



Progress and Challenges in **Urban Climate Adaptation Planning**

Results of a Global Survey

Credits

Massachusetts Institute of Technology | Department of Urban Studies and Planning

JoAnn Carmin, Associate Professor of Environmental Policy and Planning

Nikhil Nadkarni and Christopher Rhie, Research Assistants

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Executive Summary

Cities around the world are increasingly aware of the need to prepare for greater variability in temperature, precipitation, and natural disasters expected to take place as a result of global climate change. In recent years, numerous reports and manuals have been written and networks formed to offer guidance and facilitate the exchange of ideas and information. However, since systematic studies have not been conducted, the information and methods being disseminated often are based on the efforts of a limited number of cities and wisdom drawn from experience in other domains. To gain insight into the status of adaptation planning globally, approaches cities around the world are taking, and challenges they are encountering, a survey was sent to communities that are members of ICLEI-Local Governments for Sustainability. A total of 468 cities (44%) completed the 40-question survey, with the majority of respondents being from the U.S since this is where ICLEI has the largest membership.

Perceptions of a Changing Climate

Overall, 79% of cities worldwide report that in the past five years, they perceived changes in temperature, precipitation, sea level, or natural hazards that they attribute to climate change. Furthermore, nearly half of survey respondents report impacts they attribute to these climate-related changes, with the most common being disasters leading to damage of local government property. Human impacts also have been observed, with cities in Asia, Latin America, and Africa reporting deaths from disasters that they view as being associated with climate change.

Assessing Climate Impacts

Approximately 19% of the cities report that they have completed an assessment and about the same number presently are conducting one. Regionally, Africa, Australia and New Zealand, and Canada are the most active in conducting assessments, while the U.S. is the least active in this arena. Among cities that completed assessments, increased storm water runoff is the issue that most anticipate they will need to address in the near term (65%), with storm water management (61%) ranked close behind.

Urban Adaptation Planning

Given perceptions of a changing climate and assessments of projected climate-related impacts, many cities are beginning to engage in adaptation planning. Sixty-eight percent of cities worldwide report that they are pursuing adaptation planning, with Latin American and Canadian cities having the highest rates of engagement (95% and 92% respectively) and the U.S. having the lowest (59%). Cities are engaged in different activities associated with adaptation planning. At the extremes, 37% report being in the preparatory stages, while 18% are working on implementation, although many in this latter group may be linking implementation to ongoing work activities, such as land use and coastal zone planning, rather than pursuing dedicated adaptation activities.

Four types of adaptation activities are especially common and reflect the nascent state of planning initiatives in most of the cities

that participated in the survey. These activities are: (1) meeting with local government departments on adaptation; (2) searching the web or literature for information on adaptation; (3) forming a commission or task force to support adaptation planning; and (4) developing partnerships with NGOs, other cities, businesses, or community groups.

Challenges in Adaptation Planning

Cities report many challenges as they pursue adaptation planning. Globally, the three top-ranked challenges are: (1) securing funding for adaptation; (2) communicating the need for adaptation to elected officials and local departments; and (3) gaining commitment and generating appreciation from national government for the realities of local adaptation challenges. Lack of resources and limited appreciation by local officials and national governments makes it difficult for cities to make significant gains in adaptation. Many cities are making efforts to integrate adaptation into sector and community plans, although here too they note that a lack of financial and policy support makes mainstreaming a challenge.

Conclusions

Cities are facing the dual challenges of limited financial resources and limited commitment from local and national governments to adaptation. Often, cities are able to gain insights by engaging peer networks and take action through trial and error. However, the results of the survey suggest that without the commitment of local political officials and the acknowledgement of this agenda by national governments, it will be difficult to make rapid advances in planning and to move from planning to implementation. Financial and informational resources are critical, but the commitment of

local officials is essential to advancing adaptation planning and implementation.

I Introduction

Cities around the world are increasingly recognizing the need to prepare for the impacts of climate change. Already, some have seen notable changes in the intensity and frequency of extreme weather events, including heightened levels of precipitation leading to flooding. Others have experienced changes in temperatures that have contributed to extended heat waves and droughts. Still others have encountered storm surges, coastal erosion, and the disappearance of wetlands. While debates persist about whether or not climate change is due to anthropogenic causes, it is clear that new weather and climate patterns are emerging and that these changes are putting urban residents and assets at risk.

Cities are beginning to test ideas and share their experience in developing adaptation plans and identifying adaptive measures. However, the approaches cities are taking to prepare for climate impacts and the overall scope of activity associated with adaptation have not been assessed. To gain insight into global patterns of urban climate adaptation planning, a survey was sent to communities around the world that are members of ICLEI-Local Governments for Sustainability. The survey represents the first systematic study at this scale of adaptation initiatives and challenges. The summary of results presented in this report describes the strides ICLEI members have made with adaptation planning, challenges they are encountering, and resources and support they need in order to be prepared for climate impacts.

Urban Climate Adaptation Planning

Climate change is expected to have wide-ranging effects on urban areas. Anticipated changes in temperature, precipitation, and natural hazards have the potential to place stress on infrastructure, residential, office, and historic buildings, environmental quality, and both municipal and ecosystem services. Cities in all countries will encounter pressures associated with climate change. In particular, projections suggest that cities in the developed world will face notable threats to their assets while those in developing countries are expected to encounter significant increases in illness and death among vulnerable populations as a result of climate impacts (Adger et al., 2003; Dodman and Satterthwaite, 2008; IPCC, 2011).

Minimizing the impacts that climate change will have on urban assets and residents requires that local governments take steps to protect natural systems, the built environment, and human populations. Mitigation refers to initiatives that have the potential to reduce greenhouse gas emissions. In contrast, adaptation involves decisions and actions taken to decrease vulnerability and limit the effects of climate change (IPCC, 2007; Füssel, 2007; Nelson et al., 2007). The concept of adaptation is aligned with the long histories that cities have in assessing and addressing risks. For instance, most cities evaluate trends in rainfall and then take steps to manage flooding through their storm water systems. It also is common for cities to review past trends in order to anticipate heat waves and droughts and to develop plans

to address spikes in electrical demand or in reservoir depletion. Similarly, most have reviewed their emergency response systems and have emergency management plans in place to account for instances when disasters take place.

Adaptation has the potential to draw on and integrate with many activities already taking place in cities, but it also is distinct from typical approaches to urban and sustainability planning. Traditionally, urban planning draws on past trends as a basis for decision-making. In contrast, climate adaptation planning accounts for changes that are projected to take place in the future. This is achieved in a variety of ways. For instance, some cities, such as New York and London, have conducted detailed risk assessments, while others are drawing on available regional and local data to generate local scenarios (Birkmann et al., 2010; Rosenzweig and Solecki, 2010; Carmin et al., 2012). Further, some cities conduct comprehensive assessments while others focus on one or a subset of sectors (Hunt and Watkiss, 2011). No matter which approach is taken, the character of climate adaptation planning is that potential or projected climate impacts are considered in public-sector decisions and investments (Hamin and Gurrán, 2009; Anguelovski and Carmin, 2011).

While adaptation also has many techniques and measures in common with sustainability planning, it also has distinct attributes. Sustainability is the shorthand term that has evolved from the concept of sustainable development, or the consideration of environmental quality and equity in development activities (Brundtland, 1987). In recent years, some have adopted the term sustainability to emphasize the importance of environmentally sound development. The result is that there are many overlaps

between climate adaptation and environmental sustainability measures, including those designed to ensure the viability of ecosystem services, improve greenspace, foster urban agriculture, and facilitate improvements in buildings and urban infrastructure. Adaptation also goes beyond environment to address economic and equity issues traditionally associated with sustainability, such as the ways in which cities can maintain economic vitality and attend to the needs of poor and vulnerable populations in a changing climate. At the same time, adaptation more explicitly engages a wider range of issues, particularly disaster risk reduction and public health (Adger et al., 2003; Lemos et al., 2007; Roberts and Parks, 2007; Satterthwaite et al., 2007; Pelling and Dill, 2010; IPCC, 2011; Rosenzweig et al., 2011).

One concern raised by some observers is that since climate science is not perfected, they need to wait until downscaled models are available before adaptation can be advanced in cities. While efforts to improve downscaling are underway, these will take time to perfect (Mastrandrea et al., 2010). Many cities are moving forward with adaptation planning, despite the limits of climate science. Rather than become immobilized or wait for models to be developed, they recognize that they need to take action now in order to be prepared for the future. To achieve this end, they are exploring options, developing flexible plans that combine structural and nonstructural measures, and moving forward in an incremental fashion (Dodman and Carmin, 2011).

A variety of cities have initiated programs of climate adaptation. For the most part, those that have shared their experiences are high profile cities or those that have participated in international programs, such as those developed by ICLEI, UN-HABITAT through

its Cities and Climate Change Initiative, the World Bank, and the Asian Cities Climate Change Resilience Network (ACCCRN) (Anguelovski and Carmin, 2011). These cities have offered tremendous insights about adaptation planning. However, there also are lessons to be learned from the adaptation initiatives that are taking root in the many cities that have not gained recognition or public attention and from those that have been critically evaluated by scholars who are not invested in the outcomes (Carmin et al., 2012).

Survey Methodology

Generating a robust understanding of what cities are doing to address climate impacts is critical to improving our knowledge of adaptation planning and implementation. Therefore, in spring 2011, a survey was sent to communities around the world that, at the time, were members of ICLEI-Local Governments for Sustainability. The survey questionnaire consisted of 40 questions divided into six sections: (1) experience of changing weather and precipitation patterns; (2) risk and vulnerability assessment; (3) planning activities; (4) support for and influences on planning; (5) challenges and benefits; and (6) location characteristics.

Prior to distribution, the survey questionnaire was reviewed for content and clarity by ICLEI staff members in Africa, Europe, and the United States. Based on this input, the questions were refined and additional questions incorporated into the instrument. The final version of the questionnaire was translated into French and Spanish. ICLEI members around the world, as well as additional communities in Canada that participate in ICLEI programs, were then invited to participate in the survey. An introductory email that included a web link to the survey portal and online questionnaire

was the initial contact. That email offered participants the option of receiving the survey as a document. Reminder emails were sent to non-respondents at one- and two-week intervals. Additional reminders were sent to non-respondents 72 and 24 hours before the survey portal closed.

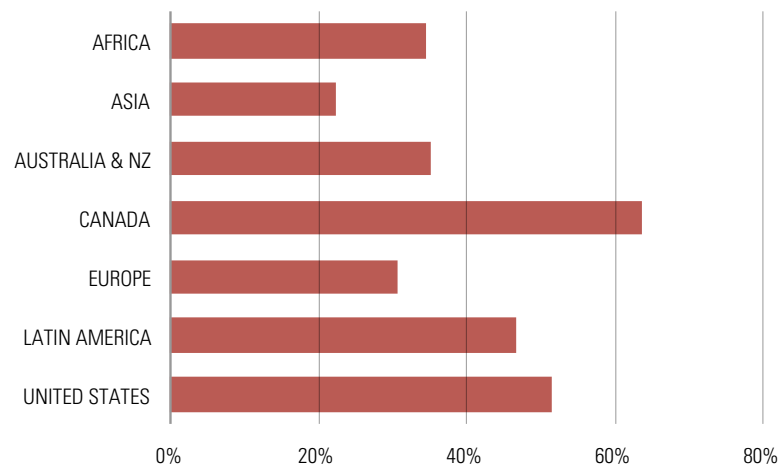
TABLE 1 | NUMBER OF SURVEY RESPONSES BY REGION

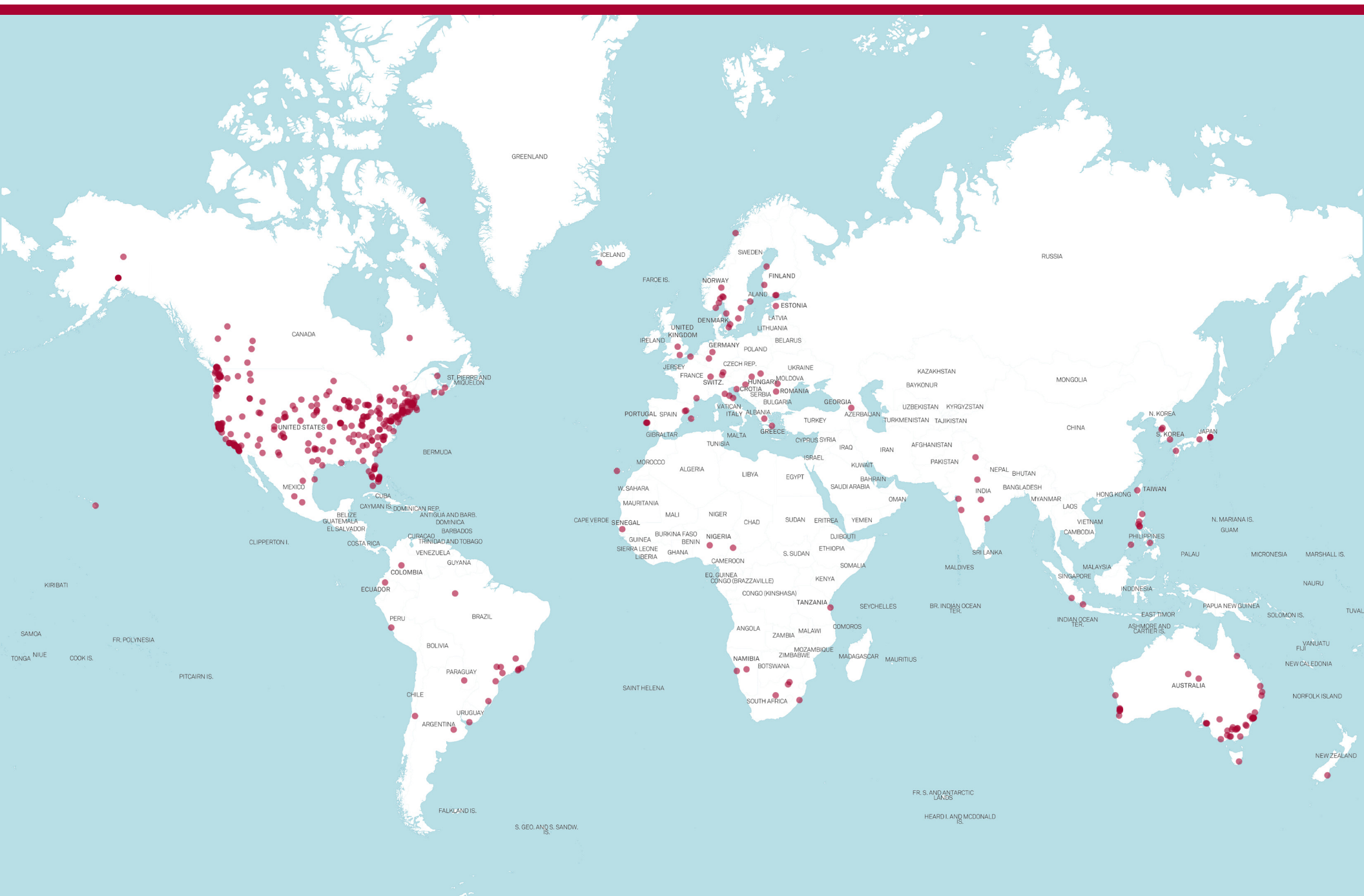
	# of ICLEI members (with viable email)	# of complete responses
Africa	29	10
Asia	108	24
Australia & New Zealand	122	43
Canada	41	26
Europe	154	47
Latin America	43	20
United States	578	298
TOTAL	1075	468

The survey initially was sent to representatives of the 1171 communities that were members of ICLEI at that time. The research team was unable to reach 96 of those communities due to inaccurate contact information or the selection to opt-out of all emails from the company used to manage the survey. Of the remaining 1075 communities, 596 entered the survey website and answered at least one question (54%). However, we base the response rate of 44% on the 468 cities that completed a portion of the survey, while noting that 39% (418 cities) completed the entire survey. As summarized in Table 1, the majority of complete

responses were from communities in the United States, where ICLEI has the largest number of members. This was followed by Europe, Australia and New Zealand, Canada, Asia, Latin America, and Africa. As illustrated in Figure 1, as a percent of possible participants, the response rate was highest in Canada, followed by the United States, Latin America, Australia and New Zealand, Africa, Europe, and Asia.

FIGURE 1 | PERCENTAGE OF SURVEY RESPONSE RATES BY REGION





CITIES PARTICIPATING IN SURVEY

PROGRESS AND CHALLENGES IN URBAN CLIMATE ADAPTATION PLANNING: RESULTS OF A GLOBAL SURVEY

II

Perceptions of a Changing Climate

Climate change is expected to manifest through shifts in precipitation and temperature, sea level rise, and greater frequency and intensity of natural hazards. These changes in urban climate have the potential to significantly impact cities, causing harm to infrastructure, buildings, and other assets, affecting the health and wellbeing of local populations, and altering environmental quality.

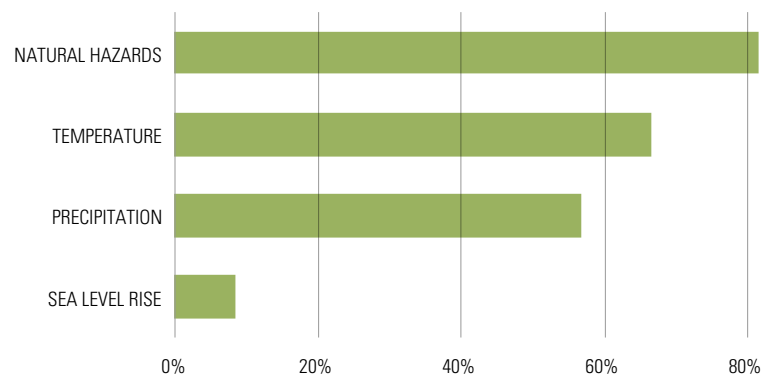
Perceived Changes in Temperature, Precipitation, and Hazards

The survey asked respondents about changes in natural hazards, temperature, precipitation, and sea level rise they have noted or experienced in the past five years, relative to historical trends. A total of 372 survey respondents, or 79%, report some changes in these categories.

Figure 2 shows the number of cities that report a change in each of the categories. The most common observation, reported by 81% of the cities, is an increase in natural hazards. Within this category, 41% report an increased intensity in storms, followed by 31% noting longer periods of drought. Flooding also is a major concern, with 13% of the cities reporting coastal flooding and 30% reporting inland flooding.

Changes in temperature comprise the second most common category of perceived change, being reported by 67% of the cities. Of those, 40% indicate that they are experiencing higher

FIGURE 2 | PERCEPTIONS OF CLIMATE CHANGE IN THE PAST FIVE YEARS



temperatures than usual. While higher temperatures are reported throughout the world, they are a notable issue in Asia (91%) and Africa (70%). In conjunction with increases in temperature, 39% of respondents note longer periods of intense hot weather.

Precipitation changes have affected 57% of cities. Overall, more cities report an increase in precipitation than a decrease. This is especially true in Africa and Canada, where 60% of the cities experiencing climate-related changes have observed increased precipitation. Australia, on the other hand, is the only region where a majority of cities (62%) note decreased precipitation. Sea-level rise is reported by a small percentage (7%) of cities. Finally, thirteen cities report experiencing climate changes in all four of these categories.

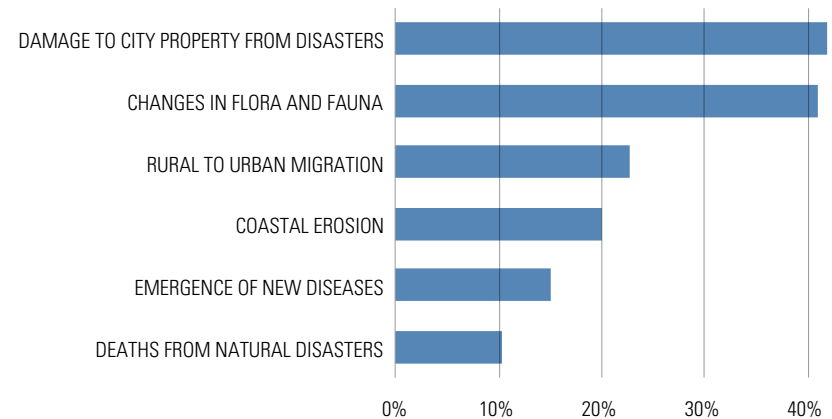
Perceived Impacts of Climate-Related Changes

Changes in the climate can have wide-reaching impacts in cities, affecting local assets, natural systems and environmental quality, and human health and wellbeing. To gain insight into the impacts of perceived climate changes, cities were asked if they experienced increases in and impacts from natural disasters, as well as changes in local flora and fauna, coastal erosion, rural to urban migration, and disease vectors in the past five years, as compared to historical patterns. Out of the 468 survey responses, 225 cities report experiencing at least one of these impacts – a rate of 48%.

As seen in Figure 3, the two most highly reported impacts are damage to local government property from natural disasters and changes in local flora and fauna. Both of these are reported by over 40% of the 225 cities that perceive they are experiencing climate-related impacts. Within each region, the presence of impacts from natural disasters largely takes the form of property damage. The exception is Asian cities. Despite 72% reporting an increased frequency in natural disasters, only 39% report increases in damage to city property.

In the environmental domain, changes in local flora and fauna are affecting all regions at relatively similar rates, with approximately 40% of cities in each region reporting that this is an issue they have observed. Only Europe deviates from this pattern, with 60% of cities noting this impact and attributing it to climate change. Coastal erosion is most prevalent in Africa, Canada, and Australia and New Zealand, where about 40% of cities report experiencing this impact. In contrast, rates in all other regions are below 18%.

FIGURE 3 | PERCEIVED CLIMATE IMPACTS



Cities also are noting human impacts of climate change. Migration to urbanized areas occurs at different rates across the regions surveyed. At the high end of the spectrum, 88% of African cities report experiencing this impact, followed by 44% of those in Asia. At the other extreme, only 14% of U.S. cities report that migration is taking place as a result of climate change. While only 10% of cities experiencing climate-related impacts note increased death, the rate is much higher in Asia, Latin America, and Africa – at 33%, 27%, and 25% respectively. There also are some increases in disease that are being attributed to climate change, with the greatest frequencies reported in Canada (50%) and Latin America (53%).

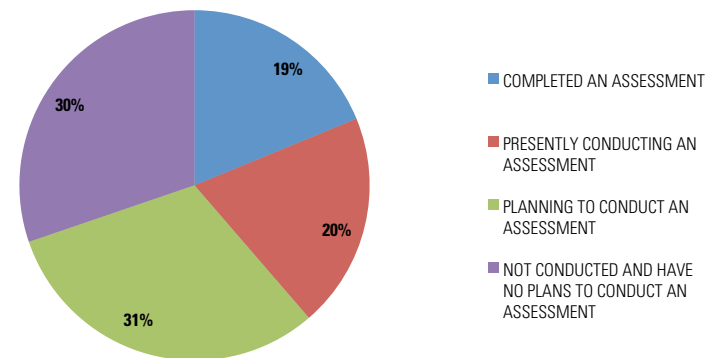


Climate Risk and Vulnerability Assessments

Assessments are a means through which cities can move from general perceptions of change to systematic evaluation of the types of climate risks and vulnerabilities they may face. A number of different types of and approaches to assessments have been promoted by international organizations and NGOs, with some emphasizing risk and others vulnerability. Therefore, cities were asked whether they are conducting either of these types of assessments and, if so, how far along they are in the process. As summarized in Figure 4, 19% of the cities responding to this question have completed an assessment and a similar number are in the process of conducting one. An additional 31% plan on conducting an assessment at some point in the future. This leaves 30% that have not assessed risk or vulnerability to climate change and do not plan on doing so. It is important to note that while some of these 30% may be electing not to evaluate risk and vulnerability, others may be assessing their status by drawing on national, state, or regional data that are readily available to them, rather than conducting separate assessments.

The plans to conduct an assessment and the degree of completion vary between regions. Cities in Canada, Africa, and Australia and New Zealand all have high rates of assessment completion, at approximately 40% in each region. Furthermore, many additional cities in each region plan on doing an assessment or are in the process of doing so. For instance, in Australia and New Zealand and in Africa, over 90% of cities indicate that they have conducted, are conducting, or are planning to conduct an assessment, while

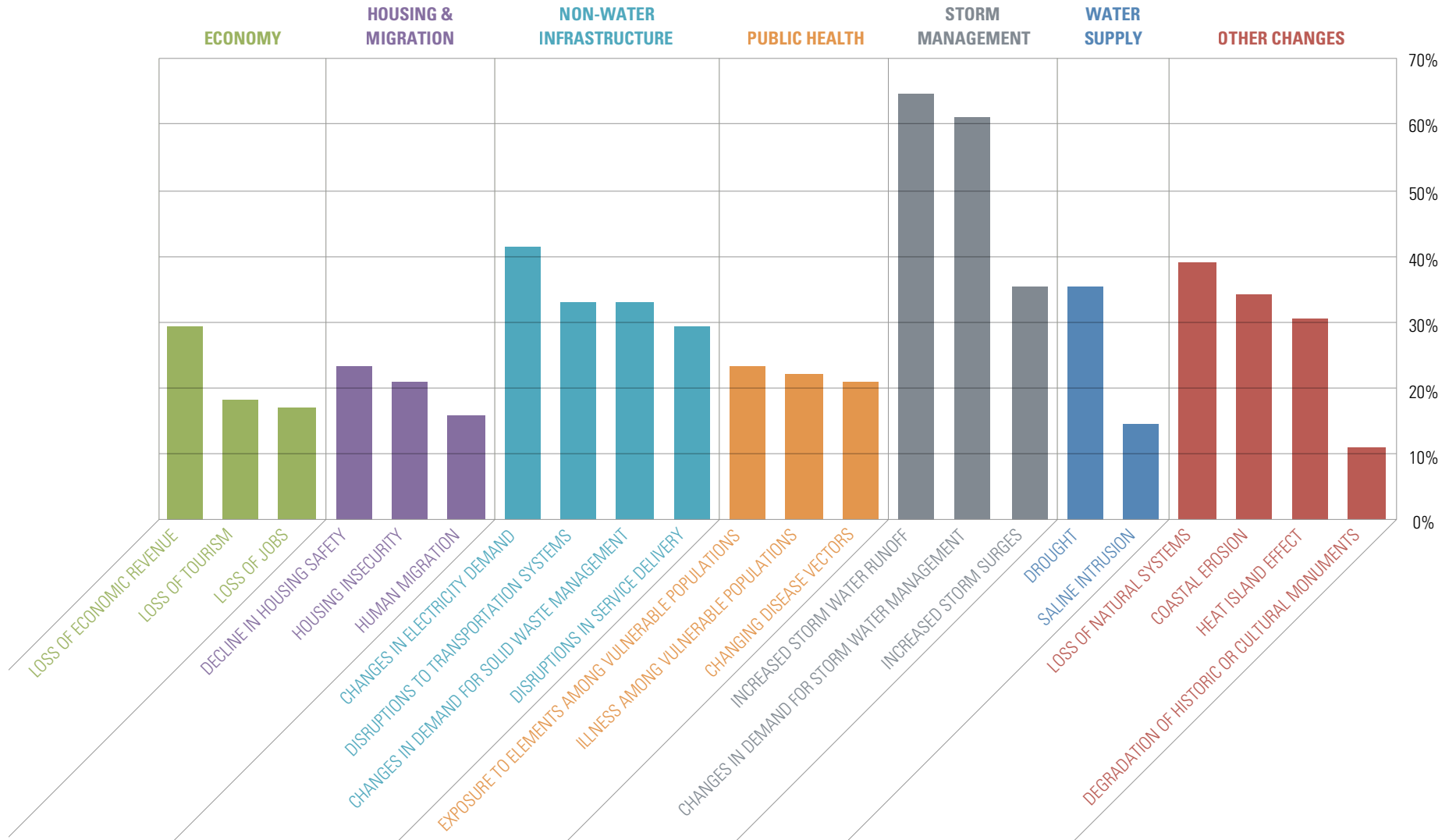
FIGURE 4 | RISK AND VULNERABILITY ASSESSMENTS CONDUCTED IN CITIES



in Canada, all cities report that this is on their agenda.

In Asia, Europe, Latin America, and the U.S., 20% of cities or fewer have completed a risk or vulnerability assessment. Cities in the U.S. trail with a completion rate of 13%. In Latin America and Europe, 45% and 40% of cities, respectively, currently are conducting an assessment. In Asia, fewer cities are in the assessment phase, but 42% still plan on conducting one. As a result, the majority of cities in Europe, Latin America, and Asia have completed an assessment, are conducting one, or plan on doing so. The U.S. is distinguished by both a low completion rate (13%) and a low percentage of cities that expect to conduct some form of assessment (42%).

FIGURE 5 | IMPACTS ANTICIPATED AS A RESULT OF CLIMATE CHANGE



Priority Issues

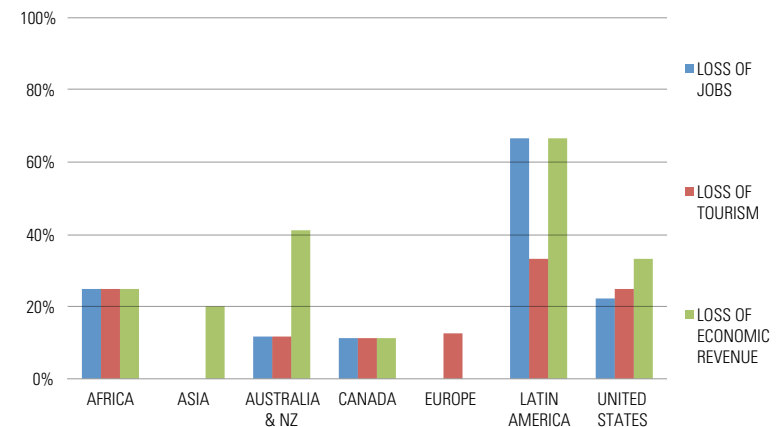
Cities that conduct risk and vulnerability assessments typically are able to identify the projected impacts and climate-related threats that they face. These specific issues naturally vary from city to city, as risks and vulnerabilities are location-specific. The 87 cities that completed assessments were asked what issues they identified as critical to address.

All of the cities report that, based on the assessment results, they expect to face climate impacts. As summarized in Figure 5, the most prevalent issues are related to storm water. Specifically, 65% expect increased storm water runoff and a similar amount (61%) report that they will face changes in demand for storm water management. Furthermore, 35% report that storm surges will be an issue. The second highest rated area of impact is non-water infrastructure. Forty-one percent of respondents note that they expect changes in electricity demand while over 30% of cities report that they anticipate facing disruptions to transportation systems and changes in demand for solid waste management. Additionally, 29% expect disruptions in future service delivery.

Other prevalent issues expected to arise as a consequence of climate change in cities around the world are loss of natural systems (39%), drought (35%), coastal erosion (34%), and urban heat island effects (30%). Notably, 29% of cities expect that climate change will bring a loss of economic revenue. Some of the least reported impacts, in contrast, are degradation of historic or cultural monuments (11%), saline intrusion into bodies of water (15%), human migration (16%), and loss of jobs (17%).

Some regions vary from the trends in the aggregate responses.

FIGURE 6 | ECONOMIC IMPACTS



In Latin America, for instance, disease, infrastructure, job loss, housing shortages, and a loss of natural systems are all major challenges expected due to climate change. Additionally, as seen in Figure 6, Latin America is the region that reports economic challenges with the greatest frequency as a climate-related issue they would need to address.

Figure 7 further illustrates that housing security and declines in housing safety are more widespread concerns in Latin America than in any other region. While housing safety and security impacts also are highly rated in Africa, human migration is the top concern in the region, as well as the highest rated of all regions. Canada also stands out as expecting significant impacts in housing safety and human migration while the U.S. anticipates impacts leading to housing insecurity.

FIGURE 7 | HOUSING AND MIGRATION IMPACTS

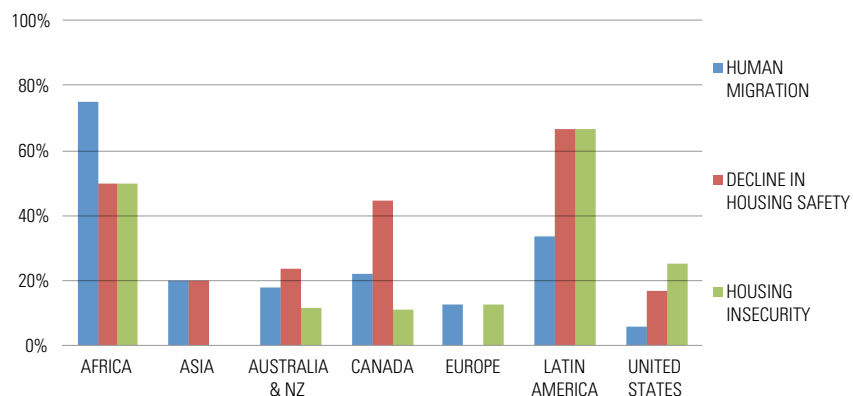


FIGURE 8 | HEALTH IMPACTS

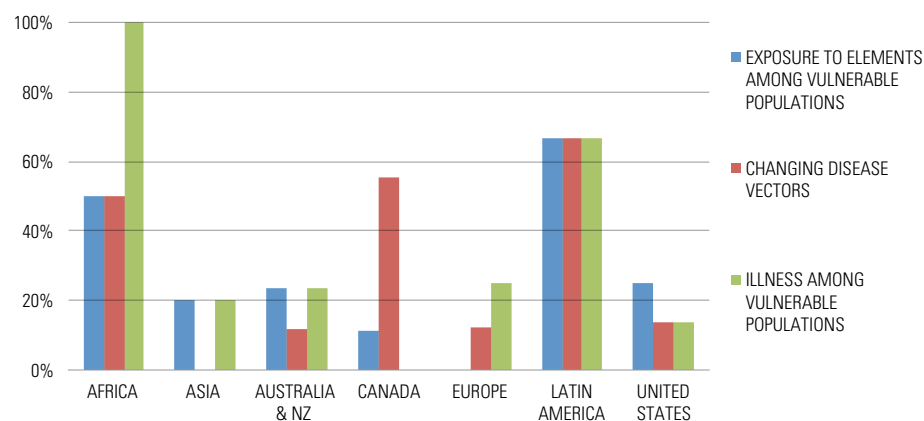


Figure 8 illustrates that illness, exposure to the elements, and changing disease vectors are expected to be most prevalent in African and Latin American cities. Developed countries also anticipate health-related impacts, with Europe rating illness the highest among developed regions, Canada anticipating changing disease vectors, and the U.S. expecting relatively high rates of exposure to the elements.

A number of other regional variations are anticipated based on the results of assessments conducted by cities. In particular, in addition to illness and human migration, African cities report that infrastructure-related issues such as electricity demand and solid waste management are likely to be challenges they will face. Canadian cities identify storm water-related challenges as the most prevalent (89%), mirroring worldwide patterns. In addition, a loss of natural systems and changing disease vectors (56% each) are expected to be climate impacts that Canadian cities will need to address. Many European cities (63%) report that disruption to transportation systems is an impact they will need to address, while Australian cities indicate that storm water issues will be one of the most significant impacts they will face (65%), followed by a loss of natural systems and changing electricity demand (47% for each). In Asia, the most predominant issues are drought and increased demand for storm water management (60% each).

IV

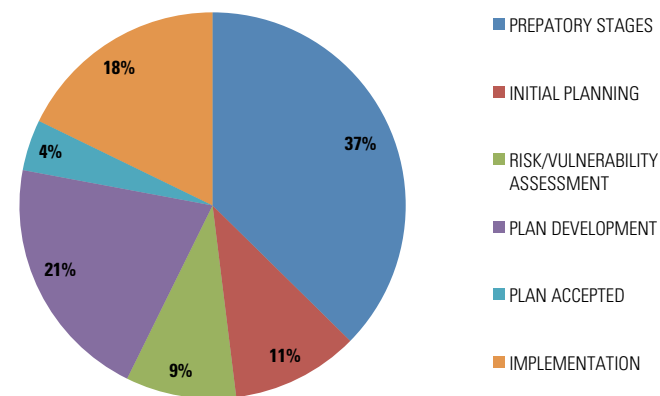
Status of Urban Adaptation Planning

In light of current and expected changes, many cities around the world report that they are planning for climate adaptation. Cities were asked if they are working on some form of adaptation planning, including being engaged in even the earliest stages of planning, such as informal discussions and meetings. In total, 68% of cities worldwide report initiating some form of adaptation planning. Latin American and Canadian cities lead with the highest rates of engagement in adaptation planning, at 95% and 92% respectively. These two regions are followed by Australia and New Zealand (86%), Europe (84%), Africa (80%), and Asia (67%). The lowest rate of adaptation planning is seen in the U.S. (59%). When the average is calculated without the U.S., the worldwide average of cities engaged in some form of adaptation planning jumps to 84%.

Cities can pursue a variety of activities in order to advance adaptation planning. Although there are manuals and guidebooks that offer step-by-step recommendations on how to plan, the field is too new for norms to be generally accepted or specific processes to be regarded as the best way to approach adaptation. To capture the status of efforts taking place in cities, respondents engaged in any form of climate adaptation planning were asked to indicate what activities best characterize their efforts at the present time.

As summarized in Figure 9, approximately 37% of cities are in the preparatory stages of adaptation planning. This encompasses

FIGURE 9 | STATUS OF ADAPTATION PLANNING



gathering information, exploring options for adaptation, and holding informal discussions. Another 11% are in the initial stages of planning, such as forming committees, researching climate science, and holding preliminary meetings. Another 9% are working on risk and vulnerability assessments. This number differs from the self-reports of assessments summarized in the previous section of this report since it is limited to cities engaged in some form of planning and that also elected to respond to this question. Finally, about 21% of the cities report that they are working on plan development, 4% have had their plan accepted, and 18% are working on implementation.

Canadian cities are fairly evenly distributed across each of the different planning phases while those in Latin America are balanced across preparation, plan development, and initial planning. Many cities in the U.S. (48%) and in Australia and New Zealand (32%) are in the preparatory stages while in Asia, many cities report that they are either in the preparatory phase (25%) or working on plan development (31%). Europe and Africa both report relatively high levels of activity on plan development and implementation. Specifically, in Europe, 18% are working on plan development stage, with an additional 9% reporting that the plan has been accepted but not yet implemented and 33% indicating that they are engaged in implementation. In Africa, 29% report working on plan development and 43% on implementation, with relatively few cities indicating that they are in the preparatory phases or working on assessments.

V

Approaches to Adaptation Planning

A number of international organizations and consulting firms have been promoting stylized approaches to pursuing adaptation and creating adaptation plans. However, cities engaged in this process demonstrate that there not only is a great deal of experimentation taking place, but that they have distinct priorities and approaches regarding the types of plans they develop. These range from strategic plans to sector plans, with some cities taking a multi-prong approach and developing strategic and sector plans.

The cities engaged in adaptation planning were asked what type of plan they are developing or have developed, with the option to indicate more than one type. Although there has been increasing rhetoric about the importance of mainstreaming and some debate about the need for general plans, about 50% of the cities are working on or have developed strategic plans.

There also is a nearly even distribution between cities pursuing detailed (19%) and sector (18%) plans. As summarized in Figure 10, cities in the U.S. (61%) and Latin America (56%) are favoring strategic plans. Among Canadian, European, and Asian cities, there is a fairly even spread between the three types of approaches. Detailed plans are strongest in Australia and New Zealand and used least in Latin America, followed by the U.S. and Africa. Africa stands out as unique in its frequent use of sector plans.

Cities pursuing adaptation planning were asked if they have

FIGURE 10 | APPROACHES TO ADAPTATION PLANNING BY REGION

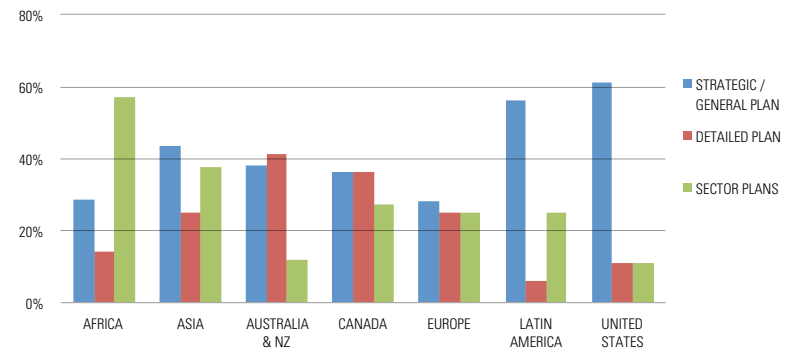
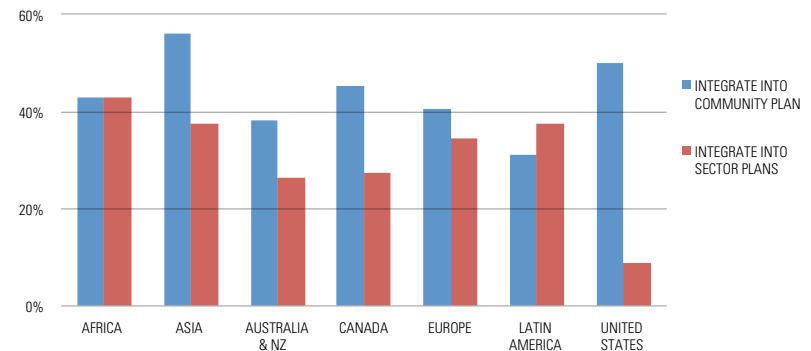


FIGURE 11 | INTEGRATION OF ADAPTATION INTO COMMUNITY AND SECTOR PLANS



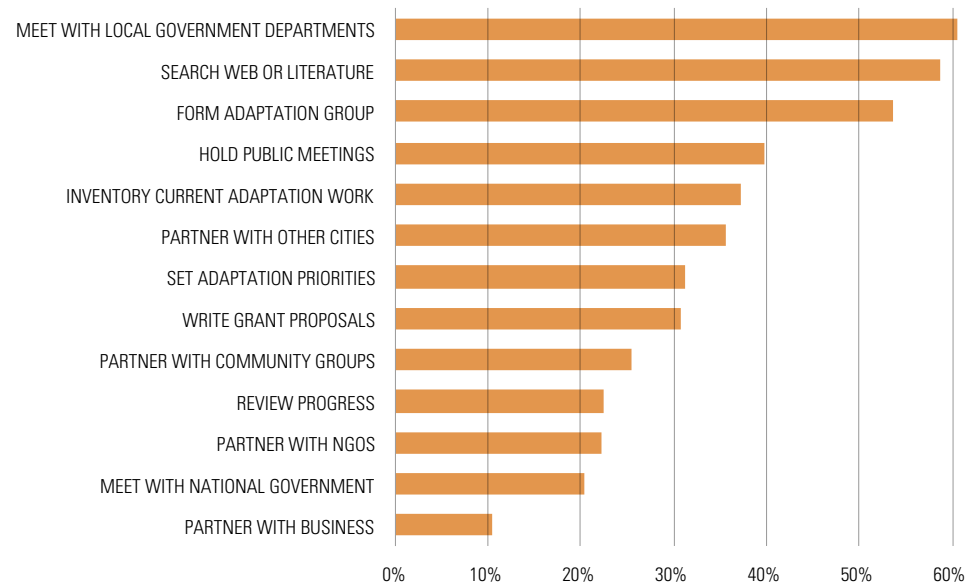
integrated (or expect to integrate) adaptation into either community or sector plans or both. Since the question did not specify the type of community plan, most responses likely reflect integration into comprehensive land use plans. As indicated in Figure 11, integration is taking place across all regions. Notably, cities in Asia, the U.S., and Canada have the highest rates of integration into community plans. These regions also have the greatest difference between community and sector integration. For instance, 50% of U.S. communities have made (or expect to make) adaptation part of community plans, but less than 9% are integrating adaptation into sector plans. While Africa has an even balance between community and sector integration, it also has the highest rate of sector integration overall (43%), followed by Asia and Latin America.

Adaptation Planning Activities

The adaptation planning process can encompass a variety of activities and participants. Although some trends are emerging, cities vary in the activities they pursue and types of stakeholders they involve. The cities engaged in adaptation planning were asked what types of activities they pursued to support and promote their planning processes. The results are shown in Figure 12.

Three types of activities are reported as common in cities worldwide. First, 61% have met with and engaged local

FIGURE 12 | ACTIVITIES TO SUPPORT URBAN CLIMATE ADAPTATION PLANNING



government departments in the planning process. The high level of engagement of local government departments is consistent across all regions and reflects the priority cities are placing on engaging and working with representatives from across departments in the planning and implementation processes. In contrast to engagement with local government departments, only 20% of the cities report meeting with national government agencies. There are significant regional differences behind this number, with over 40% of European and Asian cities engaging national government agencies about adaptation, but only 11% of U.S. cities having done so.

The second highest rated activity is searching the web or literature for information on adaptation. Needless to say, looking for web-based reports and information is a generally accessible and low cost means for obtaining information. Third, 54% of cities report that they have formed some type of group to support adaptation planning, such as a commission, task force, or advisory group. Of note, over 75% of cities in Latin America and Canada have formed such groups.

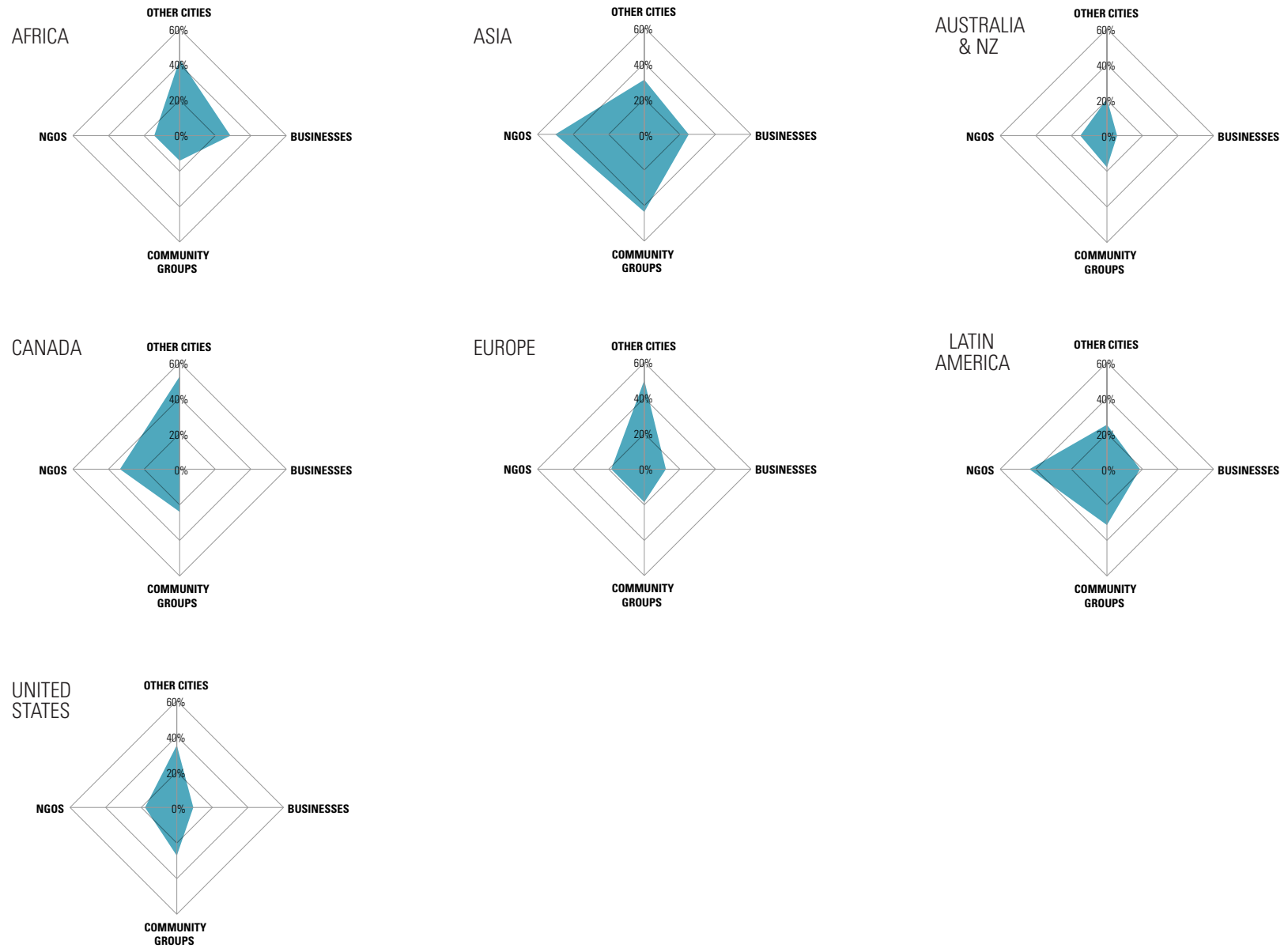
Beyond forming advisory groups, task forces, and commissions dedicated to advancing adaptation, many cities develop partnerships with NGOs, other cities, businesses, or community groups. Figure 13 shows the types of partnerships formed by cities in each region. Overall, this figure illustrates that Asian cities appear to frequently seek out partnerships, while they are generally uncommon in Australia and New Zealand. Of the various types of partnerships, those with other cities are the most common relationships in Africa (43%), Canada (52%), Europe (50%), and the U.S. (35%).

Asian and Latin American cities are distinguished by their high rates of partnerships with NGOs and community groups. Canadian cities also have a relatively high level of partnerships with NGOs (33%) while partnerships with community groups are present in just over one quarter of U.S. cities. Despite the frequency with which cities tend to engage different stakeholders, only 11% of cities worldwide report forming partnerships with business, with those in Africa exhibiting the greatest frequency (29%) in this domain.

Understanding the types of activities already taking place that

can provide a foundation for adaptation, along with setting priorities and reviewing progress, can advance planning and foster implementation. Therefore, the survey examined whether these specific activities were present in the context of adaptation. Overall, 37% of cities have created an inventory of current activities that can support or are aligned with adaptation. In contrast, 31% have set adaptation priorities and 23% have reviewed progress. The successively lower percentages seem to be aligned with most cities reporting that they are at the earliest stages of planning rather than having developed plans or being at the point of implementation. From a regional perspective, Canadian cities consistently lead in all three of these activities with 57% having created an inventory, 38% having set priorities, and 38% having reviewed their progress to date. Africa is the only region in which over half of cities have set priorities for adaptation.

FIGURE 13 | PARTNERSHIPS BY REGION



VI

Challenges in Adaptation Planning

Adaptation is a new policy arena, one where knowledge is advancing rapidly and where many local governments are taking action with limited resources. To understand the practical realities of adaptation planning, cities were asked to respond to a series of questions about the challenges they face. For each item, respondents were asked to rate the challenge on a scale of 0 through 4, where 0 equaled 'no challenge.' Figure 14 shows the percentage of cities ranking each item as a 3 or a 4.

As Figure 14 suggests, nearly all of these items are viewed as notable barriers by at least some cities, with sixteen out of nineteen items rated as major challenges by over half of respondents worldwide. Even the lowest ranked item – learning from other communities – is still a major challenge for over 20% of the cities. Since global trends can mask the unique challenges faced within regions, a chi-square test for independence was conducted on each item. The following challenges are the ones with significant regional variation ($p < 0.05$):

- Obtaining accurate scientific data
- Securing funding for adaptation
- Mainstreaming adaptation into existing work
- Generating interest among businesses
- Allocating staff time
- Reallocating existing resources to adaptation
- Connecting to the international community
- Communicating the need for adaptation to elected officials

- Gaining commitment to adaptation from political decision-makers

Resource Challenges

Not surprisingly, resource-related challenges are the highest rated overall. Pursuing adaptation planning requires the availability of funds to support staff time, hire consultants to conduct research, purchase data, and promote outreach. Securing funding for adaptation work is a major challenge for 85% of cities worldwide. However, about 70% of cities in Asia, Europe, and Canada rate this as a challenge as compared to approximately 90% in other regions (Figure 15).

Cities can look to a variety of funding sources to support their initiatives, such as national governments, UN agencies, private foundations, and development banks. Therefore, survey participants were asked about the sources of funding they have been able to tap for their adaptation work.

In general, most cities (60%) are not receiving any support for their adaptation activities. National governments are reported as providing funding most often, but this is still accessed by less than one-quarter of the cities (24%). A modest number of cities report that they are receiving funds from sub-national sources (9%) such as regional and local governments, and from private foundations and non-profit organizations (8%). Furthermore, international support from development agencies and banks, the

FIGURE 14 | GLOBAL CHALLENGES IN INITIATING OR ADVANCING URBAN ADAPTATION

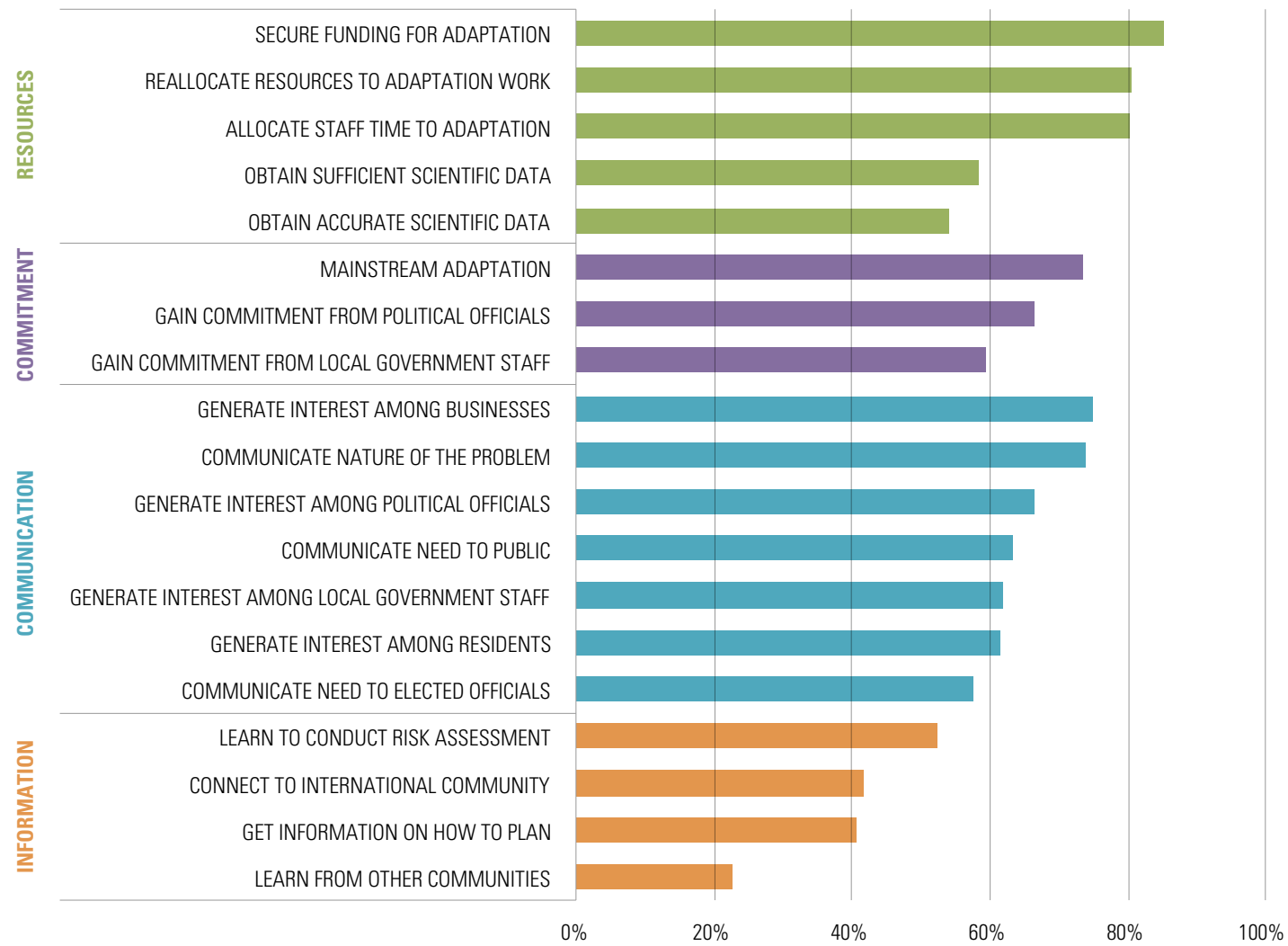
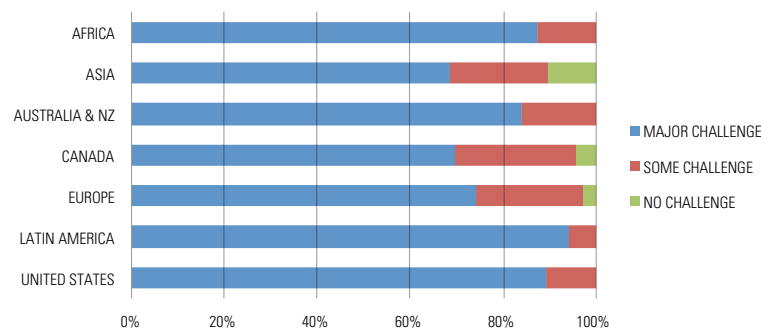


FIGURE 15 | THE CHALLENGE OF SECURING FUNDING FOR ADAPTATION

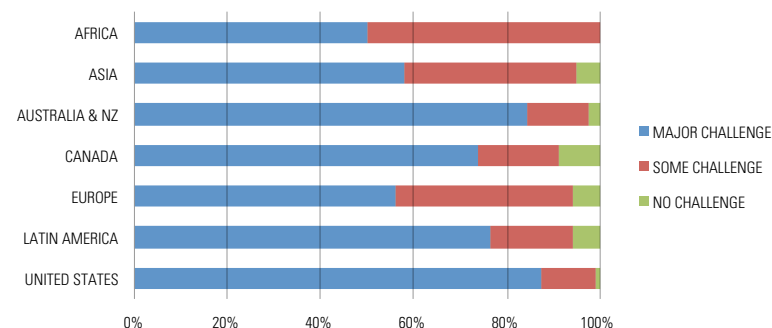


UN, research institutes, and official development assistance is quite limited, with only 2-4% of cities globally reporting that they are receiving aid from these sources.

National governments are the most common source of funding for most regions, but Africa is an exception where the most prevalent source of funding is development agencies (21%). Among other regional variations in funding, Canadian cities report high rates of sub-national funding (20%) while Europe and Asia both report international sources being the second most prevalent source of funding, at 18% and 17% of cities respectively. In Latin America, the second most common source of funding is multilateral development banks (17%). Cities in Australia and New Zealand report low levels of funding from private foundations (0%) and nonprofits (4%). Finally, rates of support for U.S. cities from private foundations (17%) and nonprofits (16%) are high compared to global averages.

The ability to draw on staff time and the reallocation of resources

FIGURE 16 | THE CHALLENGE OF ALLOCATING STAFF TIME TO ADAPTATION



to support adaptation are resource challenges in approximately 81% of cities worldwide. As shown in Figure 16, allocating staff time is a significant challenge in cities in the U.S, Australia and New Zealand, and Latin America. In contrast, fewer cities in Asia, Europe, and Africa rank this as a major challenge. Reallocating existing resources is less of an issue in Asia and Europe, posing a challenge for 60% of the cities in each of these regions, as compared to reports of 80% to 90% of cities elsewhere. In Africa, this means that reallocating non-staff resources is a greater challenge than allocating staff time, while in Canada, the reverse is true.

Commitment and Communication Challenges

Gaining commitment and communicating the importance of pursuing adaptation are ongoing challenges for the majority of cities participating in the survey. With regard to communication, 74% of cities overall report that communicating the nature of adaptation problems is a major challenge, and 58% note that communicating adaptation needs to elected officials, specifically,

is a major challenge. Canadian cities stand out as having the lowest level of challenge with respect to communicating the need for adaptation to local elected officials. Less than one third of Canada's cities note this as a major challenge, compared to 50% to 60% of cities in other regions.

With respect to gaining commitment from local elected officials and local government agencies, 73% of respondents worldwide indicated that this was a challenge. However, in keeping with communication trends, Canadian municipalities are distinguished by the strong commitment to adaptation planning exhibited by their local elected officials (48%), followed closely by cities in Europe (41%) and Asia (38%). In contrast, less than one quarter of the municipalities in the U.S., Australia and New Zealand, and Africa indicate that their local officials have a strong commitment to adaptation. All of the African cities report that they have at least moderate levels of commitment. A high level of consistency is present between the levels of commitment exhibited by elected officials and by local government departments (Figures 17 and 18).

National governments can play a crucial role in supporting adaptation planning in cities. Survey respondents were asked if they believe their national governments understand the realities that they faced when planning for adaptation. As summarized in Figure 19, only 7% of cities surveyed believe that their national governments fully understand the realities of adaptation planning at the local level, followed by 63% indicating that their national governments have some level of understanding. This leaves a total of 30% of the cities finding that their national governments have no understanding of the realities they face when attempting

FIGURE 17 | COMMITMENT OF LOCAL GOVERNMENT DEPARTMENTS

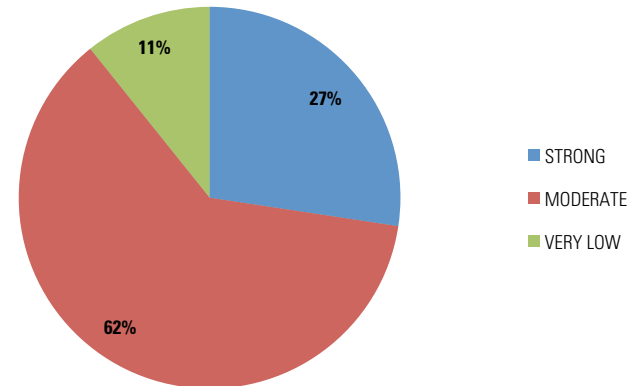
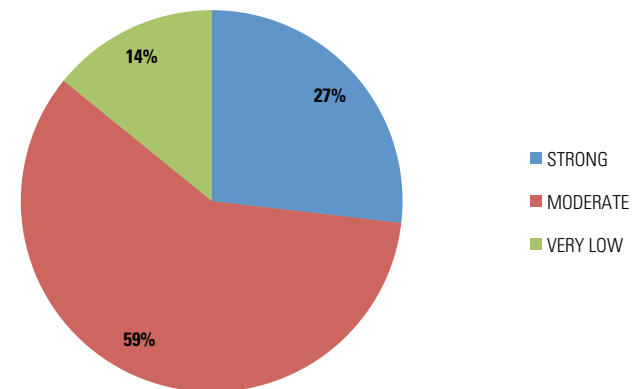


FIGURE 18 | COMMITMENT OF LOCAL ELECTED OFFICIALS



to plan for climate impacts.

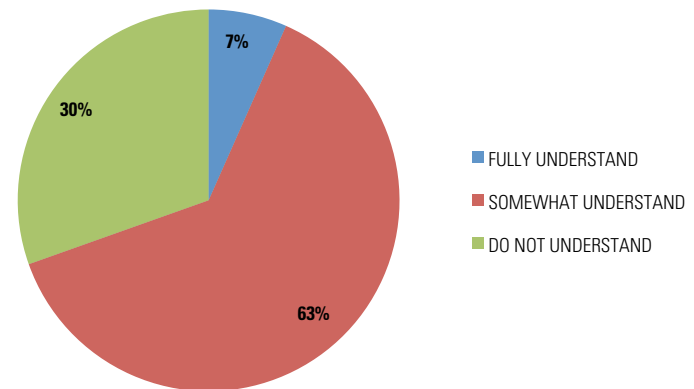
Cities in Asia, Europe, and Africa report the highest levels of understanding from their national governments. Even in these regions, however, fewer than 25% of cities believe that their national governments fully understand the realities of adaptation planning at the local level. The responses in the rest of the world are lower. A total of 6% or less of cities in the U.S., Latin America, and Australia and New Zealand report full understanding from their national governments. Most notably, not a single Canadian city reports that the national government has a complete grasp of local-level issues, while 30% indicate that national government has no understanding at all. This lack of understanding was only surpassed by the U.S., where 36% of cities feel that national government does not appreciate the challenges they face and the support they need in adaptation planning.

While many cities are wrestling with gaining the interest of political officials, they also are finding it challenging to engage business, particularly in the U.S., Australia and New Zealand, and Africa. Mainstreaming adaptation work into existing local government activities also is a significant barrier for cities everywhere, but most so in Africa, where all respondents note that this is a major challenge. In contrast, about 50% to 70% of cities in other regions report that this is an issue.

Informational Challenges

Informational challenges, as a cluster, are among the lowest ranked. Over the years, an emphasis has been placed on the need for more and better scientific data. Although not ranked as high as many other challenges, the need for data remains a

FIGURE 19 | NATIONAL GOVERNMENT UNDERSTANDING OF LOCAL REALITIES



challenge for over 50% of cities worldwide. In particular, this is noted as a greater challenge for cities in Latin America and Asia. Many cities obtain information by networking with other cities, attending international conferences, and participating in international events. Getting information on how to plan and learning from other communities are the two lowest ranked challenges. Connecting to the international community is the third lowest ranked challenge. Although rated low globally, over 50% of cities in Africa, Asia, Latin America, and Australia and New Zealand indicate that they find this a major challenge.

VII

Summary and Conclusion

Many cities around the world are aware of the potential for climate change to have an impact on their operations, assets, and residents. Nearly 40% of cities that participated in the survey have conducted or are in the process of conducting an assessment. Of these cities, all report that they expect to be affected by one or more climate-related impacts, with the most anticipated impact being increases in storm water runoff. Although there is a high level of awareness, most cities are still at the earliest stages of planning, having just started to discuss or think about the best way to proceed. In keeping with this nascent stage of planning, the most common adaptation planning activities are formative measures such as meeting with local government departments and doing online research. In envisioning the subsequent approaches they will pursue, most cities expect to develop a general strategy and to link adaptation to their comprehensive or sector plans.

There has been some debate about the virtues of developing plans versus focusing on mainstreaming adaptation. Despite the variability in these arguments, it appears that most cities are looking into both options but currently placing an emphasis on planning. Half of the cities working on planning are focusing their efforts on developing strategic plans. In addition to strategic plans, many cities are working to integrate adaptation into their existing community or sector plans. These latter approaches are suggestive of efforts being made to mainstream adaptation into areas such as disaster risk reduction and land use planning.

However, many cities note that they are finding it challenging to mainstream adaptation into other plans and into ongoing activities.

The approaches that cities are using to plan take many forms and follow different sequences. However, it is common for cities to form adaptation committees, hold public meetings, and meet with local government departments. To further facilitate the process, many cities also are forming partnerships with NGOs, community groups, and businesses. However, here too they are finding that these efforts at building partnerships are difficult, as many note that communicating with and generating commitment from local government departments and businesses are notable challenges.

Regional Trends

Although cities around the world are facing many similar impacts and planning challenges, a number of regional variations are present. African cities are distinguished by their high level of sector-based planning as well as engagement in implementation. While this bodes well for planning action and potentially for advancing development, it is not clear whether these activities are, in fact, climate-specific. Mainstreaming adaptation is a rising trend worldwide. In keeping with this movement, one possibility is that activities in sectors such as disaster risk reduction and land use planning are viewed as synonymous with adaptation. Compared to the global average, African cities have higher levels of NGO involvement in planning and lower levels of community

group and local resident involvement.

A greater proportion of cities in Latin America are engaged in climate adaptation planning than any other region. One feature that is central to Latin American cities is that they see strong links between climate adaptation and economic development, housing, migration, and public health. A further feature is that the region exhibits high levels of partnership with NGOs. In contrast to Latin America, Asian cities rank second to last when it comes to engaging in climate adaptation planning. However, this is still almost 70% of the Asian cities surveyed. Over half of the Asian cities engaged in planning are either in the preparatory stages or pursuing plan development. While cities report that they are pursuing a variety of different plan types, the region is notable for its emphasis on integrating adaptation into existing community or comprehensive plans. Further, as in Africa, NGOs are engaged in the planning process. Local NGOs are involved in the adaptation planning processes of 44% of Latin American cities and 50% of Asian cities, compared to just 26% of cities worldwide. In Asia, 50% of cities also report that international NGOs are involved in their adaptation planning, higher than in any other region.

Canadian cities are pursuing adaptation planning with a variety of approaches. However, a notable feature is that the majority have created adaptation commissions or task forces and are inventorying their current adaptation activities. Many European cities have plans under development or at the implementation stage. These cities are pursuing adaptation through strategic, general, and sectoral planning, with an approximately even split between the three types of approaches. Australia and New

Zealand lead in the percentage of cities that have completed climate risk and vulnerability assessments. While many cities in this region are pursuing adaptation planning, few are developing dedicated sector plans. Furthermore, relatively few cities in this region are engaged in partnerships, working with national government, or coordinating with local government departments. Approximately 27% of cities in the U.S. are conducting climate risk and vulnerability assessments (or have completed one) and 59% are engaged in climate adaptation planning. Despite these high rates overall, the U.S. has the lowest percentage of cities engaged in assessments and planning relative to other regions. Those cities that report that they are taking action are largely in the early preparation stages. Overall, few cities have engaged the federal government, although many are coordinating with other cities.

Barriers to Adaptation

Many cities are at the early stages of adaptation planning. However, they already are encountering notable challenges that are shaping their progress. In general, cities throughout the world report that they are having difficulty obtaining financial resources, allocating staff time, communicating the nature of the program, generating interest among political officials and business, mainstreaming, and gaining the commitment of local elected officials and government departments. Scientists and policy analysts alike have placed an emphasis on the need for more and better scientific data to enable assessments and sound planning. While accurate and sufficient data are important and are noted as challenges by survey respondents in some parts of the world, this is not as highly rated a resource challenge as the

availability of funding and staff time. In contrast to resources, information about planning and assessments are generally rated relatively low. Two additional global trends are that most cities believe their national governments have limited understanding of the challenges they are facing, and most have limited access to financial support from local, regional, national, and international sources.

When regional challenges are examined, there are a number of deviations from the global trends. Several are notable. First, obtaining scientific data is reported as a greater challenge in Latin America, Africa, and Asia than elsewhere in the world. Second, while most regions report little to no commitment from their national governments, many Latin American cities indicate the opposite, noting that they have high levels of commitment from and engagement with national governments. European cities also benefit from relatively strong support from their national governments, as do Asian cities. Third, with respect to local level commitment, Canadian cities are differentiated by the relatively high levels of support they receive for adaptation from local elected officials and government departments. In contrast, European cities have relatively high levels of commitment from local officials, but not from local departments, while cities in Australia and New Zealand have low levels of commitment from officials, but relatively high levels of support from local departments. Further, U.S. cities face challenges in gaining commitment of both local officials and departments. Fourth, informational challenges are rated low overall, but gaining information on how to plan is rated as a challenge in Africa and Asia. Latin American cities rate the

need for information on conducting assessments highest among all regions.

Conclusion

Cities around the world recognize the climate-related impacts that they face, and many have begun to pursue adaptation planning. Despite these efforts to promote adaptation, cities in all regions report that they are encountering numerous challenges. A lack of resources is a barrier to advancing adaptation worldwide. Financial resources are essential for cities seeking to make their infrastructure climate resilient, but most cities are finding that they are unable to obtain dedicated funds for adaptation. While some are folding adaptation into existing work or integrating climate change considerations into new projects as no- or low-regrets measures, most find that they are constrained when it comes to making investments. The alternative is to focus on non-structural measures such as policies and communication since they often require limited financial investment. However, cities also note that they encounter barriers when it comes to gaining the commitment of local officials and departments as well as in communicating the need for planning to government officials and other stakeholders. Further, many cities report that national and regional governments do not appreciate that cities need to take action to prepare for climate impacts.

Many cities are moving forward with adaptation, despite limited support. Often, they are moving forward a step at a time, assessing what is feasible in a resource-constrained context and identifying how adaptation links with and can be integrated into

ongoing activities. In many instances, cities find that they can obtain information by participating in peer networks and puzzle through challenges through trial and error. However, as the results of the survey suggest, without the commitment of local political officials and the acknowledgement of this agenda by national governments, it will be difficult for cities to make rapid advances in planning and to move from planning to implementation. The commitment of national and local political officials is an important foundation since it provides credibility for adaptation. While financial and informational resources will still be needed, when political support and commitment exist to promote adaptation, cities will find it easier to foster engagement among local government departments and to mainstream adaptation into their ongoing initiatives.

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