A Research study on the role of the built environment stakeholders in climate change adaptation

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1.1 Introduction

The Climate change adaptation in the UK is governed by the Climate change: second national adaptation programme (2018 to 2023) identified as NAP hereafter and the main thematic areas covered under the NAP is the natural environment, infrastructure, people and built environment, business and industry and local government sectors. Identifying the links to the built environment, the NAP has a separate section, namely people and built environment, and the other sections like businesses and industries are also indirectly linked to the functioning of the built environment(GOV.UK, 2022).

1.2 Built environment stakeholders linked to climate change adaptation.

The Stakeholders relating to the UK context have been identified under each of these topics and any other different stakeholder classifications identified have been listed in another section at the end of the topic.

1.2.1 Local and National Governments

The UK government is a pioneer in the global context to lead climate change adaptation and take the necessary steps pro-actively. 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.

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 4 sections, with recommendations for both Central Government and Local Authorities under each section:

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

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 government's current 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.

1.2.1.1   *Findings from the Primary Interviews*

- The key government agencies and their interviewees mentioned that the climate change adaptation is really important to them in a strategic manner. As an example, the National Highways England part of the Department for Transport the measures relating to the climate change scenarios are a part of the licencing procedures for these governmental organisations.
- So, they mentioned that the climate change adaptation is, something "**We've *articulated that in our standards as well".*** They further explained their role as in that as the key organisation responsible for the road network in the UK, they design, decide on the material specifications, conduct road commissioning, selection of suitable main contractors and sub-contractors, supply chain members so in all those areas they have the ability and have taken in the initiative to address the climate resilience perspectives.

- Also, in pitching the climate resilience perspectives into the organisation vision and mission of the governmental authorities they explained their proprieties as well. For example, for the transport authorities who is a major contributor to the greenhouse gas emissions, they inhouse first priority is the safety of the users. So, they also explained the importance of fitting the climate change adaptation into the organisational level vision for effective implementation.

- On the other hand, the climate change adaptation becomes key to the government organisations such as transport departments as the climate change related disaster risks become a threat to the delivery of their services. For an example the exerts form the National Highways England explained that "*strategic road network is, potentially vulnerable to a number of climate risks such as flooding, heat waves, etc. and we need to make sure that those users of our strategic road network and are able to carry on their journeys safely*".
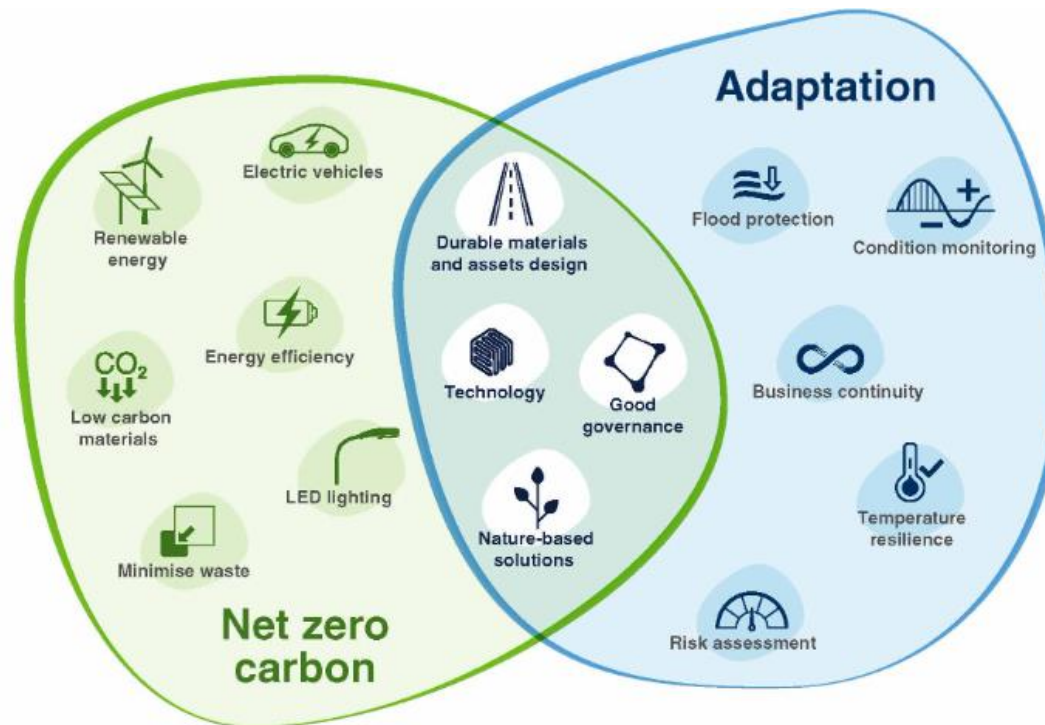

Figure 1: Net zero carbon and climate change strategy of National Highways England

- Also, another observation was that in most governmental departments and authority's climate change was a part of the environmental sustainability division. In the National Highways there is a central carbon team who is particularly engaged in planning for the climate related environmental goals. Also, in terms of environmental sustainability they cover areas like protecting biodiversity and air quality.

- From the perspective of the local governmental level there are several practices such as sustainability appraisals, strategic environmental assessments such as flood risk assessments.

- On the reporting perspectives the authorities revealed that in every five years they have a report to publish on the progress of climate change adaptation. Also, these reports for the relevant organisations aim mainly at the asset management in the relevant sectors. Also, the supply chains and the relevant stakeholders during this periodical evaluation.

- As in the stakeholders who are linked to the individual government authorities are the environmental agencies, funding agencies, general public, the supply chains, and other governmental and non-governmental organisations.

- During the data collection the role of the relevant authorities during the different life cycle stages of the built environment was also investigated. The authorities mainly replied linking to the critical infrastructure and highlighted the necessity of incorporating the climate change adaptation plans at the infrastructure planning stage at times.

- However, in terms of the challenges and shortcomings "***We've had the backing of legislation effectively to achieve because it's in the Climate Change Act, we've been able to do it because it's in our license, we've been able to do it. But as we go further through the journey about application, it becomes harder and harder because you get you, you come up against the cost of doing it essentially.***" One of the key challenges is that the co benefits of adaptation is not clearly visible in measurable terms which is challenging in fund allocation. So, proving the business case and achieving the cost-benefit ratio is imperative when it comes to actually implementing climate resilience at the ground level. The officers working the sustainability departments as well as the climate adaptation plans also find this journey up and down when it comes to the challenges linked to prioritizing the needs and deciding which functions inside the organisation needs to factor in climate resilience.

- On the whole aspect majority of respondents claimed that on the climate change adaptation perspective the institutions are less mature. "***We're not yet living and breathing carbon management.***"

- Also, few officers highlighted the need for preparing for the futuristic scenario. The tools thar are being currently used needs to be updated incorporating the future climate scenarios. Also refresher training programs were also proposed by the majority of the government officials. Currently in the infrastructure planning and delivering institutes mostly carbon management is promoted, and the time allocated for this needs to be linked with the holistic view of climate change adaptation as it involves many new areas. Also, key professionals such as climate scientist active involvement is not quite common in this subject area.

1.2.2   *Private Sector*

When discussing the private sector involvement of the Private sector in the climate adaptation process in the UK data was gathered both from secondary sources as well as primary sources. Following COP15, the UK pledged $2.4 billion in climate finance to be spent by the end of 2012, including a focus area that aims to 'create new partnerships with the private sector to demonstrate to major investors that climate friendly investments are financially viable' (DFID, DECC, DEFRA, 2011). With the Government providing the right frameworks and supporting policies, the private sector has an essential role to play in the Net Zero transition. In the UK, the recently-launched Streamlined Energy and Carbon Reporting (SECR) framework requires large private companies to report (as a minimum) on their UK energy use and associated GHG emissions (with at least one intensity metric). Beyond these, the UK is researching and piloting a series of innovative instruments and approaches to help private enterprises overcome the barriers to investment in low carbon projects in developing countries. These interventions are managed by a series of non-profit organisations and private public partnerships that run competitions and challenge funds, as well as trialling new instruments within the low carbon space.

The study being focused on the built environment perspective during the data collection the construction industry and how the private sector companies in the construction industry fit into the climate adaptation agenda was investigated. The private sector involvement in climate change adaptation targets in the UK vary through the different landscapes, industries and across contextual differences.

Several large construction companies in the UK have pledged to reach the net zero carbon emissions in align with the national climate change plans. For an example Morgan Sindall Group plc has announced their plans to achieve net zero carbon emissions in under a decade. Their plans include the following strategies. As a company Morgan Sindall Group plc has committed to : to protect and develop people, improve the environment, work with our supply chain and enhance communities("Improving the environment and quality of life.," 2023).

- Developed an in-house carbon calculator named CarboniCa tool will track and measure the carbon emissions of the projects on a whole life cycle

Figure 2: Five total commitments of Morgan Sindall Construction

basis as well as provide smart solutions on how to reduce the carbon emissions.
- Use of smart construction technologies such as off construction methods which offers shorter construction time scales and less pollution form transportation and local communities.

- Promotion of fossil-fuel free constructions. The example is the 11-storey fossil-fuel free office development in Salford. The building will run solely on 100% good-quality renewable electricity and will be net zero in operation, meeting the UK Green Building Council's 2035 – 2050 office energy performance targets. The structure will also be encased in a living façade, designed to remove air pollutants and deliver a net gain in biodiversity.

- Usage of alternative energy: Housing company Lovell is rolling out the use of HVO fuel to power generators on building sites. Compared to traditional diesel, HVO fuel – made largely of vegetable oil and waste animal fat - offers significant environmental advantages and achieves a CO_2 reduction of up to 90%.

The Kier Group Plc as a leading construction firm in the UK and their Sustainability framework is presented below. As a part of these strategic overview the company believes that a resilient environment, a resilient community (workforce, supplier & customer base) and a resilient balance sheet for the company.
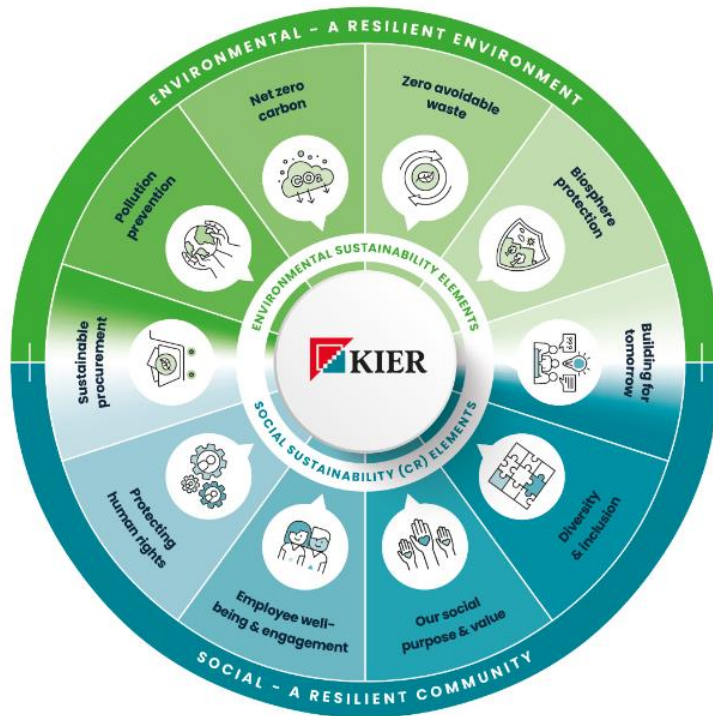

*Figure 3: Sustainability framework of The Kier Group Plc*

1.2.2.1 Findings from the Primary Interviews

The primary interviews were conducted with the private sector companies who are linked to climate change and built environment. The interview findings revealed the following.

- Sustainability was introduced to the private sector company agenda around 15 years ago and now it has been mostly embedded to the strategic goals of a company. This culture was introduced and widely popular in the late 20th century mid to late. However recently the strategic trend of the private companies has been shifted more towards digitalization.
- However, they mostly recognise climate change adaptation and sustainability as a more strategic duty rather than a practical day to day routine. Although sustainability was introduced to the corporate level strategic direction the day today roles of the built environment professionals and other stakeholders have not changed much.
- From the perspective of construction contractors, they mentioned that *"we build somebody else's design and of the client needs and apartment building we will build it".* So, they believe that climate change issues are very much related to the design rather than the construction process itself. This statement depicts the attitude and the existing knowledge at the ground level in terms of adapting the impacts of climate change. Also, the built environment professionals working for the contractors believe that the designs have been signed off and approved according to the required standards.
- Majority of the respondents claimed that they deal with sustainability and the environment on quite a low level. When it comes to the perspectives of climate change and adaptation to the future scenarios, they do not yet see the direct links to their role and the daily tasks. So, climate change adaptation is very much distant to them at the operational level. They mentioned that "*we don't really have an eye on climate change on the impacts on climate change".*
- The participants admitted that in terms of sustainability plans and climate adaptation practices they mostly conduct waste management practices.
- In most of the companies they have heard about the role of sustainability manager and most of the interviewees believed that climate change and sustainability are issues of the head office rather than the construction industry practitioners.
- When referring to the skill requirements in the climate change adaptation fields the professionals believe that there are many qualified freshmen in the job markets but their engagement in mainly with construction contractors are at a low level.
- When referring to the legal and regulatory backgrounds in the UK built environment professionals believe that the building codes are very stringent.
- In an overall perspective it was concluded that tendency towards climate change and sustainability angles have been pushed away a little bit in the new era with the whole digitalization and smart concepts. For an example the key organisations linked to built environment such as COIB, ICE and

RICS also are more towards these smart concepts recently. So, most of the participants commented that the real challenge would be to bring the climate change adaptation to the headlines and frontlines of the sectors.

1.2.3 Community

The approaches councils can take to engender local climate action
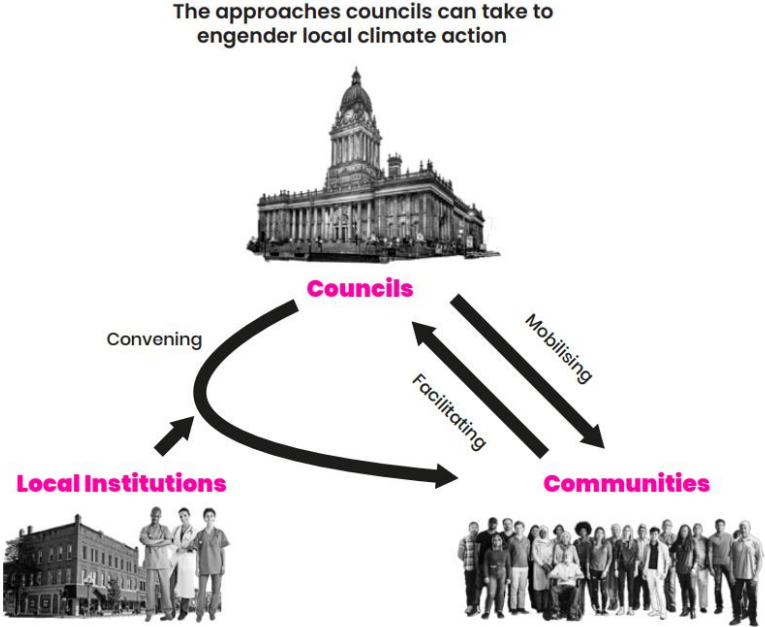
Community-led responses have the potential to contribute significantly to reducing CO2 emissions starting from the smallest rural community to the high-end urban centres. The potential for community led initiatives to create embedded behavioural change across several strands of sustainability (i.e., energy use in the home, transport, recycling, and food) is an important one. Whilst the Energy Saving Trust is primarily concerned with energy use in the home and transport, meeting the Climate Change Act's target to reduce emissions by 80% by 2050 will require a broader adoption of pro-environmental behaviours. The majority of environmental campaigns implemented by NGOs and the Government tend to focus on the simple steps we can take to live a greener lifestyle or targeted measures, such as loft or cavity wall insulation.

1.2.4   Civil Organisations and Professional Organisations

Many UK-based international civil society organisations (ICSOs) have started integrating climate change into their work. ICSOs have a key role to play in empowering local communities to better access resources on their own and improve the downward accountability of climate finance processes. As they begin to consider how to better engage with their southern counterparts on climate change, the most appropriate support and the most valued partnerships may come from approaches that build on southern NGOs' experience of disruption in the here and now. Linked effectively to ICSO work to integrate climate change into development, such experiences will provide the seedbeds for a next generation of collaboration that can help both ICSOs and southern NGOs 'get good at' climate disruption. Civil society organisations should also be at the forefront of ensuring that the changes are fair both in terms of who pays, where support from governments is focused and how the benefits can be shared. Linked to that, voluntary organisations can challenge vested interests whether within governments or from business who may try to slow progress or push costs onto those less able to protect themselves. On the other hand, the voice and agency of voluntary organisations should inform how policy and practice should be delivered.

Professionals from across sectors are inextricably involved with climate action and look to professional bodies for strong leadership and technical and ethical guidance. To date there has been a lack of recognition, resource, and adequate venues to push forward the development of net zero professional networks. The Professionals Bodies Charter is the solution to this and provides an effective platform where multi-sectoral professionals can work together on climate change. A working group of eight professional institutions have developed the Charter after meeting with over 45 professional bodies at London Climate Action Week last year. The ambition is for the majority of the UK's learned societies and professional organisations to commit to the Charter ahead of COP26 to bring wide-ranging expertise to focus on the climate crisis. With over 13 million professionals belonging to a UK membership association, the Charter has a potential to impact nearly half of the UK's working population and reaches across every part of the economy. Early signatories include the Energy Institute, the Institute of Chartered Accountants in England, and Wales (ICAEW), the Institute of Materials, Minerals and Mining, the Chartered Institute of Ecology and Environmental Management (CIEEM) and the Royal Pharmaceutical Society.

1.2.4.1   Findings from the Primary Interviews

The primary interviews were conducted with the members of the professional bodies in the built environment who are linked to climate change and built environment. The interview findings revealed the following.

- The majority of the professionals like planners, engineers believed that the climate adaptation is a part of the planning and design stage rather than the construction or occupancy stages. The findings revealed the lack of knowledge and understanding on the role of the built environment professionals in terms of climate change adaptation specially in the construction, use/occupancy and retrofitting stages.

- The professional members mostly agreed that climate change adaptation needs to be a part of every professional's agenda. "*We cannot limit it into one profession or few professions because I think I see this climate change adaptation and disaster is reduction like it is like everybody should play a small part on it basically*".
- Also, another major reveal was that no matter which profession depending on the employer they are working for their climate change approaches differ. As an example the planners and designers working for contracting organisation believed that climate change adaptation is not a responsibility of them but a role of the designers in the consultant team. As a contractor they believed that they are inly there to execute the consultants designs and plan.

1.2.5 Academia and research organisations

Focusing on the important role and positive impact education and training plays in meeting the Paris Agreement's targets, addressing current and future climate impacts, and moving beyond zero-carbon to create Carbon Positive and socially just built environments will instil a sense of purpose and excitement in meeting the challenges of our time.

UK Higher Education Institutions (HEIs) have an essential role to play in fostering such preparation, by engaging staff and students with the climate crisis, the development of and implementation of solutions to address it, and the ability to share that information with others(COP26, 2021). While many UK Universities are already taking positive steps to embed climate change education in their curricula (some of which we highlight in this set of case studies), this working paper takes as its starting point the need to holistically mainstream Climate Change Education (CCE).

On the other hand, the research institutions ALSI has a wide role to play in uplifting the climate resilience across landscape. The Economic and Social Research Council (ESRC) and UK Research and Innovation (UKRI) have a long history of supporting social science research on climate change. Between 2008 and spring 2019, UK research councils have awarded grants to 481 climate change projects with strong social science components worth £438 million overall (including non-social science components). Although the social sciences are the purview of ESRC, social science research on climate change is supported by all research councils – typically in a multi-disciplinary setting. ESRC has supported 70 per cent of the projects and is the lead council in 20 per cent of them. The Natural Environment Research Council (NERC) leads on 55 per cent of the projects, while the Engineering and Physical Sciences Research Council (EPSRC) is the leading funder of energy research. Funding has been allocated to universities across the UK, but with a noticeable concentration in London and the Southeast. Northern Ireland, Scotland and the Northeast have received the lowest amount of direct funding. The supported research covers a remarkable diversity of topics, methods, and geographies.

1.2.5.1 Findings from the Primary Interviews

- The findings from the academia and the research organisations revealed that there is current work related to climate change adaptation especially integrating with disaster risk reduction and sustainable development. The research teams have initiated on the integration of the global framework The Paris Agreement, SENDAI framework for Disaster Risk Reduction and Sustainable Development Goals. Also, as a part of their current projects they tried to see how they could integrate climate change adaptation into Disaster Risk Reduction in relation to the built environment.
- In terms of the academics who are in charge of the higher education and mentoring the future built environment professionals "*I think all the lecturers coming from multidisciplinary departments, they all have they all are stakeholders in climate change adaptation because the impact of climate change, it's fall like basically if it is even business management when they teach business management how businesses are affected from climate change and disaster*".
- Also, in terms of the challenges that academics and researchers face one main disadvantage was the barrier between the industry and the academia. "*So, industry is one of the stakeholders and if I link it with the roles and responsibilities, one of the key challenges and the problem is academic research is not transferred into the industry in relation to the climate change adaptation because most of the time.*"
- Majority of the respondents highlighted that there is a gap between transferring research knowledge into the industry and on the other hand as well. The industry knowledge is not transferred into the academic as well.
- Also as a another barrier the challenging funding landscapes were highlighted. It was difficult to obtain funding in a very competitive economic situation to do more and more research in climate change adaptation.

1.2.6 Other stakeholder categories found in the UK context.

In addition to the main stakeholder categories identified by the project report template there are different other classifications found in the UK context. The following section presents a brief summary on the categorisation and the roles and responsibilities of each category in climate change adaptation in the UK.

1.2.6.1 Stakeholder categorisation by the Green Building Council UK

The Green Building Council in the UK identifies key stakeholder groups linked to the climate change adaptation ion the UK and identify their role and responsibilities of the parties as follows(UKGBC, 2019).

- **Clients:** Demand buildings which are fit for the coming century. Ask your consultants and contractors what they are doing to ensure the building you are getting will continue to perform as intended throughout its life. Design for an agreed emissions scenario – we recommend a 2°C global temperature rise as a minimum with an understanding of the implications of a 4°C rise.
- **Consultants:** Think about the climate in 20-30 years. Will your design still perform as intended and how will your clients feel when they do not? Talk to them about the risks and encourage them to embed climate change adaptation in their brief.
- **Institutions:** Support consultants with research, design guidance and CPD. Without this, it simply cannot be embedded into the design process, and resilience will remain a niche service. Commission further academic research to fill in the blanks and extend beyond just physical risks to allow consideration of other less tangible impacts.
- **Policy makers:** Embed climate change adaptation into the upcoming revision of the Building Regulations, for example by mandating the use of future weather data and consideration of adaptation strategies. All buildings should have some degree of resilience, which must be driven by policy.

1.2.6.2 Stakeholder categorisation by the RESIN project

The European project RESIN – Climate Resilient Cities and Infrastructures project conducted a research study on "Climate Change Adaptation and Resilience Stakeholders - a Baseline Assessment for Greater Manchester" and the broad stakeholder map for climate adaptation and resilience is as follows.
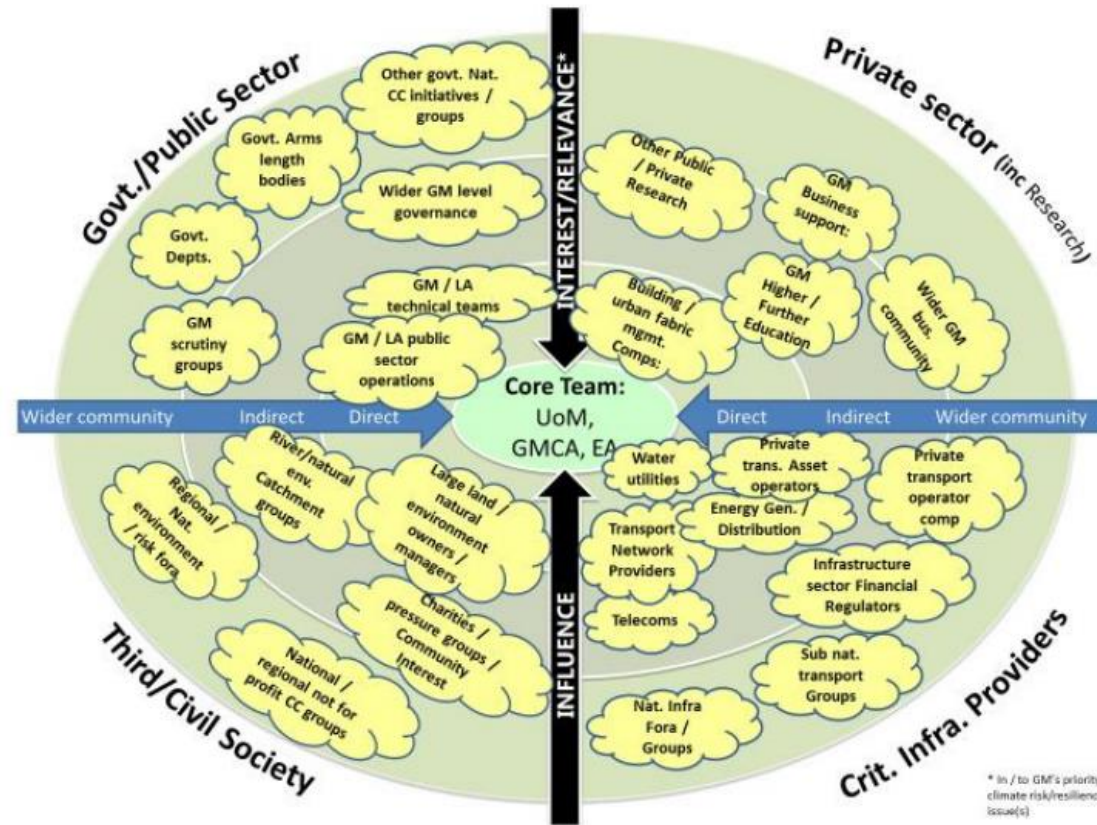
Figure 4:GM Climate Adaptation and resilience stakeholder map

1.3 Role and Responsibilities of the built environment stakeholders in climate change adaptation

You may add lines under different stakeholder categories under each category according to the context in the respective country.

No	Stakeholder Description	Key role in climate change	Responsibilities related to climate change adaptation	Current status and any remarks
1	Local and National Governments	The government is in charge of the intersection of Policy and Private Sector Action. The role of policy is to provide the requisite conditions to enable the private sector action needed to deliver a Net Zero carbon economy (Wills, 2020).	• Providing long-term visibility and certainty: The more certainty 'UK plc' has on future policy and the context in which it will operate in years to come, the more it can plan strategically for the future. This supports it to enable the transition more efficiently and effectively by helping the country to move in the same direction and avoids working to cross-purposes. • Breaking down market barriers as they evolve: Targeting and addressing specific market barriers can be instrumental in unlocking the innovation and investment needed for the transition. Adjusting policy as some market barriers are unlocked and new ones emerge is also essential to keep pace with the market. • Creating a level playing field within the UK and outside: The government has an essential role to set frameworks which can enable equitable treatment within and between sectors, supporting successful competition while maintaining fairness as well as ensuring that sectors negatively impacted by the shift to Net Zero are supported with a just transition. A level playing field is needed as much as possible within the UK, but also with competition outside of the UK supported by measures to prevent carbon leakage and maintain competitiveness.	

			• Encouraging investment in low-carbon options: Ensuring that low-carbon options are investable through frameworks and incentives, such as regulation, the tax and subsidy system or through market design, while also recognising when private investment is not yet viable and stepping in to provide more direct support or investment. • Supporting fairness and spreading the costs and impact of the transition: In some cases, additional costs may be incurred by the private sector and consumers in the transition to Net Zero. The Government has a key role to play in ensuring that these costs are appropriately spread to avoid unfairly falling onto one particular group.	
2	Private Sector		• Decarbonising operations: Looking across their operations, businesses can reduce their own direct emissions and indirect emissions by switching to low-or zero-carbon alternatives, such as converting fleet vehicles to electric, electrifying and making buildings more energy efficient, and changing electricity supply to renewables. Through its practices and investments, the private sector plays an essential role in supporting the Net Zero transition. Government should provide a stable and fair framework for businesses to deliver a Net Zero economy. The role of business in delivering the UK's Net Zero ambition 8 • Fostering innovation: The UK private sector has the ability to develop and deliver innovative technological	

			and business models, including transforming wider supply chains and in some cases completely overhauling traditional and established business practices to enable the needed transition to Net Zero. This includes for example circular economy principles which reduce overall consumption through reuse. • Leveraging procurement: Companies can leverage individual and collective buying power to create the demand for low-carbon products and processes. • Manufacturing and production: the UK will be responsible for shifting manufacturing and production technologies and practices to create the goods and processes needed to reach Net Zero. • Nudging employees and customers to make Net Zero decisions: Companies can empower these groups with information, alternatives, and the support to guide lifestyle choices towards Net Zero. • Building support for bold policy: The private sector can demonstrate that ambitious policy is possible and desirable by proving the business case, technological possibilities, and willingness to embrace change. • Setting international leadership: UK companies and global companies operating within the UK can support raised ambitions around the globe by setting ambitious strategies and targets, decarbonising international operations and supply chains, and contributing to wider systemic change around the world.	
3	Community	Community-led action is a powerful force for change,	• Ensure the wider community is both represented and heard.	

| | | which this can in practice reach its full potential for those involved in community groups. | • Start with what matters to your community most and see where it leads.
• Proactively build local networks to grow and sustain community-led action on climate change.
• Reducing food, clothing and furniture waste is a major contributor to greenhouse gases. It takes land, water, and labour to produce the goods and food that go to landfill – where they produce more emissions as they break down.
• Nurturing knowledge and skills. Knowing which environmental actions will be most effective in your area can be a challenge, but many grant holders have found new ways to get practical recommendations and advice. Some focus on learning what does and doesn't work as they go, while others have focused on ==increasing access to formal training in conservation and environmental skills that can be an important way of helping people into work.==
• A sense of connection: building belonging and community pride Local, visible transformation can change how people see their own communities, and how they feel about where they live.
• Supporting individual and community wellbeing. There's a wealth of evidence to show that nature is good for us. And a World Health Organization review found that ==increasing and improving urban green space can deliver health, social and environmental benefits, particularly among groups with lower socioeconomic status.== The most effective projects combine improving space with | |

			social engagement – and this is central to our approach to funding.	
4	Civil Organisations and Professional Bodies		• Improving the population's access to climate information. CSOs might act as bridge between research institutions and the population, leading to a more direct dialogue. • <mark>Giving voice to the most vulnerable groups. CSOs must ensure acknowledgment of the high vulnerability of these groups in public policy, through advocacy processes.</mark> • Promoting accountability through example, as a strategy to ensure quality and transparency for diverse actors' participation. • Promoting a participatory and inclusive disaster risk reduction approach. • Actively participating in inter-institutional coordination at local and national levels. • Helping people to save money and lower their carbon emissions. Engaging people in activities to reduce their carbon footprint can be a tough ask. It can feel at once abstract, and significantly bigger than anything they can affect through their own behaviour or choices. By focusing on more immediate and tangible consequences of reducing carbon emissions, grant holders have been able to make the issue feel relevant and personal. Using less energy saves money, can reduce fuel poverty and create warmer, , more comfortable homes.	

| | | The Committee on Climate Change (CCC) has had a strong influence on UK climate policy. | The roles and responsibilities of the CCC are set out in the Climate Change Act and include statutory duties to:
• Recommend to Parliament appropriate emissions reduction targets. The Climate Change Act stipulates a statutory long-term target for 2050 and a series of five-year carbon budgets, which define the path to 2050. Both sets of targets are recommended by the CCC and set by Parliament.
• Advise the Government on the risks and opportunities from climate change and evaluate its National Adaptation Programme. This duty is carried out through the Adaptation Sub-Committee (ASC).
• Monitor and assess progress on reducing emissions and on climate resilience. The CCC produces an annual progress report to Parliament, to which the Government has a statutory obligation to respond.
• Provide on-demand advice to the UK Government and the devolved administrations of Northern Ireland, Scotland and Wales on specific questions of climate policy. The CCC has advised, for example, on aviation emissions, renewable energy, the climate impact of shale gas extraction and devolved climate policy. | |
| 5 | Academia and research organisations | Focusing on the important role and positive impact education and training plays in meeting the Paris Agreement's targets, addressing current and future climate impacts, and | • Building internal capacity: All HEIs provide CPD on climate change, and paid training time, to their staff.
• Ensuring alignment and leadership: All HEIs produce an institutional strategy for their climate change education provision, to include its alignment with national and global climate targets and action, and its links to the | |

| | | moving beyond zero-carbon to create Carbon Positive and socially just built environments will instil a sense of purpose and excitement in meeting the challenges of our time. | 'invisible curriculum' of the institutions' non-teaching operations.
• Partnerships for curriculum development: HEIs to partner with industry, central government, local government and third sector organisations to enable provision of CCE that takes full account of spatial and temporal demands and opportunities in the UK's net-zero transition.
• Aligning assessment and outcomes: HEIs to work with funding and regulatory bodies, unions, professional and awards agencies to ensure staff capacity and graduate attributes fully align with the demands of addressing climate change.
• Promote a deep understanding of the relationship between built and natural environments.
• Reach across disciplines to cultivate a broader understanding of design and planning issues and solutions.
• Engage social and environmental equity issues that recognize the consequences of design decisions
• Connect students with the profession by bringing in working professionals actively designing zero carbon buildings
• Incorporate zero carbon baseline requirements for all studio design projects. | |

1.4   Challenges faced by built environment stakeholders in implementing climate change adaptation

You may add lines under different stakeholder categories under each category according to the context in the respective country.

No	Stakeholder Description	Challenges	Reasons for the challenges	Possible solutions
1	Local and National Governments	- Information gaps - The lack of integration and collaboration at the institutional level. - Lack of power at the local government level - Lack of investment in disaster resilience. - Increase and focus international research efforts on the private	- Lack of available information and its inefficiency - The absence of a systematic database for disaster losses and damages in the UK is also highlighted. - 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). - In taking proactive disaster risk reduction measures, the lack of	According to the institutional setting, disaster response and recovery, risk reduction, and climate change adaptation are separate institutions. New research in disaster risk reduction needs to be interdisciplinary, intersectoral, transboundary and transnational using a multi-hazard approach.

		sector and adaptation.	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.	
2	Private Sector	• Lack of involvement of the private sector.	• 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).	• 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, Amaratunga, & Haigh, 2018; O'Brien, O'keefe, Rose, & Wisner, 2006). • 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. • Fund research using a bottom-up approach. Current research relies to a great extent on existing tools and

				examples. Given the problems of existing tools when reaching poor and vulnerable communities and SMEs, it is important to explore the interface between vulnerable communities and the private sector on the ground in order to develop new approaches. • Examine how the private sector can take on projects for the public good (usually non-bankable), including through PPP, other risk-sharing facilities or by creating new classes of assets that can be monetised and help make public-good projects bankable.
3	Community	• Lack of knowledge on resilience mechanisms. • Lack of capacity to act within the community. • Complexity of acting on climate change. • Lack of acknowledgement and recognition of community	• Not enough people with the desire to get involved and the skills needed to, for example, develop the organisation, act as volunteers on its behalf or later manage volunteers and staff. • Lack of revenue funding to support community activities and fund the core organisation. • Lack of specialist knowledge around technical potential of ideas for reducing CO2 emissions.	• Need for support on organisational issues e.g., setting up an organisation, business planning, employing staff etc. • Need for increased connectedness and influence with other community organisations, into the council and with important local and wider stakeholders. • Increase of trust from key stakeholders in communities' ability to deliver. • Improve knowledge and understanding of how community activities impact on CO2 emissions.

		contribution including:	• Confusing range of sources of information and guidance on energy efficiency and renewable energy. • Lack of understanding of planning and regulatory system as it relates to renewable energy. • Need for 'at risk' work to develop renewable energy projects with no certainty of outcome. • Unfamiliarity with the commercial approach to seeking investment capital increasingly needed as grants for renewable energy technologies reduce. • Cultural mismatch between communities and businesses involved in energy efficiency programme delivery.	• Need for short-term impact to build confidence and maintain motivation. • Need for positive feedback and local profile for community success in order to feel good about involvement. • Key factors for engaging communities and sustaining involvement. • Succession: community-led initiatives are heavily reliant on volunteer time, and this can be very intensive, particularly when volunteers also have full time jobs (which many do). Furthermore, the successes of community initiatives are often the result of high levels of enthusiasm and energy amongst volunteers. There is a risk that over time this will diminish. To ensure the long-term sustainability of the community group, it is therefore important to ensure that additional volunteers are recruited along the way and there is someone to 'handover the reigns' to, particularly for leadership roles (e.g. the Chair). This also brings the added benefit of new ideas that may arise with 'new blood'. • Build on people's strengths: identifying the different skills and interests of community group members and building on these, enabling them to do what they

| | | | | are good at and enjoy can also help to maintain interest, motivation and passion for the cause, whilst at the same time maximising resources of the group. |
| | | | | • Build on and publicise successes: establishing a community group to pursue action on climate is a slow and long term process. Therefore it is important to build on any successes and milestones achieved, no matter how small, to demonstrate to volunteers and the wider public the impact of the group's efforts, helping to maintain and enhance motivation and interest. • Trust: a key benefit of community groups acting at a local level and led by local residents, is the implicit level of trust that the group can entail. People are more likely to trust and listen to their neighbour than instruction from a higher level. • Sensitivity to individual needs: As with any initiative that requires households to change behaviour or install measures, it is important to be sensitive to the different attitudes, motivations, understanding, tolerances and capacities of individuals in the community. |

4	Civil Organisations	• Disaster response and recovery take more priority than disaster risk reduction.		• Improving the population's access to climate information. CSOs might act as bridge between research institutions and the population, leading to a more direct dialogue between both parties. • Giving voice to the most vulnerable groups. CSOs must ensure acknowledgment of the high vulnerability of these groups in public policy, through advocacy processes. • Promoting accountability through example: as a strategy to ensure quality and transparency for diverse actors' participation. • Promoting a participatory and inclusive disaster risk reduction approach. • Actively participating in inter-institutional coordination spaces at local and national levels.
5	Academia and research organisations	• Communication gaps.	• Communicating their scientific findings to the non-scientific community, for example, the general public and policymakers • 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	• Develop suitable communication mechanisms accessible to all businesses or science communities. • 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;

				accountable for the current disaster risks and the future anticipated ones due to changes in climatic conditions.	GOV.UK, 2011; Kim, 2014; Prabhakar, Srinivasan, Shaw, & change, 2009)
6	Professional bodies	• Lack of training and development	• Limited training on climate change, to tackle the climate change implications of decisions which are likely to impact adaptation and mitigation efforts.	• Professional associations would need to accompany the requirement to give climate-related advice with requirements to obtain additional training and professional development, and their members would probably incur costs in doing so.
				• Chart the path to sustainability for our members, by developing, reporting on, and sharing resources to create Climate Action Plans to reduce our emissions in line with 1.5 °C of warming. • Speak with a unified voice to and with professional bodies, government, and the public by creating an interdisciplinary professional bodies forum. • Empower and inspire our members to drive sustainable growth, by providing continuous professional development tools, principles, and resources.
		• Insurance issues arising from the new requirements.	• Since many professionals are already providing advice on projects that emit greenhouse gases and/or are impacted by rising global temperatures,	• That being said, sooner or later insurance companies will begin adjusting their policies to address climate risks, whether or not the professional associations have shown

		professionals are already potentially liable for failing to address these impacts, or for addressing them incompetently. But the insurance companies covering these professionals do not appear, for the most part, to have re-evaluated their policies in light of the risks of climate-related liability.	leadership. And when that occurs, professional associations that have provided guidance and required that their members attain a minimum level of training on related issues should benefit.

1.5   Educational Training Framework

1.5.1   Training required to become a professional

An overview of existing educational training opportunities in the country and specifying at which level. (EQF or equivalent) Provide a brief description and where relevant provide links to institutions and courses. In the description include the following: level, content (part of or entire course), duration. Are the educational courses provided optional or compulsory? Other professionals should be added for the respective country as required.

No	Professionals (Provide where applicable and additional)	Formal Education in Climate Change Adaptation	Educational Institute / Provider	Link	Additional remarks
1	Architect				
2	Engineer				

No				
3	Town Planner			
4	Surveyor			
5	Anthropologist			
6	Economist			
7	Sociologist			
8	Other			

1.5.2 Continuing Professional Development Opportunities

An overview of existing educational training opportunities in the country and specifying at which level. (EQF or equivalent) Provide a brief description and where relevant provide links to institutions and courses. In the description include the following: level, content (part of or entire course), duration. Are the educational courses provided optional or compulsory?

No	Professionals (Provide where applicable and additional)	CPD in Climate Change Adaptation	Educational Institute / Provider	Link	Additional remarks
1	This course is for secondary subject leaders,	**Integrating climate change into the secondary curriculum**	National STEM Learning	https://www.stem.org.uk/cpd/ondemand/501481/integrating-climate-change-secondary-curriculum	• Evidence for human-caused climate change • Impacts of climate change • How can individuals help tackle climate change?

	teachers and trainee teachers.		Centre in York.		• How is business and technology helping to tackle climate change

2		An outline of the main vulnerabilities, risks and likely impacts of climate change, and a detailed description of the assessment of impacts and engineering strategies for adaptation in a number of key areas.	**Newcastle University**	https://www.ncl.ac.uk/sage.cpd/cpd/ccvuln.php#aboutthecourse	• **Key Vulnerabilities and Risk** and frameworks for assessment
					• **Impacts and Adaptation**:
					   o water resources
					   o flooding - fluvial and pluvial, sea level rise and coastal
					   o critical infrastructure
					   o food and agriculture, water-energy nexus
					   o heat, people and buildings
					• Consolidation: **Sustainable Cities** - strategy, design and implementation.

3		**Climate Change Essentials**	The University of Hull	https://www.hull.ac.uk/study/cpd/courses/climate-change-essentials	Drawing on real world examples and taught by experts in climate change from the University's world-renowned Energy and Environment Institute (EEI), the course provides learners with the insight they need to understand the key concepts around climate change and net zero, enabling them to plan and adapt to the challenges of a changing climate.
4	Secondary subject leaders, teachers and trainee teachers	**Integrating climate change into the secondary curriculum**	National STEM Learning Centre in York.	https://www.stem.org.uk/cpd/ondemand/501481/integrating-climate-change-secondary-curriculum	• Evidence for human-caused climate change • Impacts of climate change • How can individuals help tackle climate change? • How is business and technology helping to tackle climate change

5	This course is for teachers of secondary school students aged 11-14 years old, including Key Stage 3, S1-S3 and Junior Cycle (Ireland).	**Teaching climate change**	National STEM Learning Centre in York.	https://www.stem.org.uk/cpd/ondemand/489691/teaching-climate-change	This course covers: • what is climate change? • climate change in the taught curriculum • climate science projects for students, such as ESA Climate Detectives • how climate change is measured using satellite data • mitigating climate change
6		Climate Change: Vulnerability, Impacts and Adaptation	Newcastle University	https://www.findcpd.com/search/Programme-Details.aspx?EID=109905	The course outlines the main vulnerabilities, risks and likely impacts of climate change in a range of areas of the human, built, and natural environments, and describes in detail, for a number of key areas, the assessment of impacts and engineering strategies for adaptation. The course can be tailored to specific sectors, and you may choose to specialise and attend: • Days 1-3 **Impacts and vulnerability** - methodology, application of climate scenarios, natural environment, water resources, sea level rise • Days 3-5 **Adaptation** - infrastructure, heat waves, urban drainage, sustainable cities
7	Professionals working in climate change adaptation either in local authorities, consultancies or	Professional Certificate In Strategic Climate Change Adaptation	The Institute of Management and Leadership (ILM) has approved	https://www.cisl.cam.ac.uk/education/learn-online/business-and-climate-change-towards-net-zero-emissions-online-short-course	A comprehensive analysis of the mechanisms behind strategic climate change adaptation will be provided, with subjects to be discussed including: • Paris 2015: The outcomes and the consequences • Implementing climate change adaptation • Legislation effects of climate change on human systems

	risk management. The course covers science and theory through to practical implementation so would suit policy makers as well as practitioners.		this training course		• Disaster risk reduction • Green growth and eco-cities • Government oversight, adaptation and transparency • Mobilisation for climate change adaptation • Learning Outcomes By the end of the course the delegates will be able to: • Develop, construct and implement strategic climate change adaptation plans • Lead effective organisational change • Apply the key principles of adaptation to their organisation • Improve legislation and transparency whilst reducing disaster risk • Analyse, enhance and evaluate performance • Engage stakeholders and mobilise support to pass effective and enforceable legislation
8	This course will benefit professionals seeking to upskill themselves in climate change risk, adaptation measures, and low carbon innovation.	Business and Climate Change: Towards Net Zero Emissions online short course	University of Cambridge	https://www.cisl.cam.ac.uk /education/learn-online/business-and-climate-change-towards-net-zero-emissions-online-short-course	▪ A meaningful understanding of the organisational risks and strategic opportunities presented by climate change ▪ Practical insights and knowledge from real-world examples of successful low carbon initiatives ▪ Strategies for leading collaborative efforts and advancing people, profit, and the planet ▪ Insights needed to rewire your business model for resilience and profitability over the long term ▪ A low carbon transition action plan to start leading change and meeting your personal and organizational sustainability goals

All courses available for international students	Climate Change Diploma Course	Centre of Excellence Platform	https://www.prospects.ac.uk/universities/centre-of-excellence-29771/centre-of-excellence-29771/courses/climate-change-diploma-course-140526#section-course-content	By studying this course, you will: • Understand the development of Earth's structures, its biomes, climate regulation, and oceans • Become familiar with the anthropogenic influences of agriculture and industrialisation on climate change • Learn about the effects of climate change on the planet and humanity • Explore climate response strategies and the possible future of climate change	

1.6 Assessment of the regulatory framework for built environment professionals.

Refer to the same list of professionals as above.

No	Professionals (Provide where applicable and additional)	Is there a regulatory framework for the professionals?	Licensing Requirements	Mutual Recognition Framework	Number of Registered Professionals	Employment Statistics
1	Architect	RIBA Regulation of Architects	There are several licencing categories offered by the RIBA, UK	For UK architects wishing to work in the EU, arrangements	There were 42,547 architects on the Architects Register at the end of 2019.	• Estimated staff employed in UK architectural practices: 44,000 • Total revenues: ¬£3.6bn

				have been put in place with the Republic of Ireland following an agreement between the ARB and the Royal Institute of Architects of Ireland to continue to recognise each other's qualifications. However outside of this, there is no mutual recognition for UK architects seeking recognition to offer services in EU.	Currently according to the RIBA website 28,000 current RIBA Chartered Members have given their consent to appear in the RIBA online directory.	• A third of revenues in these practices comes from housing, with UK architects working across a range of project types, including the health, education, and commercial sectors. • Projects worked on in the last 12 months: 173,000. • Revenue from outside the UK: ¬£625m(CIC, 2020)
			• RIBA Chartered Membership • RIBA Chartered Practice • RIBA Student Membership • Retired Chartered Membership • RIBA Associate Membership • RIBA Affiliate Membership(RIBA, 2022)			
2	Engineer	The Engineering Council is the UK regulatory body for the engineering profession	There are several licencing categories offered by the Engineers Council UK.	To ensure that professionally registered engineers' skills are recognised internationally, the Engineering	• Over 229,000 Engineering Technicians (EngTech), Incorporated Engineers (IEng),	• The UK's engineering workforce is over 5.5 million people

				Council is active within a number of multilateral mutual recognition agreements with other national engineering bodies. These agreements establish internationally benchmarked standards which allow signatory bodies to recognise each other's academic and professional qualifications, aiding mobility. In particular, the Engineering Council was a founder member of the Washington Accord and has subsequently	Chartered Engineers (CEng) and Information and Communications Technology Technicians (ICTTech).	

				worked with international partners to develop further agreements. The governance of these sits within the International Engineering Alliance (IEA). The Engineering Council is a member of:		
				• The Agreement for International Engineering Technicians (AIET) • The Dublin Accord (DA) • The International nal		

			Engineering Technologists Agreement (IETA) • The International Professional Engineers Agreement (IPEA) • The Sydney Accord (SA) • The Washington Accord (WA)		
3	Town Planner	**The Royal Town Planning Institute (RTPI)** is the professional body representing planners in the	There are currently eight membership classes: • **Student** For full or part-time students on courses related	The RTPI International Strategy promotes them as an avenue to not only attract new members, but to	The members of RTIP are as follows. • England-19610 • Wales-1162 • Scotland-2089	Around 22,000 planners currently working in the UK, about three-quarters of whom are RTPI members. This makes the profession smaller than other built environment professions.

| | | United Kingdom, and Ireland. | to planning or the built environment.
• **Licentiate** Licentiate membership is the main pathway to qualify as a Chartered Town Planner.
• **Member** Chartered membership signifies that its holder has knowledge, skills and competence in spatial planning in appropriate depth and detail. Members may use the post-nominals MRTPI.
• **Fellow** Fellowship is the organisations most prestigious accolade and recognises those who have made a major | support and retain existing ones. It also aims at enhancing planning knowledge through mutual learning and to make better planning available where it is most needed by supporting members in being heard and in sharing their expertise with others through equal partnerships. | • Nothern Ireland-735
• Ireland- 349 | |

			contribution to the profession. Fellows may use the post-nominals FRTPI. • **Legal Associate** For qualified legal practitioners who specialise and have experience in planning law. • **Affiliate** For people who have an interest in planning or are working in planning but are not yet qualified for other membership classes. • **Retired** For those no longer practicing or earning an income from planning.			
4	Surveyor	The Royal Institution of Chartered				

		Surveyors (RICS) is a global profession al body for surveyor s, founded in London in 1868				

1.7   Existing Chamber / Institutions / Associations representing built environment professionals.

1.7.1   What frameworks are currently existent in the local context?

1.7.2   Details of Existent National Associations

1.7.3   Membership Numbers

1.8   Identification of skill gaps

1.8.1   Anticipation of skills

The reference forms the secondary studies and the primary interviews collected summarizes the key knowledge and skill gaps in relation to climate change adaptation in the UK. One of the key knowledge facts that needs to be incorporated is the concept of living with climate change. Climate change adaptation is not a division of sustainability or any other part of work but it needs to be embedded into all work plans and visions from top to bottom.

Also, the clear ground level plans on climate change adaptation is not available in all disciplines and pathways. Hence the stakeholders' employees and all connected parties need to be communicated of the working skills they need to acquire in handling climate change adaptation. All the disciplines of work need to identify their links to the changing climatic conditions and how it will impact their roles and responsibilities. However according to the stakeholder interviews conducted majority of the built environment stakeholder lack an idea of how their professional roles are affected by the climate change scenarios. Often, they perceived climate change as another are linked to the sustainability division in their company.

1.8.2   Actions to avoid labor shortages.

In terms of the skills on climate change there needs to be more competency in applying the climate change scenarios to the built environment during planning, design, construction and retrofitting. However currently the according g to the respondents of the interviews they do not identify a clear skill shortage I the climate change adaptation field. There are a lot of fresh graduates who posses the latest knowledge on the advancements it's just they their knowledge needs to be aligned and adjusted with the longer-term climate change vision.

Currently there is different professional courses on climate change provided in the UK but there is a minimum awareness amidst the built environment stakeholder on these.

1.8.3   Incentives in training for climate change adaptation

N/A

1.8.4   Skill shortages

In terms of the skill shortages there were several highlighted during the interview.

- Climate sciences basic knowledge.
- Ability to draw and link the climate change impacts with their professional roles and responsibilities.
- Skills to measure the long-term benefits of climate change adaptation.
- Skills to negative for the required resources to implement the climate change adaptation plans amidst the competing needs.
- Communication and dissemination skills to win the stakeholders for the local climate change adaptation.
- Improve knowledge on green energy sustainable production processes and decarbonising operations.
- Skills on how to align the industries with the net zero strategy.

1.9   References

APA style references are to be used. All references should be listed in alphabetical order at the end of the report. See below for examples.

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