



Inspiring trust for a more resilient world.

Whitepaper:

The role of standards and National Standards Bodies in achieving Net Zero

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Any errors that remain are entirely the authors' own responsibility.

Contents

Acronyms.....	4
Foreword.....	5
Executive Summary.....	6
1. Context, Challenge and the Conclusions of COP 26	11
2. Accelerating the Transition to Net Zero: The Role of Standards, Standards Bodies and the BSI Approach	16
A. The Role of Standards, National Standards Bodies and the International Standardization Organizations: ISO and IEC.....	17
B. BSI's Strategic Partnership with Government to achieve Net Zero.....	22
C. The Role of Standards in Bringing Integrity to Voluntary Carbon Markets.....	28
D. The role of standards in bringing integrity to trade of Net Zero products.....	28
E. Developing an Agile Approach to Standardization.....	29
F. Conclusions and Recommendations.....	31
3. Accelerating the Transition to Net Zero : The Role of Cities, Smart City Concepts, Digital Infrastructure and Data	33
A. An Overall Strategic Vision and Integrated Processes for Delivery at the City Region Level.....	35
B. Conclusions and Recommendations.....	40
4. International Cooperation and the Role of Standards and National Standards Bodies in Achieving Net Zero	41
A. Funding.....	41
B. The IMF/World Bank Tools.....	42
C. The role NSBs and standards can play in developing countries.....	44
D. Conclusions and Recommendations.....	45
Box	
Box 1: National Standards Bodies.....	18
Box 2: 2021: A game-changing year for International Standards.....	19
Box 3: Using Standards and the Quality Infrastructure System to combat Greenwashing.....	21
Box 4: Case Study on the UK's approach to Net Zero.....	23
Box 5: Facilitating the roll out of Smart Energy Appliances and Electronic Vehicles Charging Points.....	31
Box 6: Net Zero in the Royal Borough of Greenwich, London, UK.....	34

Acronyms

AF	Adaptation Fund	ISO	International Organization for Standardization
ARSO	African Organization for Standardisation	ITU	International Telecommunications Union
BEIS	UK's Department for Business, Energy and Industrial Strategy	LDC	Less Developed Country
BIM	Building Information Modelling	LDCF	Least Developed Countries Fund
BSI	British Standards Institution	MDB	Multilateral Development Bank
CCC	UK Climate Change Committee	NDC	Nationally Determined Contributions
CBI	Climate Bonds Initiative	NGO	Non-Government Organization
CCPA	IMF/World Bank Climate Change Policy Assessments	NSA	Non-State Actors
CfD	Contracts for Difference	NSB	National Standards Body
CEN	European Committee for Standardization	OECD	Organization for Economic Co-operation and Development
CENELEC	European Committee for Electrotechnical Standardization	PPA	Power Purchasing Agreements
COP 26	26th UN Climate Change Conference	PAS	Publicly Available Specification
CSN	Commonwealth Standards Network	PIM	Public investment Management
EV	Electric Vehicle	PBS	Professional & Business Services
GCF	Green Climate Fund	SCCF	Special Climate Change Fund
GDP	Gross Domestic Product	SDG	Sustainable Development Goal
GDPR	General Data Protection Regulation	SIDS	Small Island Developing States
GHG	Green House Gas	SME	Small and Medium Size Enterprise
IC-VCM	Integrity Council for Voluntary Carbon Markets	UK	United Kingdom
IEA	International Energy Agency	UN	United Nations
IEC	International Electrotechnical Commission	UNEP	United Nations Environment Programme
IMF	International Monetary Fund	UNDRR	United Nations Office for Disaster Risk Reduction
IEA	International Energy Agency	UNCTAD	United Nations Conference on Trade and Development
IoT	Internet of Things	VCM	Voluntary Carbon Markets
IPCC	Intergovernmental Panel on Climate Change	VCMI	VCM Integrity Initiative
ITS	Intelligent Transport Systems	WG	Working Group



Foreword

In his opening statement at COP 26 in Glasgow António Guterres referred directly to the importance standards for net zero commitments. His remarks reflect a sea-change in attitude across governments and organizations towards the value of standards to address global challenges.

As the global economy has adapted to the COVID-19 crisis, it seems that industry leaders have emerged from lockdown more convinced than ever about the urgency of climate change. Their investors, shareholders, employees, suppliers, customers, families and friends are demanding that they take action. I saw this at COP 26, where the mood had changed compared to previous years.

There was a sense of determination in the air to make it happen. The need for common standards of measurement, reporting, performance and adaptation was openly discussed as a tool for governments and private sector organizations to achieve Net Zero. The pace has only accelerated since then and we see growing commitment from the leading international, regional and national standards organizations to support this huge effort.

COP 26 highlighted the scale of the challenge ahead. We need to deliver transformation on a global scale and in a world of transformation, all parts of society need to have confidence and trust in the outcomes, and in the processes for delivering those outcomes. International Standards are central to this journey.

Consensus, stakeholder led standards are the most effective and fastest means to capture and disseminate global good practice across borders and industry sectors and we at BSI are determined to play our part in the process. Together with the International Organization for Standardization (ISO) we developed the London Declaration, a commitment to ensure that international standards take a science based approach to climate change, now supported by many other national standards bodies (NSB), regional and international standards organizations. We are working with government bodies across the UK to ensure standards support their Net Zero strategies and with the innovation community to develop standards that will accelerate the deployment of new technologies. In the financial sector, we are pioneering new standards for sustainable finance and supporting the Integrity Council for Voluntary Carbon Markets (ICVCM), a UNFCCC initiative to bring much needed quality standards and governance processes to those offering carbon credits. We are working with organizations and business associations to promote the use of standards as a performance accelerator and internally we are developing more agile approaches to standards development, reflecting the needs of policy makers, industry and academics for speed.

I am delighted that as part of our thought leadership on the role of standards in the global economy, BSI has published this White Paper. For too long standards have been an underused and under-valued tool for business performance improvement. António Guterres' opening remarks at COP 26 on the importance of standards are evidence that the mood has changed. Policy makers and business leaders urgently need more insight to learn how to exploit the standards we already have, to reduce the complexity of multiple standards and to address gaps that will increase trust and commitment. This paper is aimed at helping nation states and non-state actors (industry, cities, organizations) to achieve their Net Zero objectives. We welcome anyone interested to work with us to accelerate and scale change through better use of standards in the delivery of the global Net Zero transition.

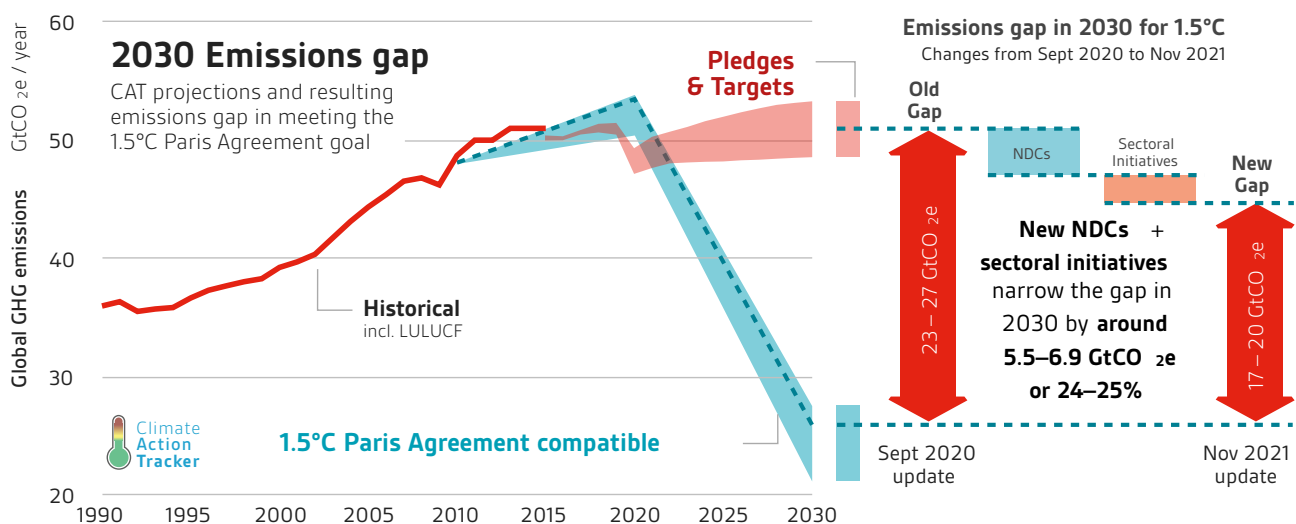
A handwritten signature in black ink, appearing to read 'Scott Steedman'.

Scott Steedman
Director-General, Standards

Executive Summary

Leading experts and politicians, particularly from the most vulnerable nations, had been hoping for a major breakthrough at COP 26. They thought that the extreme weather events, which have been experienced worldwide and captured so vividly on news bulletins in recent years, would have added sufficient weight to the steady accumulation of scientific evidence that has been compiled by the Intergovernmental Panel on Climate Change (IPCC) over decades, to achieve that breakthrough. However, it was not to be. As the UN Secretary General, António Guterres remarked in his statement on the COP 26 Conclusions, "...unfortunately the collective political will was not enough to overcome some deep contradictions." The phasing out of coal remains a sticking point for major users, and national commitments together with the sectoral initiatives announced in Glasgow, to reduce carbon emissions by 2030, remain at around half the level required to meet the goal. The 1.5°C target lies within reach, but there is little illusion at the scale of the challenge this represents or the consequences of failure.

Figure 1 The 2030 Emissions Gap



Source: Climate Action Tracker²

This paper cannot cover the political differences which lie at the heart of the negotiations, nor does it seek to do so. It rather seeks to demonstrate that, if nation states are to undergo the societal transformation that is required to achieve the emissions targets, at a price that is affordable, then targets, taxes and technology are not enough. A more holistic approach is required where international standards have a central role to play, not simply in defining with greater confidence the carbon savings generated by any particular intervention but, more importantly, as a means of ensuring that solutions and good practice are transferable worldwide. This would enable both developed and developing countries to work towards Net Zero more cost effectively, and to achieve their Sustainable Development Goals (SDGs).

This paper is therefore aimed at policy makers in developed and developing countries, including the UN and its agencies, the World Bank/IMF and at development banks and donors, together with National Standards Bodies³. We also hope it will be of interest to the wider business and academic community, particularly those with an interest in the issues around climate change and its impact on the developing world. What this paper seeks to demonstrate is that new approaches to addressing the challenge can bring about significant benefits in the form of:

1 <https://www.un.org/sg/en/node/260645>
 2 https://climateactiontracker.org/documents/1002/CAT_2021-11-11_Briefing_GlasgowSectorInitiatives.pdf
 3 In the context of this paper, NSBs are those organizations appointed by, and accountable to, national governments for managing national standards used by industry and regulators in their country. They are also responsible for maintaining the national membership and national delegations supporting the work of regional and international standards organizations, e.g. CEN/CENELEC, ARSO, ISO and IEC. The national members of the IEC, commonly known as National Committees, perform the same function as the NSBs in ISO.

- building trust in new Net Zero systems and, thereby, converting suspicion and fear of change into a growing sense of the opportunity that Net Zero affords;
- ensuring a cost-effective means of scaling up solutions and transferring knowledge worldwide;
- reducing the cost of the pathway to Net Zero by around a half; and
- providing the framework for “crowding in” much needed private finance.

We have structured the paper in the form of four main Chapters:

- 1 The Context, the Challenge and the Conclusions of COP 26:** the chapter briefly summarises the IPCC evidence on the scale of the challenge, the consequences, in terms of rising global temperatures, of different scenarios, and the extent to which COP 26 secured the path to 1.5°C. As its title suggests, it provides the scene-setter for the discussion that follows.
- 2 The Role of Standards and Standards Bodies in Accelerating the Transition to Net Zero:** In his concluding remarks⁴, the UN Secretary General, António Guterres, also spoke of the climate of mistrust that is enveloping global relations, and how climate action can help rebuild trust and restore credibility. In this paper we take his argument one step further, namely that climate action itself needs to be based on trust and credibility: we believe it is only by adopting a holistic approach to adaptation and mitigation, which is supported by International Standards, as developed under WTO principles, that we can build the necessary trust and credibility into the Net Zero agenda.

Standards codify consensus based, good practice. They help establish a common understanding of concepts and terms, develop agreed methodologies for measuring outcomes, articulate the principles and processes by which those outcomes might be achieved, and are reviewed periodically to ensure relevance in a world of rapid change. This is essential to building trust and confidence in new Net Zero systems.

The chapter sets out the role of standards in tackling the challenge of transformation, and the work of International Standardization organizations, specifically the International Organization for Standardization (ISO) and the International Electrotechnical Commission (IEC), to provide a forum for developing a common approach and common standards, which all countries can adopt. With their extensive coverage of sectors, their access to technical expertise, their global reach, and long tradition of consensus-based approaches, these international standards bodies provide policy makers with a powerful vehicle for driving change.

Chapter 2 illustrates how National Standards Bodies (NSBs) can play a pivotal role in supporting national policy makers by describing how BSI, as the UK's NSB, has been collaborating closely with the UK Government to develop standards in key areas, with new, agile processes to reflect the pace of technology change. It also illustrates how voluntary, consensus-based approaches can not only underpin technology developments, but also vitally important market developments as well, such as bringing confidence and integrity to the global Voluntary Carbon Markets (VCM). However, the chapter also points to concerns by leading European companies that the regulatory and standards framework, around the sustainability agenda, lacks clarity, making “green” innovation strategies more difficult to develop and promulgate⁵.

Chapter 2 reaches the following main conclusions, that:

- COP 26 highlighted the importance of international standards in building trust in the outcomes of policy interventions and business claims relating to carbon reduction. However, there needs to be much wider recognition that international standards play a key role in underpinning, and building trust in, the service systems themselves (e.g. distributed renewable energy and Net Zero “intelligent” transport) and in the carbon offset markets that are growing rapidly as non-state actors seek to secure credibility for their Net Zero strategies.

- Governments should work with NSBs to develop a standards strategy in key sectors, to inform policy makers and business how global good practice might be accessed, and how procurement processes might benefit. They should also consult the VCM Integrity Initiative (VCMI) and the Integrity Council for Scaling VCMs (IC-VCM) to improve their access to the voluntary carbon market.
- To ensure a global perspective, and a common approach to addressing the global challenge of Net Zero, NSBs should ensure that national standards catalogues use international standards to the greatest extent possible.
- While at present standards are developed upon the demand of stakeholders, standards bodies need to take a more pro-active lead in creating the standards that their foresight activities indicate are necessary to achieve Net Zero and, thereby, provide policy makers and business with a clear framework and the practical means for implementing Net Zero policies. This should form part of a wider strategy by the standards community to be more agile in its approach to standards development, in order to keep pace with the speed of technology change and the urgency of the Net Zero agenda.

3 The Role of Data and Holistic Smart City Concepts in Enabling the Transition: we recognize that the IPCC's guidelines for measuring national greenhouse gas (GHG) inventories, and their key sectoral components, are an essential policy tool for developing and revising Nationally Determined Contributions (NDCs) of GHGs, while also providing a consistent basis of comparison of performance between countries, and over time. A national framework of targets, combined with regulation, funding, and incentives, provides an essential base for a credible Net Zero strategy. However, if the Covid pandemic has taught us anything, it is that a societal response to a national challenge requires a strong local input. Ultimately, it is the design, implementation, and communication of Net Zero strategies by local authorities, within the national framework, which will determine success.

Chapter 3 emphasises the importance of complementary spatial policies, relating to towns and cities, in a world that will be 70% urbanised by 2050. It sets out an integrated, systemic approach that combines national policy frameworks with smart and sustainable city concepts, based on eleven key elements to form a solid bridge to a Net Zero world. The main conclusions are that:

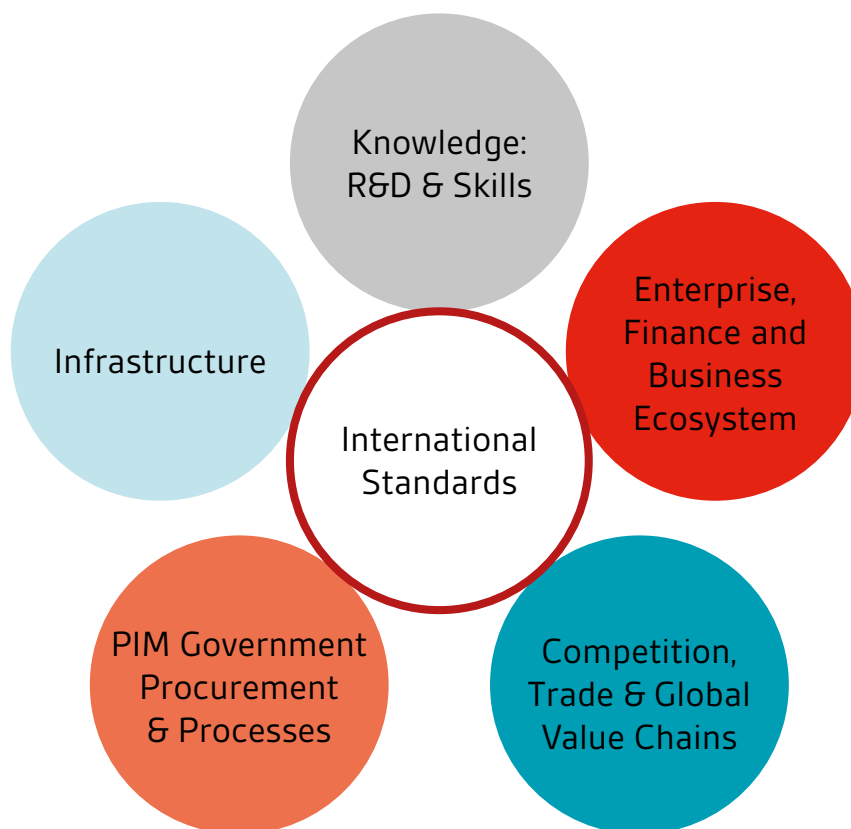
- although sectoral strategies are clearly important, Net Zero is fundamentally a behavioural challenge that is firmly located in the community, and complementary spatial strategies are essential.
- as policy moves from target setting to delivery and performance monitoring mode, it is only holistic smart city strategies, developed within the context of the national strategy, with clear governance frameworks, including agreed levels of (city) autonomy, accountability, funding, and transparency, that will lead to maximum engagement and lowest cost delivery.
- In this regard, engagement is not a call to arms from central government, but a demonstration by local government that Net Zero policies lead to a better quality of life for all and that, to achieve these societal objectives, the 4 Ds – urban Design, Digital infrastructure, Data and Digital twins – are central to success.
- Standards play a vital role in enabling the above agenda, including the development of citizen centric data management strategies, secure digital ID and digital networks, and the interoperability of service systems. They also have a key role in developing metrics that demonstrate the societal benefits from transformation e.g. reducing fuel poverty, improving air quality, reducing travel times and creating healthier communities that successful transformation demands.

4 International Cooperation and the Role of Standards in Achieving Net Zero: much of the focus of discussion on international cooperation to achieve Net Zero, including at COP 26, has inevitably been on finance. According to the IEA⁶, investment in clean energy by emerging and developing economies would need to increase from current levels of \$150 billion pa to \$1 trillion pa by 2030 to achieve the Net Zero scenario by 2050. It estimates that, in sub-Saharan Africa, energy investment will need to rise to more than 6% of GDP by 2030. On top of this, the recent Adaptation Gap Report 2020 by UNEP⁷ estimated the annual cost of adaptation in developing countries to be \$70 billion, rising to \$140-300 billion in 2030, and up to \$500 billion in 2050. Finance on

this scale is clearly a barrier to implementation in developing countries, devastated by Covid, and where debt to GDP ratios regularly exceed 100%. As the IEA points out, such a level of investment can only be achieved if there is a switch away from public to private, and it anticipates that more than 70% of clean energy investment – mainly renewables and energy efficiency – will be privately financed, from a global investment pool of \$200 trillion. This chapter summarises the steps that have been taken, to date, to help developing countries address the challenge.

But, as we noted in Chapter 3, access to finance is not the only barrier, and we suggest that the bridge to Net Zero, which combines national and local strategies, might be adopted by developing countries as a holistic, and more cost effective, framework for addressing the climate challenge. The chapter also contrasts the dynamic engagement between policy makers and the NSB in the UK – a situation with parallels elsewhere in the developed world – with that of many developing countries. For the most part, standards uptake is low, and the resources devoted to address climate change by NSBs are at a bare minimum. The key point is that standards touch all elements that contribute to productivity and sustainable growth, as Figure 2 below illustrates. Moreover, a recent review by ISO⁸ (April 2021) indicated a significant link between standards uptake and economic performance in various countries, including South Africa.

Figure 2 Key factors of Economic Development



Chapter 4 draws the following main conclusions, that:

- while skills, infrastructure and enterprise are critical to sustainable economic growth, developing the role of NSBs as agents of transformation that shift the business focus towards quality processes and outcomes, should become a much more important part of the policy mix. Development agencies and the standards community need to collaborate to raise the profile of standards, improve the capacity and status of NSBs, and make the concept of standards led, sustainable growth a reality.
- while the ability to develop this agenda will differ between developing countries, policy makers should consider developing regional hubs of expertise to apply standards to key value chains/sectors, promote intra-regional and global trade, and underpin government procurement.
- development banks should promote the uptake of international standards as a means of reducing the risk on their loan books and “crowding in” private finance to fund projects.
- the uptake of international standards would provide a strong basis for increasing regional and sub-regional trade, as part of the wider sustainable growth agenda.

In conclusion, the recent report by Climate Action Tracker (Ref.2) suggests that, even accounting for the latest NDCs and allowing for the sectoral initiatives announced in Glasgow, emissions in 2030 are likely to be around twice the level that is required to meet the 1.5C target. Clearly, willing the ends is not enough, and it requires more than papers to conjure up the means. Nevertheless, we hope that readers will view the proposals presented here as a positive contribution to the debate on how to achieve Net Zero, and that policy makers will, at the very least consider and, ideally, adopt them. If policy makers or business leaders want to examine our assumptions or debate the viability/practicality of our proposals further, we are very open to such engagement. In the race to achieve Net Zero, building trust lies at the very heart of successful transformation; engaging society effectively is the key to acceptance; and resources – i.e. “the means” - will flow quickly to transparently good investment proposals. The approach set out in this paper will deliver all three of these ambitions, at pace and at scale.

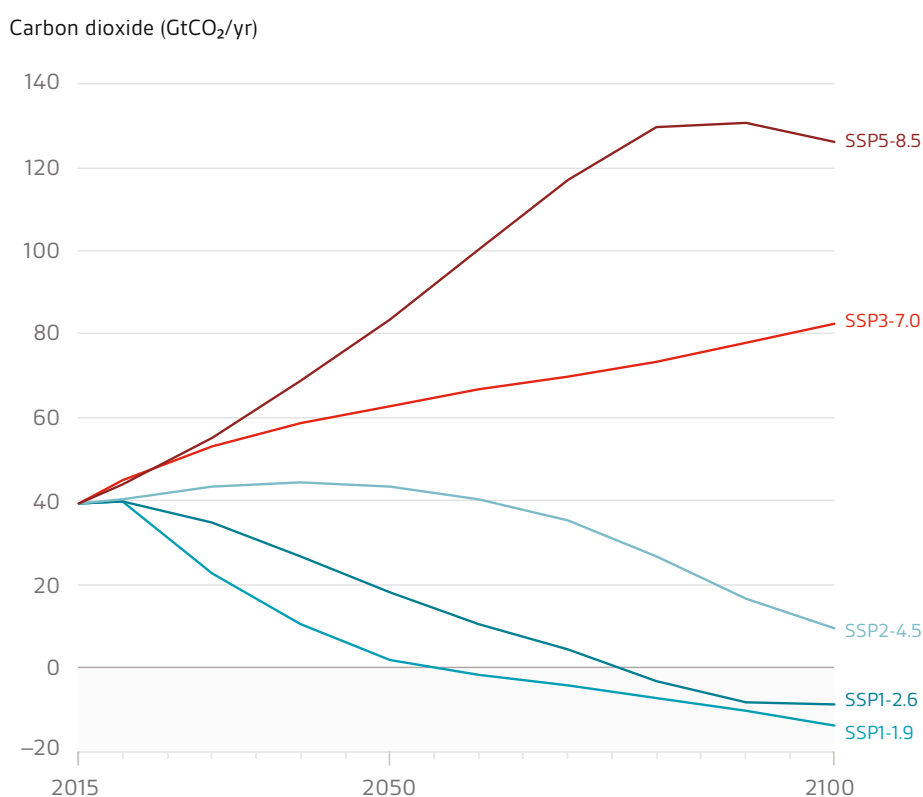
1. Context, Challenge and the Conclusions of COP 26

The latest contribution to the 6th IPCC assessment report by Working Group 1 (WG1)⁹, on the science of climate change, provides the context, and confirms the scale of the task ahead, if we are to limit global warming to 1.5 degrees Celsius. Contributions by WGII and WGIII, including the costs and benefits of mitigation and adaptation, will be published in early 2022.

Figure 3 below, drawn from the report, shows the level of CO₂ emissions in relation to five scenarios, and Figure 4 shows, for each scenario, the impact of overall emissions on global surface temperatures by the end of the century. It is important to note that:

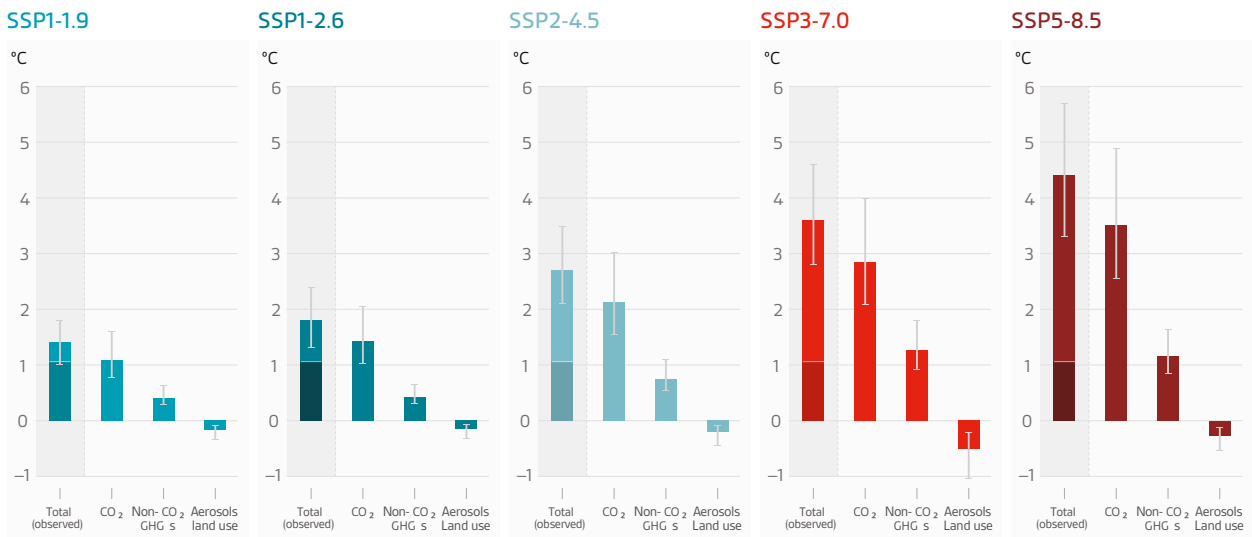
- The differences in impact on carbon emissions, between the scenarios, only really emerge in the second part of the century.
- Carbon emissions are the most important to address, and only the two most stringent carbon reduction scenarios will result in zero emissions by the latter part of the century; these are the most likely to keep global surface temperature increases within the 2 degrees Celsius target, adopted in Paris in 2015, and only the most optimistic is consistent with the 1.5C target (see Figure 4).
- The medium emission scenario (SSP2-4.5), which most closely proximates to current national commitments, is likely to fail to reach the agreed target and, hence, could result in surface temperatures exceeding 2.5 or even 3 degrees C.
- The two upper scenarios relate to a world without constraints, which would result in an increase in temperature that would cause widespread social disruption and ecological disaster.

Figure 3 Future Annual Emissions of CO₂ across Five Illustrative Scenarios



Source: IPCC. AR6 August 2021

Figure 4 Impact of Each Scenario on Global Surface Temperatures, 2081-2100, relative to 1850-1900, degrees C

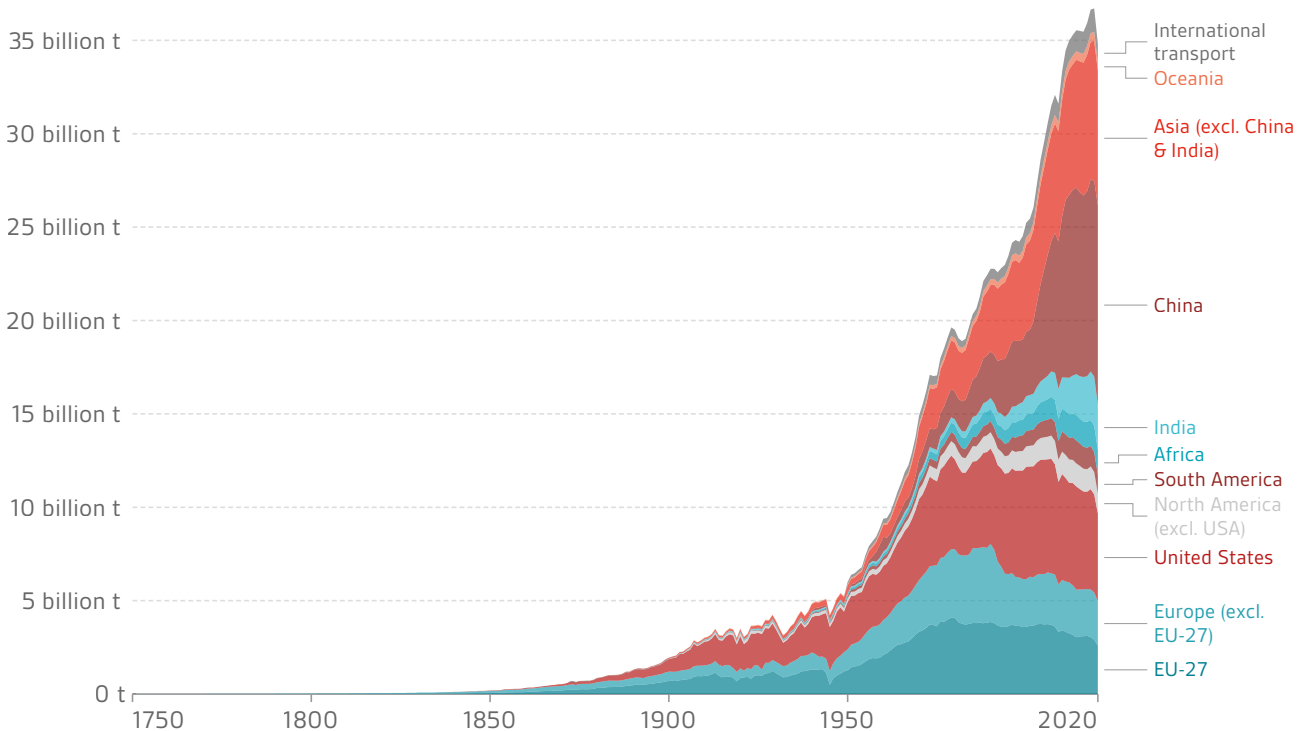


Total warming (observed warming to date in darker shade), warming from CO₂, warming from non-CO₂ GHGs and cooling from changes in aerosols and land use

Source: IPCC. AR6 August 2021

The first two scenarios, to reduce carbon emissions to zero, require systems and societal transformation on a massive and truly global scale, at a time when developing countries are beginning to experience the benefits of relatively low cost and reliable energy from fossil fuels. Figure 5 below shows that, currently, almost half of emissions arise in Asia, although much of this is the result of embedded carbon, exported in products to the developed economies in the West. Moreover, while Africa only accounts for 4% of global emissions at present, its rapidly growing, aspiring urban population will account for a much higher share of the emissions, unless effective carbon mitigation strategies are put in place.

Figure 5 Annual Total CO₂ Emissions by World Region



Source: Our World in Data¹⁰

Although developing countries in Africa and the Caribbean contribute little to global warming, they have experienced an upsurge in extreme weather events over the past few decades. In monetary terms, the UN and World Bank estimate that developed countries account for 60% of the economic losses recorded between 1970-2017¹¹, but the proportion falls to a quarter, in terms of the number of disasters recorded, and only 6%, in relation to the number of deaths. And, of course, the impact on GDP and public finances are orders of magnitude different. For example, in 2005, the worst storm to hit the USA, Hurricane Katrina, inflicted some \$100 billion of damage, which is less than 1% of US GDP, and total economic losses of around 1.2%. A recent climate change assessment report, prepared for Belize by the IMF (2018)¹², notes that the average annual losses from storms and floods amount to 7% of GDP, and that there is a one in one hundred years chance that the cost of a disaster will exceed 100% of GDP. Thus, while there is considerable support across all countries for investing in mitigation measures, unsurprisingly, in the Caribbean and elsewhere in the developing world, adaptation and resilience are the policy watchwords.

Conclusions/Outcomes of COP26

We have spoken of the disappointment at some of the outcomes in relation to the scale of the challenge set out by the IPCC report. But it would be wrong to assume that nothing was achieved. In a fortnight of announcements and negotiation, on topics ranging from finance to deforestation pledges, and zero emission cars, the main themes were:

- **The Glasgow Climate Pact**¹³: this draws together the key elements of the negotiation to form a consolidated agreement. Much focus has been given to the watering down of the text, from “phasing out” unabated coal production to “phasing down”, but this is the first time that specific reference has been made to coal as a target. While substance was lacking, in terms of reduced nationally determined contributions to hit the 2030 target, the Pact:
 - firmly places 1.5C as the policy goal;
 - recognises that this requires a 45% reduction in global CO2 emissions by 2030, from levels in 2010;
 - recognises accelerated action is required early in this decade, to achieve this goal
 - requests countries to revisit and strengthen their targets by the end of 2022.
- **Finance, Loss and Damage and Adaptation**: unsurprisingly, the question of how to finance transformation and the impact of climate change was the key theme of the conference. Within that, the main issues, and agreements reached, related to:
 - **The Copenhagen pledge**, where the failure of the developed world to fulfil the commitment made in 2009 to raise \$100 billion per year by 2020, to support developing world efforts, was, from the outset, a source of distrust. The expectation is that the target will be met in 2023¹⁴ and will continue through to 2025; the question of post-2025 finance will form part of the discussions for COP 27.
 - **Loss and damage**, where the objectives of the developing world are to create a significant new stream of funding, over and above adaptation and mitigation, to help vulnerable countries recover from the devastation of extreme weather events. The argument is that the advanced economies have created these adverse weather conditions, through their intensive use of fossil fuels since the Industrial Revolution, but it is this connotation of liability that is creating resistance from the richer nations. The upshot was an agreement “to discuss the arrangements for the funding of activities to avert, minimize and address loss and damage”: developed countries agreed to fund the dedicated network of interest (the Santiago network) to develop proposals for COP 27.
 - **Adaptation**, where developing countries urged richer nations to support their efforts to cope with climate change. The agreement calls for a doubling of Adaptation funds by 2025, compared to 2019, which will result in a total of \$40 billion pa. As commentators point out, this is a small proportion of the amount the UNEP expects developing countries to spend on adaptation in the years ahead – rising from \$70 billion, at present, to \$140-300 billion in 2030. However, it has the huge advantage of being grant based in an area where private finance is rarely available.

¹¹ https://library.wmo.int/doc_num.php?explnum_id=10902

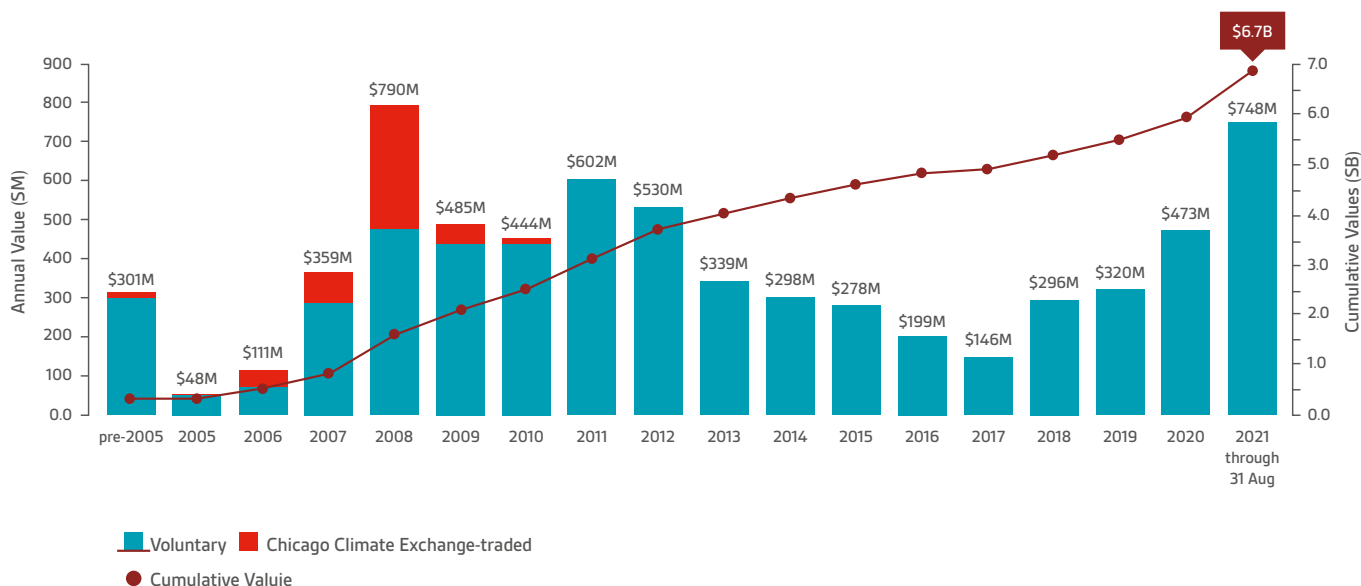
¹² <https://www.imf.org/en/Publications/CR/Issues/2018/11/16/Belize-Climate-Change-Policy-Assessment-46372>

¹³ https://unfccc.int/sites/default/files/resource/cop26_auv_2f_cover_decision.pdf

¹⁴ <https://www.cleanenergywire.org/news/wealthy-nations-100bn-climate-finance-pledge-delayed-2023>

- **Transparency:** the Transparency Rules mean that progress on national commitments can now be validated and monitored for all nations. To date, only the wealthy nations have been under an obligation to report, and major emitters, such as China and India, have not reported for many years. COP 26 means that all countries will report their progress on emissions every two years, in a common format, which will be subject to expert and peer review. This is a major step forward, although the flexibility built into the requirement, for the benefit of developing countries without the technical capacity to complete the exercise, provides potential ambiguity – but one which can be addressed through technical assistance.
- **Carbon Markets and Non-Market Agreements (Article 6 of the Paris Agreement):** Carbon offsets and Voluntary Carbon Markets (VCMs) have developed since the Kyoto Protocol was ratified in 2005 and, following a dip as a result of the Financial Crisis of 2008, they have grown more recently and quite rapidly since 2019. As a result, there has been growing interest in the role VCMs can play in providing private capital in support of a range of mitigation projects, and predictions about the size of this market in 2030 range from \$50 billion to \$150 billion pa, a significant increase on current levels.

Figure 6 Market Size by Traded Value of Voluntary Carbon Offsets 2005 - Aug. 2021.



Source: Ecosystem Marketplace¹⁵

Aside from the fundamental challenge raised by environmentalists that carbon offsets simply salve consciences, and do nothing to reduce the carbon footprint of the buying organizations, the growth of these markets has also raised questions about the quality and integrity of the carbon credits on offer. From the earliest years, a number of organizations were established, with the support of NGOs, to bring integrity and transparent standards to the market, notably the Gold Standard (2003) and Verra (2007). The former has generated over 2,000 projects, reducing emissions by 173 million tonnes of CO₂, and the latter 1,700 projects, reducing emissions by 630 million tonnes. However, with many players entering an emerging market, making claims about their environmental credentials, where there are a wide range of “products” and transparency was often lacking, concerns about the veracity of claims increased. According to some commentators, the markets for carbon credits had taken on all the characteristics of second-hand car markets, where quality assessments lack rigour, with adverse consequences for the price of credits and the credibility of corporate claims.

Even the UN Secretary General, in his opening speech to the Conference, was moved to remark that:

"...But we also need greater clarity. There is a deficit of credibility and a surplus of confusion over emissions reductions and Net Zero targets, with different meanings and different metrics. That is why – beyond the mechanisms already established in the Paris Agreement – I am announcing today that I will establish a Group of Experts to propose clear standards to measure and analyze Net Zero commitments from non-state actors."

Furthermore, in the case of carbon credits, the lack of commensurate adjustment to NDCs had led to double counting.

Article 6 of the Paris Agreement (2015) sought to bring more structure and integrity to these markets by limiting the volume of post-Kyoto offsets that were eligible, in order to reduce the risk of flooding the market with offsets of doubtful provenance, and by ensuring corresponding adjustments were made to NDCs when credits were sold and transferred overseas, to avoid the risk of double counting.

Negotiation of Article 6 involved difficult trade-offs between the parties, but the scale of the opportunity afforded by properly constituted VCMs, and the risk of undermining the Agreement, resulted in the rulebook for authorised carbon markets being agreed in Glasgow. The main elements were:

- The risk of double counting authorised carbon credits, whereby both the country offering the credit and that buying it can claim the reduction on its carbon budget, has been removed. Every purchase needs to be balanced by a corresponding adjustment to the authorised credits of the issuing country.
- Credits generated, between 2015-2020, from reduced deforestation and forest degradation (under the UN REDD+ scheme) have been excluded from the market. However, up to 320 million tonnes of CO₂ equivalent of credits have been carried over from the Kyoto protocol.
- 2% of the officially authorised credits will be removed from the system, to bring a net reduction in emissions.
- 5% of the proceeds from offset trades will be channelled to the Adaptation Fund, to benefit developing countries.
- Disputes around carbon offsetting projects will be subject to an independent grievance process, in response to requests from environmental and indigenous groups.

While the rules of the authorised carbon credit market have been settled, the agreement specifically allows for unauthorised credits to be issued, and these do not require an automatic adjustment. The threat posed by this potential loophole is recognised and is being addressed through a consensus based, multi-stakeholder approach that we consider in the next chapter.

Thus, COP 26 achieved significant progress in tidying up some important areas of the Paris Agreement, but the fact remains that insufficient progress has been made on the substance, in particular the gap between:

- the needs of the developing world to cope with the impact of climate change, and their ability to fund it
- the 2030 objective of a 45% reduction in carbon emissions, compared with 2010, and commitments that will achieve this goal.

Cost and trust are the main barriers to transformation, for developed and developing countries alike, and the rest of this Paper sets out how they might be addressed.

2. Accelerating the Transition to Net Zero: The Role of Standards, Standards Bodies and the BSI Approach

Following the Introduction, this chapter has six main themes:

- The role of standards in addressing the variety of challenges faced, and the commitment of the standards making community to be in the vanguard of Net Zero developments;
- How BSI is supporting the UK Government in developing its zero-carbon strategy;
- The role of standards to bring integrity to Voluntary Carbon Markets;
- The role of standards in bringing integrity to the trade of Net Zero products;
- The need for more agile standards making processes, to respond to the pace of change and the urgency of the situation;
- Recommendations and conclusions.

Introduction

The scientific data is clear – climate change is a global challenge that requires global action to meet the 1.5-degree Celsius target, as expeditiously and equitably as possible. What is also clear is that business needs an agile, global regulatory environment that provides opportunities to innovators to offer solutions at scale.

In seeking to achieve their Net Zero pledges, Governments have adopted a wide range of policies, such as taxes, legislation, regulation etc, which is resulting in a growing and fragmented set of measures that may not necessarily be the most effective and efficient way of achieving the global target. Innovation is essential to achieving Net Zero and yet the evidence suggests that Governments are failing to create the necessary market environment for innovation to prosper. For example, in 2018, only 29 percent of U.K. businesses believed that the government's approach to regulation facilitated the entry of new products and services on to the market¹⁶. Moreover, as we highlight later in this chapter, a large sample of leading European companies consider the lack of a clear regulatory environment to be a significant barrier to innovation and transformation, in the area of sustainability.

Governments are well aware of the challenge which the pace of technology change and innovation poses for regulation – “pacing problems” – as well as “co-ordination problems”¹⁷ arising from innovations which straddle sectors or transcend national borders. Thus, the concept of agile regulation is alive and well in the OECD¹⁸, with the Italian Presidency of the G20 commissioning research on the extent to which members are adopting agile approaches to the regulatory governance of innovation, a report which was published in August 2021¹⁹. Furthermore, to address the challenge of helping innovators navigate different national regulations, seven countries - Canada, Denmark, Italy, Japan, Singapore, UAE and the UK, under the auspices of the OECD and World Economic Forum – have signed the Agile Nation Charter²⁰ to ease the regulatory path for innovators in their respective countries.

It is interesting to observe that the diverse, multi-stakeholder led approaches recommended for agile regulation are the same as those utilised in the International Standards Organizations (ISO and IEC) to develop voluntary standards which their NSB members can adopt. The standards development process is underpinned by consensus of a wide range of stakeholders - business, regulators, policy makers, NGOs, academia and other representatives of society – and eschews prescription in order to create the right environment for technological innovation. Standards play an important role in moving ideas forward and providing confidence in their use. They are building blocks for innovation that can foster the diffusion of knowledge globally and, thereby, accelerate and facilitate the scale-up of new products and services.

This chapter seeks to demonstrate that international standards and NSBs can help regulators protect citizens from the risks associated with new developments, without constraining the pace of innovation, and can underpin international regulatory cooperation through its wider global reach. International standards ensure a common approach across borders to measure, address and communicate progress in tackling climate change. In this way, NSBs and the International Standards Organizations would achieve the necessary consensus to create a common understanding of new concepts, establish a level playing field for new technologies in global markets, and facilitate widespread diffusion, while policy makers could decide whether there was a need for regulation, in the knowledge that international standards would be available to support it, if required. By engaging closely with NSBs, regulators can leverage the well-established standards development process/mechanism to mitigate risk and achieve their Net Zero objectives.

It is to be noted that this paper focuses primarily on the international standardization system, which relies on the participation of National Standards Bodies, and National Committees, led by the International Organization for Standardization (ISO) and the International Electrotechnical Commission (IEC). However, it is important to recognize that there are other types of standards in that can be used to support public policy initiatives, including those developed by Intergovernmental Organizations (e.g. ITU and FAO/WHO Codex Alimentarius Commission (CAC)), regional standards developed by groups of NSBs, private standards published by industry organizations or consortia and, increasingly, Voluntary Sustainability Standards (VSS) aimed at social and environmental initiatives.

A. The Role of Standards, National Standards Bodies and the International Standardization Organizations: ISO and IEC

Standards codify consensus-based, good practice. They help to establish a common understanding of concepts and terms, develop agreed methodologies for measuring outcomes, articulate the principles and processes by which those outcomes might be achieved, and are reviewed periodically to ensure relevance in a world of rapid change.

However, the value of standards comes not only from the knowledge therein, but from the standards development process which emphasises the three Cs: Convening, Collaboration and Consensus. That process, and the adoption of standards:

- helps countries shape their national climate action plans - standards are methodologies that work;
- ensures climate change solutions are inclusive, since the standards development process ensures all voices are heard;
- can enable consensus on, and the wide-spread adoption of, solutions through the use of standards development;
- opens markets and creates economies of scale, which speeds diffusion and reduces the price/cost of new technologies.

As Box 1 describes, NSBs are the gatekeepers to this dynamic standardization process, with a unique convening role to bring together a variety of stakeholders in an economy to address the challenge in question.

Box 1: National Standards Bodies

National Standards Bodies (NSBs) form part of the National Quality Infrastructure ecosystem which provides the standardization, metrology, accreditation, conformity assessment and market surveillance processes that ensure that goods, services and processes meet a nation's quality, safety and environmental requirements. At the national level, NSBs facilitate the development and publication of national standards to address market needs by convening a wide range of stakeholders, including government, private sector, civil society, academia, trade associations etc. The approach by each NSB, and its interaction with policy makers and regulators, differs according to the national context, institutional structures, mandates and constraints. It is to be noted that around 48% of NSBs are departments of Government, a proportion that is even larger among developing countries²¹.

Thus, within the policy nexus, NSBs have a unique role to play. They offer government departments and regulators a potentially independent, stakeholder driven approach, where the expertise engaged, and the consensus-based process, provides policy makers with a powerful tool for securing agreement on a range of policy issues/objectives. The resulting voluntary standard is the tangible outcome that provides a sound basis for policy implementation, which is acceptable to the diverse stakeholder group involved in its development.

NSBs are also at the core of the international standardization process and play an important role in representing national interests at the regional and international level e.g. in the International Organization for Standardization (ISO) or the International Electrotechnical Commission (IEC). Each NSB or National Committee has the opportunity to contribute to the development of international standards and is strongly encouraged to do so, such that their challenges and concerns are reflected, but also retains the right to develop and publish its own independent national standards. The international standardization system encourages NSBs to participate actively in the consensus building process at the international level, in order to be able to formally adopt the international standard, unchanged, as the national standard, to facilitate friction-free trade.

As a result of NSBs' participation in regional and international standardization activities, they can act as conduits for the transfer of global best practice into the 'real' economy and support their government to use standards as an additional tool to achieve their public policy objectives.

ISO, based in Geneva, comprises 165 NSBs, with membership based on one member per country. Its work is divided into a wide range of technical committees, populated by experts and other stakeholders, seeking agreement on common standards as well as bringing global coordination to various competing bottom-up initiatives that may cancel each other out. The standards that arise from this process have a built-in legitimacy and deep international buy-in: they are based on systematic collaboration between countries and are built on consensus. As a result, ISO standards have worldwide credibility and, once a consensus-based standard is agreed by the members, it can be adopted globally by all ISO members, unchanged or adapted to meet the national requirements/context. As such, international standards are perhaps the most cost-effective means for collating and diffusing knowledge across borders, as well as making it easy to ensure uptake.

The IEC is a global, not-for-profit membership organization, composed of 88 member countries represented via a national committee of stakeholders in the field of electrotechnology, whose work underpins quality infrastructure and international trade in electrical and electronic goods. IEC work facilitates technical innovation, affordable infrastructure development, efficient and sustainable energy access, smart urbanization and transportation

systems, climate change mitigation, and increases the safety of people and the environment. It also administers four conformity assessment systems.

ISO, the IEC, and the International Telecommunications Union (ITU), under the banner of the World Standards Cooperation (WSC), work together to advance and strengthen the voluntary consensus-based international standards system. They maintain numerous technical committees with work programmes and standards development activity that directly support the UN's Sustainable Development Goals. This includes:

- management and measurement of drinking and wastewater (SDG 6)
- the IEC's work on rural electrification, micro and smart grids, energy efficiency and energy management, where ISO also plays a role (SDG 7)
- quality management guidelines for sustainable development in communities and developing frameworks to ensure the effective integration of digital services in smart cities (SDG 11)
- recycling and life cycle assessments (SDG 12)
- the quantification and reporting of greenhouse gas (GHG) emissions and carbon footprints (SDG13).

Most recently, in its 2021 London Declaration, ISO, on behalf of its members, together with BSI, has committed to incorporate climate science into new standards and to review existing standards, see Box 2 below.

Box 2: 2021: A game-changing year for International Standards

Two initiatives have been launched in 2021 that will help deliver Net Zero goals:

1. The 2021 London Declaration

In September 2021, ISO members approved the ISO London Declaration, which is ISO's commitment to climate action. The London Declaration, proposed by BSI, pledges to:

- incorporate climate science in the development of all new and revised international standards and publications
- strengthen the involvement of civil society, and those most vulnerable to climate change
- ensure that all voices are heard in the development of standards and can have positive climate action when implemented.

This ground-breaking initiative has been endorsed by IEC and CEN/CENELEC.

The scale of this commitment, its global reach, and potential impact should not be underestimated. ISO's 800 Technical Committees (and sub-committees) extend into all areas of the global economy, co-ordinating some 14,000 Committee members, and engaging hundreds of thousands of experts with a deep knowledge of how climate science can be incorporated into the standards in their respective fields of expertise.

In support of the London Declaration, ISO's Climate Action Toolkit²² provides examples from different countries on how National Standards Bodies engage with Government and Industry to understand the value and importance of standards to accelerate transformation.

Building on the London Declaration, BSI is working with ISO on the development of an action plan to support the implementation of the London Declaration.

2. Our2050World

This is an open collaboration between international organizations and standards bodies to drive transformational collective action to achieve Net Zero by 2050. The scale of transition required will only be possible through collaborative action to drive net-zero compatible market frameworks, which include voluntary and mandatory interventions. The collaboration will seek to:

- Reach clarity and consistency on targets, measurements and reporting
- Make action easier through accessible and pragmatic guidance
- Accelerate solution-oriented innovation.

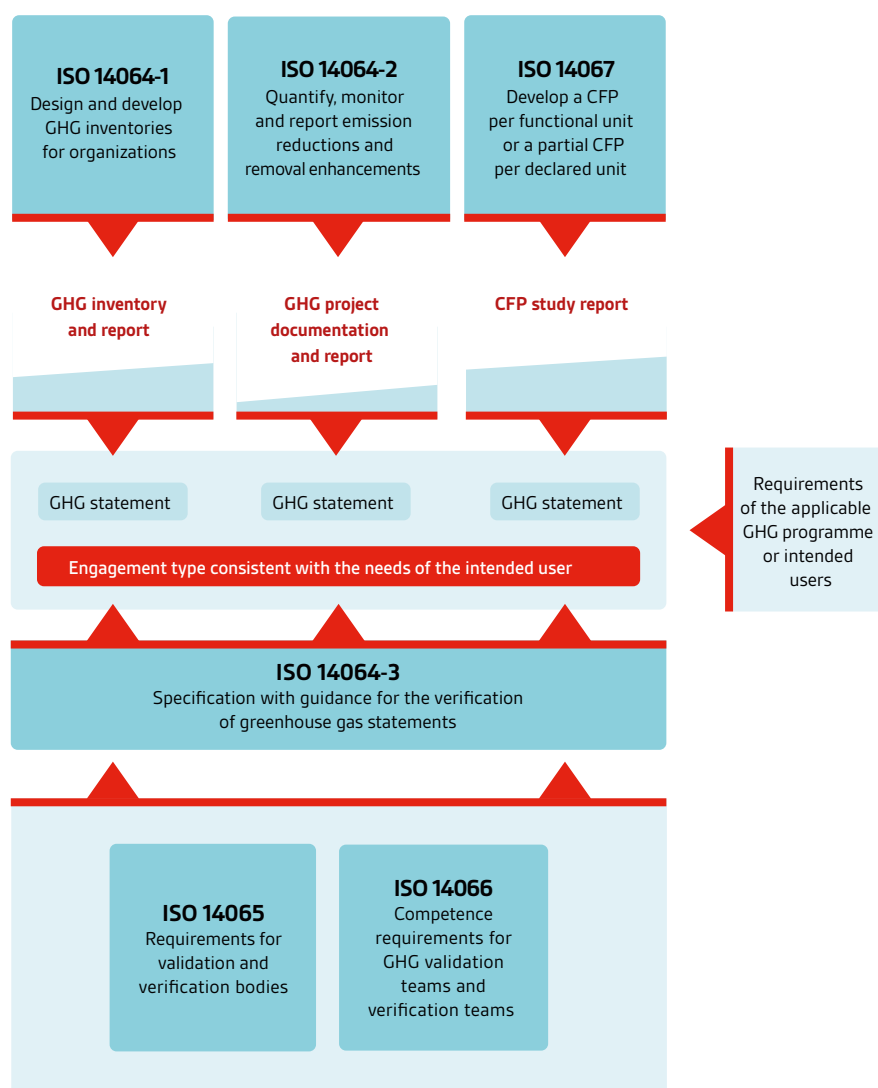
The initiative is led by BSI and includes the International Organization for Standardization (ISO) and the Race to Zero campaign.²³

A good example of the role and importance of ISO standards lies in validating corporate claims concerning GHG emissions, as in Box 3 below.

Box 3: Using Standards and the Quality Infrastructure System to combat Greenwashing

Standards enable harmonized and consistent measurement of Green House Gas (GHG) emissions. The ISO 1406x series provides the tools for organizations to develop their baseline inventory of GHG emissions - the starting point for all programmes to control and then eliminate GHG emissions. This can be at an organizational level, or at the detailed level of an individual process or product, also known as its “carbon footprint”. Having such data and information enables organizations, regulatory bodies and companies to make informed decisions and then track their progress in reducing GHG emissions. However, standards are not enough to ensure acceptance of test results. The wider quality

Figure 7 ISO 1406x series at a glance

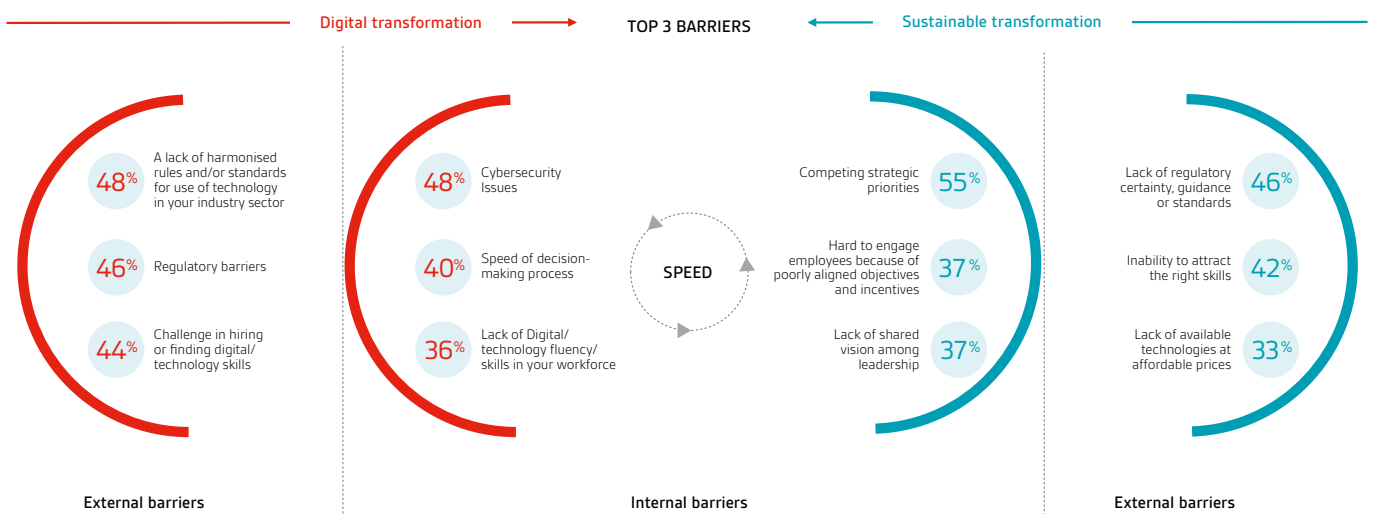


Source: ISO²⁴

infrastructure system, specifically conformity assessment services and accreditation, provides assurance to customers that the test results can be trusted, as illustrated in the schema above.

While the standards institutions are the facilitators of the standards making process, the drive for standards emanates from a market need that is recognised by leading companies in their fields and/or supported by policy makers/NGOs. In this context, it is important to note a recent survey of leading companies in Europe, carried out by Accenture Research, in relation to where competitive advantage would lie in the years ahead²⁵. Senior executives are convinced it will be linked to a company's ability to execute a dual or twin transformation in terms of digitalization and sustainability. In responding to the survey, they identified internal barriers to sustainable transformation to be competing priorities and a lack of clarity in the corporate vision and objectives. However, the single most important external barrier was the lack of regulatory certainty, guidance or standards, with a similar response in relation to digital transformation – see Figure 8 below.

Figure 8 Barriers to Digital and Sustainable Transformation



Source: Accenture

In the view of European industry, there is clearly a significant gap in the policy framework that needs to be addressed. We consider, in the following section, how BSI has been seeking to fill this gap, with the aim of sharing the lessons with NSB partners.

B. BSI's Strategic Partnership with Government to achieve Net Zero

The UK's Net Zero Strategy: Build Back Greener²⁶, published on 19 October 2021, recognizes the role of BSI in supporting the transition to a Net Zero economy:

"The BSI, in its role as the UK's national standards body, works across the sectors and topics that will be critical in achieving Net Zero, including greenhouse gas management, energy transition, biodiversity and sustainable finance. This work is helping the UK to take a global leadership role in Net Zero and influence change on a global scale... Through BSI's international reach, the UK will be able to help stakeholders reach consensus in international climate change standards and lead change globally in support of Net Zero."

The UK strategy, as advised by the UK's Climate Change Committee, is summarised in Box 4 below. It forms the context for BSI's partnership and illustrates the sector based approach.

Box 4: Case Study on the UK's approach to Net Zero

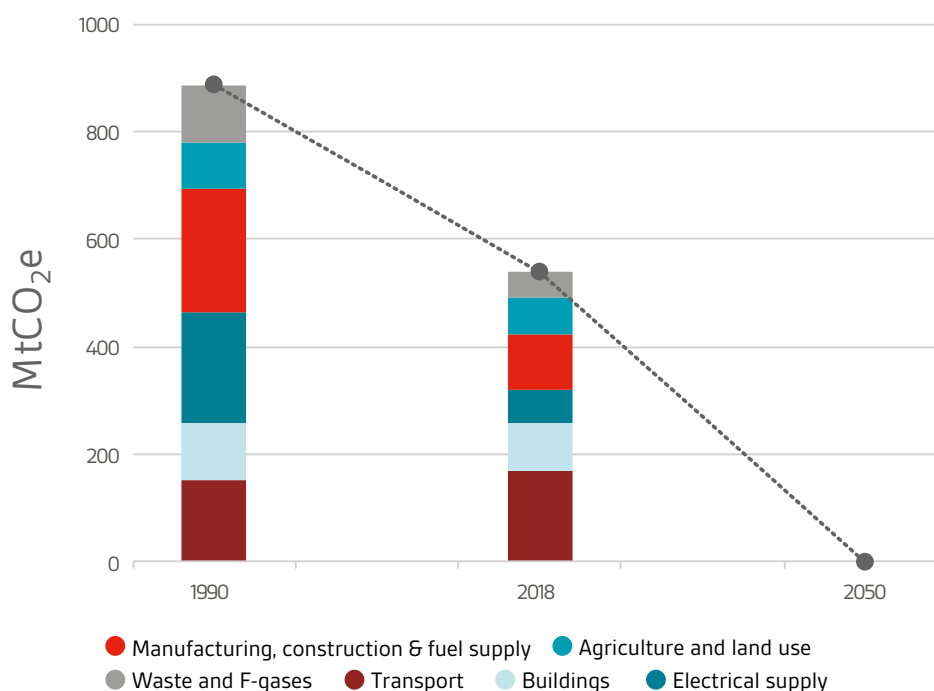
In December 2020, the UK's Climate Change Committee (CCC) published its 6th Carbon Budget report²⁷. In essence this is a decomposition analysis of carbon emissions by sector, supported by scenario planning, to develop a costed, balanced Net Zero pathway for the UK. The main sectors, which form the Pathway include:

Sector	Share of Carbon Emissions in 2019 (%)
Transport	Surface: 22; Aviation: 7; Shipping: 3.
Buildings	17
Electricity Supply	10
Manufacturing and Construction	20
Agriculture	10
Waste	6

Figure 9 below shows the progress that has been made to date in reducing emissions from these carbon intensive sectors, and points to the even steeper decline required to 2050.

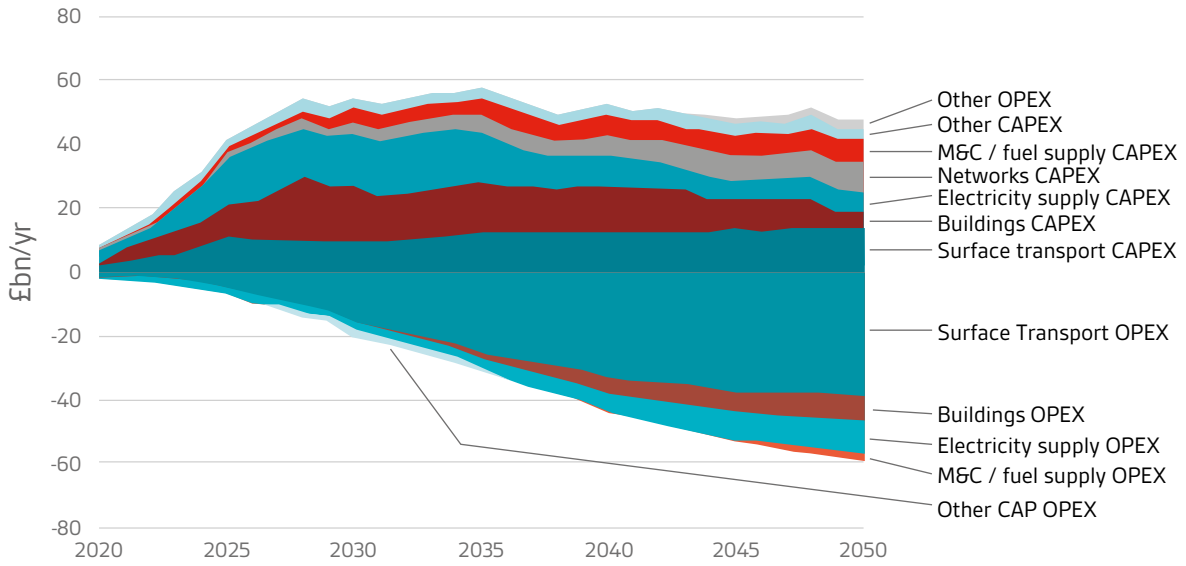
The estimated costs of such a transition are projected to match its scale (see Figure 10). The 6th Carbon Budget report estimates that the capital and investment costs of its balanced Net Zero pathway would rise from £10 billion per annum, at present, to over £50 billion by 2030 and remain at least at £40 billion pa until 2050. Investment is mainly required in transport, buildings and energy supply, while the savings in operating costs are heavily skewed in favour of transport, with the overall estimated resource costs amounting, on average, to 0.6% of GDP.

Figure 9 Emissions by Sector 1990-2050



Source: CCC 6th Carbon Budget Report

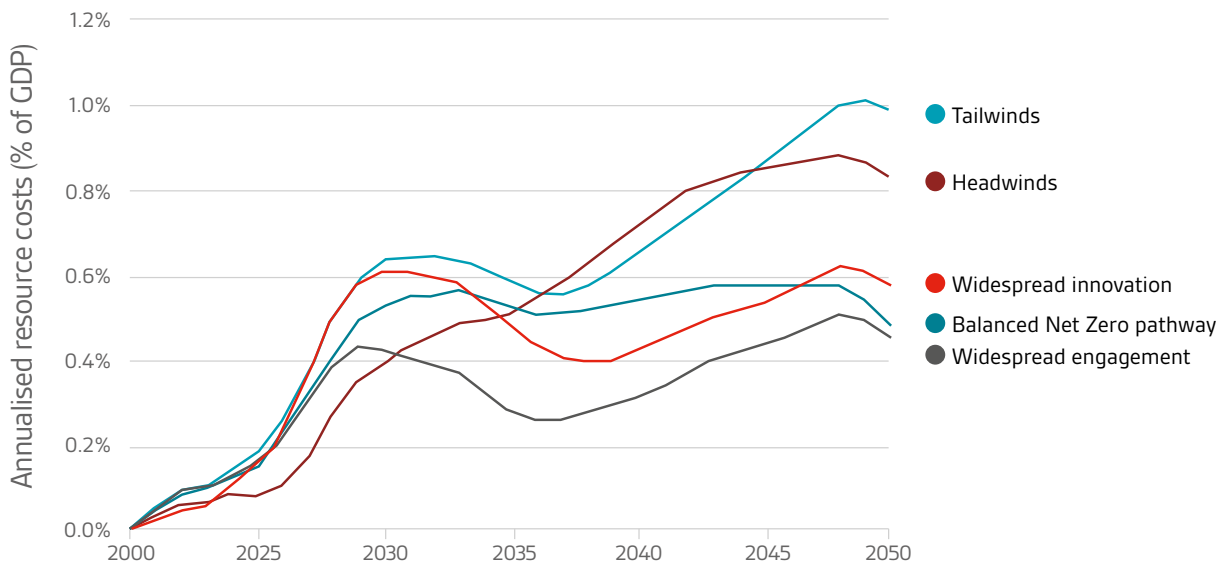
Figure 10 UK Balanced Pathway Investment and Savings



Source: Op cit

However, as Figure 11 below illustrates, differences in assumptions/scenarios have a significant impact on the estimated resource costs of reaching Net Zero by 2050. The scenario of "widespread engagement", where society is accepting of the changes required and participates actively in supporting them, faces overall resource costs of around one half those of the balanced pathway, and a world of "widespread innovation" also enjoys better returns on investment.

Figure 11 Annualised Resource Costs of the Different Scenarios



Source: CCC 6th Carbon Budget Report

Through its active consultation of stakeholders - in the UK and globally - BSI is drawing up a standards development strategy for each of the key sectors, with a view to accelerating decarbonization and promoting resource efficiency. The relevant standards developed to date, for the decarbonization of key industrial sectors are set out as an interactive tool on the BSI Website²⁸:

- Energy: to support, enable and accelerate the transition from an energy system based on fossil fuels to a Net Zero energy system that is flexible, secure, interoperable and fully integrated (including electrotechnical, electrical energy storage, electric vehicles and EV charging, smart homes and businesses)
- Transport: to deliver a cleaner and more sustainable future mobility for all, making journeys more efficient and cleaner (including mobility/electric vehicles, electric and hydrogen vehicles, EV charging, intelligent transport systems (ITS), automated driving systems, materials and low emission fuels and emission testing)
- Built environment: to reduce embodied and operational carbon and to support the shift to lower-carbon/sustainable materials, methods of construction and operation and decommissioning and recycling processes (including energy efficiency retrofit, sustainable construction processes, sustainable products and materials)
- Manufacturing: to support the complex decarbonization of value chains and supply chains (including materials and packaging)
- Digital: to reduce its own carbon footprint and use of energy (to power data centres, and in the hardware supply chain) but also in enabling other sectors to hit their targets (including smart and sustainable cities and communities and digital manufacturing)
- Healthcare: to reduce the carbon footprint and environmental impact of healthcare services (including energy and environmental considerations and buildings and constructed assets)
- Food: to support and enable the shift to sustainable and resilient future food systems that provide access to healthier food for everyone (including energy and environmental considerations, greenhouse gas emissions, carbon neutrality, circular economy and food safety).

For each of the sectors, BSI:

- Convenes – industry, government and wider societal stakeholders to identify if, and where, standards enable and accelerate policy outcomes (related to Net Zero), and build strategic standardization programmes to deliver on these outcomes
- Creates and works alongside committees of experts to develop and maintain an extensive portfolio of standards that supports the needs of the sector
- Collaborates with stakeholders to contribute to the delivery of government policies and helps industry meet regulatory targets
- Develops strategic standardization programmes for emerging markets and innovations to help drive sustainable growth and meet ambitious policy, industry, and societal commitments
- Works in partnership with the stakeholders from across the relevant sector to deploy flexible standards development mechanisms to create best practice, keep pace with technological, and commercial developments.

Figure 12 overleaf illustrates the overview of the key standards that are moving the energy sector to Net Zero.

Key standards for a smart, flexible, low-carbon energy system

Electrotechnical

- BS 5918** Solar heating systems for domestic hot water. Code of practice for design and installation
- BS EN 61400-1** Wind turbines. Design requirements
- PD IEC/TS 62600-100** Electricity producing wave energy converters. Power performance assessment
- BS EN 62446-1** Photovoltaic (PV) systems. Grid connected systems

Electric vehicles and EV charging

- PD IEC TS 61980-2:2019** Electric vehicle wireless power transfer (WPT) systems
- PD ISO/TR 8713** Electrically propelled road vehicles. Vocabulary
- BS IEC/TS 61851-3 series** Electric vehicle charging system

Electrical energy storage

- BS IEC 62933 series** Electrical energy storage (EES) systems
- PAS 7062** Electric vehicle battery cells – Health and safety, environmental and traceability considerations in cell manufacturing and finished cell – Code of Practice [in development]
- PAS 7061** Batteries for vehicle propulsion electrification – safe and environmentally conscious handling of battery packs and modules – Code of practice [in development]
- PAS 7060** Health, safety and environmental considerations in [EV] Vehicle design and use – Guide [in development]

Energy use and efficiency

- BS EN ISO/IEC 13273-2** Energy efficiency and renewable energy sources. Common international terminology. Renewable energy sources

- BS EN ISO 50001:2011** Energy management system requirements

- BS EN 16231** Energy efficiency benchmarking methodology

- BS EN ISO 14001** Environmental management systems

Grid/supply

- BS EN 50160** Voltage characteristics of electricity supplied by public electricity networks
- BS EN 61850 series** Communication networks and systems for power utility automation
- BS EN 62488 series** Power line communication systems for power utility applications

Smart homes and businesses

- BS EN 50491 series** Home and building electronic systems (HBES) and building automation and control systems (BACS)
- PD CEN/CLC/ETSI TR 50572:2011** Functional reference architecture for communications in smart metering systems
- PD CEN/TR 16061:2010** Smart gas meters
- PAS 1878** Energy smart appliances – Classification – Specification [in development]
- PAS 1879** Energy smart appliances – Demand side response operation – Code of Practice [in development]
- BS EN 62056 series** Electricity metering data exchange
- BS 18477** Inclusive service provision

Figure 12 Overview of Standards to Decarbonize the Energy Sector

C. The Role of Standards in Bringing Integrity to Voluntary Carbon Markets

As noted earlier, COP 26 brought much needed agreement on the mechanisms for handling authorised credits, and in restricting the volume of carbon offsets that originated under the Kyoto Protocol. However, a potential loophole remains with unauthorised carbon credits, the arrangements for which were not settled in Glasgow and, hence, leave the system open to poor quality, and the possibility of double counting in a large and growing area of international co-operation. Three groups were established, prior to COP 26, to try to create clarity and integrity in the market:

- The UN Special Envoy for Climate Action and Finance, Mark Carney, initiated the establishment of a Taskforce on Scaling VCMs (TSVCM), a private sector led initiative (re-named, at the end of 2021, the Integrity Council for VCMs, or IC-VCM). This now comprises over 250 member institutions, covering a wide range of stakeholders, that is seeking to establish quality standards and governance processes for those offering credits; it published its Phase 2 report in July 2021²⁹ and a further progress report is expected in the Spring. BSI is bringing its expertise in multi-stakeholder approaches to standards development in support of this network.
- The VCM Integrity Initiative, established to support the UK Presidency at COP 26, is similarly constituted with a wide range of stakeholders, with similar objectives, namely to improve the integrity of VCMs and ensure they make a significant contribution to Net Zero objectives and the UN's SDGs. The focus is on ensuring that the use of carbon credits by Non-State Actors (NSAs) aligns with the Paris Agreement and that claims are credible, transparent, and widely understood. It too will be reporting in the Spring with its guidance to NSAs.
- The LEAF Coalition, established in April 2021, to address the specific challenge of de-forestation, with the support of the Governments of the UK, USA and Norway, and sponsored by large private sector corporations, eg Amazon. In response to the charge that carbon credits were simply passing responsibility to others, corporate sponsors have to commit to independently verified carbon reductions, in line with the Paris Agreement, in their own value chains, and join the UN Race to Zero. The Coalition announced at COP 26 that it had raised \$1 billion and that some 23 jurisdictions, including several regions in Brazil, Costa Rica, Ecuador, Mexico, Nigeria, Ghana, Kenya, Vietnam and Nepal, had become eligible for support – an area greater in size than the EU. The programme is managed by Emergent, a US non-profit organization, and payments will only be made against performance, which will be assessed according to the TREES standard, independently verified by third parties.

The importance of these activities, together with the Gold Standard and Verra's Verified Carbon Standard, is that they bring integrity to unauthorised credits, through a voluntary, standards-oriented approach, based on consensus among diverse stakeholder groups. They provide an important case study in how voluntary standards can provide an effective international framework/mechanism to achieve public policy goals in very difficult circumstances.

D. The Role of Standards in Bringing Integrity to the Trade of Net Zero Products

In the race to reduce CO₂ emissions, attention is shifting to how the price of carbon can be reflected consistently through whole value chains and across borders, without distorting trade³⁰. The accuracy of measurement of emissions is of paramount importance to make meaningful comparisons possible. However, the reality is that there are multiple measurement methodologies available in the market, with the risk of more methodologies emerging, if no effort is made to create a common approach. The case for international standards to provide consistency has never been so strong.

Multiple methodologies informed by different standards and therefore different regulations will impose additional costs on producers, as their CO₂ measurements need to comply with multiple 'national' methodologies. A further concern is carbon leakage³¹, where the difference in the degree of rigour of measurement between countries, or limits/thresholds on CO₂ emissions, can create a significant arbitrage in the price of carbon intensive components e.g. steel, and as a result, a rise in offshoring of production of goods with a high proportion of those components

e.g. motor vehicles, to those less stringent countries, giving rise to pollution havens. The EU's potential Carbon Border Adjustment Mechanism (CBAM) is an action to prevent the risk of carbon leakage and ensure a level playing field between the EU and other countries where regulations are lax. The success of CBAM will rely on careful determination of carbon border taxes. Similarly, there is parallel concern that some countries may use carbon border taxes as a basis for protection³². It is clear that the harmonization of methodologies, standards and verification processes to measure CO₂ is essential to avoid obstacles to trade.

In response to challenges of this nature, the WTO TBT agreement strongly encourages the use of relevant International Standards to be incorporated in technical regulations. Article 2.4 of the WTO TBT Agreement emphasizes that where international standards exist, WTO members should use them in full or relevant parts, as the basis of their technical regulations. Furthermore, Article 2.5 lends a presumption that a technical regulation, underpinned by relevant international standards, does not create an unnecessary barrier to international trade.

ISO has responded in kind by developing a suite of international standards to support the measurement of CO₂ emissions – see Box 3. It is to be noted that the ISO System is underpinned by the TBT Committee's Six Principles for the development of international standards: Openness; Transparency; Impartiality and Consensus; Effectiveness and Relevance; Coherence; and the Development Dimension; and, to ensure global consensus, it invites the participation of the 165 NSBs to co-create international standards.

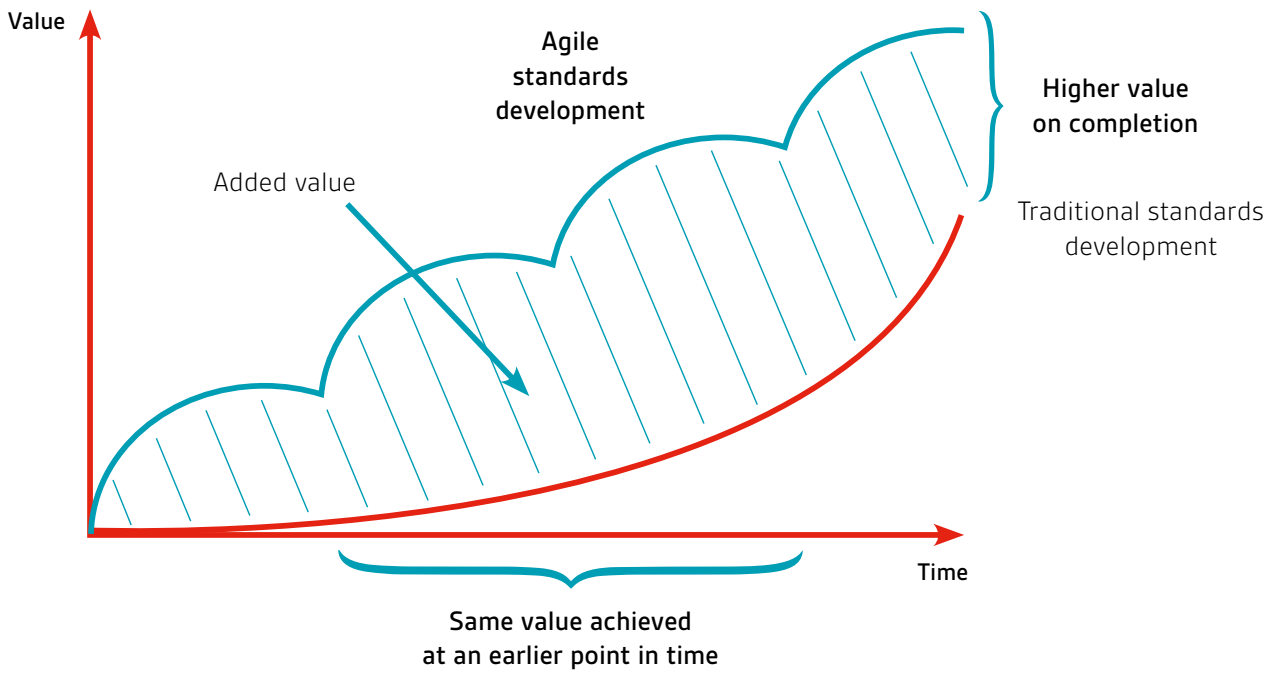
Thus, as the drive to Net Zero intensifies, international standards for measuring carbon emissions and product carbon content will play an increasing role in providing a common yardstick, building trust and confidence, bringing integrity to corporate claims, and facilitating trade of Net Zero Products. It will be important, therefore, that NSBs and the wider quality infrastructure system, which help to build trust and confidence in the measurement of CO₂ in developing countries, are able to advise companies, wishing to participate in global value chains, of the international standards to which they must conform.

E. Developing an Agile Approach to Standardization

Just as regulators need to become more agile, standards bodies need to review their processes as well. Given the speed with which the market adopts new technology, and the urgency to deliver solutions, it became clear to the standards community that it needed to reduce the development time to bring standards to the market. As a result, BSI has been at the forefront of developing new approaches to standards making. Whereas traditional methods of standards development can take up to two years for consensus to be reached on a suitable output, BSI has developed a more agile approach that embeds shorter milestones that deliver value earlier, and more frequently, in an iterative standards development process, which incorporates early user input, and accelerates the point at which usable content is made available. Of course, agility cannot be at the expense of quality and reliability, so some of the characteristics of more traditional standards development have been retained. These fast-track paths to standardization are particularly useful for emerging technologies, and provide a significant advantage over traditional methods, as seen in Figure 13 below.

³² <https://www.frontier-economics.com/uk/en/news-and-articles/articles/article-i7771-carbon-border-taxes-help-or-harm-to-european-industry/>

Figure 13 The value of agile standards development



Source: BSI

The two dynamic approaches to standardization with greater flexibility are:

- BSI Flex Standard: where there is a low level of certainty about “what good looks like” and good practice needs to evolve through a series of iterations.
- Publicly Available Specification (PAS): where new concepts are becoming widely accepted and minimal change is expected. Around 30% of PASs have gone forward to form the basis of international standards.

The UK Government has been backing BSI's agile approach to standardization in a number of key priority sectors, to accelerate innovation. An example is given below in Box 5.

Box 5: Facilitating the roll out of Smart Energy Appliances and Electronic Vehicles Charging Points

To support the UK Government's ambition to move towards a Net Zero and 'smart' energy and transport sector, the UK's Department for Business, Energy and Industrial Strategy (BEIS) commissioned BSI to conduct a landscape mapping of the standards and regulation in this space, to identify knowledge gaps and immediate needs to accelerate the uptake of energy smart appliances and enable the roll-out of electric vehicle charging points.

To coordinate the rapid and interrelated/crosscutting standard's needs, and to align new standards to existing and planned regulation, BSI formed a Strategic Advisory Group (SAG). The SAG consists of a broad range of stakeholders including a cross-departmental government team, the regulator, innovator community, industry and trade associations, joint government-industry task forces, certification and accreditation bodies, academia, research and consumer interest groups.

Within 16 months, two new consensus-based, fast-track, iterative publicly available specifications (PAS) were published by BSI in May 2021, sponsored by the UK Government:

- PAS 1878: Energy Smart Appliances – System functionality and architecture
- PAS 1879: Energy Smart Appliances – Demand side response operation – Code of practice.

This stakeholder work and the PASs will help inform planned government regulation and guidance on energy smart appliances, accelerate innovation and growth. Furthermore, the PAS can provide the basis for certification schemes and accreditation framework, which will drive transformation throughout the economy. It is envisaged that the PASs will be put forward for consideration to ISO and IEC for use as global standards for industry.

F. Conclusions and Recommendations

Chapter 1 set out the scale of the challenge that the Net Zero agenda presents, and it is clear that the scale of investment required, and the need for new innovative approaches, requires the private sector to play a major role. The task of Government is to provide the leadership and the holistic framework that enables the private sector to innovate, to gain widespread acceptance of the new solutions, and mobilise capital on a global scale, if we are to hit the 2050 target.

Research and development, the pricing of carbon, the availability of finance for investment, the openness of markets to new products and services, the processes to procure them, the reassurance that the new service systems are robust and resilient, and the ability to monitor and compare progress, all need to work in harmony to succeed. But establishing trust in the new Net Zero paradigm, and the (personal) data flows that underpin it, is a pre-requisite for success. The process of standards making, and implementation, is an agile, consensus-based and inclusive policy tool, which engenders that trust in each and every area of change, not least in the security of the digital infrastructure, and in the way data will be handled.

In outlining the strategic role that BSI has played in the UK, in close collaboration with regulators and policy makers, this chapter has sought to demonstrate that NSBs and standards are a key ingredient in the policy mix, particularly in convening and supporting co-ordinated, consensus-based approaches. And, of no less importance, it has also sought to demonstrate that, at a time when negotiators are finding it difficult to reach international consensus on sensitive issues, such as the conduct of voluntary carbon markets, with all the dangers of fragmentation that

would result, standards making bodies have 75 years of experience, and an extensive infrastructure of international co-ordination and technical expertise to underpin the global consensus that emerges in the form of international standards. We consider this to be an asset that has been seriously underexploited, to date.

We therefore conclude with the view that:

- While agile regulation, based on foresight of future developments and consensus among diverse stakeholder groups, is to be welcomed, policy makers need to avoid duplicating the activities of NSBs and, thereby, compromising the unique role that they play. Instead, they should engage more closely with standards development activities, build on their experience, and explore how regulation, if necessary, can make better use of international standards.
- Net Zero requires a global perspective, and a collective response in developing solutions – now is not the time for parochialism in policymaking. Thus, both NSBs and national policy makers need to avoid a blinkered approach that focuses on national standards and national regulations and, as a first step, examine what international standards have to offer.
- National standards catalogues, underpinned by international standards, ensure a common approach across borders to measure, address and communicate progress in tackling climate change. In this way, NSBs, ISO and IEC would achieve the necessary consensus to create a common understanding of new concepts, establish a level playing field for new technologies in global markets, and facilitate widespread diffusion.
- Standards making processes themselves cannot stand still: technology developments, and the narrowing window of opportunity to achieve Net Zero by 2050, require greater agility without compromising on the quality of the process.
- NSBs in developing countries need to be empowered and well-resourced to have the capacity to replicate the role that their counterparts play in the developed world. However, the potential for NSBs, and the effective adoption and dissemination of international standards, to make a significant contribution to achieving Net Zero and SDGs requires a special policy focus, and we return to this subject in Chapter 4.

Recommendations

We therefore recommend that:

- Policy makers and regulators should engage with NSBs, to raise their profile and exploit the NSB's voluntary, consensus-based approach to tackling public policy issues.
- Working together, they should anticipate future needs and develop a standards-based strategy, for each sector, to contribute to Net Zero and sustainable development goals. It would then be for national policy makers/regulators to decide whether, and how, to use the International Standards available as a basis for their own national regulatory frameworks.
- NSBs should ensure that national standards catalogues are underpinned by international standards, so that all countries seek to adopt common solutions to this global Net Zero challenge.
- International standardization bodies should review their standards development processes and seek to reduce the time horizon for standards development, without compromising on quality. As part of this process, and in close collaboration with stakeholders, they should be pro-active in developing a forward-looking agenda, so that international standards are timely in meeting both business and policy needs.
- As a key building block of a Net Zero city (see Chapter 3), the concept of urban “digital twins” should be a prime candidate for early agile standards development. BSI has carried out the necessary horizon scanning³³ and begun the process of Flex standards development. The sooner we understand how to deploy this vital tool cost effectively on an international scale, the sooner cities will be able to make a full contribution to the Net Zero agenda.

3. Accelerating the Transition to Net Zero: The Role of Cities, Smart City Concepts, Digital Infrastructure and Data

This chapter briefly sets out the fundamental importance of digital technology and data and the role of cities in the delivery of a Net Zero strategy. It then sets out an eleven-point approach to delivering the Path to Net Zero, which maximises the scope for citizen engagement.

Digital infrastructure and data: In an important contribution to the debate on Net Zero, “Digital Technology and the Planet”³⁴, the Royal Society places digitalisation and data at the centre of the transformation, and highlights the fact that the proportion of the world’s population, using the internet, is set to explode from 51% in 2018 to 66% in 2023 (it is already 97% in the UK). By contrast, the 6th Carbon Report seemingly takes the role of digitalisation as a given, since it only appears explicitly as a Box on page 404. At a time when the quality and capacity of digital connectivity needs to improve significantly, and yet the capacity to generate relevant data through the IoT, analyse it and act upon it remotely, is expanding exponentially, there is a danger that the real driver of change, and the real driver of inclusive access to a Net Zero world, is being overlooked. Indeed, some harsher critics might view the Committee’s report as an analog solution to an existential problem in a digital age.

The role of cities: As the International Energy Agency (IEA) report on “Empowering Cities for a Net Zero Future”³⁵ points out, with more than 50% of the world’s population living in cities and, with two thirds of its energy consumption, 70% of annual carbon emissions, as well as 80% of global GDP accounted for by cities, mitigation of emissions begins and almost ends in the urban environment. With urbanisation expanding apace – 70% of the world’s population by 2050 – there is little need to look elsewhere for solutions. However, rather like digitalisation, the role of the city/local authorities to drive change, and ensure the costs and benefits are equitably distributed at local level, appears in the UK’s 6th Carbon Report as a consultant’s report³⁶, when their role is central to local design, delivery and the widespread engagement that would halve the cost of transformation.

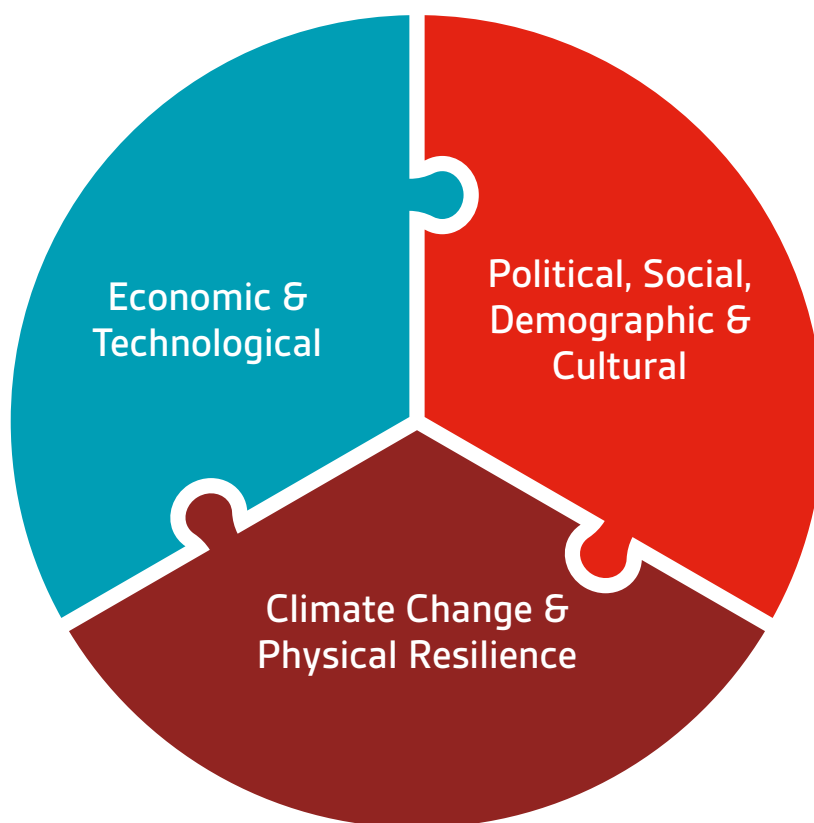
The response to Covid-19 has demonstrated the importance and value of a strong local role in changing behaviours and tackling the challenge, within the context of a national framework. We believe that the sectoral approach and the importance of place can, and should, be reconciled. Technology/data, and the BSI/ISO standards in support of technology change, have a fundamental role to play in achieving this complementary approach, and the purpose of this chapter is to suggest how.

History shows that cities are Darwinian: they need to be agile and adaptive in order to survive and prosper in the face of a range of threats, which are economic and technological, societal, health and demographic pressures, as well as climate related. If cities fail to protect their populations from these threats, be they climate related or economic, then society can fracture, as we saw in New Orleans in 2005, in London in 2011 and, more recently, in Paris with the “gilets jaunes”. A city’s best way to develop a resilience against these challenges is to adopt holistic smart city processes that are truly inclusive, and measure progress against, for example, Sustainable Development Goals.

34 <https://royalsocietypublishing.org/doi/10.1098/rsos.200100>
35 https://www.g20.org/wp-content/uploads/2021/07/FINAL_G20-Smart-Cities_WEB-PRESS.pdf

36 <https://www.theccc.org.uk/wp-content/uploads/2020/12/Local-Authorities-and-the-Sixth-Carbon-Budget.pdf>

Figure 14 The Importance of Smart City Processes in the Face of Multiple Challenges



Box 6. Net Zero in the Royal Borough of Greenwich, London, UK

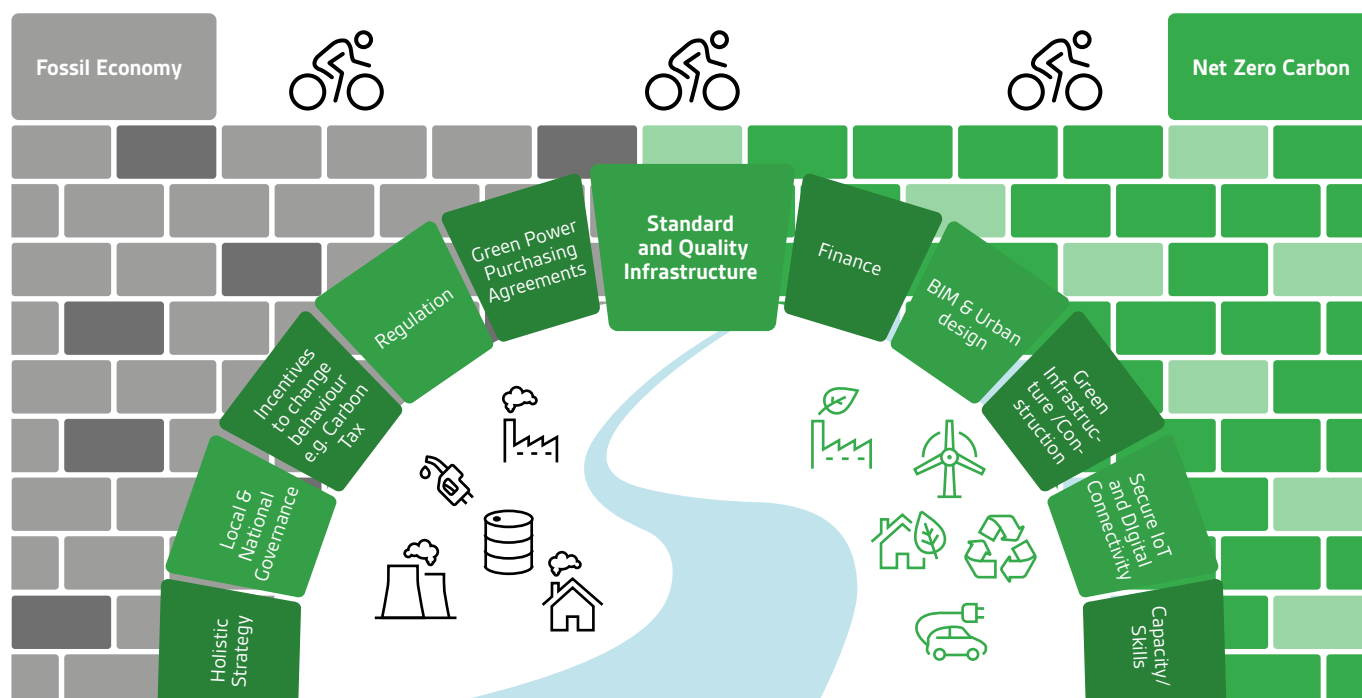
The Royal Borough of Greenwich was one of over 300 local authorities to have declared a Climate Emergency, following the declaration by Parliament on 1 May 2019, and it commissioned research from Element Energy on the priorities and cost of implementing an Action Plan to achieve carbon neutrality by 2030. The Council published its draft 2021-2030 Plan in November 2020³⁷. This includes a 45% reduction in car use; a 35% reduction in municipal waste and a recycling rate of 70%; all council homes to be heated and powered by non-fossil fuels, and heat networks to serve 13,000 homes; with an overall estimated cost of £1.6 billion over ten years. Aside from the problem of funding, the transformation required of society to handle the challenges it faces is simply unattainable, without resort to holistic, systemic thinking, significant behavioural change, enabled by new (digital) technology.

A. An Overall Strategic Vision and Integrated Processes for Delivery at the City Region Level

As Prof Nick Stern has noted, “Climate change is a result of the greatest market failure the world has seen”. In fact, it displays the full gamut of market failures, including negative externalities, information failures, market co-ordination failures, and the challenge for cities and poor, small economies of financing massive investments. To address these multiple failures, and adapt to climate change and mitigate its causes, cities need to set out a strategic vision of the inclusive, Net Zero society they envisage in the years to come, within the context of a national framework and national targets. But strategic visions, particularly those involving paradigm shifts in service delivery and consumer behaviour, are not enough. Transformation on this scale requires political leadership and courage of the highest order, a structured process to deliver change, proper governance processes to manage that change, the engagement and trust of stakeholders, and mechanisms for ensuring that the benefits are realised – in short, they need to apply smart city concepts and build a robust bridge to Net Zero.

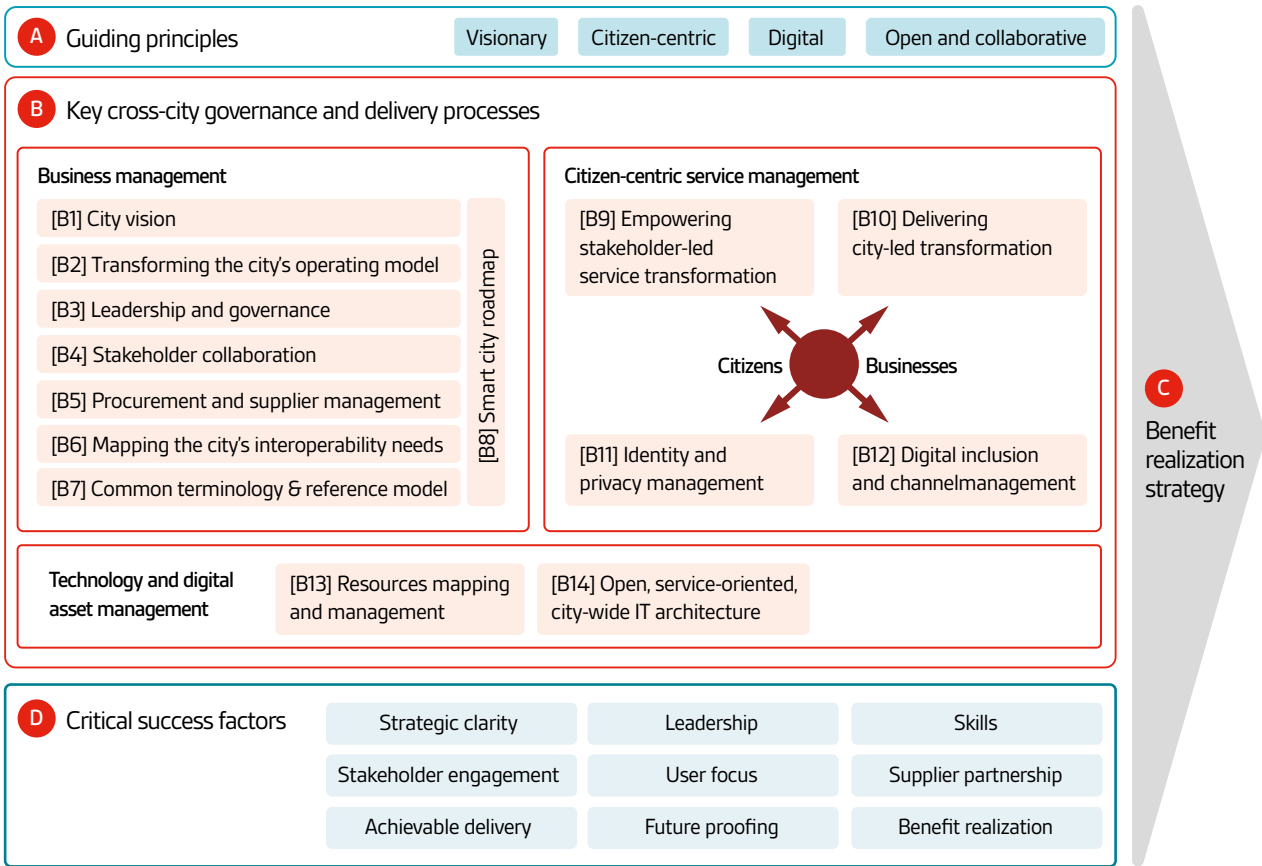
This bridge, illustrated in Figure 15, is in effect built in partnership between state and local/regional authorities, together with the business community, academe and other stakeholders. The section below sets out the key areas of focus.

Figure 15 Building a Bridge to Net Zero



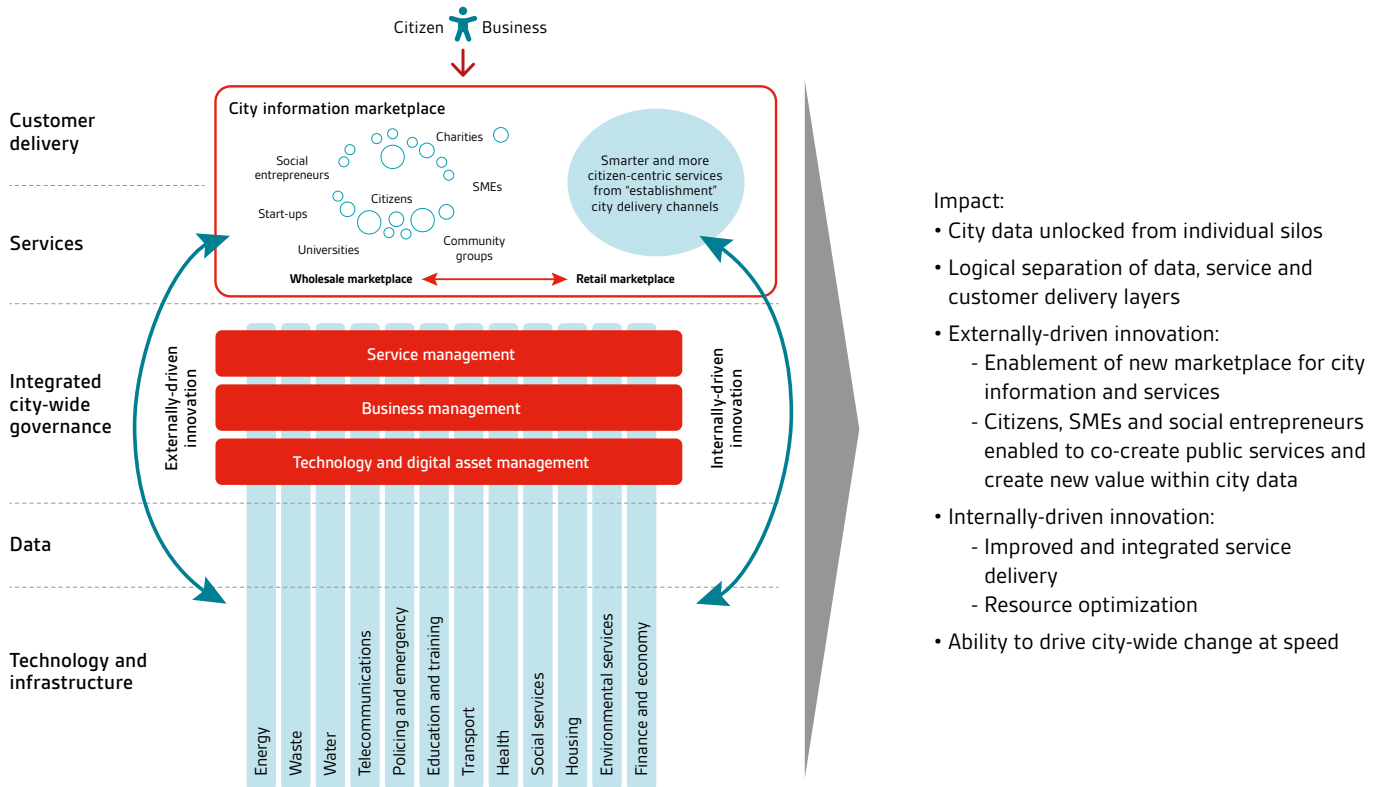
- (i) **A Comprehensive, Holistic Strategy:** As we indicated above, to be successful the roadmap to Net Zero requires not only a national framework that identifies the steps key emitting sectors need to make, and how the costs and funding are to be shared between the state and regions/sub regions, but also holistic integrated strategies at the local level. These need to deliver the agenda in a way that regenerates both the economy and the local built environment, while being fair and manageable for the poorest in the community. Each city will have its own vision and priorities, but a comprehensive model of how to develop such a strategy, and mobilise (or “de-silo”) city data to achieve the objectives, is (freely) available in the form of PAS 181³⁸, which subsequently became ISO 37106. Figures 16 and 17, drawn from PAS 181, set out the framework, and illustrate the shift from siloed information to a shared approach. Furthermore, since the way personal data is handled is critical to building trust, further Publicly Available Specifications (PASs) in the 180 series have been published, to help cities create their own “citizen centric” data strategies, which are consistent with security and GDPR requirements.

Figure 16 High Level Structure of the Smart City Framework



Source: PAS 181

Figure 17 A New Integrated Operating Model



Source: PAS 181

- (ii) **National and Local Governance:** Experience suggests that, while strategies and action plans are essential, it is the governance arrangements at national and local level that are, ultimately, the key determinants of success. To be successful they need to:
- achieve the right level of autonomy for regions/sub regions to deliver against agreed national targets, with clear objectives, responsibilities, and accountability;
 - provide high levels of transparency, including benchmarking/monitoring against agreed metrics;
 - offer full and proper consultation; and
 - commit to inclusivity.

Local authorities need absolute clarity on the extent of government subvention over time, and the degree to which they will be required, and able, to raise funds on their own account. The flip side of autonomy is accountability: ratepayers, as well as central Government, will wish to be able to monitor progress on expenditure and outcomes consistently over time and across local authorities. ISO standards are available to provide such datasets for benchmarking and monitoring purposes, and Governments should stipulate monitoring requirements in return for their support.

- (iii) **Incentives:** Many countries are using explicit fiscal measures to encourage the move to greater energy efficiency. For example, import duties are imposed on vehicles with high engine capacities, and “feebates” have been introduced on, for example, the energy performance of vehicles and fridges, where a pivot level of consumption e.g. 5kWh/month is set, and fridges with higher energy consumption pay a set amount, e.g. \$30 per kWh on the difference, and those with a better performance than the pivot receive a subsidy. “Nudge” theory can also play a role in changing behaviours but, until the social costs of emissions are incorporated into energy prices, it is difficult to be optimistic that society will make the switch to alternative energy systems that is fundamental to success. Of course, this is political sensitivity of the highest order. However, the inevitable loss of revenues from fuel tax is concentrating minds in Finance Ministries everywhere, as is the need to discourage business from off-shoring the problem, by outsourcing manufacture to countries with less rigorous carbon reduction regimes. But the message to governments is clear: the sooner the price/tax regime for carbon is determined, the sooner the next phase of the transition will take place.
- (iv) **Green Power Purchasing Agreements (PPAs)/Contracts for Difference (CfDs):** PPAs – long term contracts between electricity generators and, typically, public utility purchasers - are a well-established policy tool for providing suppliers with the confidence/incentive to invest in new capacity, on the basis of assured take-off and price. CfDs³⁹ are a more recent innovative approach – the first auction in the UK was held in 2014 - to encourage the development of different renewable technologies, and their supply chains, in preparation for the growth in demand for clean electricity. Groups of renewables, or “Pots”, with similar characteristics of technology readiness, are allocated a budget and the right to develop new projects is auctioned to generators. The generators submit bids in the form of a fixed or “strike” price – the price at which they will supply from a given date for a fixed period (typically 15 years for wind power), and bids are accepted from the lowest bid until the budget is used up. If, over the contract period, electricity prices are below the strike price, the supplier is compensated and vice versa. There have been three rounds of allocations, with new as well as established renewable technologies being involved, and a fourth was launched shortly after COP 26, with a wide range of technologies grouped in three Pots⁴⁰ The competitive nature of the process has resulted in a significant reduction in the strike price since the first round, to the extent that the latest strike price is expected to be below electricity prices when the projects come on stream in the next few years. The UK has developed an expertise in translating (auction) theory into policy practice – knowledge and experience, from which the developing world could benefit.

39 <https://researchbriefings.files.parliament.uk/documents/CBP-8891/CBP-8891.pdf>

40 https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1036257/cfd4-allocation-round-notice.pdf

- (v) **Regulation:** Regulation is a powerful if, at times, rather blunt policy tool which, like carbon pricing, is politically sensitive. Early notification that, for example, fossil fuel heating and cooling devices will be banned, or that petrol driven vehicles will need to be replaced with EVs, sends a powerful signal to the market that Net Zero alternatives will prosper. Other forms of regulation that set the required performance by a specific date, e.g. energy efficiency of buildings, similarly force the pace of change.
- (vi) **Capacity and Skills:** Net Zero offers cities an enormous opportunity to regenerate and provide a wide range of employment opportunities, provided people have the skills. However, these should not be too narrowly defined in terms of Net Zero, but include:
- data management and analytics skills;
 - the transformation of skills requirements in a construction industry that is moving to energy efficient, digital construction and off-site build; and
 - the management and repair of the utility infrastructure that is digitally enabled.

We should also not overlook the importance of improving the capacity and skills of local authorities to procure and manage contracts that are underpinned by digital technology, data and standards. As many commentators have noted, the shift to Net Zero affords the opportunity to transform skills and productivity across many sectors, and all regions have an opportunity to capitalise.

- (vii) **Building Information Modelling (BIM) and Urban Design:** As Winston Churchill said in a debate on how to rebuild the House of Commons, after its partial destruction in WW2, “We shape our buildings and afterward our buildings shape us.” So, it is with urban design. One of the main objectives of city planners is to reduce and change the mode of travel away from the motor car: this is closely tied to the concept of the 15 minute city, where people can access their place of work and amenities within 15 minutes of walking or cycling.

Another key issue confronting cities is the need for flexibility in response to changing economic circumstances: in the wake of the pandemic, and with online shopping changing the face of High Streets, local authorities need to review land use within the urban environment, and developers need to be able to repurpose buildings safely and cost effectively. Authorities also need to be able to model the impact of new developments and engage with local residents about the potential impact, in a way that is consistent with the national planning policy framework.

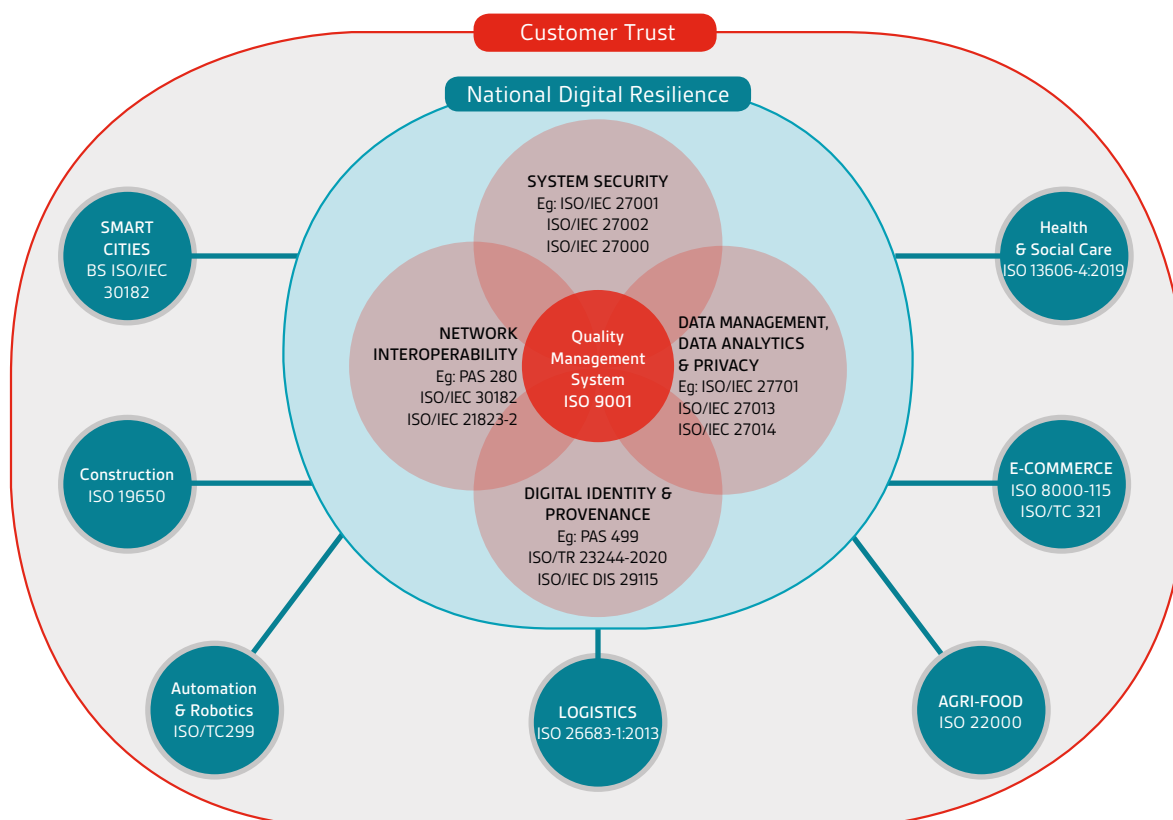
BIM, the semantic web, and the development of “digital twins” (with their ability to test the performance of the real infrastructures before installation) are critical to the design, modelling and real world monitoring and control of the way the urban infrastructure is performing. While further research is required to refine the models, this is not futuristic: Singapore is already leading the way⁴¹. But without standards to enable BIM and the semantic web, so that sensor data is machine readable, and real data can validate/inform the models, the concept would have little practical application. In response to this urgent need, BSI is using its Flex standards approach to develop standards in the digital twin domain, such as Flex 260⁴², which is defining the meaning of digital twins, including the benefits to be derived from connecting cyber-physical systems.

- (viii) **Secure IoT, Digital Infrastructure and Data:** Underpinning the entire shift to Net Zero, and the key to active engagement, is a secure and competitive fixed and mobile digital infrastructure. The roll out of full fibre and 5G is underway but, to secure the real engagement of the community, it has to be accessible to all, in the same way that Rowland Hill’s “Penny Post”, the telegraph, and railways combined to transform communication, in the mid 19th Century, for all but the poorest. However, just as the Queen’s head on stamps and royal status of the Mail gave people confidence in the innovative “pay in advance” model of the newly established Post Office, so today’s digital infrastructure, IoT, platforms and apps to share personal data, need to build trust through a clear commitment to security, safety and privacy, in the form of adherence to rigorous standards; these are set out in our earlier Paper on Digital Transformation⁴³.

To help less developed countries appreciate the importance of standards in the digital transformation process, BSI is developing a toolkit which explains the main issues to address and how standards tackle them, in relation to four core themes:

- System security;
- Data management, analytics and privacy;
- Digital ID and Provenance;
- Network Inter-operability

Figure 18 Building Digital Resilience through International Standards



Source: BSI Digitalization Whitepaper

New technologies, such as Artificial Intelligence, Blockchain, and Quantum Computing, are emerging in the next wave of development, and the continuous review and updating of standards will be important, to ensure that they remain relevant in a world of rapid change.

- (ix) **Green Energy Infrastructure and Construction:** Of course, the transition to a Net Zero world requires investment in the green infrastructure for energy, transport, manufacturing and the built environment, as all national strategies recognise. The greater the investment, the greater the scope for economies of scale, and we have discussed in the previous chapter the role that standards can play in opening up markets to generate those opportunities for innovation.
- (x) **Finance:** as we highlighted earlier, affordability and finance are perhaps the greatest barriers that developing countries face in addressing climate change, and yet a whole new set of financial instruments are developing around carbon reduction at an incredible pace. According to the Climate Bonds Initiative⁴⁴ (CBI), an independent organization that validates and monitors developments in “green” finance, the issuance of green debt is expected to reach \$450 billion by the end of 2021, compared to around \$250 billion in 2020 and \$190 billion in 2018. It expects new issues to reach \$1 trillion in 2023, which is almost the total of \$1.3 trillion issued to date. Half the debt in H1 2021 has been issued by corporates, such as Daimler using green

44 https://www.climatebonds.net/files/reports/cbi_susdebtsum_h12021_02b.pdf

finance to fund its EV development. Sovereign and government backed issuers accounted for around 25%, development banks for 10%, and local government only 2%.

As a result, developed markets account for three quarters of the issuance, and emerging economies only 19%, with Latin America and the Caribbean accounting for 2% of green debt in the first half (H1) of 2021, and no issuance from Africa at all. With Gothenburg leading the way among European cities in launching green “muni-bonds”, and with a mature bond market in the USA ready to expand rapidly, the challenge is how to help developing countries in their attempts to access this market, not least cities seeking to transform their carbon intensive energy and transport systems. There is no shortage of projects, but Johannesburg offers one of few examples among developing countries. Creditworthiness is a key barrier, and both the development banks and organizations like the Green Climate Fund have an important role to play in providing guarantees or leverage in support of flotations, and advising on the best way forward, for developing economies. There is growing pressure to invest more, and we believe that the risk profile of investment could be significantly improved, and loan books extended, if the culture of international standards could be incorporated into Fund and MDB lending strategies, for the benefit of all. This is not simply using standards to define categories of “green” but as manuals of good practice in rolling out Net Zero investments.

- (xi) **Quality and Standards:** In drawing this section to a close, it is clear that standards are important to the successful implementation of the Net Zero agenda, as it plays out on the ground. We have sought to depict the path to Net Zero as a bridge built with both a sound policy/market framework on the one hand, and the real and digital components of a smart, sustainable community on the other. We see the role of standards as the keystone to combining, and giving strength to, both pillars - providing assurance to, and reducing the risk of, investment – while supporting the engagement and innovation scenarios that can substantially reduce costs.

B. Conclusions and Recommendations

We have indicated that the policy analysis and process for achieving Net Zero should be strengthened in two key areas, namely digital infrastructure/data and the role of cities. Cities are the great integrators of utility systems – energy, transport, water, waste and telecommunications - and the great centres of innovation, where new technologies are developed and socialised. Of course, policies will have to be inclusive – the rural hinterland must not be forgotten – but, increasingly, cities are where Net Zero policies will play out, where engagement has to be successful (as Covid has demonstrated), and where the opportunities for synergy lie. Within that context, effective place-based policies are paramount, and the affordability and accessibility of digital connectivity, its security, and that of the devices embedded in the new service systems, are critically important to achieving policy goals. But local authority budgets are in a precarious state, and national policy makers need to recognise that additional duties for local authorities have to be fully funded.

Recommendations:

- As policy moves from target setting to delivery and performance monitoring mode, it should include – indeed, give priority to – promoting holistic, smart city concepts and measuring and comparing city performance. This should be not only in relation to carbon-intensive sectors, but also in the uptake of next generation digital connectivity (full fibre and 5G/6G) and how social objectives, e.g. reducing fuel poverty, are being fulfilled. This requires the establishment of standardised measures and full transparency.
- We recommend the 11-point plan set out in this chapter – the Bridge to Net Zero - as the basis for reconciling national/sectoral and local strategies, and achieving our goals.
- A spatial approach has to be properly funded. Governments will wish to consider the extent to which the current division of responsibilities and funding needs to be amended, in order for local authorities to play a full role in the transformation process.

4. International Cooperation and the Role of Standards and National Standards Bodies in Achieving Net Zero

This chapter briefly sets out:

- The funding mechanisms that have been developed in relation to increasing funding needs
- The new policy tools that have been developed to help developing countries plan for climate change and manage their scarce resources
- The role NSBs and standards can play in developing countries
- Conclusions and Recommendations.

As we noted in Chapter 1, the developing world contributes relatively little to GHG emissions and yet is disproportionately affected by extreme weather events. It is also clear that the cost of adaptation and mitigation is beyond the reach of most developing countries. As the impact of climate change has become more apparent, the UN and its agencies have increased their focus on improving access to funds, strengthening the resilience of developing countries to withstand the shocks of extreme events, and supporting their efforts to mitigate emissions. This Chapter highlights the steps that have been taken, to date, to help developing countries address the challenges, including the type of finance that is required and the processes for improving the financial management of the risks associated with climate change. It concludes by outlining how standards and NSBs can help accelerate the transformation underway, in a cost-effective way and, in so doing, “crowd in” private capital with the support of Multilateral Development Banks.

A. Funding

Several funds have been established over the past 20 years to address the finance gap, in particular:

- **The Least Developed Countries Fund⁴⁵ (LDCF):** established in 2001, the Fund is operated by the Global Environment Facility (GEF), and, as of October 2019 some 51 countries had accessed a total of \$1.4 billion for work on their adaptation programmes.
- **The Special Climate Change Fund (SCCF)⁴⁶:** established at the same time as the LDCF and operating in parallel, the SCCF supports vulnerable developing countries to address adaptation issues. In the 20 years since its inception the SCCF has invested \$355 million in 87 projects, from improving soil management and land quality to developing solutions assessment tools and private sector led innovation.
- **The Adaptation Fund⁴⁷ (AF):** also established in 2001, the AF has grown into a \$1 billion fund that has committed about \$850 million in over 100 developing countries and about half of the funds in its current portfolio of projects/programmes allocated to the Least Developed Countries (LDCs) and Small Island Developing States (SIDS), possibly the most vulnerable countries in the developing world.
- **The Green Climate Fund⁴⁸ (GCF):** formally established in 2010 under the Cancun Agreement, the GCF raised over \$10 billion by the end of 2014 and in 2019 it replenished the Fund by a similar amount. It offers a range of financing instruments, including grants, concessional debt, guarantees or equity instruments to leverage blended finance for investment in climate action in developing countries. It is mandated to invest 50% of its resources in mitigation projects and 50% on adaptation. Furthermore, at least half of its adaptation resources must be invested in the most vulnerable countries (SIDS, LDCs, and African States).

When set against the \$1 trillion pa until 2030 that is required by developing countries to achieve their Net Zero Goals by 2050, and the additional cost of adaptation, the combined sums would seem to be a drop in the ocean. Finance on this scale is clearly a barrier to implementation and of considerable concern to developing countries, devastated by Covid. As the IEA points out, such a level of investment can only be achieved if there is a switch away

⁴⁵ <https://www.un.org/ldcportal/least-developed-countries-fund-ldcf/>

⁴⁶ <https://www.thegef.org/topics/special-climate-change-fund-sccf>

⁴⁷ <https://www.adaptation-fund.org/>

⁴⁸ <https://www.greenclimate.fund/>

from public to private, and it anticipates that more than 70% of clean energy investment – mainly renewables and energy efficiency – will be privately financed, from a global investment pool of \$200 trillion. Of course, these funds are mainly managed by the financial markets of developed economies and investment in the developing world faces challenges, in terms of cost and availability of capital. In such circumstances, development banks and multilateral funds have a critical role to play in supporting new models of blended finance that reduce the risk profile of investment, and help developing countries to tap into private capital markets' growing appetite for long term clean energy investments.

Private capital will respond, provided both the revenue streams and the promises of carbon reduction are robust and reliable. This will require tangible commitment by governments to establish the right framework of change – the skills, the clarity of strategy, policy and commitment, and the demonstration by consumers and business that they, in turn, will embrace the necessary change. We believe that international standards and NSBs have a critical role to play in underpinning the quality of the processes, the monitoring of performance and, above all, establishing people's trust in the new paradigm. Through ISO, they also provide a powerful knowledge transfer and market opening mechanism which, at present, is being severely underutilised. We consider this in Section C.

B. The IMF/World Bank Tools

For over a decade the World Bank has been supporting countries to develop mechanisms to place a price on carbon, through the Partnership for Market Readiness Programme (PMR), with nearly \$80 million allocated to governments to implement readiness activities. Its recently renamed successor, the Partnership for Market Implementation (PMI) Programme, aims to raise the ambition of countries and to support the scaling up of efforts, not least by raising awareness through its research into carbon pricing⁴⁹ and lessons to be drawn from experience⁵⁰.

For its own operations, the World Bank conduct greenhouse gas (GHG) accounting and apply the shadow price of carbon in the economic analysis to reflect the global externality of the GHG emissions when evaluating investment decisions. In addition, to assess the risks of carbon and financial lock-ins of policies, technologies and investments in the face of decarbonization policy, new methods, metrics and analytical tools are being developed to quantify lock-in risks, accounting for expected development benefits and country contexts.

In more recent years, the World Bank has given a particular focus to the need to build resilience into projects at an early stage in their development, and screens all its operations for Climate and Disaster Risks⁵¹. New tools have also been established to support developing countries better understand, track and manage climate change risk. The newly launched Resilience Rating System (RRS)⁵² is a project-based tool that provides a simple approach to measure and disclose the extent to which adaptation and resilience considerations have been integrated into project design, both in terms of (i) the confidence that expected investment outcomes will be achieved, and (ii) the project's contribution to adaptive development pathways. The Adaptation Principles framework proposes a set of priority areas and specific actions and indicators that can be used to assess a country's actions and readiness for adaptation and resilience.

Project-level risk assessment and screening are complemented by country-level diagnostics. For instance, a systematic adaptation and resilience diagnostics allows the WB to evaluate country-level readiness for adaptation and resilience, and support countries to plan and prepare for climate impacts on their financial systems and economies as a whole. And macroeconomic assessments, such as those carried out for Fiji, the Caribbean countries, and increasingly elsewhere, as part of systematic assessment in the Country Climate and Development Reports (CCDRs), help apply an economywide approach to resilience.

And IMF staff wish to do more. In a recent report to their Executive Board⁵³, they have sought to strengthen the Fund's engagement on climate issues with members. In discussion, Directors agreed and emphasized that this should be aligned with the standards being developed by relevant international standard-setting bodies, to ensure consistent policy advice. They also stressed the importance of partnering with other institutions, and a more systematic approach to collaboration to leverage the expertise of other institutions.

49 <https://openknowledge.worldbank.org/handle/10986/35620>

50 <https://openknowledge.worldbank.org/handle/10986/36021>

51 <https://climatescreeningtools.worldbank.org/>

52 <https://openknowledge.worldbank.org/handle/10986/35039>

53 <https://www.imf.org/en/Publications/Policy-Papers/Issues/2021/07/30/IMF-Strategy-to-Help-Members-Address-Climate-Change-Related-Policy-Challenges-Priorities-463093>

The CCPAs that have been piloted to date offer a framework of analysis of a member's approach to:

- climate change risks and expected impacts;
- disaster planning;
- contribution to mitigation;
- adaptation plans;
- financing strategy for mitigation and adaptation;
- risk management strategy;
- national processes;
- priorities.

The reports provide a valuable overview of the climate change risks, and the extent to which the country's planning and budgeting processes are handling those risks. While it is early days, and only a small number of studies have been completed, a number of common themes have emerged, in particular that, in small states:

- There is simply not the capacity in the public sector to handle the range of issues that climate change is imposing on public administration. This is in addition to current weaknesses, including:
 - Public Investment Management (PIM) and the quality of project appraisal is patchy, with proper processes being usually linked to donor requirements;
 - Procurement processes and transparency of outcomes are also highly variable in quality;
 - The oversight of PPP arrangements.
- Mitigation, in the form of a shift to renewable energy, affords the opportunity to reduce reliance on fossil imports and ease pressure on exchange rates.

The reports also raise questions about the scope of the analysis itself, in particular:

- How does the climate strategy link to the overall economic regeneration strategy and SDGs, and to what extent is it holistic and inclusive?
- To what extent do the chosen countries seek to adopt global best practice in implementing their climate change strategies?

In terms of the size of their populations and GDP, many smaller developing countries are very similar to cities but, of course, population densities are considerably less: often, a dominant capital city accounting for a high proportion of the nation's GDP, with smaller townships and villages comprising the rest. However, urbanisation is growing fast – often chaotic – and so there is a real opportunity for the Net Zero agenda to be integrated with (post Covid) economic regeneration, to build more resilient communities in the developing world, and help them achieve their SDGs. We therefore believe the previous chapter, on smart city concepts, recommending an integrated, holistic approach, is essential to promoting both mitigation and adaptation in developing countries, and is complementary to the top down, macro approach of the IMF.

However, the overriding issue for developing economies, large and small, is affordability and vulnerability, in the wake of the Covid pandemic. A country, such as Belize, with a debt to GDP ratio of 130%⁵⁴ will struggle to invest sufficiently in the adaptation measures to cope with the hurricanes that sweep the region, never mind mitigation, while being watchful of the risks of debt default, as the IMF has noted. Belize is not an isolated case - the scale of the task is truly massive. The recent Adaptation Gap Report 2020 by UNEP⁵⁵ estimated the annual cost of adaptation in developing countries to be \$70 billion, rising to \$140-300 billion in 2030, and up to \$500 billion in 2050. The concern is that, while finance for adaptation is increasing, so is the need, with the result that the gap is not narrowing.

These issues were raised in Glasgow, but the gap between the needs and aspirations of the poorer nations, and the richer nations' willingness to increase their contributions, still needs to be reconciled. It is not the purpose of this paper to engage in this debate – it is well covered elsewhere – but simply to note that this Marshallian vision, of untrammelled support for countries in need, needs the focus and drive of a George Marshall, if the necessary investments are to be made.

C. The role NSBs and standards can play in developing countries

While access to finance is, of course, key to investment in new technology, we believe policy makers need to look to look more broadly at the barriers to Net Zero transformation and sustainable development, on the lines of UNCTAD's e-trade readiness assessments. We have set out our own holistic approach in the form of the Bridge to Net Zero in Chapter 3. This is similar to the UNCTAD framework because we consider the societal transformation towards Net Zero to be directly analogous to digital transformation, where trust by consumers in the security, privacy and efficacy of the system is vital to uptake. This section considers how the quality and standards infrastructure might play a greater role in the paradigm shift that is Net Zero. The international standardization system, comprising ISO, IEC, and ITU, can be a powerful supporting mechanism to drive change through the dissemination of good practice, via their large membership base across the globe as outlined in Chapter 2.

To help us understand the extent to which developing countries are deploying standards to underpin their efforts in climate mitigation and adaptation, we undertook a survey of a number of NSBs in Africa and the Caribbean. Our preliminary findings suggest that developing countries are not adopting standards to anything like the same extent as the developed world: the uptake of standards, with the exception of ISO 14001 and 50001, is minimal. We conducted further interviews to understand the nature of the key bottlenecks:

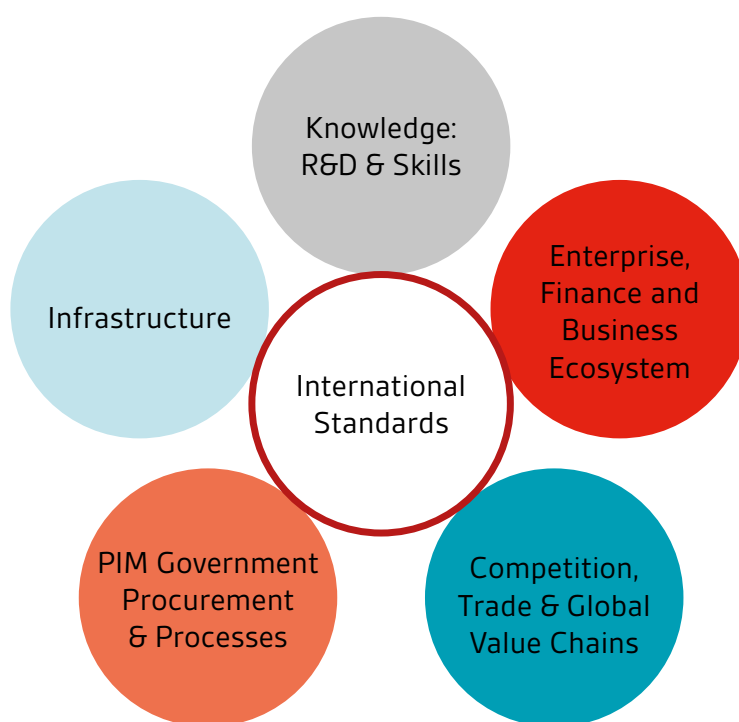
- **Lack of market demand:** Standards are developed/adopted by NSBs when there is market demand. However, there appear to be serious information failures, on the part of governments and the private sector, on how standards can help both parties to achieve their objectives. Using standards requires a marked shift in culture/mindset. The starting point is appreciating their value, and raising the necessary awareness requires dedicated resources, as well as relevant case study material. Another effective way to mainstream the culture of standards within an economy, is to use them in public procurement policy. This presents opportunities to ensure the quality of systems and processes, but it also needs to be complemented by policies, which raise the uptake of International Standards in local firms, to ensure that they are not excluded.
- **Insufficient political buy-in:** Securing high-level political buy-in for standards development is difficult. Priorities are often shifted towards more tangible investments, the benefits of which are easier to communicate, such as roads, healthcare, and the education system. This may be because there is considerable research on the social and economic benefits derived from investment in such infrastructures, and relatively little on the benefits from standardisation and quality infrastructure.
- **Lack of capacity and recognition of NSBs as an agent for change:** For the most part, NSBs lack the skills and resources to engage effectively with government Ministries and SMEs on the benefits of using standards; in a vicious circle, there is inevitably little focus on standards to drive the agenda and little authority granted to NSBs to serve their role in supporting the economy as an agent for change. It is only by capacity building, awareness raising efforts, and demonstrator projects that the role of NSBs and standards can be elevated to that of agents for change.

Notwithstanding the relatively low uptake of standards in the developing world, there are a number of relevant case studies that are driving transformation, which have been included in the ISO Climate Action Toolkit⁵⁶, see below:

- Building National Energy Policy in Jamaica [Climate_Case_Study_BSJ.pdf \(iso.org\)](#)
- Carbon footprint as a tool to reduce emissions – Iran (ISO 14067) [Climate_Case_Study_INSO.pdf \(iso.org\)](#)
- Reducing Vehicle Emissions -Rwanda X2: [Climate_Case_Study_RSB.pdf \(iso.org\)](#)

However, these are hard-won examples, rather than the systematic adoption of standards, and such effort needs to be recognized and scaled-up to achieve Net Zero. We therefore conclude this section by noting that, if developing countries are going to regenerate in the face of Covid and climate change, and if they are to “crowd in” private finance, then development agencies and MDBs need to revisit the models of sustainable development, innovation and productivity growth, such as the OECD’s Productivity Report⁵⁷. These models are multifaceted, with a focus on the role of knowledge and skills, investment in infrastructure, the importance of competition, trade and access to global value chains, and the availability of finance. Such elements are, of course, of fundamental importance – as much in the developed as in the developing world - but one element has been consistently overlooked in recent times, namely standards. Standards touch all aspects, as illustrated in Figure 18 below. This, combined with their relatively low cost of development and dissemination, means that they are the most cost-effective technology/good practice diffusion tool available to policy makers. As such, we believe they, and the institutions which promote their development and dissemination, merit much greater policy focus than hitherto.

Figure 18 Key factors of Economic Development



We are strengthened in this view by a recent review by ISO⁵⁸ (April 2021) of the impact of standards adoption on economic performance, in a number of developed economies (together with South Africa), which revealed consistently positive results. Furthermore, it is only relatively recently that standards processes have been dedicated to carbon reduction and, as we have described above, they are a powerful tool to break the link between economic growth and carbon emissions.

58 <https://www.iso.org/files/live/sites/isoorg/files/store/en/PUB100456.pdf>

D. Conclusions and Recommendations

We conclude this chapter with the leitmotif of our paper, namely that because they touch so many points of the sustainable development agenda, standards and standards bodies are an essential part of the policy mix which, in the developing world, is being overlooked. However, a number of issues have emerged:

- The scale of the sustainable development challenge is such that partnership is the only way forward, making best use of the expertise available. Development banks, together with UN agencies, the standards community and sponsors from the developed world, need to collaborate in their relationship with host governments.
- Holistic approaches which link local spatial strategies to national frameworks are essential to cost-effective implementation.
- International Standards provide a focal point for many of the elements of a Net Zero strategy. However, there is a wide range of capability among developing nations and, in many cases, NSBs are starting from a relatively low base of engagement in promoting Net Zero transformation. It is unlikely that all can develop a standards capability to match the need. There is, therefore, a strong need to consider the development of regional hubs of expertise that can help bridge the capability gap.
- In providing leverage for private capital, MDBs have an important role to play in incorporating global best practice into their lending strategies, in support of mitigation, adaptation, and SDGs. They can help to drive change by requiring borrowers to adopt international standards in their procurement and project management processes, thereby raising the quality of projects, reducing the risk on MDBs' loan books, achieving higher returns for borrowers, while securing widespread social benefits.
- The Net Zero agenda provides an opportunity to catalyse economic regeneration and trade, where standards can provide the level playing field, and ensure that markets are open.

Recommendations:

- In considering the elements that contribute towards inclusive, sustainable growth, development agencies should give much higher priority to standards and quality infrastructure in their capacity building activities in developing countries. Developing the role of NSBs as agents of transformation, and as institutions which shift the business focus towards quality processes and outcomes, should become a much more important part of the policy mix.
- The Standards Community should:
 - work with the UN Agencies, World Bank and MDBs to ensure that international standards are incorporated into aid, procurement and lending programmes in a consistent manner that supports the development agenda.
 - advise on the scope for developing regional standards hubs to provide thematic standardization expertise in cases where it is not nationally available. This would pave the way for business clusters to develop around Net Zero initiatives.
- Government Departments in the developing countries should work with NSBs to develop standards strategies in their areas of policy interest, just as UK Government Departments have worked with BSI. NSBs can provide policy co-ordinators with a comprehensive picture of the standards map, how it relates to the barriers/ challenges that need to be addressed and, through their networks, help policy makers identify possible gaps and solutions.
- As we indicated in Chapter 2, NSBs should make international standards the basis for their national standards catalogues and, where an unmet need for standards exists, they can turn to ISO for support in developing the necessary standards that can be globally applicable.
- With the support of aid agencies, BSI/ISO should work with NSBs and government bodies in developing countries to ensure that public sector procurement processes are based on standards and, therefore, provide a means for ensuring that innovation and competition have an important role to play in achieving Net Zero.

- MF/WB should consider incorporating standards in to its CCPAs, and MDBs should consider incorporating standards into their lending strategies
- UN Agencies, such as UNCTAD, should consider how the standards community can support its trade and development policies in relation to Net Zero and development.

Finally, to return to the central theme, what would success look like? It would be that developing countries, in partnership with the developed world, would effect a smooth transition to a Net Zero world, in line with global targets and, in so doing, achieve their sustainable growth objectives. Sadly, the path has been anything but smooth to date and, if anything, COP 26 indicated that we are all still in for a bumpy ride. The paradigm shift in behaviour that is entailed, and the extent of the investment required, are on the same scale as the Industrial Revolution - in many ways, in reverse. However, the focus that large corporates are now giving to climate change, and the mechanisms for promoting transparency of performance, have led to a recent upsurge in “green” activity in capital markets. This, together with the scale of the resources that are potentially available, and being mobilised, give more than just a glimmer of hope.

We believe a degree of optimism to be justified, if three fundamental conditions are met:

- Sectoral and national strategies are complemented by spatial, “smart city” approaches to provide a holistic framework for transformation that resonates and delivers at the local level.
- Policies to promote systemic change are based on international standards in a way that supports the crowding in of private finance, and the effective monitoring of both NDCs and VCMs.
- In addition to supporting the traditional elements of economic development policy, such as skills, infrastructure, enterprise etc, development agencies and MDBs support the quality and standards infrastructure of target countries and take the necessary steps to drive forward the concept of standards/quality led growth and make it a reality.

For those who might question the cost of such capacity building and standards development, we argue that they would bring the cost of transformation far nearer to the “widespread engagement” scenario than any other and, as such, they are infinitesimally small compared to the massive savings generated. Moreover, by placing quality standards at the heart of development policy, such an approach would hasten the integration of developing countries into regional trade networks and global value chains and, thereby, secure a step change in economic performance.

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About BSI

BSI is a global thought leader championing business excellence, innovation and best practice. It has grown into an international research, advisory and regulatory organization of over 3,500 staff in 80 global locations.

Whether by developing agile standards or offering quality management advisory services, BSI remains true to its original mission of 'making excellence a habit' in organizations all over the world.

Standards Policy

The Standards Policy team is the focus for the formation of policy for BSI's NSB functions and is responsible for developing and maintaining effective relationships with other national, regional and international standards bodies (including ISO, IEC, CEN and CENELEC), international organizations and UK Government in order to enhance the UK's profile and influence globally.

Knowledge Sector

The Knowledge Sector team is the focus for the strategic leadership of our Sectors. We use our insight and channel expert knowledge to shape and position standards, products and services that benefit the global standards community and ensure that Standards contribute to the solutions of the key global challenges faced today and into the future. The team is responsible for effective relationships with national and international Government departments on specific issues as well as industry, academia and consumers.

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