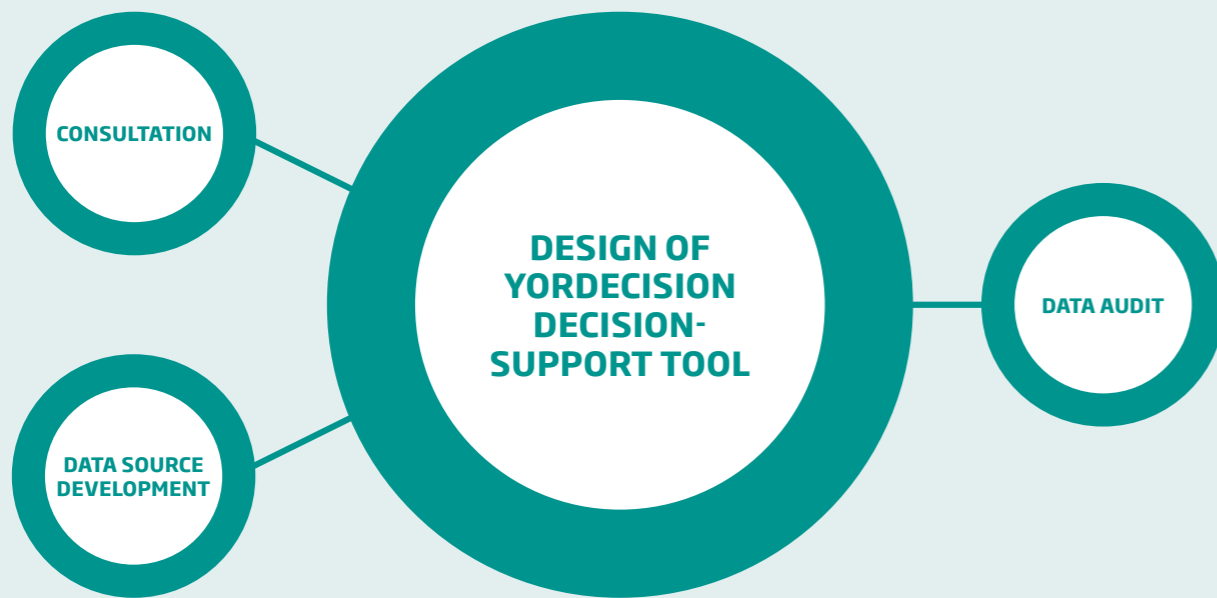
CONSULTATION

Right from the start, we have been determined to ensure that our activities are focussed on the needs of the local community.

We began by consulting stakeholders to discover what concerns they have about York's environment and how they might affect the health and wellbeing of the city and its citizens. Through a series of engagement activities we approached businesses, community groups, residents, experts and specialist organisations working in the heritage, health, culture and environmental sectors – enjoying face-to-face consultations with over 100 members of the public, plus other interactions via internet-based questionnaires.

The most important themes that emerged were:

- Built Environment
- Water and Flooding
- Natural Environment
- Pollution
- Liveable city
- Culture and Heritage
- Travel and Transport

Exploring each of these themes through further consultation, the team was able to identify a series of specific questions for investigation. These have served to inform the ongoing priorities of the YCEO, with three of the themes in particular being explored in much greater depth: air pollution; heritage; and the built environment.

Choosing to work with us therefore presents an opportunity for partners to focus their future activities in ways that are more likely to make a difference.

DATA AUDIT

One of the most fundamental tasks facing the YCEO during its pilot phase was to carry out a data audit. We wanted to know two things:

1. What kind of environmental data is needed to support effective decision-making in relation to health and well-being?

2. What data currently exists?

To begin answering the first of these questions, we drew on our initial round of consultation work, which had unearthed public concerns about the 'built environment'. We engaged with stakeholders including engineers and experts in health, planning and digital technology to identify specific factors underlying this area of concern, and how much data existed to inform our knowledge of each one.

What we discovered was a mixed picture of availability of data. While there was relatively good data availability for some underlying factors, such as the presence of greenery, it was poor for other factors, such as how open space is used in the city. To our knowledge no such detailed investigation has been carried out in the city before and it has given us an invaluable picture of data availability.

On top of this, the work that we have carried out to develop the City of York Council's Open Data Platform – and to explore the data resources made available by other collaborating partners – has given us a detailed understanding of what data exists. As a result, we are confident that the YCEO will be able to draw on as broad a spectrum of data as possible.

DATA SOURCE DEVELOPMENT

One of the main strengths of the YCEO is that it is co-led by the City of York Council. Not only has this ensured that we maintain a strong, practical, real-world focus, it has also allowed us to enjoy the benefits of their pioneering Open Data Platform – the primary source of data for the YCEO.

At the beginning of the pilot phase, a new section of the Open Data Platform was devoted to the YCEO, with a specifically designed user guide created to encourage consortium, city and other interested parties to publish new and novel data required by other elements within the project.

Work also began to populate this new section with datasets and models, which had previously been unpublished at a local, regional or national level. Today it boasts almost 1,000 such datasets – most generated and owned by the City of York Council, together with others provided by partner organisations such as the British Geological Survey. These datasets, which were chosen on the basis of feedback gathered during our consultation activities or because they could inform future technological decision-making tools, cover a wide variety of issues, including:

- % of healthy eating adults in population
- % of mothers smoking at time of delivery
- Air quality readings
- Automatic cycle counters
- Average excess waiting time for frequent bus services
- Business rates
- CCTV locations
- Daily footfall in the centre of York
- Electric vehicle charging points
- Location and size of open spaces for children
- Location and species of trees throughout the city
- Location of community venues
- Location of GP surgeries
- Location of traffic signals
- Missed bin collections
- Road and footway condition
- Ward profiles

As a result, the YCEO section of the Open Data Platform has become a resource of unparalleled scope, including scores of previously untapped datasets relating to the environment and health. This in turn means that YorDecision – the YCEO's future decision-support tool – will be correspondingly more powerful.

DESIGN

All of the work undertaken on consultation, data source development, and data auditing was designed to inform the final deliverable of the YCEO: the initial scoping of an analytical framework to support the development of a decision-support tool – YorDecision – that allows users to draw on disparate data sources to answer their specific questions.

This is a complex challenge. The analytical framework needs to make it possible to take data – both historical and live – from a wide variety of sources, delivered in a wide variety of formats, harvested by a wide variety of technologies, focussed at a wide variety of scales, and designed to address all kinds of different questions for different purposes. It then needs to make it possible to aggregate and 'normalise' all of this disparate data so that it can be interrogated in a consistent manner by the YorDecision decision-support tool.

To illustrate the potential power of our analytical framework – and to show how different environmental data sources can be combined to influence people's interaction with their environment – we have worked with the British Geological Survey to explore how YorDecision could be applied for use in some specific examples. The tool could, for instance, be used in the future to answer such questions as: 'Will the air quality affect my health if I go for a jog?' and 'Are the river conditions safe for me to go rowing?'

To answer the question 'Is it safe to go rowing today?', YorDecision could access normalised data pulled together via the Open Data Platform from sources such as the Met Office (current and forecast wind speed, wind gusts and rainfall), the Environment Agency (river levels), and in the future, other sensors (monitoring debris in the river, for example). Based on this data, a rowing club member could then receive the response required to make a suitably informed decision. It may also be possible further down the line to refine the tool by drawing on additional data such as current and forecast air quality to make its output even more relevant and targeted.
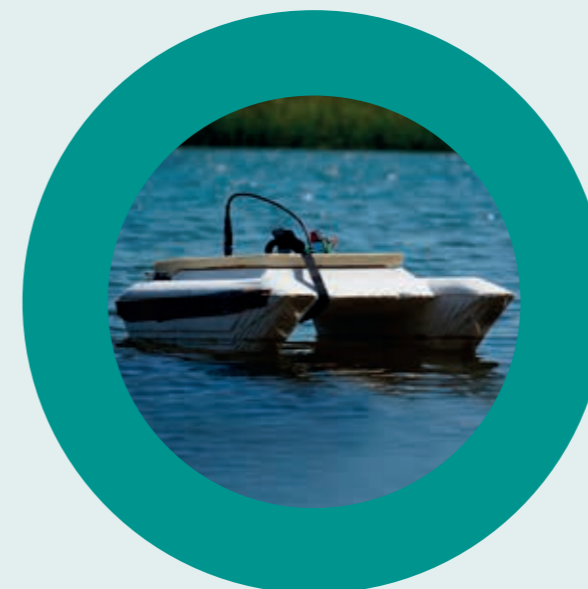
Of course this is just one example of how YorDecision could address one possible issue, but what's important is that it demonstrates the learning that we, as a wider team, have completed to date. It also underlines the broader potential of YorDecision and our underlying analytical framework to tackle challenging issues. As intended at the outset of our pilot phase we are now ready to work with stakeholders in the city – and more widely – to make YorDecision a reality.

TAKE THE NEXT STEP WITH US

Thanks to the work that we have completed during our pilot phase, the YCEO is uniquely well positioned to answer the questions that decision-makers want to address, and to address the related aims of grant-funding bodies.

BROAD PROVEN EXPERTISE AND INSIGHT

The foundational work that we have carried out so far has given us insight into every point along the data lifecycle, from gathering to collation, integration to modelling, analysis to application. Depending on the strategy and aims of a potential collaborating organisation, we can advise on:

- What issues are important to the public
- What data exists to inform particular decisions
- What other data it would be useful to collect
- How best to go about collecting that missing data
- How best to harness the power of our analytical framework
- How to make use of the YorDecision decision-support tool in the future

A FLEXIBLE, SCALEABLE DATA SOLUTION

We stand ready to act on our advice, by developing YorDecision to achieve highly targeted results. In this way, we believe we can provide a direct, practical, positive impact on the efficacy of decision-makers – whether they be individuals, companies, or government bodies. We have the data and the technological framework to deliver results across a wide range of decision-making scales.

READILY ADAPTABLE TO YOUR LOCATION

While we are using York as a test-bed for understanding the links between the total environment and health and well-being, our work is not specific to York and the principles and technologies we have established can be applied to a wide range of places. This might include other cities, towns or rural communities, both in the UK and further afield.

START EXPLORING THE POSSIBILITIES TODAY

Whatever your location and whatever your specific requirements or strategic plans, we are ready to help you or your stakeholders base future health and well-being decisions on the very best environmental data.

To find out more and to help shape the future of the YCEO, please contact Professor Alistair Boxall:

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○ IBM UK
○ Invisible Visible
○ Joseph Rowntree Foundation
○ Make It York
○ Natural England
○ PerkinElmer
○ Public Health England
○ The Rivers Trust
○ Science City York
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○ Tang Hall Big Local
○ Woodland Trust
○ York Business Improvement District
○ York Minster

We would also like to thank all the residents who attended meetings, gave feedback on key challenges, filled out questionnaires, and helped design and shape functionality within the Open Data Platform. Without their input it would have been impossible to understand how research impacted on real-life issues and concerns.

RESEARCH COUNCILS UK

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