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# Local Level Complexities in Governance of Climate Change Mitigation Practices and Adaptation Measures in U. S. Cities

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**Author's contribution**

*This whole work was carried out by the author SAS*

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## ABSTRACT

While global negotiations regarding climate change between nations are underway around the world, locally scaled policies and measures for climate protection and resilience are drafted and implemented by municipalities across the globe. These political units, with their small contributions to the much larger issue at hand are unable to fully receive adequate gains of their policies for their local stakeholders, as theory states that local level administrators would find it difficult to reduce emissions for the benefit of the global citizenry. In other words, municipalities are concerned with the provision of locally-based public goods and services. For climate policies however, they are locally producing a global public good. On the other hand, local level leaders have an advantage as they control many of the factors related to emissions, such as land use decisions, residential and commercial regulations, transit options and solid waste disposal. This is perhaps fitting due to the nature of the place-based vulnerability where impacts are experienced in the forms of inundation, heat waves, bushfires or rising sea levels. Additionally, due to their structure, it is comparatively easier to implementing such policies successfully than many international policy makers who have struggled with such goals or milestones due to added complications. This essay will explore the rudimentary complexities at the city level and observe the paradox of participation and engagement in sustainable addressing global climate change.

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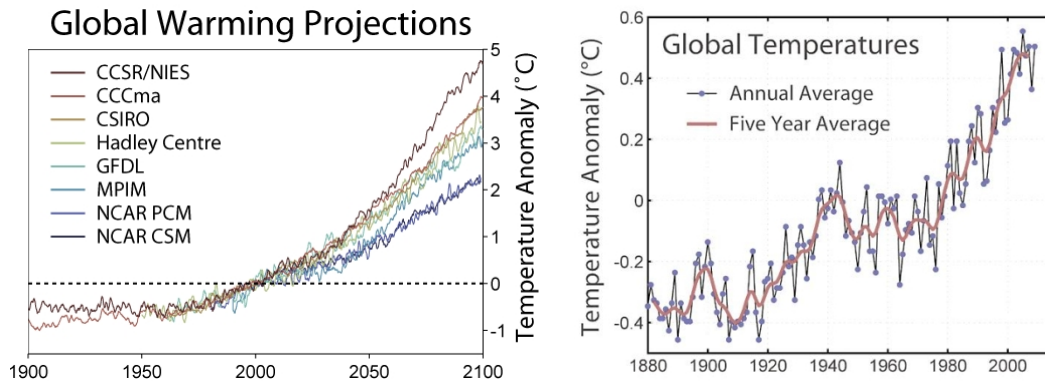
## **1. INTRODUCTION**

In spite of the absence of major financial incentives or substantial structural support, local level policy makers have approached the topic of global climate change with innovation. Climate change, which is perhaps one of the most pressing realities facing mankind has garnered tremendous dialogue from nearly all communities around the world. Cities are of major importance in this very dialogue of climate change and environmental sustainability. A majority of the earth's growing population is projected to live in cities. Not only are they responsible for a majority of earth's energy and resource consumption, cities also subsequently produces the highest amount of wastes and emissions and are therefore most affected by the impacts of climate change – both now and in the future. Solutions to human caused acceleration of climate changes must be locally based–driven by local organizations and individuals. In drafting mitigation and adaptation policies or influencing sustainability practices, local governments are therefore increasingly stressing civic involvement and public engagement in relevant programs and initiatives. Various institutional problems and the lack of a universally accepted local sustainability framework have however caused a significant stagnation in the collective progress to create appropriate action plans or meeting emissions or waste reduction targets. The current study explores local leadership and innovation strategies and national public opinion in the United States regarding solutions to global climate change and mitigation schemes from a multidimensional analysis, as well as briefly observing tentative local level adaptations plans designed in order to address this global change.

### **1.1 Global Change**

Climate change around the world is a very real issue. (Fig. 1.) Greenhouse gases trap energy from the sun in the earth's atmosphere and heat it up. While this is necessary for life on the planet, higher amounts of emissions and increases in greenhouse gases are speeding up this warming. The change in temperatures is melting polar ice caps, which is increasing sea levels and displacing human beings from various coastal regions around the world. Hence, the most sensible option to addressing global climate change is to significantly reduce emissions so that heating could be slowed down. These emissions are mostly given off from industrial plants, locomotives, living things and buildings [1]. Added trends of globalization have further unveiled greater influence of privatized environmental governance on the global scale [2].

The essence of global environmental management with economic and social implications have started to shift away from state capacity, thereby empowering the civil society which experienced the introduction of activity organizations and interest groups gaining power as non-state actors. These different actors are capable of having differential access to decision making [3]. This has a profound effect on international relations as the trend predicts an inevitable and likely shift from states towards firms, which will herald a new dynamic of interaction between the public and private sectors [4]. The main reason for this is the neoliberal notion of 'free trade' efforts where trade barriers have been sought to be removed completely and this is seen in various countries where the governments have resorted to replacing environmental regulations with standards such as the ISO series [5].



**Fig. 1. Global Temperature Rise in C in the past Century**

Complex systems are constantly evolving to their surroundings where minute incremental changes, such as the shift from states toward firms in one level can potentially be compounded to major differences in the next level, as far as governance is concerned. Climate change or sustainable development precepts are therefore social-ecological subsystems. Observing self- organization within these in particular, can be crucial in order to understand the patterns emerging from various inter-component interactions. For example, sustainable development or mitigation and adaptation for climate change tend to be rooted locally in the short term, with eventual global implications in the long run. Hence, rhetoric or willingness for national leaders affects municipal actions and this can impede the vision of sustainable development or fruition of the global climate goals [6].

Repeated studies have narrowed down the main barriers to clean technology developments. First, behavioral barriers exist in the form of knowledge gaps, incorrect perception, misinformed constituent opinions, concerns or stewardship. Next, limited action capacity, administrative issues or implementation problems make up the institutional barrier. In addition, there are technical barriers involving skills, complexity in technological systems integration, management and facilitation. Moreover, there exist political or regulatory barriers in discriminatory or regulatory policies and state monopolies. Finally, the financial problem, especially in incentives, conventional subsidies, risk-management in costs, the reality of inadequate investment returns and high upfront or transactional costs also serves as a major hurdle to comprehensively addressing this global change [7].

As a majority of GHG emissions come from energy, mostly from highly industrialized nations (See Fig. 2). It is crucial to streamline this sector and bring technological innovation to the systems. Recent energy efficiency and de-carbonization of the U.S. economy falls short of the required level for achieving the goal. Eighty to eighty three percent of U.S. emissions are planned to be reduced by 2050 with CO<sub>2</sub> accounting for 80% of all U.S. GHG emissions, which is why carbon emission reduction is important. However, ambitious de-carbonizing would still fail to yield desired emission reductions, unless the U.S. moves to rapidly reduce energy intensity and remains on the path for an extended period of time [8]. Cap and trade mechanisms for carbon trading are a cost effective approach to mitigating or reducing emissions that municipal governments can oversee and local companies can participate in. Both market based and regulatory approaches would influence the total cost of the scheme and these costs would be distributed throughout the economy for society to bear. GDP-CO<sub>2</sub> relationships are hard to draw internationally as primary verifiable data remains highly

variable over time and between nations [9]. It is however clearer for national considerations, for example, the cap and trade provision with the American Clean Energy and Security Act 2009 could potentially lead to a reduced U.S. GDP of 0.25 to 0.75% by 2020, and 1 to 3.5% by 2050 according to the Congressional Budget Office. With adjusted inflation, in 2050, the GDP will be 2.5 times as large as 2009 when the study was conducted. At the local level, GHG inventories can clearly illustrate the state of emissions from the city's operations and that of its surrounding areas.

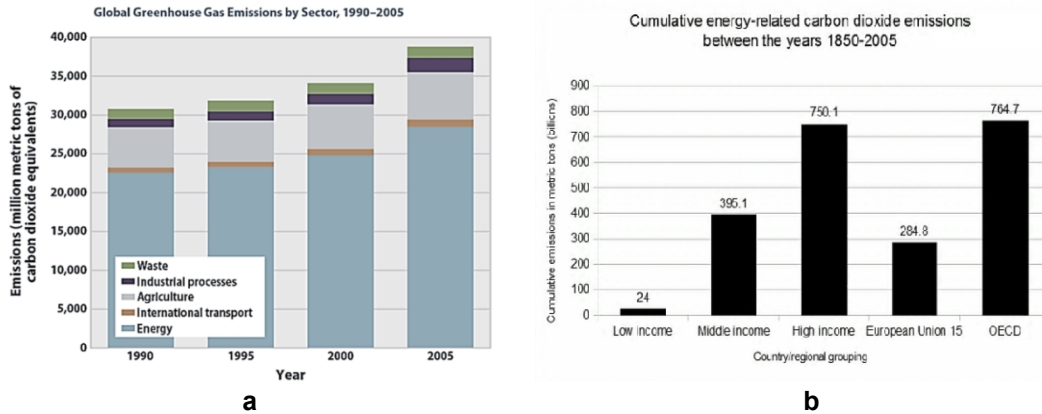


Fig. 2. Sectorial carbon emissions (a) and regional origin (b)

Legislations and policies at various levels have deep-rooted public implications, especially in terms of employment. Jobs are a hot topic in current times, and this aspect of climate regulations has received great importance recently, as stringent policies in carbon emission reductions would not benefit labor markets which is slow to adjust to the shift, compared to the output demands; CBO also estimates a possible loss to purchasing power, primarily affecting the middle of the income distribution [10]. American public opinion and support on this issue is generally skewed and divided. As an international problem, the issue of climate change cannot be resolved without significant international cooperation and coordination. Moreover, international CO<sub>2</sub> reducing energy policies are largely country specific and dependent on different variables [11]. While the challenge in the U.S. is to balance sectorial energy supply towards secure, affordable and clean technology for economic growth, simultaneously reducing emissions, in other developed countries like Europe, the economic system can respond to the carbon constrained parameters and maintain the same level of GDP at the same time. Also, in Europe's case, cap and trade can be fully utilized to reduce 75% of Kyoto costs when compared to zero use of carbon trading [12,13].

With increased local, national and global population, income and economic growth, the intensity of emissions relative to activities must also be evaluated. Global growth rate for population and per capita income can outpace the rate of decline and intensity. This means that incremental changes affecting the latter cannot achieve sufficient overall decline to reduce emissions over decades. Higher costs of this initiative should be weighed with the dangerous costs of climate change. The two-fold challenge is also to adopt and implement policies to encourage the development and use of low GHG emitting technologies while maintaining a sufficiently high rate of intensity decline over the long term [14]. Even though individual energy sources may emit less or no carbon based particles, increases in total energy users due to population growth, lifestyle changes and higher consumption resulting

from improved economic growth, may overall negate it. Adding to the mix is the complexity arising from the economic, technical and political difference among conflicting regional, national and local circumstances.

Another benefit is that carbon markets can lead to enhanced renewable energy technological integration and greater environmental performance, as local solutions have lower costs and risks and more accommodating energy portfolios. Additionally, implementation at this level is not only just reliable or cost-effective, but more realistic and manageable than national energy policies, thus higher chances of success and addressing the issue [13].

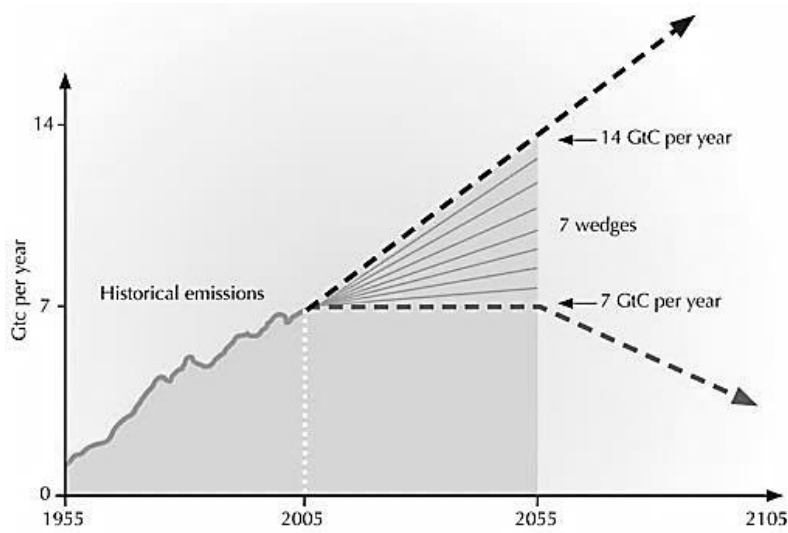
## **1.2 Mitigation**

Scientists and practitioners are able to show robust and compelling scientific projections that seem to support the possibilities of halting the detrimental effects of global emissions. Political involvement and policy support is crucial to the issue and is still lacking. There are no 'misperceptions of technological readiness', as 'revolutionary changes' in future technology are not required at all, technologies that do exist can be scaled up to meet set milestones. None of the relevant technologies are pipe-dreams or lab tests waiting to be operational, but viable and proven options that require major funding from the public sector to be scaled up. There is enough capital in the world to finance a rapid transition to a low-carbon society with mitigated emissions and significantly developed clean technological systems [7]. Although there exists great challenges associated with a change, such as with the deployment and integration of renewable energy sources penetrating the U.S. electricity sector, it is still possible [15]. As a nation, the U.S. would need to hold carbon emissions under 7 billion tons or less each year [16]. This is an ambitious goal, as even at the time of the study, the emissions were more than doubling and projected to continue to do so, for the next 50 years.

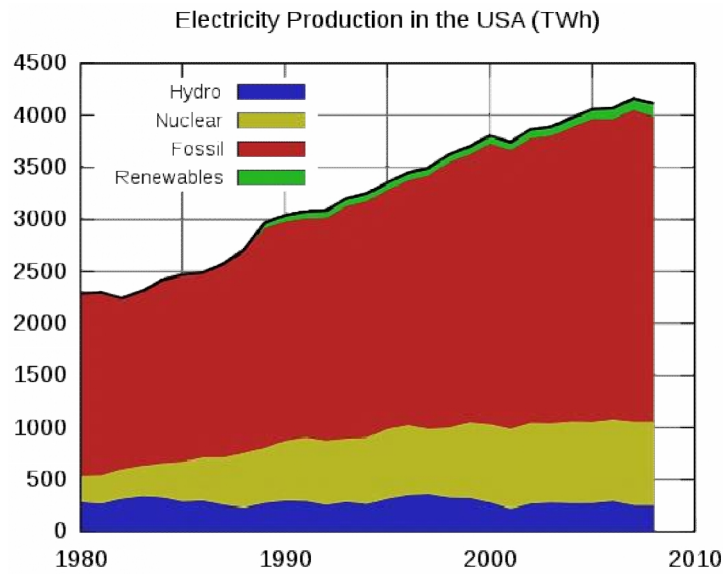
In order to graphically illustrate the simple reduction phenomenon, 'Business as Usual (BAU)' line is initially projected that is increasing exponentially above a flat line called the reduced trajectory, constant at 7 billion tons (planned in 2005). On one abscissa is the amount of emissions, while on the other is the time we have in years to hold off the increased emissions (See Fig. 3). The triangle that forms in between is the net reduction required, and is divided into smaller triangles called wedges, each of which represents an active sector such as transportation, energy, waste management, construction or agriculture – and this is where emissions can be reduced. There is an immediate necessity to fill these wedges in the next half- century starting now, delaying will cause the Business-as-usual trajectory to rise, making it harder to do something. This is because current wasteful business operations and policy incapacibilities to put comprehensive mitigation policies to effect will cause irreparable damage.

A shift in fuel from coal-based power to renewable sources, such as wind or photovoltaic or even nuclear energy and using our natural gas reserves is required. Also, reducing deforestations should also be key as plants and trees sequester huge amounts of carbon from the atmosphere. The possibility of such radical changes around the country in such a short time has however raised some questions [17]. Scientists observed subsequent advancements in the wedge concept plan and pointed out, what seemed like flaws in the scheme by analyzing the difficulty in quitting the ongoing addiction of high carbon emitting fossil fuel sources. As Fig. 4 suggests, most of the U.S. energy comes from conventional fossil fuel sources. Government regulations such as the planned international agreements

during the Kyoto Protocol have not worked and emissions are rapidly and continuously rising, while the proposed scaling up of the required technologies are moving relatively slowly, if moving at all.



**Fig. 3. Global Carbon Emissions Stabilization Wedges**



**Fig. 4. U. S. Electricity production sources**

Radical phasing out of current operations and energy sources is highly unlikely from a logistical and financial standpoint as major mobilization of energy sources and relevant infrastructure is required to achieve the wedges goals that were quantitatively identified. In other words, the increased carbon emissions were not a predictive glitch within the stabilization wedge model but attributed due to society's inability to do something about.

Although earlier state that this is dependent on a lot of variables and assumptions, but mainly due to inaction. The Business-as-usual scenario is worse than predicted and that eighteen wedges would be required as opposed to the seven initial wedges. It would extremely difficult to produce a huge amount of energy from carbon neutral sources as we currently neither possess enough talent or resources to address it, and extremely expensive infrastructure mobilizations and substantial research and testing is needed to largely scale up the current operations.

Incentives, such as global subsidies need to be rectified so that this phenomenon of depleted energy with higher emissions could be decisively stopped and turned around, with urgency. Revolutionary changes are needed as soon as possible for a chance to combating this global climate change. The unpredictable emissions scenario due to public acceptance of policies, technological innovations, fuel prices and especially cost reduction across many sectors. Scientists agree on the underlying assumption a 1.5% annual carbon emissions growth rate could grow to a 2% or even 3% by the end of the century in which case instead of seven wedges, eighteen and twenty five respective wedges would be necessary, pushing the climate change solution and goals away from our reach.

For example, one of the mitigation schemes can be the building and construction industry needing more efficient in both design and maintenance. It was further pointed out that it would lead to significantly lower consumption of energy and subsequently, the emissions. In the buildings sector alone, one-fourth of the emissions in the world could be reduced in an attempt to solve the world's climate problem. For this particular solution, a more incentive based approach can be taken to the wedges plan. The main opposition to this scheme of retrofitting existing buildings or designing new structures with energy and resource efficient technologies is the perception that it would lead to compromise in both comfort while incurring higher costs during construction. These concerns and misconceptions can be put to rest by analyzing case studies of real company energy records; and not research studies conducted by third party organizations. In addition, the increased productivities are not just a temporary phenomenon but can be sustained over a period of time. A national survey, for instance, points out that electricity costs range around \$1.53 per square foot, with repairs and maintenance adding around \$1.37. These are both included on an average square of \$21 per square foot of space while worker productivity costs around \$139 per square foot, almost seventy times as much as mere energy costs, meaning that if productivity is improved due to enhanced building performance, costs are virtually not an issue. In other words, a minute increase in productivity can offset a company's annual energy costs [18].

There is a difference between energy conservation and energy efficiency and that although both activities lower energy consumption, conservation of energy implies a decrease in service or comfort while efficiency meets or exceeds the quality of service. Moreover, there is a direct correlation between the said design changes and reductions in absenteeism in nearly all such cases. This validates the premise of profit driven steps toward environmental sustainability, and illustrates a potentially small payback period coupled with higher business productivity. So it can now be argued, that such changes on a large scale would not hurt the economy or negatively affect the lifestyles of human beings on the planet, but lead to more economic activity and social equity. In addition, this example of the building industry and possible technological and industrial changes to the current operations can illustrates how such changes in all sectors, in the local city-levels, pointed out in the stabilization wedge plan can take the current scheme closer to the goal of the solution of the global climate issue, so long as it is acted on immediately without any further delay.

### **1.2.1 City-level Action Plans**

At the local level, climate action starts with changing behavior. The current work briefly suggests a new way of looking at the issue and for a way forward towards a future where a new ecosystem could be constructed by innovative strategies at the city level, thereby creating new economic opportunities that arise from such an evolution. This would ideally be fitting into regional climate change adaptation plans, making the phenomenon applicable to most local entrepreneurs, businessmen, scientists and is especially appealing to economists, politicians and environmentalists at the local level. The solution should not revolve around idealistic principles but elaborations of robust economic theories that pervade efficiency in terms of realistic life-cycle costs involved in business planning and operations.

The environment is treated as a resource input in the life-cycle of a real world business model, depicting how a more interrelated assessment of the value of the resources used can be created. Attention should be paid to not pit the industry against the environment, and in no way does it lead to an anti-consumerism discussion; however, it potentially implies a drastic change of lifestyle that we have gotten used to and possible financial and logistical hardship. With the advent of social media, cloud computing and a growing technologically savvy population in both urban and suburban spheres of cities, high speed internet connectivity can consolidate various needs and demands of the city and its people. The outcome of mitigated costs of increasing urbanization is beneficial to the growth of economic activity, business competition and public satisfaction of city services. Systems can be designed through smart phone applications, wireless gadgets and the internet to collect and analyze updated data that enhances the usability and efficiency of the city's infrastructure. The high-speed fiber is advantageous, as system efficiency and business completion of a city greatly hinges on the proper utilization of city-wide broadband and Wi-Fi connections.

But a more pressing question arises from such a proposal: How does one practice control in these times, when grievances regarding an organization's product or service are shared to the entire world the instant they are experienced? Just a few decades ago, executives of information technology bases had doubts about providing computers to their workers in fear of losing control of their command by giving them free access to information. The recent prominence of social media poses a similar yet far-reaching predicament to the leaders and managers of today. This can be a crucial roadblock in the acceptance of any innovative schemes in the municipal structure from both public and private sectors at the city level.

In a more general sense, the fact that more and more consumers are embracing enterprises with open models that listen to them and share ideas and beliefs, means that the old model of command and control is disappearing fast, with leaders having to either adapt to this novel concept or getting left behind. Leaders have taken to writing their own blogs realizing that this form of real time communication with both employees and customers builds the kind of relationships they want to ideally build. This is not only important, but makes sense logically. When most of the current executives of prominent companies were in universities or graduate schools, social media was not present. For some instances, the internet was not even a factor in regular operations. Now, almost each and every organization accepts the internet as a fundamental component of their business model and operations, but a majority of the world's cities do not make adequate use of available technologies and hence incur wastes.

Given various recent events, public confidence in many institutions and firms throughout multiple industries are at an all-time low, and this transfer of power and the idea of an open



system of governance will have tremendous impact on the relationship of the leader, the management and those they serve. However, the archaic notion of the 'command and control' model is robust in a sense, as an open organization can be too open – leading to issues in risk management. It goes beyond an impulsive employee violating regulations that not only leads to fines but could potentially also significantly damage the public trust further.

For example, sending a culturally insensitive tweet or hateful status update, could be some cyber threat problems in service delivery. The only way to address this is not through the openness, but stricter, non-open leadership much like the old model. This new system also does not address managerial challenges such as other legal problems with compliance, human resources, financial or quality control, almost all of which require a robust, centralized control system and strict operational protocols [19]. Current trends constantly calls for a democratization of the organizations, but the attempt to maintain quality and stability and trying to meet the financial bottom line or adherence to the mission statements might take precedence over mere openness. At times, it can even be at odds with heralding new leadership processes, open communication, and related change or innovation. This is one of the reasons why cities and communities resist such a revolutionizing change.

Even plans that are put into place do not yield the desired results. Sometimes programs can be designed to fail due to mismanagement, so it is therefore crucial to evaluate or assess the program's effectiveness. Comprehensive monitoring systems could be one such measure which aims to support credible program evaluations targeted towards GHG emissions reductions by providing valuable feedback in the productivity, impacts and program effectiveness and subsequent feedback to the project components. So, sustainability evaluations can provide feedback throughout the project's or program's life cycles, improving overall efficiency, and subsequently helping the governments make decisions about budgets and funding or for allocating resources. This could also be a way to make the programs and projects accountable to the public while potentially providing organizational transparency, besides evaluating the effectiveness.

Depending on the program, the objectives, outcome and output indicators would need to be identified by a holistic and inclusive method. The next stage dealing with capable administration and infrastructure would stress on reliable and valid collection of data. In trying to find the effectiveness it is important to know who the audience is, or who would like to evaluate the program to find its effectiveness. Given the nature of the problem, the audience might be the citizens, businesses, city, state or federal/national government or a combination of these. Depending on the audience, the data from the district and regional offices could be collected in standardized government forms and then converted to analyze the data electronically which is discussed above. This is only possible if there are no major obstacles in the monitoring or evaluation plan, such as lack of staff, high staff turnovers, poor management or infrastructure or under-qualified staff etc. If this is the case more resources should be invested in the evaluation budget and into staff training. The team could further breakdown the task by forming smaller teams at the various levels, investing financial and logistical compliances, if applicable. The entire evaluation could review a sample of a specific number of public works projects per year or per a certain number of months to investigate the effectiveness. Each step is important as without them, it would be relatively difficult to measure program impacts or assess the effectiveness of the program on the beneficiaries. Further, a cost-benefit or a cost-effectiveness analysis could be utilized to assess program efficiency. The benefits of the projects and their program cost could be compared, where a lower cost-benefit ratio would mean that the program is efficient. The

obvious problem with this, however, is that while costs are monetized, benefits are usually not.

Embracing a city's entrepreneurial nature, individual citizens and businesses can develop this software and make applications for smart mobile devices, according to their interests and service preferences, such as trails in city parks or better biking routes for cyclists. This provides a way for the stakeholders to be engaged as the citizens and businesses can be equally involved in the city while developing applications for better services through adequate utilization of technologies. The city could provide information and necessary data openly to interested parties or by launching competitions. Since this requires minimal financial responsibility on the city's part, events such as an open-source contest could be organized to promote such collaborations under sponsorship of local and interested entrepreneurs. Initially, if budgetary constraints exist due to limited funds, individual citizens and businesses could themselves design applications and databases on the city's behalf, leading to cheaper, smarter and faster sources of innovation. The city can expedite this trend by bringing the interested parties together. This investment should lead to increased efficiency and generate returns in the form of lower costs in the municipal service provision. In the long run, government funding may be critical to cover capital costs through state-owned banks or direct public financing, in addition to private sector funds and third parties providing later capital for development after the completion of the initial phase.

Both long term and short term goals would need to be identified as the politically charged, short term delivery of results can take precedence over long term strategy. The initiative also needs to be marketed with promises, not just rhetoric, when the city evaluates and makes a public promise to the citizens and stakeholders. Data and informational use derived from these technologies have the ability to transform relations with citizens, businesses and the public officials. The city therefore needs to provide or help the private sector to complement provisions of this innovative municipal infrastructure. This way, businesses will be enabled to function effectively while the city authorities can offer appropriate and efficient public services. Also crucial is the city's business and public leadership. Researchers define leadership as a system of persuasion, where the leader persuades the followers to pursue the shared vision, or as a performing act where holistically, and with subtlety, the leader attempts to influence his or her followers by blending feelings, emotions, and actions in pursuit of the vision. Personal opinions and perceptions can easily influence decisions for a person in a position of leadership and addressing municipal adaptation programs is no different from either corporate or policy making perspectives. There are some key differences between public and general leadership as public leadership can be seen as the same as 'regular' leadership but with further constraints and additional challenges. This is based not only on the unique challenges and limitations of scope experienced by the public sector but also due to other complexity factors that they face.

Leadership demands to be viewed from two different sectors and between industries. Private and public sectors have historically been viewed as different, but with recent trends in globalization, drastic shifts are taking place that are altering these sectors to their very cores [20]. For example, there is greater commercialization or privatization of public services around the world, as well as increased stakeholder awareness and analysis in the private sector. However, there still exist stark fundamental differences not only in each sector's structure, goals, purpose, drivers or values, but also in their organizational culture, environment and even skill set and talent management. It is due to this that the leadership for these two distinct yet somewhat similar systems is different, but, it also has to be noted that skills in one of these sectors can sometimes be useful or transferable to the other. The

private sector leadership is profit based and revolves around the idea of optimized efficiency, whereas public service leadership is goal oriented and suboptimal at best, and not only do they have to look at their program's or project's financial situation, they have to do so while providing the best services possible.

Leaders in the public sector do not pursue goals for monetary gains, but in an effort to solve some of humanities' most complex and pressing issues, such as climate change or resource conservation. When businesses choose a particular industry, product or service, they do so by picking one that is most likely to return investments or reduce risks in operations, but public sector organizations provide solutions for issues from which financial profits cannot be reaped or ones that are plagued with such social problems. In many instances, public service leaders regularly have to negotiate between constituencies and resolve conflict. This facet is rare or different in the private sector whose operations also allow for a degree of freedom or flexibility, a fact that is in turn rare in the public sector.

Businesses, for example, can outsource operations to cheap labor countries to help save money and hence increase the profit margin, making it easier to meet their primary objectives. Their public service counterparts, however, usually cannot do so. Not only are they structurally not able to do this, but their primary objective would be compromised as those they serve would then be worse off. This shows that in the case of public service leaders, the limiting factors can be disproportionately related, making key decisions and leading the followers towards the goals and visions much harder. This notion significantly illustrates the dilemma of the public service leaders. In addition, there exists certain dynamics and additional challenges in forming and leading teams of diverse individuals, with sometimes conflicting personalities. How they can be best led towards verifiable completion of milestones considered integral to the shared vision is perhaps also a crucial question. From a public leader's perspective, understanding the mentality of the led, or opinion and perception of the constituency sheds further light on the leader's duties as well as the soundness of their vision – be it sustainable development, climate change or emissions mitigation. It is almost human nature to blame the top when things go wrong and it can be easy to overlook that the follower's ineffectiveness can be falsely reflected on policy makers or corporate management.

At the municipal level, city staff needs to evaluate current municipal operations to identify if there are any conflicting regulations, complicated processes or 'silo mindsets' within that hinder the full acceptance of an integrated innovative scheme to cut wastes and emissions. Next, the administration should conduct surveys to public officials, businesses and private individuals to understand any learning gaps between the key stakeholders regarding the issue, causation and probable solutions to climate change and its local implications. Municipal bureaucracies are structured to perform tasks with consistency and stability and are likely to resist change. Experimental innovation or risk taking can be institutionally blocked in such settings as technologically-driven public sector projects may fail if management does not consider and address risks. Any resistance among the staff, therefore, should be overcome with proper training and skills development. This calls for careful handling of the project as with multiple and diverse stakeholders, there exists a high level of interdependence with competing values which leads to socio-political complexities. It would be beneficial for city council members to work with the departments to lead the change as management and policy needs to be considered alongside the implementation of technology. Beyond the typical sharing of knowledge, policy coordination across organizational norms and at all levels is critical. In addition, top-management support and

cross-organizational leadership is also important if collaboration among the diverse actors is to be sought [21].

In the short term, online portals on websites, text messages and smart phone applications can be popularized and in the long term, kiosks could be constructed through the outward growing circles of the city for easy access to regular services. Digital content and collaboration technologies can be popularized in a cost-effective effort to provide quality services and experiences in education and healthcare through storage systems for student or patient records and easier content sharing. Filing taxes, paying fees, applying for and issuance of licenses, permits and registrations and other online delivery of services should be made easier. This will reduce transaction times by foregoing unnecessary paperwork while improving transparency. Business transactions can be automated to be far quicker and simpler, cutting down processing times for most services and not requiring users to drive out and then wait in line. Automatic updates on changes and details, for example, GPS installment on public transport, paramedics, security services so that users can monitor location, deployment and arrival times can also be beneficial in cutting wastes and hence emissions [22].

Both internal and external conflicts in operations can and will occasionally arise that are deemed detrimental to the goal and vision. Researchers have constructed frameworks that illustrate the various kinds of roadblocks to any organizational practice. The model is applied for an innovative municipal level plan in the present study (See Table 1). The challenges of resolution can be especially difficult today with the greater diversity in background, identity or ideology. Coming to a consensus, therefore, is now more complex than ever. Despite coverage of contemporary organizational and institutional cultures and norms, today's leaders cannot escape the fact that the workplace, and in fact all of society is much more diverse, and successfully navigating through the variations of human interactions will be extremely crucial. With a field as varied as climate change or environmental sustainability, this challenge is magnified among municipal or local policymakers and businesses.

**Table 1. Innovative Municipal Planning Roadblock Assessment Framework [58]**

<b>Machine Metaphor</b>	<b>Organism Metaphor</b>	<b>Brain Metaphor</b>	<b>Culture Metaphor</b>
The plan is an organized input into the municipal system	The plan is interactive to its surrounding environment	The plan is geared towards parallel information processing	"Not part of our culture"
<ul style="list-style-type: none"> <li>• Put in place to provide operational efficiency</li> <li>• Predicted outcome: Lower municipal costs</li> <li>• No specific place in org-chart</li> <li>• Key piece to the 'emissions reduction' puzzle</li> <li>• Decisive 'top-down' or 'bottom-up' plan</li> </ul>	<ul style="list-style-type: none"> <li>• Ideally should adapt to the high-tech external conditions</li> <li>• Will fail unless it evolves with the circumstances</li> <li>• The city is a thriving system with its own life-cycle</li> <li>• City needs also has to be satisfied</li> <li>• Meet city demand with adequate supply</li> </ul>	<ul style="list-style-type: none"> <li>• Individual initiatives form a coherent big-picture pattern</li> <li>• The scheme processes itself intelligently</li> <li>• Uses feedback loops and builds networks</li> <li>• Constantly learning and applying knowledge</li> </ul>	<ul style="list-style-type: none"> <li>• Bureaucracies are structured to perform stable tasks</li> <li>• Experimental risk-taking may be institutionally blocked</li> <li>• Source of potential resistance among the staff</li> <li>• Operations can be constrained by Bureaucratic ideals and culture</li> </ul>

**Table 1 Continued .....**

<b>Political Metaphor</b>	<b>Psychic-Prison Metaphor</b>	<b>Flux Metaphor</b>	<b>Domination Metaphor</b>
Stakeholder involvement is crucial	“Silo mindsets” taken as an organizational norm	City management, demand and supply is always changing	Unintended effects of major municipal change
<ul style="list-style-type: none"> <li>• Plan ideally adds transparency in municipal processes</li> <li>• New dynamic in budgeting and funding</li> <li>• Indirect political will or influence</li> <li>• Some groups might be negatively affected in terms of power</li> </ul>	<ul style="list-style-type: none"> <li>• Conventional operations seem normal</li> <li>• The innovation might seem too extreme</li> <li>• Managers might subconsciously reject or impede progress</li> <li>• Trapped inside their own conventional thought-process</li> </ul>	<ul style="list-style-type: none"> <li>• The city services and stakeholders are constantly changing</li> <li>• Previous stakeholder expectations may currently differ</li> <li>• Need to adapt to changes to succeed or remain relevant</li> </ul>	<ul style="list-style-type: none"> <li>• Local business still dependent on old model</li> <li>• Heightened dependence on technology</li> <li>• Reduced social interactions</li> <li>• Emergence of new power base</li> <li>• Disruptive to system</li> </ul>

**2. MATERIAL AND METHODS**

In the current research, we are observing two sets of nominal variables and the relationship between them. A chi-square test was used for all of the tested research hypotheses. The data is from a national poll from July 23-28, 2008 in the U.S. It samples 1000 adults (over the age of 18) living in the United States, and respondents are selected by Random Digit Dialing (RDD). The chi-squared ( $\chi^2$ ) tests tested hypotheses with a chosen level of 0.01 to ensure statistical significance. Datasets were merged to produce 2 X 2 contingency tables [23].

- $H_{A1}$ : There is an association between the U. S. public’s perceptions of the future state of the economy and their support for action on global warming.
- $H_0$ : There is no association between the U. S. public’s perceptions of the future state of the economy and their support for action on global warming.

The test (N=641) observed the collective economic interests of the people and their support. More people who thought it will help the economy (55.2%) supported U.S. action, than those opposed to it (44.8%) who instead felt that it would hurt the economy. For respondents who indeed felt that U.S. action would hurt the economy, a majority felt that the U.S. should not take any action (88.2%), while a mere proportion (only 11.8%) of people who felt it would help the economy preferred inaction. Both the second and third tests were statistically significant ( $\chi^2 = 55.686$ ,  $df = 1$ ,  $p < 0.001$ ). This illustrates an economic support for an environmental issue.

Beyond corporate influences, politics has the ability to play an important role in these issues. Differences in opinions according to the individual’s political identity are also noted in the current study and other relevant literature. For instance, to gain a comprehensive understanding of the issue and why people reacted the way they did, political influences on the issue of climate change and mitigation was observed [24] where the paper further looked

at comparative policy studies between nations adhering to emissions reduction policies and nations that decided not to, for many reasons, including the ones highlighted in this research study [25]. Like President Bush, republicans have consistently downplayed the seriousness of global warming, and in 2003, 49% of republicans believed that the seriousness of global warming is exaggerated by the news which increased to 59% in 2004, before going back to 50 in 2005. This is in stark comparison to 21% of democrats who felt the same way in both the years of 2003 and 2004, and just 15% in 2005. In 2008, 49% of democrats felt that global warming will post a serious threat to them or their way of life within their lifetimes, compared to 26% of republicans [24].

According to a study at Yale University, a large majority of Americans (68%) favored, at least in principle, an international treaty that goes far beyond the current Kyoto Protocol to require the U.S. to cut its CO<sub>2</sub> emissions by as much as 90% by 2050 [26]. But again, this does not come without economic implications for the country and her people. The study, also found that there is continued strong opposition to carbon taxes, such as higher taxes on electricity with 71% of respondents strongly opposed or somewhat opposed to higher gasoline taxes. So, paradoxically, while most Americans strongly support national and international action on global warming, they remain adamantly opposed to higher taxation as a means to achieve goals. In addition, 82% of Americans were willing to spend an extra \$100 a year by using electric utilities that are primarily produced by wind, solar and other renewable sources, and 89% of Americans agreed that any newly constructed home, be it residential or commercial building, will have to meet higher energy efficiency standards. Finally, 87% of Americans agree that the U.S. can take actions that will reduce global warming. On another note, 76% of the people disagree with the premise that the actions of a single country like the U.S. won't make a difference in the reduction of emissions or mitigating the causes and effects of global warming and climate change. Directed policies and cost implications for a shift will have an impact on the general public. For instance, the changes to policies and fuel regulations in the American transportation sector will likely change way of living for a majority of the American populace [27].

A pattern in the public opinion regarding this global issue emerged in the last 20. In 1998, 39% of Americans supported immediate steps, a percentage which decreased in 2004 to 31% but increased again to 34% in 2005 [28]. Conversely, in the same year, 44% of Americans felt that although this pressing issue should be addressed, it should be done gradually. This percentage slightly increased in 2004 to 45% before going down to 42%. The year 2004 is crucial in the scene as it coincided with the U.S. Presidential Elections with Republican George W. Bush emerging as the winner – a politician who is against mitigation or emissions cap. Furthermore, George Bush did not ratify the Kyoto Protocol due to higher costs incurred from the U.S. perspective and according to public opinion and the percentage of people in agreement with his policies of taking no real steps to stop climate change was 23% in 2004, which was higher than both 1998 (15%) and 2005 (21%). Politics is a key consideration that goes into Climate Change policy as U.S. climate change politics and policy making are changing in the public, private and civil society sectors. These changes are likely to influence U.S. federal policies [29].

A year earlier, in 1997 during the Clinton era, 20% of the U.S. people felt that the U.S. efforts to mitigate the effect of climate change and global emissions would cost too much money and hurt the U.S. economy. The number increased to 29% in 2004, before decreasing to 23% the following year. However, on the other hand, 67% of the people felt that the U.S. economy would become more competitive because the mitigation efforts will result in more

efficient energy use and save money in the long run. This number stayed the same in 2004 before increasing in 2005 to 71%.

Finally, in 2002, 64% of the U.S. public felt that they, as a nation, should participate in the Kyoto Protocol, which increased to 65% in 2004 and again to 73% in 2005. Only 21% of the people in 2002 felt that the U.S. should not participate in such treaties, and this number decreased to 16% in 2004, and stayed the same in the following year. The treaty provisions were legally binding with 42% of the polled U.S. public believing that the U.S. should in fact abide by, and this percentage remained the same in 2004 and 2005. Around 22% of the people thought that the U.S. should not abide by the limitations in the protocol, a number that increased slightly to 23% in 2005. In 2004, 36% of the people polled had no opinion or knowledge about the treaty, which became 35% the following year. President Bush's withdrawal from the treaty was a topic of discussion and scrutiny by the U.S. public which is why awareness about the program may have risen. In April 2001, a Gallup Poll observed that 41% of the U.S. public approved this decision while 48% disapproved it. By July of the same year the figures amounted to 32 and 51%, respectively.

As socio-economic and geo-political circumstances shape public opinion in the U.S., an eventual shift in the policy preferences of the American people is likely to lead to congruent changes in policy [30]. Specifically in the field of environmental policy, there exists a strong link between environmental conditions and opinion, as well as opinion and policy responsiveness [31]. Participation among the citizens therefore is very important in the discussion of local-level sustainability [32].

H<sub>A2</sub>: There is an association between the U.S. public's rationale for reduced carbon footprints and their support for action on global climate change.

H<sub>0</sub>: There is no association between the U.S. public's rationale for reduced carbon footprints and their support for action on global climate change.

To gain a more comprehensive understanding of the issues at hand, various other associations were also looked at. For example, a study (N=420) explored the relationship between the motives behind the public's environment friendly ways of life (economic savings vs. ecological awareness) and their views on U.S. action and inaction. More people who actually wanted to improve the environment wanted the U.S. to take action (67.4%) than the 32.6% of people who just wanted to save money. Interestingly 67.4% of people who wanted to save money felt that the U.S. should not take any action, while only 32.6% of environmentally conscious individuals said so. This test again was statistically significant with a p of 0%, hence the null hypothesis was rejected to again conclude that indeed there was an association between the U.S. public's rationale for reduced carbon footprints and their support for action on global climate change ( $\chi^2=21.385$ ,  $df=1$ ,  $p<0.001$ ). To account for political willingness to the solution, the goal is not to explore policy support but to transform businesses to better lead a revolution, and business or industrial end of the solution. This involves making a case for resource efficiency and system effectiveness, and expanding business borders to include ecosystem services as currently we assume unlimited access to subsidized resources. This also means a paradigm shift, a change in our perspectives by including a natural capital on business balance sheets by expanding industrial and business principles, thereby combating this global problem. Long term profit should be the driving force behind a global strategy and where the 'big picture' mentality dominates any thought process rather than decentralized compartmental or incremental strategies. In other words, a long term future vision should not be confused for a short term plan. In addition, although a lot of focus had been placed on incentives, taxation, subsidies and investments

responsibilities that may make it easier or harder to achieve efficiency in systems and organizations, not much is said about challenges in adopting new technologies or infrastructure investments or political roadblocks to creating the new incentives or subsidies. It is therefore crucial to understand the business end of the solution, and not how it relates to other components such as policy support or financial feasibility.

- H<sub>A3</sub>: There is an association between the U.S. public's political affiliations and their preference for global warming mitigation initiatives.
- H<sub>0</sub>: There is no association between the U.S. public's political affiliations and their preference for global warming mitigation initiatives.

The respondent's political affiliations were compared to their solutions for global warming (N=786) More democrats (49.2%) than republicans (22%) indicated that they preferred government involvement and that regulations were the most effective solutions in fighting global warming. More republicans (36.3%) preferred business competition in the market than democrats (26.4%). The independents preferred government support (28.6%) but mostly business competition (37.3%). As per generalized political ideologies, republicans are characterized as preferring less government involvement in any issue, while democrats preferred amore involved role of the government; this test attested to this very notion. This test was statistically significant ( $\chi^2=44.848$ ,  $df = 2$ ,  $p<0.001$ ).

Equity based tensions also stem from public participation and the subsequent citizen's support of and involvement in local sustainable programs. Since sustainability policies are linked to a city's financial health [33], the current study evaluates the public perception before the economic meltdown of 2008, when cities started reporting affected municipal sustainable initiatives related to the recession [34]. Participatory policy frameworks invite the highest citizen involvement levels, so cities need to identify relevant stakeholders from which to invite appropriate participation [35,36].

Democracies around the world, where the majority of the earth's population currently live, regardless of their actual operational definition, are ineffective in finding a solution for this eminent problem. Although democracies are designed to value citizen involvement in governance and public opinion, some common examples to its ineffectiveness are the extreme minority representation of almost all 'green parties' in the world's political stages [37]. Larger democracies and economies like the United States have failed to partake or ratify important treaties on the environment even though they pioneered environmental legislations in the 1970s. Market based incentives might work, but corporations are seen as poor custodians of our future as they are driven mainly by profits. NGOs, research institutions and members of the academia are constrained within their frameworks and are, at times, excluded from global decision making. Special attention also needs to be paid in the use of political rhetoric versus scientific persuasion – it is argued that, no progress has been achieved in combating global climate change problem because politicians and policy makers are skilled in using rhetoric and have been using it to delay any real action. Scientists suggests, that just stating 'boring' facts that are seemingly not interesting to anyone is the major reason behind this trend, which is why people rather listen to the dramatic politicians and media briefs for their translations of the issue [38]. The posture of procrastination and maintain the status quo is no-longer justifiable, as doing nothing may seriously jeopardize not only the environmental situation in the long run, but also market share of the innovative technologies in the short term [39].



### **3. RESULTS AND DISCUSSION**

At the city level, various challenges can hinder tasks towards a sustainable community, and these challenges are often between or within cities and the region [40,41]. It is therefore difficult to understand what sustainability should look like at the city level, and most cities, as a result, are reluctant to tackle the challenge making it a “truly daunting task” [42,43] and [44]. Since a one-size-fits-all approach to local sustainability is currently missing, with countless U.S. cities constantly invested in sustainability programs regardless, these initiatives remain largely situational and are shaped by local circumstances. Researchers have argued that local governments have three main ways of implementing energy policies, which is one of the major sustainability considerations – regulatory mechanisms, financial incentives, and local relationships [45]. Researchers further presented the 3E’s framework, consisting of equity, economic and environmental considerations, and identified major secondary orientations such as social capital, urban design, urban ecology, metropolitan governance and ‘eco-communities’ [43,46]. Within the 3E’s spheres, tensions among these tenets are common. This is where conflicting perception permeates opinion – as there is a widespread idea that traditional economic development is at odds with current or future sustainability practices between the environment and economics. In terms of classical economic perspectives of growth, many costs may not have been factored into measurement of price and production. Hence, modern economists have recently noted that it is more sensible to be requiring something other than traditional economic growth in order for communities to be sustainable, with reduced costs and risks in urban areas by local governments to this cause [47,48]. For instance, empirical research shows that cities that rely on manufacturing for its economic sustainability are more prone to take environmental sustainability less seriously [49].

In the face of political uncertainties and competing interests, a clear-cut solution becomes difficult to find [50]. On one hand, mayoral governance at the local level might facilitate the solution from a cost-savings standpoint [51], while on the other hand empirical research shows that a council manager government has a positive effect on local level sustainability efforts [52]. More specifically, empirical research also states that having a city staff or government personnel especially designated for coordinating municipal sustainability actions will lead to increases in local action [53]. Local level awareness in this matter is crucial [54] and although climate change action plans have a high level of awareness, there is relatively limited meaningful “local-level action approaches” for mitigation among both the decision makers and public [55,56]. In the future, all sectors will likely rally to face these impeding challenges [57].

Although the highly interrelated issues and the roadblocks seem to be much clearer on this international debate of global climate change implication for cities, the clearing of the roadblocks on the way to the possible solutions is still hard to conceptualize. There are a lot of factors upon which the end result will depend on. Certain actions would result in mitigation of emissions, but the question of its viability still remains. Are we willing to burden huge costs or change our lives? How far we are willing to go to change the way we have gotten accustomed to live.

### **4. CONCLUSION**

While in its most direct definition, environmentalism conceptualizes nature and refers to practices of conserving the natural world from man-made impacts, sustainability goes a step

further by including the built environment in addition to the earth's natural ecosystem. Contemporary efforts stemming from sustainable practices mostly include addressing the rapid depletion of the planet's resources and the threats of global climate change, caused primarily from emissions. Global Warming has therefore become a major political concern everywhere around the world. Although scientists, politicians and policy makers alike have varied views on this issue, many have been trying to find out how to stop it and what might be the most cost effective way of doing so. The problem is also an important issue commonly discussed by the public masses; however, their opinions are shaped by certain socioeconomic and geopolitical considerations. Knowing the trends about the issue, the public can gain a more comprehensive understanding of the causes of global warming and the specifics of the policy debate. On the other hand, the academia and the policy makers alike can gauge the awareness of the issue of global warming, as the perception of the level of agreement or concerns among experts from various fields can influence the way the impacts are mitigated.

In addition, knowing the public's opinion regarding global climate change, administrators can observe the support for policy action and the potential economic costs as well as the support for many other international treaties that were put into effect to create global shift towards an equitable, sustainable future. With the general growth of scientific, industrial and political work across many academic fields, it is hardly surprising that the interrelated issue of depleted resources and climate change, and its possible solutions, have attracted considerable attention around the world in recent years. It is surprising, however, that there is still a significant amount of disagreement on the existence of this global issue, and our collective willingness to fight the battle and to do something about it. Cities will be the arena where this battle with climate change will be ultimately decided [58]. This is fitting as cities consume around 60-80% of the planet's energy production and give off about the same proportion of the world's carbon emissions to the earth's atmosphere [59]. Cities are and will continue to be an influential player in the grand scheme as population growth and migration patterns warrant that the majority of humans will ultimately reside in cities around the world. It is also for these reasons that cities are most at risk from the effects of climate change, therefore, there is an immediate necessity for appropriate adaptation plans.

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Author has declared that no competing interests exist.

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