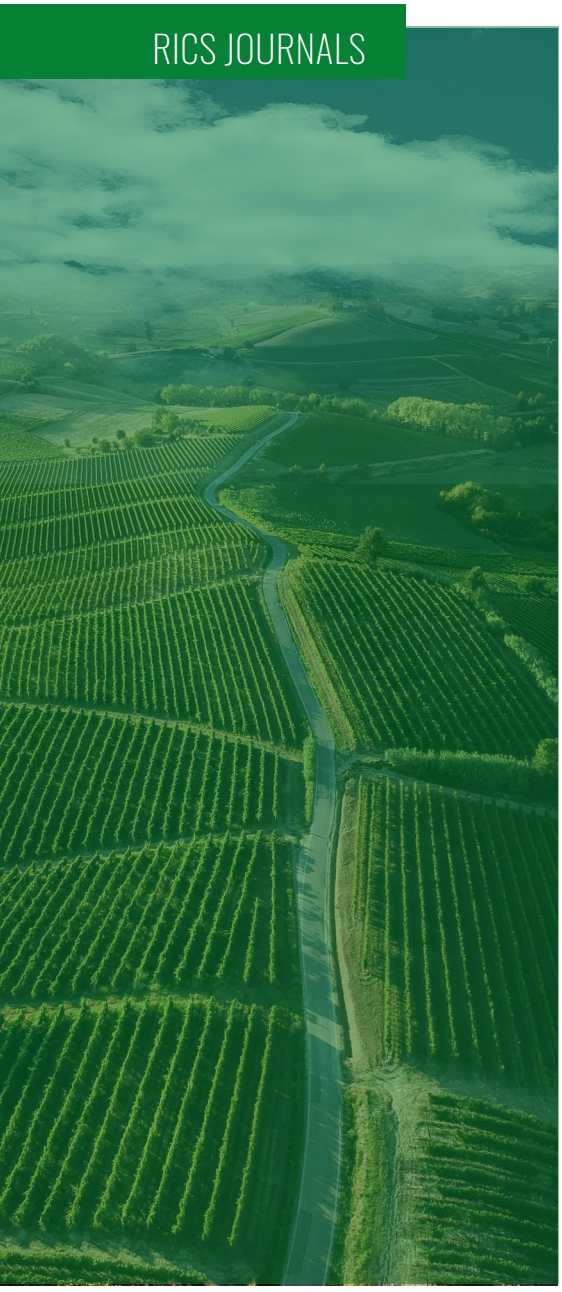
Land Journal

Editor's choice

MARCH 2022 – MAY 2022



Welcome to RICS Journals Editor's choice (March 2022 – May 2022)

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We will produce a pdf collection of journal articles every quarter and we would welcome any feedback **journals@rics.org**

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Benchmarking is critical to rural success

LAND JOURNAL
First published 14 April 2022

Construction of creeks and a new access road. Part of the 155ha Lower Otter Valley Climate Adaption scheme in East Devon

With the biggest change in the rural sector for more than 40 years underway, an RICS insight paper sets out an overview of benchmarking the assets and resources in rural businesses

By Ian Bailey

What is benchmarking? One definition is the process of comparing an organisation or business and its operations and processes against other organisations in the same sector or in the broader marketplace.

Ed Barnston of Barnston Estate defines it as: 'the collation, comparison and analysis of data, normally quantitative rather than qualitative, across time periods, to assist with evidence-based decision making.'

Challenging the performance of a business using benchmarking should be imperative in any economic climate. However, with so much change in the sector, it is even more critical.

Indeed, the changes impact the resilience of the traditional focus of rural estates and expose them to a much wider range of stakeholders who have an interest in what is happening on the land.

This is already becoming apparent through:

- planning objections
- feedback for rural development and diversification
- active community groups
- the environment being more closely examined at a landscape scale.

All of which will result in increased collaboration across rural estates and rural land-based businesses.

Applied data through benchmarking will be important for communicating and demonstrating accountability to external stakeholders, for example local communities, and providing an evidence base for policy changes that might include pressures on land ownership. On the latter, there is already some pressure, notably in Scotland, to demonstrate optimum land use to justify ownership and management decisions.

As the drive towards net zero continues, there are likely to be potential conflicts for land use that will impact on rural estates and rural land-based businesses. One example might be whether land is used for tree planting or food production.

Benchmarking is essential both for the understanding of current business performance and its ability to help drive businesses forward. To be successful, managers of rural estates and land-based businesses and their advisers must recognise this.

> "Benchmarking is "the collation, comparison and analysis of data, normally quantitative rather than qualitative, across time periods, to assist with evidence-based decision making."
>
> Ed Barnston of Barnston Estate

Our research for the **RICS benchmarking insight paper** shows there is a wide range of views and expertise on the need for, the content of and the depth of benchmarking required in the rural sector. There are currently many different approaches to benchmarking and a lack of coordination and agreed standards for the sector and RICS members.

It is difficult to give a comprehensive inventory of existing benchmarking tools and surveys because of the wide scope of the various surveys and low participation levels. The economics of administering benchmarking surveys also means many are below the radar.

However, section 6 of the insight paper attempts to outline the primary surveys and tools currently available to land managers and advisers for UK rural property, UK property and international rural property. All of this shows the clear need for consistency in benchmarking performance of rural estates and rural land-based businesses.

The case for KPIs

The diverse range of assets and income streams coupled with diverse ownership motives on rural estates and rural land-based businesses make this a difficult problem to solve. However, this diversity strengthens the need for key performance indicators (KPIs) that are sector-focused but which provide a holistic view of the health of the business.

This mix of sector KPIs with a holistic assessment is especially critical when developing future strategies, especially for the efficient use of funds. It is particularly relevant for contributing to the typical rural estates' reporting structure, which includes family, trustees, shareholders, staff and their responsibilities.

There is also a need for a range of KPIs that enable specific parts of the business to be benchmarked in isolation. A fully diversified rural estate encompasses so much that any rural land-based business should be able to select the relevant KPIs for a rural estate to do its own specific benchmarking.

> It is easy to complicate benchmarking and lose sight of the key objectives for carrying out the exercise.

A holistic assessment of the business and establishing a performance baseline early on is the key to success. This sets out the foundation for strategic business plans and allows future change to be effectively measured and monitored against the plan.

It is easy to complicate benchmarking and lose sight of the key objectives for carrying out the exercise. Therefore, it is important to start with a simple framework of KPIs that:

- are relevant
- have readily available data
- are straightforward to calculate
- provide a holistic assessment of the business.

The five key stages in establishing a successful benchmarking project are described in Figure 1.

Choosing KPIs for rural business

When considering which KPIs might be suitable for improving performance on rural estates and land-based businesses, the list soon becomes long and complex.

The selection of KPIs for an individual business will be determined by the objectives for holding or owning the estate, which may include:

- investment performance
- income generation
- environmental stewardship
- social stewardship
- strategic development
- long-term hold for future generations.

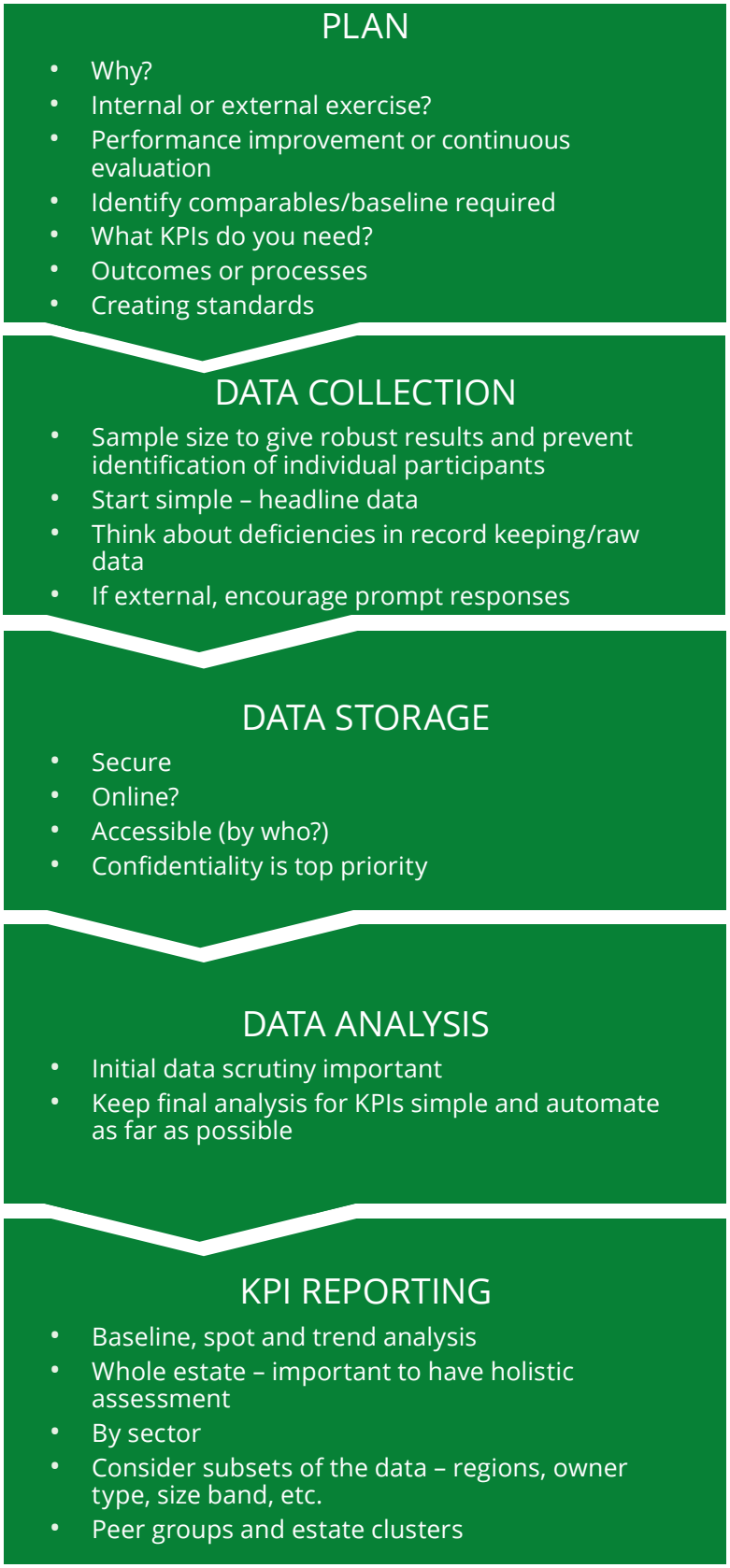

Figure 1: Rural estates benchmarking workflow

The framework in Figure 2 aims to guide discussions on KPIs for the business. Further detail of the KPI themes of each of the hierarchy levels in the pyramid is given in Table 3, p. 32 of the insight paper.

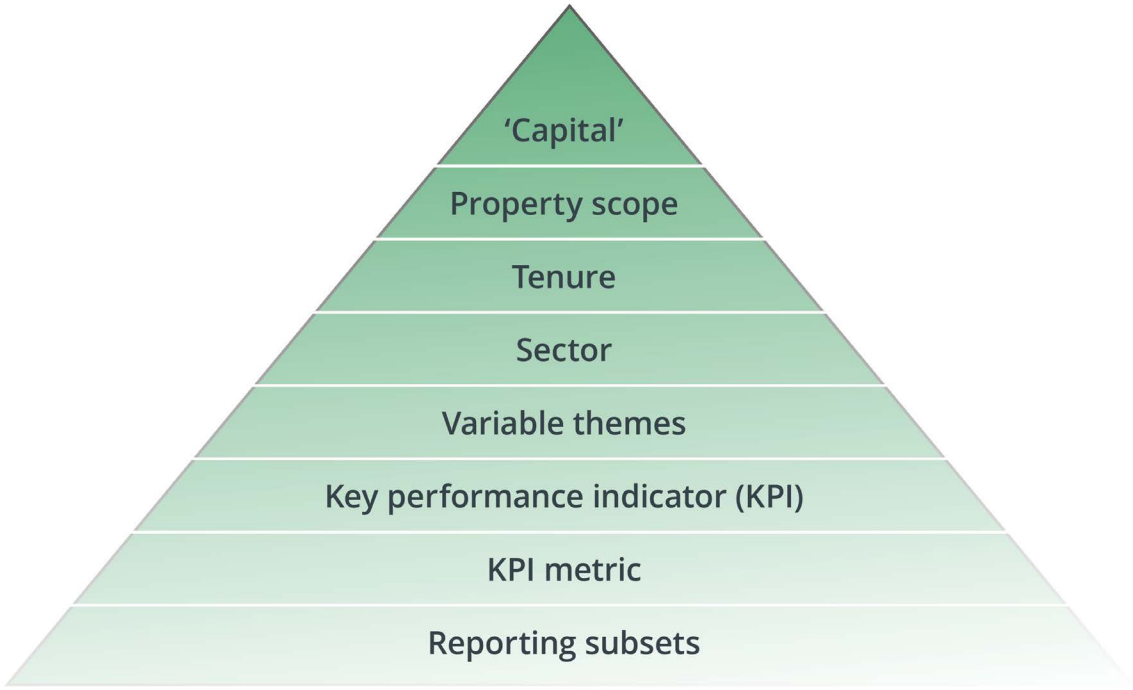

Figure 2: Developing KPIs for land-based businesses – broad framework
© Ian Bailey. Source: *Benchmarking in the rural sector* insight paper, Figure 6

Keeping it simple is a challenge but this must be a key consideration as time is money to land managers and advisers.

Data is king for rural business

Change is inevitable, and the pace of this change is likely to be rapid relative to the past. There is likely to be a significant shift from the current view of assets and tenure. This will be especially true for land use and its impact on the natural environment.

The efficient use of data will be key to managing business in all industries. Data on rural estates and land-based businesses is already being collected across many applications and platforms. The challenge will be to integrate and analyse this data to produce metrics that are clear, relevant and available to rural estates and land-based businesses to create a baseline and to provide information for benchmarking performance internally and externally.

Benchmarking should not be regarded as a quick fix, and the information must be acted on to improve performance. The objective is to ensure that estate and rural land-based businesses can act and react to changes in a timely and efficient way to ensure a thriving and sustainable rural economy.

Related articles

Read online now

Benchmarking success in rural estates

By Ed Barnston

Ian Bailey
is a partner at Triage
Contact Ian: Email | LinkedIn

Related competencies include:
Big data
Land use and diversification

RICS benchmarking insight paper

RICS is delighted to publish this **insight paper** on the key subject of benchmarking at this critical juncture for rural land-based businesses. RICS is interested to find out what the sector wants to see covered in future standards. We welcome your feedback. Please **email** RICS land specialist Fiona Mannix with your views.

What makes a Young Surveyor of the Year tick?

LAND JOURNAL
First published 11 March 2022

By Abigail Jones MRICS

Land (Rural and Urban) Young Surveyor of the Year Abigail Jones explains what attracted her to the profession

LJ: What made you decide to become a surveyor?

Abigail Jones: I come from a farming background and studied geography as an undergraduate, and always had an awareness and interest in my surroundings. Surveying is such a varied profession that affects everyone. We experience property and the environment in a personal and professional sense day in, day out. The pandemic has highlighted this because we have been inside our houses all day, every day. We were made aware of how the space we were living in was making us feel. So the environmental, social and governance (ESG) and health and well-being agendas are a huge growth area for our profession, for good reason.

LJ: What skills and other qualities would you say people need for this type of work?

AJ: Creativity, enthusiasm and passion, because what you can achieve is transformational. The opportunity has to be matched by your determination to achieve the best you possibly can from a place.

It is a profession that is flexible and allows you to move within it. There are so many possibilities in terms of roles and specialisms and sectors that it allows you to navigate yourself to where your strengths and skill sets lie.

Once you qualify, you're not stuck in that sector. The beauty of surveying is that you create a very flexible skill set that can be applied in different areas. It is also about communication, because it involves people and the relationships you have.

LJ: Why did you choose your specialism in development?

AJ: I work mainly in agency and consultancy in the development sector. I was fortunate that I had an internship in the development team in Savills, and then I realised it's a broad sector that involves a number of teams. I really enjoy working with different specialists.

For example, we work closely with our rural team at the inception of land development, mainly in the East of England on greenfield sites and regeneration schemes. Then you move on to work with the planning team and sometimes the commercial team, the urban design team and the residential development sales team.

I have such a broad view of the process, and I watch the built environment change and develop and improve around me. The beauty of my role is that I see the process through from beginning to end. I'm interested in influencing change and collaborating with other specialisms. I am really interested in the concept of placemaking which is under pressure to be more than the aesthetic.

> "Every day is different. In our profession you work with such a broad spectrum of clients and projects"

It is no longer just about early investment in the infrastructure or providing a quality environment. It's about sustainability, inclusiveness, health, wellbeing, connectivity, creating a diverse and integrated community – all social value aspects, which alongside good development principles, should be fostered from the outset, at planning stage, however they aren't easily measured financially.

LJ: Did you have a mentor?

AJ: I've had a number of colleagues who have been incredibly supportive and encouraging over the years, but my entire team and company provided me with a number of opportunities. I entered the job market in 2013 after the financial crash, just when things were just starting to become more positive.

Now I make sure that I provide my team, especially the more junior members, with that support network and encourage them to ask questions.

CGI of proposed new town, Northstowe, © Homes England

I ask questions every day myself and have a strong appetite for anticipating where the industry is heading. Learning is fundamental to our role. I like to surround myself not just with colleagues and clients, but also my peers from other companies. It's all about learning from each other and gaining different perspectives. I think it's important to keep your network as wide as possible.

I'm a firm believer in sharing ideas and challenging each other as well to support innovation across the sector. I recognise the importance of leading the discussion on making improvements in our industry. Through blogs that I write, presentations I provide or through my day-to-day role, I really enjoy the opportunity to influence the future of the development land sector.

LJ: What is an average day like for you?

AJ: Every day is different. In our profession you work with such a broad spectrum of clients and projects. I think that should be a consideration for anyone considering a career in surveying.

An average day usually entails working closely with different project teams on different sites. That may mean advising them on how to promote a particular asset through the planning system or suggesting an alternative use for it.

It involves problem-solving and imagination as well. If you are looking at a property or a field, you've got to be able to visualise what it could be. The job is creative: it's not just the financials and running the numbers, though of course that's important. It is also about thought leadership, and responding to what the community wants and to the environment.

> "The APC is a stamp of approval for best practice, and highlights your expertise to the client"

We want to work out how we can create places that are going to enhance the environment, communities, the climate and health and well-being are all interlinked. There is potential to create some amazing new places and spaces that manage to benefit all three.

It isn't just about housing, either; it's also about non-residential uses. How are you going to create that community? What are the intangible qualities that create the place, and how can you define them – thinking about the facilities and the infrastructure that are required?

LJ: What are the main challenges of working on large-scale projects?

AJ: Obviously it depends on technical delivery factors and the ownership status, and these may need to be worked through. The planning system is a process that has to be navigated. You must not think about your scheme in isolation: you have to think about connectivity to the existing settlement.

You've got to consider future generations as well and what they want from the place they're going to live, work and play in. So we think about how a scheme could work in a way that is sustainable and sensitive to the environment. Obviously it has to work financially as well, for the landowner, those delivering it and potential purchasers. It's important to provide a wide range of affordable homes, of different types and tenures.

It's a constant balancing act in terms of financial viability, securing planning permission and responding to the potential residents' wants and needs. That's the exciting part, because you are establishing a new place and community.

We need to be better at understanding that it's not just about these places looking aesthetically pleasing and being designed with quality products. It's also about understanding how the different uses in the larger scheme are going to complement each other and operate practically.

> "The beauty of surveying is that you create a very flexible skill set that can be applied in different areas"

The best projects take into account the intangible qualities, the mechanics of a new community and what they actually need.

LJ: Is there one project that you've particularly enjoyed?

AJ: I definitely align with what certain landowners or clients are trying to achieve with places they're seeking to deliver. For instance, I work closely with Homes England including on their planned sustainable new town, Northstowe, in Cambridgeshire. I support its strategic objectives of accelerating the provision of homes through the use of modern methods of construction and environmentally friendly approaches.

We are certainly seeing more and more landowners and clients realising the importance of the ESG agenda and carbon-zero initiatives. Those clients are exciting to work with because they have a long-term, strong and well-founded vision.

LJ: Why did you take on the role of an RICS APC assessor and counsellor?

AJ: I wanted to help others especially as they're starting out in their careers. I'm grateful for those individuals who have helped me in my career, and I want to make sure newcomers to the profession feel that they have that opportunity for support and mentoring as well.

The APC represents the knowledge that is fundamental for a chartered surveyor's career. It's a stamp of approval for best practice, and highlights your expertise to the client. I wanted to support that process and give something back to the profession. You're influencing an individual's credibility and helping them develop into the best professional they can be.

LJ: Do you think do you think the skills surveyors need are changing?

AJ: Technology has a large part to play in our profession, and can enhance our offering. We need to understand how it can improve and make us more efficient and effective. However, we need to pick and choose when to embrace it given our profession is centred around people and relationships. The workforce now entering our company grew up on social media. So we need to ensure we understand the new expectations and requirements of this generation. They will be motivated in different ways to us.

LJ: Do you have a message for aspiring surveyors?

AJ: It's a profession that you can be enthusiastic and passionate about, but it does require you to work hard to progress. It's great to be involved in a sector that everyone can relate to, and which can potentially influence and improve everyone's lifestyle and how they feel.

Abigail Jones MRICS
is director, development, Savills
Contact Abigail: Email

Related competencies include:
Development appraisals
Planning development and management
Sustainability

RICS signs up to climate action charter

LAND JOURNAL
First published 4 March 2022

With RICS becoming a signatory to the Professional Bodies Climate Action Charter, the organisation has committed to educate, influence and act for a net-zero future

By Phil Underwood

With climate action and net zero in the limelight following COP26, RICS has signed the Professional Bodies Climate Action Charter. This commits the organision to educate, influence and act as we transition to a net-zero world in collaboration with the Society for the Environment (SocEnv).

SocEnv already licenses RICS to award the chartered environmentalist (CEnv) registration to members who demonstrate high levels of environmental competence. Such registrants prove that they can use their knowledge, experience and evidence-based thinking to protect and enhance the environment.

The Professional Bodies Climate Action Charter

In the lead-up to COP26, SocEnv became a founding supporter of the **Professional Bodies Climate Action Charter**. This commits signatories to support carbon reduction ambitions in line with the Paris Agreement, and work towards the UN Sustainable Development Goals. Collaboration, leadership and competence are key.

The charter seeks three commitments from professional bodies.

- Develop, report on and share resources to create climate action plans for reducing emissions, in line with limiting global warming to 1.5C.
- Speak with a unified voice to and with other professional bodies, government and the public by creating an interdisciplinary forum.
- Empower and inspire members to encourage sustainable growth by providing continuous professional development tools, principles and resources.

The charter enables organisations to share knowledge, increasing their ambition and providing a framework for collaboration towards meeting climate change targets. It also ensures that professional bodies take action themselves.

RICS commits to climate action

As a leader in its sector, RICS has a vital role to play in supporting and inspiring professionals and businesses to make informed, positive environmental decisions. The organisation can help change the way its members work through CPD, sector standards, events and mandatory requirements.

Land and resources global group director James Kavanagh explains: ‘Climate action, sustainability and the important role that the built and natural environment plays in achieving net zero is at the heart of RICS’ strategic direction after COP26.

To ensure national and international goals for carbon emission reduction are met, all sectors must play their part

‘We are delighted to join this far-sighted and important initiative, and look forward to working with SocEnv and constituent professional bodies on making it a success.

‘Environmental professionals have a significant part to play in helping clients better understand sustainability. It is in all our interests to empower and inspire our members to promote sustainable growth.

‘RICS values its relationship with SocEnv highly, as it does the opportunity to allow chartered surveyors to add CEnv to their professional credentials.’

Multidisciplinary collaboration towards sustainable future

SocEnv chief executive Dr Emma Wilcox supports RICS’ commitment. ‘To ensure national and international goals for carbon emission reduction are met, all sectors must play their part,’ she says. ‘Professional bodies are well placed to take a lead in making this happen. With this in mind, I am pleased that RICS has joined the Climate Action Charter, showing leadership for its members.

‘As with all sectors, we know that there are many environmental challenges. But the multidisciplinary nature of the charter will support RICS on its journey to a more sustainable future.

‘It is also clear that with more RICS members actively training in environmental issues, a greater number will be able to demonstrate their own leadership by gaining the chartered environmentalist registration.

‘Proven environmental competence is essential in ensuring effective and efficient implementation of good practice, providing a sound platform for future generations of environmental professionals to build on.’

Phil Underwood
is engagement manager at SocEnv
Contact Phil: Email

Related competencies include:
Environmental management
Legal/regulatory compliance
Sustainability

LAND JOURNAL
First published 22 March 2022

Waste sector can do more to curb global heating

Waste's historic contribution to slow climate change has been underestimated – but there is significant potential for the waste management sector to contribute to mitigation

By Prof. David C Wilson

Municipal solid waste management is an essential service – and one we take for granted in the global north unless there is a disruption to regular collections. Such universal collection dates back to the 19th century in the global north. Since the 1970s, we have also been upgrading standards for disposal and incineration.

Much progress has been made since the 1990s in:

- diverting waste from landfill
- increasing recycling rates
- preventing waste.

However, at least a third of the world's population has no waste collection service, and people have to manage their own solid waste. They do so by open burning, or by dumping on land, into water, or at a communal site.

Even when waste is collected, it often goes to an uncontrolled municipal site. Many of these are continuously on fire, because once started, either accidentally or by pickers trying to recover more metals from the ashes, the fire can continue underground and be difficult to extinguish.

Waste management can help combat climate change

The management of waste and resources can contribute to combatting climate change in at least four ways.

Direct emissions

- Reduction in methane. Waste is an important source of methane through the decomposition of organic materials in controlled or uncontrolled landfill sites.
- Reduction in black carbon, also generated by the open burning of waste.

Both methane and black carbon are among the so-called short-lived climate forcers. They have much greater global heating potential than carbon dioxide, although they decay more quickly in the atmosphere. This means that any reduction in those emissions will do more to mitigate climate change in the short term than comparable reductions in carbon dioxide.

Indirect savings

- Recycling and energy recovery. Using recycled materials as secondary raw materials to displace virgin materials in industrial production significantly reduces carbon (and equivalent) emissions – for example by more than 90% for aluminium or more than 70% for plastics. Energy recovery from waste also provides potential carbon savings in energy generation, the amount depending on the fuels that are displaced.
- Preventing waste avoids the carbon emissions associated with producing and distributing the product that had become waste.

When accounting for carbon (and equivalent) emissions, the Intergovernmental Panel on Climate Change (IPCC) uses a simplified linear economy model to avoid double counting. Waste management is defined as the sector of the economy that disposes of wastes from up-stream sectors including agriculture, energy, industry and residential and commercial. Arguably, this was a reasonable representation of waste management in IPCC's baseline year of 1990. But this narrow definition excludes recycling and waste prevention, both essential elements of modern waste and resource management as the linear economy evolves towards a more circular economy, and where the resulting carbon savings accrue to other sectors of the economy.

The **IPCC's Fifth Assessment Report** (AR5) attributed just 3–5% of global greenhouse gas (GHG) emissions, in terms of carbon dioxide equivalent (CO_2e), to the waste sector in 2010. This focuses entirely on the direct emissions, with more than 90% coming from methane, **listed above**. But even there the estimate is low. In the global north, the collection and control of methane emissions from landfill dates back to the 1970s, well before the 1990 baseline date used for carbon accounting. Also, the carbon equivalence factor for methane used in AR5 and in all the other data reported below was 28; the 2021 AR6 report reassessed this to take into account aerosol–cloud interactions and

recommended use of the higher factor of 80, which would increase earlier estimates of the contribution of methane as a percentage of global emissions by a factor of more than two.

GHG share from UK waste keeps falling

Taking figures for the UK as an example, the **waste sector** accounted for 90m tonnes CO_2e in 1990, from a UK total of 890m tonnes. By 2010, this had fallen to 41m tonnes from the waste sector, out of a UK total of 690m tonnes; and by 2018 to 33m tonnes out of a total of 530m tonnes.

By 2010, the waste sector's emissions had dropped by 55% from the 1990 baseline. The sector's contribution to the total UK emissions had declined from 10% to 6%, and the sector had made around 25% of the UK's total emissions cuts over 20 years.

These impressive levels of carbon mitigation between 1990 and 2010 were achieved both by further methane control and by diverting waste from landfill, with dry materials recycled, organics diverted to anaerobic digestion and composting, and food waste cut, for instance through **WRAP's Love Food Hate Waste campaign**.

But the carbon benefits of recycling and waste prevention go way beyond reducing direct methane emissions from the sector. Again, using the UK as an example, a **recent industry report** suggests that sorting and recycling alone helped avoid 45m tonnes CO_2e of emissions in 2018. A **WRAP report** shows that food waste alone accounts for 36m tonnes. Recycling instead of producing virgin material and reducing food waste each avoided more than the 33m tonnes CO_2e that the IPCC-defined waste sector emitted in 2018.

In the global south, bringing waste under control is a major public health priority

Controlling waste in lower-income countries

In the global south, bringing waste under control is a major public health priority. The aim is to increase the proportion of municipal solid waste collected to 100% and to phase out uncontrolled disposal and open burning (SDG indicator 11.6.1). Both local and global environmental benefits could be huge. One estimate is that the plastic reaching the oceans each year could be reduced by at least 50% if this target is achieved.

The global climate benefits are also significant, although reported GHG emissions could potentially increase in the short term. This is because waste data is traditionally poor, and as management improves so will measurement, thus increasing the reported figures. Furthermore, as waste is controlled, the potential for methane emissions from anaerobic decomposition in landfill will increase.

One result is that in many low- and middle-income countries (LMICS), the waste sector as defined by IPCC could easily exceed the 1990 UK contribution of 10% to total emissions (even before allowing for the AR6 increase in the methane equivalence factor).

Another is that as waste generation rates per capita continue to increase in LMICS, and stabilise or decline in their high-income counterparts, the IPCC's measured global contribution from the waste sector in the former countries would increase over time if there were no mitigation. All this still neglects black carbon emissions from the open burning of waste. A lack of data kept this out of any quantitative assessment by the IPCC up to AR5 in 2013.

But research since then by Natalia Reyna, a student at Imperial College London, estimated that black carbon emissions from open burning of waste could contribute between 2% and 10% of global CO_2e emissions. The range reflects the then current best estimate of the carbon equivalence factor for black carbon of 2,000-5,000.

The IPCC's recent AR6 reduced the recommended factor significantly, so an updated estimate might be 1-3%.

AR6 does at least now include this as a source. However, its estimate that 9% of global black carbon emissions come from open burning of waste falls just below the 10% threshold above which waste management would have made it into the high-level reports as a significant source of GHGs.

890m tonnes
Total UK emissions in 1990

90m tonnes
Emissions from UK waste sector in 1990

690m tonnes
Total UK emissions in 2010

41m tonnes
Emissions from UK waste sector in 2010

530m tonnes
Total UK emissions in 2018

33m tonnes
Emissions from UK waste sector in 2018

The carbon benefits of recycling and waste prevention go way beyond reducing direct methane emissions from the sector

Potential carbon savings from waste and resource management

When I started working as an international waste management consultant in the 1970s, the sector had the narrow, end-of-the-linear-economy focus of the accounting conventions subsequently adopted by the IPCC. But over the past 25 years, the sector has worked hard, first to take a broader perspective on waste and resource management, and now to move towards a circular economy.

As a member and past president of UK professional body the Chartered Institution of Wastes Management (CIWM), I am no longer a chartered waste manager but rather a chartered resource and waste manager. Our new **purpose** as an institution is 'to move the world beyond waste'. But the perception among the climate community, policy- and decision-makers is still based on the official IPCC numbers, which show that the narrowly defined waste sector was a relatively small contributor to global GHG emissions in 2010, and thus not a priority for investment in mitigation.

This perception is wrong. We need to find ways to convey the bigger picture – that the emissions from the waste and resource management sector itself are far outweighed by its potential for enabling much larger savings across multiple sectors of the economy. These can be achieved both by recycling and recovery of waste, and by waste prevention.

How big could that contribution be? Given the notoriously poor data on waste and resource management, the best we can give is a rough figure.

Conservative estimates would give a range of 5–10% or more for each of the following:

- direct emissions of methane from landfill and of black carbon from open burning
- indirect savings from recycling and energy recovery in other sectors
- indirect savings from waste prevention.

Totalling the three segments adds further to the uncertainty, but whether the result is 15%, 20% or even higher is immaterial. We are confident that the overall contribution is significant, and needs to be recognised and integrated into the Nationally Determined Contributions under the Paris Agreement to have a chance of meeting its goal to limit global heating to 1.5°C or 2°C.

So we need to put better waste and resource management firmly on the agenda at the forthcoming COP27 – and beyond.

Prof. David C. Wilson
is an independent consultant and visiting professor in waste and resource management, Imperial College London
Contact David: Email | Website
A version of this article first appeared on WasteAid's website

Related competencies include:
Sustainability
Waste management

Best practice for landlords and tenants

RICS has published an **Insight paper** that provides an overview of the strategic framework adopted by Network Rail for the leasing and management of its waste-related sites.

Given the growing demand for sites suitable for waste-related activity, by publishing this paper, RICS provides some key learnings for professionals advising landlords and tenants of such sites and provides an insight into how best to minimise risk for all concerned.

How does climate change affect coastal regions?

LAND JOURNAL
First published 12 May 2022

By Prof. Dilanthi Amaratunga FRICS

Coastal areas are essential to many local and national economies – but are also especially vulnerable to climate change. What impacts is it having?

Around 10% of the world's population live or work in low-lying coastal regions . Coastal populations are highly vulnerable to climate change, being particularly affected by rises in sea level and wave height, coastal erosion, cyclones, and flooding.

Yet such areas are also focal points of trade, fishing and tourism, and thus vital to local economies. To protect these communities, it's vital that we understand the impacts of climate change and help them adapt appropriately.

Evidence of coastal climate change

Sea-level rise, higher atmospheric and oceanic temperatures, changing precipitation rates, and more frequent extreme weather events are the primary evidence of climate change in coastal areas. Globally, sea-level rise will threaten 95% of coastal regions during the 21st century. It is also the most immediate challenge for small island states.

Thermal expansion of oceans and polar ice melting are the main causes for sea-level change. In addition, sea-level rises lead to the following problems in coastal regions:

- flooding
- increased salinity
- inundation of land habitat
- changes in shorelines
- damaged mangroves and wetlands
- groundwater depletion.

These impacts will lead to the degradation of coastal ecosystems, loss of livelihoods and essential community services.

The UN's Sustainable Development Goals **11 Sustainable cities and communities** and **13 Climate action** highlight the need for a multidisciplinary, collaborative approach to limit the vulnerability of such communities to the physical, social, economic and environmental impacts of climate change.

Physical impacts

The physical impacts of climate change in coastal regions include:

- damage to critical infrastructure
- interrupted access for emergency services
- degradation of building materials and structures
- changes in energy consumption
- governance and institutional change.

Transport systems are part of the infrastructure that provides essential access for emergency services such as police, fire, and healthcare. Ports are another example of critical infrastructure threatened by the effects of climate change.

Meanwhile, building materials and structures can be damaged by ion-based salts in seawater. They corrode concrete and steel structures on bridges, roads, and pavements, leading to the risk of failure and potential injuries.

Contamination of lead by seawater and rising concentrations of chlorine cause increased corrosion of pipes. Corrosion contaminants pose a risk to wells and drinking water.

Social impacts

The social impacts of climate change in coastal regions include:

- threat to life
- decreased agricultural productivity
- need for social protection programmes
- displacement of people
- food and freshwater insecurity
- human conflict
- health risk.

The threat of permanent inundation, mainly due to rising sea levels, will displace coastal communities and destroy their livelihoods. Voluntary migration mainly occurs due to slow-onset changes such as decreased water resources, changes in weather patterns, rising temperatures and coastal erosion. Involuntary displacement, also called distress migration, mainly results from extreme weather conditions and hazards.

Thermal expansion of oceans and polar ice melting are the main causes for sea-level change

Such migration will increase pressure on urban infrastructure and services and economic growth rates. It could also lead to increased health risk and unrest. Hence, there is a need for social protection programmes that act as safety nets for climate refugees.

While rainfall and temperature are key for crop productivity, extreme climates, soil salinity in coastal areas, pests and diseases will affect the agricultural sector. These will lead to food insecurity in urban and rural communities. Appropriate, sustainable food control measures should therefore be designed, taking possible future conditions such as climate and land cover into consideration.

Economic impacts

The economic impacts of climate change on coastal regions include:

- loss of income leading to economic depression
- loss of employment in marine industries
- depleted resources
- inability to plan for economic development
- adaptation and reconstruction costs.

More than 80% of global goods and commodities are **traded by sea**, making ports vital economic assets. Unfortunately, one-third of sea ports worldwide are in areas at risk of severe tropical cyclones. Such ports are also prone to inundation because of hurricane storm surges caused by rising sea levels.

Although the marine economy is responsible for a considerable proportion of national GDP and employment in many coastal countries, extreme weather fluctuations, sea-level rise and other climatic changes will affect sectors such as tourism, fisheries and aquaculture. Food security and coastal employment will also be put at risk.

Coastal populations are highly vulnerable to climate change, being particularly affected by rises in sea level and wave height, coastal erosion, cyclones, and flooding

The change in climatic conditions and the subsequent impacts will affect economic development and people's livelihoods in coastal regions. Small island developing states such as Malta will face numerous economic issues.

Reduced tax bases, diminishing reserves and credit ratings, and increased borrowing during reconstruction will be challenging for these maritime nations. If economic losses due to climate-related hazards could be minimised, considerable GDP could be diverted towards other developmental needs such as education, health and reducing poverty.

Environmental impacts

The environmental impacts of climate change on coastal environments include:

- damage to the ecosystem
- impact on biodiversity
- pollution
- reduced quality of surface, ground and drinking water
- cost of environmental restoration.

Sea-level rise and global warming, increasing atmospheric carbon dioxide, ocean acidification and other climate extremes directly damage ecosystems such as salt marshes, mangrove forests, seagrass beds, soft sediments, kelp forests and coral and oyster reefs.

The degradation of mangrove ecosystems is a growing concern. This has come about because of sea-level rise, extreme weather events, changes in precipitation, and increased carbon dioxide concentrations in the water. Mangrove systems are crucial because they act as sea defence systems protecting the coastal line, controlling water flow speed and reducing the impact on coastal infrastructure.

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Ocean acidification and temperature variations also damage coastal ecosystems. The increase in ocean temperatures has lowered productivity, diversity and the resilience of nearshore marine ecosystems over the past few decades.

Changing climatic conditions also affect municipal solid waste landfills. Potential hazards include landslides and flooding due to intense rainfall or coastal inundation. This can cause toxic substances to disperse into the ground or groundwater.

Impact on the coastal built environment

Continued development worldwide, our growing population and the increased probability of extreme climate change-induced hazards have adversely affected built as well as natural environments. Climate change can affect property, infrastructure, coastal industries and marine ecosystems.

The construction industry and built environment professionals have a vital role to play in rectifying physical damage caused by disasters. Because the built environment is the most dangerous place during such disasters, its ability to withstand them will determine the resilience of the community.

Sea-level rise, heavy downpours, extreme heat and other climate-related phenomena are already damaging buildings and infrastructure. In future, some coastal infrastructure is likely to be ineffective.

As construction affects climate change and vice versa, the design in the built environment needs to plan for the impact of future climate and land-use change, and implement mitigation strategies for increased air temperature that minimise heating and cooling demand.

In coastal regions, structural changes to the built environment will require measures that include:

- sea walls and breakwater arms
- water recycling systems
- waste-water treatment plants
- beach nourishment sand pumping.

There is thus mounting pressure for built environment professionals, including planners and architects, to promote sustainable construction to reduce risks to human and environmental health.

Prof. Dilanthi Amaratunga FRICS is professor of disaster risk reduction and management and head of the Global Disaster Resilience Centre at the University of Huddersfield
Contact Dilanthi: Email

Related competencies include:
Environmental management
Management of the natural environment and landscape
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Americas, Europe, Middle East & Africa
aemea@rics.org

Asia Pacific
apac@rics.org

United Kingdom & Ireland
contactrics@rics.org

rics.org