

Opportunities and constraints for integrating the requirements of the Paris Agreement with the SDGs and the Sendai Framework in the context of built environment in coastal regions



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1. The Paris Agreement

1.1 Country statement of commitment to the agreement

As a country, the UK has a national goal to eliminate greenhouse gas emissions in 2050. This is mentioned in the UK Climate Change Act, a legally binding document that makes it a long-term legal commitment as a nation. This national goal was set in 2019 after the advice of the Climate change committee in 2018(CCC, 2018). The most important aspect is that this goal includes international shipping and aviation, indicating a complete 100% target to reduce greenhouse gas emissions. Furthermore, Wales and Scotland, which are devolved administrations, have their own territorial climate legislation and targets within the UK. For instance, Wales, which has the more significant proportions of agricultural emissions, is set to reach 95% greenhouse gas emission reduction by 2050, while Scotland has a target of reaching 100% by 2045 due to their capability in high CO2 removal. However, due to this variation as a single nation, the UK is expected to reduce greenhouse gas emissions by 100% by 2050.

Concerning the progress on the execution of the Paris agreement in the UK, on the 4th of December 2020, UK's new Nationally Determined Contribution (NDC) under the Paris Agreement commits the UK to reduce the UK's emissions by at least 68% by the end of the decade, compared to 1990 levels.

1.2 Institutional structure/mechanisms responsible for implementing the Paris Agreement

Before establishing the Paris Agreement, climate change mitigation was governed by the Climate Change Act 2008 in the UK. Subsequently, the Paris Agreement is the leading global agenda that drives this process. The Climate change Committee, known as CCC, is the UK independent advisory body that leads the country's climate change response agenda. CCC was established in the year 2008. Its duty is to provide regular insights and advice regarding the directions and policy changes relating with reference to the progress on the execution of the Paris agreement in the UK, Concerning the progress on the execution of the Paris agreement in the UK (CCC, 2018).

As a part of its long-term vision, CCC conducts annual assessments and bi-annual reviews to evaluate these long-term climate targets. The results are published highlighting the critical emerging issues and the recommendations on the way forward, which assist in the policy formulation on climate change.

Furthermore, the following regulatory guidelines are available in the UK in terms of statutory requirements.

- Planning and Energy Act 2008 sets the energy efficiency standards for the local authorities.
- The National Planning Policy Framework provides local planning authorities guidance on sustainable practices.

1.3 National Statement on progress in implementing the Paris Agreement

In 2019 the UK pledged to reach a net-zero greenhouse gas emission target by 2050. This was initiated following the CCCs advice by the national government and became one of the first nations to adopt this legally binding commitment towards net-zero targets. From 2008, as a part of the UK's climate change plans, the carbon budget concept was introduced by the Climate change Act. This carbon budget sets a five-year statutory cap on the UK's greenhouse gas emissions. Six carbon budgets have been developed for the period ranging from 2008 to 2037. CCC records that the UK meets only first and second carbon budgets (DENTONS, 2022). Figure 1 demonstrates the CCCs recommendations for the UK to reach its net-zero emission target in 2050.



Figure 1:The CCC's recommendation for a UK 2050 Net Zero target

1.4 Specifics of the Paris Agreement and the Built environment

The built environment provides the context for all human endeavours. It includes structures and facilities built in urban and suburban areas like roads, utility systems, schools, subdivisions, housing, and accompanying physical features. In the context of the UK, the built environment contributes to more than 25% of the direct carbon footprint (UKGBC, 2022). Accordingly, in line with the UK's net zero carbon emission commitment as per the Paris agreement, there are several initiatives by the Green Building Council in the UK.

Residential buildings Non-residential buildings 68 55 Manufacturing & construction Electricity supply 39 Fuel supply 539 (703) Surface transport 15 Waste MtCO₂e F-gases Aviation 115 39 Shipping Agriculture Land Use, Land-Use Change & Forestry

According to the 2018 records, the UK emissions are presented as follows.

Figure 2: UK greenhouse gas emissions 2018 (MtCO2e). Grey bubble represents consumption-based emissions

Most emissions are accountable to the surface transport sector, residential building sector and manufacturing and construction sectors. However, further analysis shows the built environment's contribution and how the breakdown occurs. Figure 3 demonstrates the Proportion of Built Environment emissions from the 2018 total UK GHG emissions. The greenhouse gas emission accountable to the built environment vary across numerous industries such as buildings, manufacturing and construction, waste management, transportation, gas industry(UKGBC, 2022).

From another perspective, a built environment encompasses life's infrastructure that protects and enhances our ethical and societal needs, reflects the quality of human life, and contributes to our vulnerabilities (Bosher, Carrillo, Dainty, Glass, & Price, 2007). According to ISDR (2010), vulnerability is determined by physical, social, economic, and environmental factors or processes that increase a community's susceptibility to the impact of climate change and subsequent hazards (Malalgoda, Amaratunga, & Pathirage, 2010). Therefore, the quality of a built environment is a critical aspect as the components of a low-quality built environment can be a disaster waiting to happen (Malalgoda, Amaratunga, & Haigh, 2013).



Figure 3: UK greenhouse gas emissions 2018 (MtCO2e) showing influence and control of the built environment

Source: (UKGBC, 2022)

1.5 Carbon emissions and the building industry – policy and action

The UK clearly understands the need and importance of Government policy in identifying and setting out the policy level recommendations for each sector with the targets for 2030(UKGBC, 2021).

It is reported that most of the local governments are taking urgent action to address emissions from buildings, as they exert considerable influence through local planning policies and programmes. The Steering Group and Task Groups of UKGBC have developed the following policy. The Policy Recommendations are structured into the following sections, with recommendations for both Central Government and Local Authorities under each section:

- Buildings Operational Carbon
- Buildings Embodied Carbon
- Domestic Retrofit
- Infrastructure

The policy recommendations are long documents further supplemented by a stakeholder action plan. The policy recommendations are documented in a table format where the central government recommendations and the local government level recommendations are provided separately. In addition, the table depicts the targets by 2025 and 2030 separately. (The detailed policy recommendations are attached to this document.)

Furthermore, in November 2020, the UK initiated a Ten Point Plan for a green industrial revolution.

- Point 1- Advancing Offshore Wind
- Point 2- Driving the Growth of Low Carbon Hydrogen
- Point 3 -Delivering New and Advanced Nuclear Power
- Point 4 -Accelerating the Shift to Zero-Emission Vehicles
- Point 5 Green Public Transport, Cycling and Walking
- Point 6 -Jet Zero and Green Ships
- Point 7- Greener Buildings
- Point 8 Investing in Carbon Capture, Usage and Storage
- Point 9 Protecting Our Natural Environment
- Point 10 Green Finance and Innovation

This also covers essential elements relating to the built environment. However, the latest edition of the climate change adaptation plan in the UK specific to the built environment is the Net Zero Whole Life Carbon Roadmap for the Built Environment(UKGBC, 2021). In this roadmap, the scope of the built environment emissions is summarised as follows.

Table 1: Scope of Built Environment Emissions

	Embodied	Operational Carbon	Operational	F-Gas
	Carbon	(Regulated)	Carbon	
			(Unregulated)	
Domestic	Embodied	Carbon from regulated	Carbon emission	F-Gas leakage
Buildings	carbon from	energy uses:	from unregulated	from
Non-Domestic	Construction,	 Heating 	energy uses:	refrigeration,
Buildings	Maintenance	Cooling	Cooking	heat pumps
Infrastructure	& Demolition.	• Ventilation &	 Appliances 	and air
	Both domestic	Pumps	• Lifts	conditioning
	and	 Lighting 	• Small	plant within
	consumption	Hot Water	power /	buildings.
	(imported)		plug	
	emissions.		 loads 	
			IT servers	
		Carbon from the	Not in scope (i.e.	Not in scope
		operation of	"User Carbon")	
		infrastructure:		
		• Street & public		
		realm lighting		
		Communication		
		networks		
		Water supply &		
		treatment		
		• Waste		
		treatment		

1.6 Opportunities and constraints of implementing the Paris Agreement

It is recorded that the UK Ten Point Plan for a green industrial revolution will produce 90,000 job opportunities across the UK o immediately, and by 2050, nearly 250,000 jobs. Furthermore, with the new concepts like clean energy, the global targets will be to reduce the global investment in electrical systems by 83%, which amounts to USD 13.3 Trillion(GOV.UK, 2020). As a green concept pioneer, the UK had a vast opportunity in producing renewable green energy cclimate change adaptation. It develops new British science and technology opportunities to create and use clean energy. The engineers, construction professionals, and relevant authorities are currently developing the latest methods with high potential in the international market. Spanning clean energy, buildings, transport, nature, and innovative technologies will mobilize more than £12 billion in government investment. Accordingly, by 2050, the private sector investment will increase three times (UNFCCC, 2020).

The UK has become leading in creating the offshore wind capacity, which becomes a clean energy source required for the climate adaptation plans. By 2030 the UK plans to increase their production capacity nearly four times, creating employment opportunities, especially in the UK coastal regions(GOV.UK, 2020). However, in reaching these targets, fluture needs include a better response to the uncertainties of climate change, is also needed(de la Vega-Leinert & Nicholls, 2008).

Reaching net-zero emissions will be a global necessity to limit climate change. However, achieving it on the timescales necessary to meet the aims of the Paris Agreement will be very challenging for all nations. Given current uncertainties around domestic feasibility, the inclusion of non-CO2 emissions, and the ambition of other countries to reach zero, the flexibility on how best to reflect the aim of global net-zero emissions in a UK target is essential. Addressing these uncertainties is critical and will be instrumental in achieving a realistic robust target by creating the right incentives.

One central area that will positively contribute to the climate change revolution is Research and Development. Support for research, development, and demonstration to help clarify whether options deliver genuine long-term greenhouse gas removal and address technical, environmental and social challenges. Examples include improving the measurement of land carbon, assessing impacts over the lifecycle of bioenergy crops and biochar, and testing direct air capture processes.

Another triggering point in this journey will be the provision of incentives. It will support the deployment by removing barriers and incentivising technically more mature options. In addition, targeted deployment can help bring down costs and understand more about impacts. Deployment examples include carbon capture and storage infrastructure, sustainable bioenergy crops, afforestation, and wood in construction.

Finally, integration into policy and accounting frameworks so that removals count equally with emissions reduction. The lack of long-term policy commitment is a crucial barrier to development. For example, schemes such as the EU Emissions Trading System (ETS) and the Common Agricultural Policy (CAP) could be structured to reward removals but currently are not.

Addressing these scenarios will better achieve the Paris agreement goals and positively support the climate adaptation plans.

2. The Sustainable Development Goals

2.1 Country statement of commitment to the SDGs

In line with the global agenda "Agenda 2030," UK Government also has established its approach to delivering the Global Goals for Sustainable Development locally and internationally(GOV.UK, 2019). Later in 2019, this commitment was further increased by the net-zero emission target by 2050 in the face of climate change(Saha, Al-Shaer, Dixon, & Demirag, 2021). The commitment of the UK is led by the tag line of Leave no one behind and involves concentrations around gender, equality, peace, and security.

Currently, the UK's sustainable development goals are executed through Single Department Plans. Accordingly, each government department is held accountable for aligning its actions. Furthermore, the cabinet office will have a leading coordination role in executing the SDGs locally and internationally.

As a part of their SDG implementation, the UK undertook a national review in 2017 led by the UK Government's Department for International Development (DFID)(GOV.UK, 2019). The results have witnessed that the UK spends 0.7% of their Gross National Income on Official Development Assistance in line with the UK-Aid strategy. According to the project's focus, the following section discusses the SDG progress through the reflections on Goals 9 and 11.

2.2 Reflections on Goal 9 – Industry, innovation, and infrastructure

Under this sustainable development goal, the aim is to develop resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation. The sub-targets are depicted in Figure 4. From there, the progress of the UK context is recorded through statistics. So, for example, a target relating to climate change adaptation can be illustrated as per figure 4.



Figure 4: Sustainable Development goals -Goal 9 Targets

The fourth indicator under the SDG no 9 is to improve the sustainability infrastructure and industries. This could be supplemented by increased resource-use efficiency and greater adoption of clean and environmentally sound technologies and industrial processes. Accordingly, the progress of the UK context could be depicted as follows through the CO2 emissions per unit of value addition.



Figure 5: CO2 emissions intensity by industry

The UK has contributed to innovations in the polymer industry, such as chemical recycling plastic solutions. The product transformation in the polymer industry will have a multisectoral impact on the electronics, transport, construction, building, agriculture and food and drink sectors(BPF, 2021).

Under this goal, the focus is to improve innovations in the UK industries to achieve long term sustainability. However, according to the UKRI website, a few of the UK's latest innovations and industry advancements can be summarized as follows(UKRI, 2022).

Project Name	Investment Value	Purpose
UKRI Airborne Laboratory	£5.5 million	Atmospheric monitoring
		facilities for specially adapted
		aircraft which will investigate
		climate change, pollution and
		severe weather.
The Square Kilometer Array	£14.75 million	This will develop telescopes to
Observatory		research the development of
		the early universe and study
		insight on dark matter, cosmic
		magnetic fields and exoplanets.
CoSTAR	£410,000	A national infrastructure
		providing on reducing resource
		consumption and performance
		enhancement.
Population Research	£450,000	A longitudinal population study
		portfolio of more than 70
		years.
John Innes Centre	£1 million	A global interdisciplinary hub
		for researching plant and
		microbial sciences
Nuclear Magnetic Resonance	£25,000	Development of Nuclear
(NMR) spectrometer		Magnetic Resonance
		spectrometer system.
Floods infrastructure	£260,000	Development of new national
		Floods and Droughts Resilience
		Infrastructure.
Service Robotics proving	£500,000	Developing advanced service
ground		robotics or 'robots in the wild'
		to navigate complex and often

		unstructured environments
		including public spaces.
Research Infrastructure for	£200,000	Integration of art facilities and
Conservation and Heritage		expertise, transforming the
Science		conservation and analysis of
		the archaeological collections.
Relativistic Ultrafast Electron	£1.36 million	Provision of a facility to
Diffraction and Imaging		observe how structural
(RUEDI)		changes occur within different
		materials through the
		application of electrons for
		diffraction patterns and
		images.

2.3 Reflections on Goal 11: Sustainable cities and communities

In terms of developing sustainable cities in the UK, Sheffield holds the first place within the UK.



Figure 6: Sheffield city centre

Figure 7: Peace gardens and Town Hall in Sheffield

With the focus on the coastal cities, the first plastic-free town in the UK is Penzance. Going in the same direction, Cornwall also achieved this in 2018. Furthermore, the greatest challenge to sustainable cities is urbanization taking place at a rapid speed. DFID is the leading organization in addressing the urbanization agenda (GOV.UK, 2019). IN the year 2017 the government spending on s research, urban and rural development and planning, multisector aid and environment protection amounted to £1.2 Billion.



Figure 8: Penzance: Britain's First Plastic-free Town

Accordingly, the UK has strong motives to move towards sustainable practices and in some of the central greenhouse gas-emitting sources, these initiatives have been developed. However, few of the recent development in terms of sustainability angles consider the automotive industry, aerospace, and agriculture.

The UK Government has committed to paying nearly £500 million to deliver up to £1 billion for the development and mass-scale production of the electric vehicle industry (GOV.UK, 2021). In addition, in 2020, the Jet Zero Council partnership with the collaboration of the UK government launched a target of net-zero aviation by 2050. Earlier this year, the UK Government and industry announced an £84.6 million investment to develop zero emissions flights, using alternative energy sources of hydrogen or electricity, which can unlock nearly 5,000 jobs across the UK(GOV.UK, 2021). Furthermore, the Agricultural Transition Plan published illustrates the ambition of the UK for a renewed agricultural sector and other new schemes that will support increased agricultural sustainability and productivity(GOV.UK, 2021).

Oil and Gas - The UK Government will provide £27 million for the Aberdeen Energy Transition Zone, helping Northeast Scotland to play a leading role in meeting the UK's net-zero ambitions. A further £5 million for the Global Underwater Hub, on top of the £1.3 million committed last year, and up to £2 million to further develop industry proposals for the North Sea Transition Deal will support areas like Aberdeen transition to a low carbon future(GOV.UK, 2021). The progress of sustainable development goal no 11 in the context of UK is evaluated and presented under the leading indicators of the SGD 11. For example, concerning indicator 11.1, the Proportion of urban population living in slums, informal settlements or inadequate housing, the progress is shown as per the following chart. It clearly shows how people residing in informal and unsafe conditions have reduced over time.



Source: Ministry of Housing, Communities & Local Government

Figure 9: Percentage of dwellings or households failing the decent homes standard.

2.4 Concluding statement on the SDGs

As the focus of this research is on the coastal regions and their built environment, there was no evidence where current studies directly focus on the sustainability of coastal regions specifically. However, implementation of SDG s in practicality faces several challenges. One challenge is the mobilizing the right resources, for example, the financial resources, investments, and human capital in the right direction. The increased populations and modern urbanization put extra pressure on the urban infrastructure such as housing, transport, and waste disposal. Furthermore, the inequality increases the societal vulnerabilities and makes the sustainability targets challenging to achieve. When it comes to ground level sustainable implementation, governance becomes challenging. Overlapping jurisdictions lack of coordination and integration further impose restrictions on the sustainable plans.

3. Sendai Framework (2015-2030)

3.1 Country statement of commitment to the Sendai Framework

As the country statement of commitment on the Sendai Framework, the following quote is extracted from the UK Government Statement to UN Global Platform for Disaster Risk Reduction held in Cancun, Mexico, in May 2017.

"The UK has taken quite positively and responded to the efforts made by the UN, countries around the world and nongovernmental organizations in the execution of the Sendai Framework. The UK continues to develop its broad resilience architecture, both individually and when appropriate in partnership. We remain committed to sharing lessons learnt on our resilience journey with the international community".

In the context of the UK, the civil protection practice of Integrated Emergency Management (IEM) is the primary execution mode for the Sendai Framework. Furthermore, national disaster risk reduction strategies are executed through the Civil Contingencies Act (2004), where the appointed officials are responsible for carrying out risk assessments and post-disaster activities.

The SFDRR is a non-legal, non-binding document. At the same time, IEM is made up of statutory obligations and doctrine-based delivery and comparison of these two facilities to track the SFDRR progress at the national level in the UK. The comparison shows that most of the aspects at the UK national level are on track concerning the execution of SFDRR (Deeming, 2017).

3.2 A brief statement on the country's meeting of the framework's four priorities

The Natural Hazards Partnership (NHP) is a leading establishment about handling natural hazards in the UK(Hemingway & Gunawan, 2018). This was formulated in 20111 and it initially consisted of 13

public sector institutions. NHP is currently responsible for monitoring, forecasting, and issuing warning notices regarding natural hazards and associated disaster risk in the UK.



Figure 10: Natural Hazards Partnership (NHP) 'wheel' of organizations who are NHP partners

The engagement of multi-sectorial participants in the NHP has facilitated the simultaneous disaster risk reduction studies across several scientific disciplines, which has enhanced robustness through validation and review. Furthermore, as the NHP involves many institutions, a clear organizational structure is established to avoid confusion and improve clarity. The following figure presents the Organizational structure of the NHP with the roles of the related parties(Hemingway & Gunawan, 2018).



Figure 11: Natural Hazards Partnership organizational structure with brief role descriptions.

3.2.1 Priority 1: Understanding disaster risk

"Disaster risk management needs to be based on an understanding of disaster risk in all its dimensions of vulnerability, capacity, exposure of persons and assets, hazard characteristics and the environment."

In line with this priority, the Civil Contingencies Act (2004) has the primary responsibility of establishing and assessing the risk-bearing capacity of the UK in the face of emergencies. The act has established the uniformity and the formalities of carrying out the risk assessments in the process of IEM. The Local resilience forums do these risk assessments, and formalities are documented in the statutory publication named Emergency Preparedness. In this process, a community risk register will be developed, which will assist in a crisis regarding planning and resourcing priorities (Deeming, 2017).

3.2.2 Priority 2. Strengthening disaster risk governance to manage disaster risk

"Disaster risk governance at the national, regional, and global levels is vital to the management of disaster risk reduction in all sectors and ensuring the coherence of national and local frameworks of laws, regulations and public policies that, by defining roles and responsibilities, guide, encourage and incentivize the public and private sectors to take action and address disaster risk."

The UK inherits a progressive national policy and framework for managing risks supplemented by the National Risk Assessment that drives all government institutions attached to this risk management framework. As a part of this SFDRR priority 2, the Civil Contingencies Act and the civil protection sector facilitates a step-by-step methodical approach, as illustrated in figure 2. The main underlying principle

in the UK context is that in case of disaster handling, the decision needs to be taken at the lowest possible level with maximum coordination from the rest of the chain of authorities(Deeming, 2017).

Furthermore, National Resilience Planning Assumptions and National Capabilities Programme further develop practical risk reduction measures by detecting the expected consequences of potential hazards and executing the necessary plans to manage the risk levels. The strong UK Lead Government Department (LGD) model encourages all aspects of risk management to be addressed in partnership between government, industry, and regulators. However, in recent years, the UK civil protection arrangements have been further improved by introducing the Ministerial Recovery Group (MRG) concept.



Figure 12: Likely form of Central Government engagement based on impact and geographic spread of an emergency in England (GOV.UK, 2016).

Furthermore, although Sendai Framework for Disaster Risk Reduction was formally established in 2015, disaster resilience has been of concern in the UK before the SFDRR establishment. For example, in 2011, the Department for International Development (DFID) decided that disaster resilience should be a central objective of its development and humanitarian programming. As a result, between 2011 and 2015, it conducted a process of mainstreaming resilience objectives into all relevant programmes.

This meant ensuring that disaster risks informed investment decisions and that programmes were designed or adapted to be resilient to natural hazards (ICAI, 2018).



Figure 13: Timeline of disaster resilience in DFID programming

3.2.3 Priority 3: Investing in disaster risk reduction for resilience

"Public and private investment in disaster risk prevention and reduction through structural and nonstructural measures are essential to enhance the economic, social, health and cultural resilience of persons, communities, countries and their assets, as well as the environment. These can be drivers of innovation, growth, and job creation. Moreover, such measures are cost-effective and instrumental in saving lives, preventing and reducing losses, and ensuring effective recovery and rehabilitation."

In focus on the disaster resilience investments in the UK were the Political Champions Group in 2012 was initiated by the UK Government's and the United Nations Development Program (UNDP), acting as co-chairs, (PWC, 2013).

The UK (HM Government, 2011) also has a strategy to ensure new and existing infrastructure is preparing for a changing climate. Infrastructure resilience requires investment decisions to take account of how climate change results in changing patterns of consumer demand -to ensure that infrastructure assets partake greater suppleness for the anticipated future changes with a minimal

cost and supporting this through infrastructure organizations and professionals with the right skills and capacity to manage that adaptation.

3.2.4 Priority 4: Enhancing disaster preparedness for effective response and to "Build Back Better" in recovery, rehabilitation, and reconstruction

In terms of recovery, rehabilitation, and reconstruction the build back better principles have been witnessed in the UK in the most recent pandemic situations. The UK's current UK government recovery strategy first prioritizes health, safety and rebuilding of livelihoods second, and thirdly the effect of social distancing is considered. This national strategy focuses on the short-term. However, on the global response, the UK discusses building cleaner, healthier, more inclusive, and more resilient economies and societies(Bolton, 2020).

In face of the climate change associated future disaster risks, the UK Government has identified the need for better, greener, and faster infrastructure projects. Some of the infrastructure projects are listed the Oxford-Cambridge Arc, led by the Ministry of Housing, Communities & Local Government (MHCLG); the New Hospital Programme within the Health Infrastructure Plan, led by the Department of Health & Social Care (DHSC) ; the A66 Northern Trans-Pennine upgrade, led by the Department for Transport (DfT) and the Northumberland Line, led by Northumberland County Council in partnership with DfT

3.3 A brief statement on the country's meeting of the framework's seven targets

No data is available relevant to each of the targets precisely. However, there are many occasions where the UK national level involvement contributes to achieving the framework seven targets.

(More specific data will be collected during the primary interviews)

- Reduce disaster mortality
- Reduce the number of people affected
- Reduce direct economic loss concerning GDP
- Reduce disaster damage to critical infrastructure
- Increase national and local disaster risk reduction strategies
- Enhance international cooperation on risk reduction
- Increase availability and access to multi-hazard early warning systems
- Implications of implementing the Sendai Framework on risk reduction in coastal zones

3.4 Summary of opportunities and constraints

Information gaps

One of the challenges towards executing the SFDRR practically is the lack of available information and its inefficiency. Government plays a vital role in providing information on and projecting the future climate for the UK through processes such as Climate Change Risk Assessment in the UK. However, this information needs to be communicated and mainstreamed to the relevant public and private sector authorities to understand climate change and the associated disaster risk. Furthermore, the available information does not provide sufficient depth and breadth regarding their contextual differences. Therefore, it is hard for individual organizations to understand their risks and appropriate responses (GOV.UK, 2011). Therefore, addressing this, the new research in disaster risk reduction needs to be interdisciplinary, intersectoral, transboundary and transnational using a multi-hazard approach. Furthermore, these studies need to focus on understanding how to prevent disasters and how to respond to and recover from them(Abeling & Sustainability, 2015; Bosher et al., 2007; Hemingway & Gunawan, 2018; Hesselman, 2019; UNISDR, 2015).

In further explaining the information gaps in the UK climate change adaptation and disaster risk reduction, the absence of a systematic database for disaster losses and damages in the UK is also highlighted. Furthermore, there are deficiencies in the multi responders understanding the early warning messages. It is mainly accountable for its organizational settings' communication modes (UNISDR, 2015). However, there are also opportunities to develop suitable communication mechanisms accessible to all businesses or science communities. Further, another prominent problem climate scientists face is communicating their scientific findings to the non-scientific community, for example, the general public and policymakers (Dias, Amaratunga, & Haigh, 2018).

Challenges created by the institutional settings

In the context of the UK, its highlighted disaster response and recovery take more priority than disaster risk reduction. Furthermore, according to the institutional setting, disaster response and recovery, risk reduction, and climate change adaptation are separate institutions. Furthermore, in taking proactive disaster risk reduction measures, the lack of power at the local government level can also be seen. Due to budget and resource limitations, the local authorities are more focused on the immediate issues than proactive disaster resilience improvement measures. However, by creating the right incentives and setting the right priorities, there is a huge opportunity to increase disaster risk reduction measures at the ground level. (AlHinai, 2020; Dias et al., 2018; O'Brien, O'keefe, Rose, & Wisner, 2006).

Managing Uncertainties

Disaster risk management is an evolving area due to changing climate and disaster risk day by day. Therefore, the disaster risk reduction strategies need to be accountable for the current disaster risks and the future anticipated ones due to changes in climatic conditions. For example, with the continuous global warming sea level rising, the climate might change persistent. As a result, the adaptation of the local infrastructure is challenging. However, this also creates an opportunity for developing advanced techniques in projecting the potential impact on the infrastructure due to climate deviations and capacity building of the local infrastructure(Brown & Damery, 2002; GOV.UK, 2011; Kim, 2014; Prabhakar, Srinivasan, Shaw, & change, 2009).

Attracting resilience investments

The rising trend in the natural hazards and their consequences imposes the vital necessity of more and more investment in disaster resilience (ADB, 2013). In addition, climate change, hazard occurrence patterns and urbanization with informal human settlements have increased the exposure levels of communities. The increased pressure imposes the necessity of resilience levels which could be implemented through disaster preparedness plans and adopting build-back-better principles during the reconstruction phases. However, investing in resilience reaps its harvest mainly in the long run, which is discouraging for the communities to invest in disaster resilience which acts as a significant challenge towards practical implementation of disaster risk reduction (CISL, 2016). This is the case in the UK as well. Therefore, there is a critical need to capture the full range of benefits of the resilience investments covering all perspectives of economic, ecological and social 'resilience dividends' (Dias et al., 2018; Rozer, Surminski, Laurien, McQuistan, & Mechler, 2021). Accordingly, there are new opportunities to develop the policies like triple dividend of resilience and link them to the ground level strategies.

5. References

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