

INNOVATE
CITIES



Global Research and Action Agenda for Cities and Climate Change Science (GRAA) *2026–2028 Priorities*

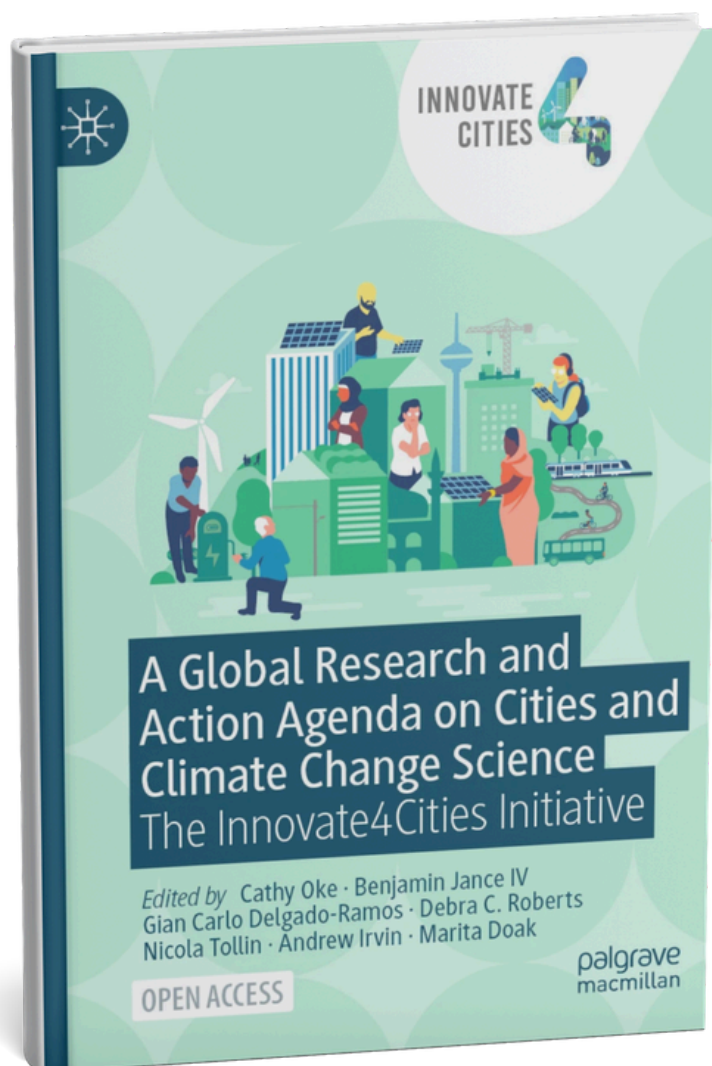
*An Output from
Innovate4Cities 2026*



Introduction to 2026–2028 GRAA priorities

The key output from the very first Cities and Climate Change Science Conference, 2018 in Edmonton Canada, was the landmark Global Research and Action Agenda on Cities and Climate Change Science (GRAA). Since then two further iterations have been made, updating the knowledge gaps and action priorities for cities on climate change. See the Innovate4Cities Book – published in 2026 – or more information on the history of the Conference series and subsequent development of the GRAA and impact it has had, leading up to the Innovate4Cities 2026 Conference in Nairobi Kenya, June 24–26 2026.

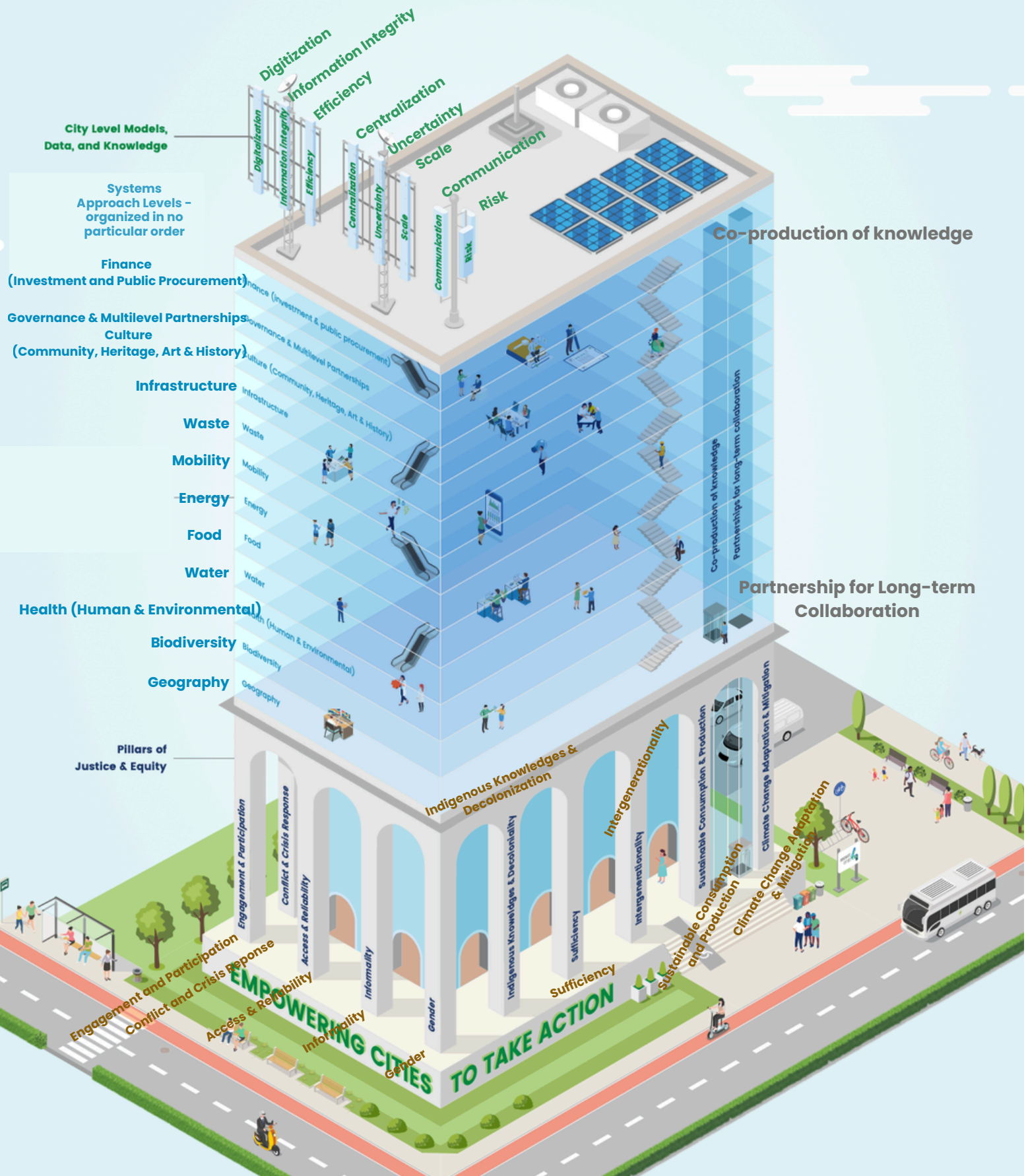
A decision was made for the 2026 Conference, to take the lessons and recommendations from the 97 authors who contributed to the Innovaet4Citeis book, combine this wisdom with themes and participant input from the Nairobi event, to generate a key list of ten – taken from the most recent iteration of the GRAA – from 2024.



Download the book



A systems approach to research & innovation in urban planning & design utilizing city-level models to deliver just & equitable action in climate resilient development





Scoring Methodology

2026 – 2028 GRAA Knowledge Gaps and or Action Priorities determined via alignment across I4C2026 conference proposals, I4C book recommendations, I4C2026 workshop and I4C2026 participant survey

Combined Score:

Sum of all per-theme alignment scores for the GRAA item – higher = more cross-cutting relevance across groups & themes and Chapter 12 book recommendations..
https://link.springer.com/chapter/10.1007/978-981-95-6517-7_12

Number of Proposals:

Number of I4C2026 conference session proposals matched to this item – reflects live community demand

Duplication Weight:

Items appearing in multiple groups/themes receive higher combined scores, reflecting broader structural relevance

Rank:

Final rank by combined score; ties broken by raw proposal count, then group breadth, then alignment with book recommendations, then theme breadth

195

2024 GRAA actions and knowledge gaps (items) reviewed against 2026 I4C conference proposals

12

Recommendations from Innovate4Cities book concluding chapter

20

Top ranking Items workshopped and shared in I4C26 survey, 45 responses

10

Top 10 GRAA

Action

A recommended action for cities to implement

Knowledge Gap

A gap in research / evidence that needs to be addressed

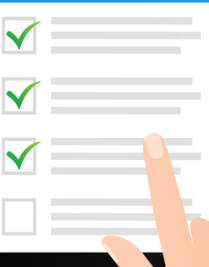
Action & Knowledge Gap

Item appears as both an Action and Knowledge Gap across themes

Rank	Combined Score	Gap #	Knowledge Gap	# Proposals (I4C26)	GRAA Group Breadth	GRAA Theme Breadth	Rank Priority Breadth	GRAA Themes Tagged
TOWERS								
Communication								
1	8.68	66	Decentralized access to context-specific tools for dealing with scenarios faced by cities in developing regions, including knowledge/resource-sharing tools and adaptive regulatory mechanisms/processes for underserved populations.	168	3	3	4	Empowering Cities to Take Action, Communication, Access & Mobility
2	8.60	68	Existing international research and funding partnerships have not effectively bridged the knowledge gap between research findings and local implementation to support urban transitions.	33	6	6	4	Decentralization, Communication, Governance & Multiscale Partnerships, Infrastructure & Housing, Engagement & Participation, Empowering Cities to Take Action
3	8.57	67	A better understanding of how historical inequities and intergenerational issues of justice and equity in cities are compounding current climate and environmental justice issues is needed.	2	3	6	7	Communication, Carbon Community, Habitat, Air & Energy, Engagement & Participation, Gender, Indigenous Knowledge & Sustainability, Interoperability
4	8.56	71	Cities experiencing ongoing disruptions, such as human conflict, suffer from poorly coordinated regulation of formal policies, necessitating robust formal and informal partnerships to prioritize immediate and long-term climate challenges.	2	6	5	6	Climate Change Adaptation & Mitigation, Communication, Conflict & Crisis Response, Governance & Multiscale Partnerships, Partnerships for Long-Term Collaboration
5	8.54	67	Methodologies are needed that harmonize varied perspectives and ensure inclusive, data-informed climate action strategies for systems approach considerations and multi-sectoral collaboration between stakeholders.	39	3	6	4	Co-Production of Knowledge, Digitalization, Information Integrity & Transparency, Communication, Governance & Multiscale Partnerships, Empowering Cities to Take Action
6	8.50	63	Research is needed on how mobile phone data can be used to understand exposure and citizen response to climate disasters and risks and inform policy to reduce future risk.	0	3	6	4	Risk, Communication, Data Literacy, Digitalization, Information Integrity & Transparency, Communication, Governance & Multiscale Partnerships, Empowering Cities to Take Action
7	8.48	50	Increased understanding of how overlapping jurisdictions and agencies, adjacent jurisdictions, and special-purpose districts interact to develop strategies to move climate change policy.	0	3	4	6	Communication, Decentralization, Governance & Multiscale Partnerships, Engagement & Participation
8	8.41	160	While there is recognition of the value of indigenous knowledge, there are limited models for fostering meaningful collaboration between indigenous and scientific communities to jointly develop climate solutions.	39	2	3	4	Communication, Engagement & Participation, Indigenous Knowledge & Sustainability
9	8.39	104	Urban wellbeing efforts face challenges around conveying goals and outcomes due to socio-cultural and ecological perceptions which inhibit greater community participation and support for urban climate initiatives which require long-term environmental/human health and socio-economic performance.	0	1	1	8	Communication
10	8.26	103	Poorly coordinated formal and informal policies require cross-sectoral communication mechanisms to bridge gaps and enhance effort ability to tackle both immediate and long-term challenges in the face of prevailing consumption-driven communication.	0	1	1	5	Communication
11	8.18	121	Communicating the robust findings around the sunk costs of how heavy reliance on fossil fuels exacerbate greenhouse gas emissions, increase risk, and deplete natural capital, and which energy sector actors are culpable for inaction enabling our current 1.5°C.	2	2	2	1	Energy, Communication
Decentralization								
1	8.88	68	Existing international research and funding partnerships have not effectively bridged the knowledge gap between research findings and local implementation to support urban transitions.	33	6	6	4	Decentralization, Communication, Governance & Multiscale Partnerships, Infrastructure & Housing, Engagement & Participation, Empowering Cities to Take Action
2	8.71	68	Current efforts to scale urban climate and biodiversity projects often fail to consider system dynamics, resulting in isolated successes rather than broader, integrated impacts.	0	6	5	8	Co-Production of Knowledge, Scale, Decentralization, Bioenergy, Climate Change Adaptation & Mitigation
3	8.51	50	Increased understanding of how overlapping jurisdictions and agencies, adjacent jurisdictions, and special-purpose districts interact to develop strategies to move climate	0	3	4	6	Communication, Decentralization, Governance & Multiscale Partnerships, Engagement & Participation

Rank	GRAA #	Stream	Priority (Summary)	Score	Proposals	Appearances
1	259	Action	Civil conflict/crisis implications for sustainable local governance and economic, social, environmental costs	8.47	29	x11
2	258	Action	Plan all action to 1.5°C overshoot scenarios; finance local development at speed exceeding national dialogue	5.13	2	x8
3	54	Knowledge Gap	Digitalization of city-level data to improve urban functions (water, waste, electricity) and build resilience	4.55	40	x5
4	39	Action	Equitable knowledge dissemination via co-design/co-production partnerships across all sectors and communities	4.44	83	x6
5	149	Action & KG	Optimise resource demands across systems; integrate renewables into transit and active transport solutions	4.39	18	x6
6	2	Action & KG	Quantify emissions savings for deep building energy retrofits; incorporate digital tools for emission reduction	4.26	86	x6
7	257	Action	Just transition policy design: decentralise job creation in climate action; address unsustainable job losses	3.86	11	x6
8	68	Knowledge Gap	Bridge gap between international research/funding partnerships and local implementation for urban transitions	3.40	33	x5
9	61	Knowledge Gap	Support local governments to capture & share case studies on best practices, barriers and innovations	3.34	54	x4
10	255	Action	Upskilling/training programs for green jobs; prepare youth, disadvantaged groups for climate action workforce	3.23	27	x5

ONLINE SURVEY



GRAA 2026–2028: Top 10 — Verified GRAA Detail

Action

A recommended action for cities to implement

Action & KG

Item appears as both an Action and Knowledge Gap across themes

Knowledge Gap

A gap in research / evidence that needs to be addressed

GRAA #	Stream	Full GRAA Priority / Knowledge Gap Text	GRAA Level	GRAA Themes / Topics
259	Action & Knowledge Gap	An understanding of the implications of civil conflict and crisis of both natural and anthropogenic origin in terms of both economic, social, and environmental cost (including displacement, loss and damages, and misattribution of resources towards unsustainable practices) is imperative in fostering sustainable local governance free of conflict-related losses.	Partnerships for Long-Term Collaboration	Access & Reliability; Communication; Conflict & Crisis Response; Culture; Engagement & Participation; Finance; Governance & Multilevel Partnerships; Mobility; Health; Partnerships for Long-Term Collaboration; Risk; Sustainable Consumption & Production
39	Action	Equitable development and dissemination of knowledge and data inclusive of co-design and co-production through collaborative partnerships across public and private sectors, and civil sectors (including youth, indigenous populations, residents of informal settlements, and other marginalized individuals).	Co-Production of Knowledge; Partnerships for Long-Term Collaboration	Communication; Culture; Engagement & Participation; Informality; Indigenous Knowledges & Decoloniality; Intergenerationality
258	Action	Local governments should plan all action in accordance with 1.5°C overshoot scenarios expected within the next generation, financing local level development across all sectors at speed and scale exceeding that of the national-level multilateral dialogue.	Empowering Cities to Take Action	Climate Change Adaptation & Mitigation; Culture; Engagement & Participation; Empowering Cities to Take Action; Finance; Governance & Multilevel Partnerships; Intergenerationality; Risk; Sufficiency; Uncertainty
54	Knowledge Gap	Further research is needed on how Digitalization of city-level data and solutions can improve key urban functions (water, waste, electricity management) increasing efficiency and contributing to mitigation, in addition to building adaptive capacity and resilience and providing other societal co-benefits.	Not tagged to one of the three GRAA Delivery-Approach levels (topical / System Approach item)	Efficiency; Digitalization; Waste; Energy; Water; Climate Change Adaptation & Mitigation
255	Action	Collaboration between governments, businesses and training institutions to design upskilling/training environmental employment programs to prepare the population (youth, disadvantaged groups, unemployed, people working in the FF sector, etc.) for climate action/green jobs. This is important not only to ensure those who need the jobs the most are able to access them, but also to ensure that climate action is not further delayed because of an unprepared workforce.	Co-Production of Knowledge; Partnerships for Long-Term Collaboration	Co-Production of Knowledge; Engagement & Participation; Informality; Intergenerationality; Partnerships for Long-Term Collaboration; Sustainable Consumption & Production
68	Knowledge Gap	Existing international research and funding partnerships have not effectively bridged the knowledge gap between research findings and local implementation to support urban transitions.	Empowering Cities to Take Action	Centralization; Communication; Governance & Multilevel Partnerships; Infrastructure; Engagement & Participation; Empowering Cities to Take Action
25	Action	Governance landscapes (considering formal and informal actors) to support greater generation of local and subnational revenue and which support groups marginalized due to gender, age, race, ethnicity, religion, indigenous status and disability.	Not tagged to one of the three GRAA Delivery-Approach levels (topical / System Approach item)	Finance; Governance & Multilevel Partnerships; Geography; Engagement & Participation; Access & Reliability; Informality; Gender; Indigenous Knowledges & Decoloniality; Intergenerationality
147	Action & Knowledge Gap	Innovative financial instruments can help address uncertainties related to climate financing. Most financial research focuses on environmental or economic returns, while the social impacts of financial mechanisms, especially in ensuring inclusivity and social justice, are often overlooked. There is limited research on how finance mechanisms can be designed to address social equity concerns in urban sustainability. Studies are needed to explore how financial models can ensure equitable distribution of benefits across urban populations, particularly marginalized communities.	Not tagged to one of the three GRAA Delivery-Approach levels (topical / System Approach item)	Uncertainty; Finance; Engagement & Participation; Sustainable Consumption & Production
140	Knowledge Gap	Local governments need guidance and support to incorporate digital technologies into broader, systemic approaches that include anticipatory policies, civic engagement, and multi-stakeholder collaboration. In this way, the goal is to support cities with digital transformation rather than the implementation of single point digital solutions.	Not tagged to one of the three GRAA Delivery-Approach levels (topical / System Approach item)	Digitalization; Engagement & Participation; Governance & Multilevel Partnerships
149	Action & Knowledge Gap	Cities must prioritise the optimisation of resource demands across all systems to minimize waste, particularly focusing on integrating renewable energy into transit and active transport solutions (which build upon water, food, and energy systems), including simplified graph-based transit modeling to efficiently design and test projects, ensuring cities can implement proven improvements with minimal delays.	Not tagged to one of the three GRAA Delivery-Approach levels (topical / System Approach item)	Efficiency; Infrastructure; Energy; Mobility

2024 Outcome Report: GRAA

The following pages are reproduced as they appear in the 2024 Outcomes Report. They contain the complete list of GRAA knowledge gaps and actions that were used during the scoring methodology for prioritization.

Global Research & Action Agenda (GRAA)

GRAA Research Gap (what is missing)

Action Priority (what is important)

Towers City-Level Models, Data, and Knowledge

I	Communication	63, 103, 104, 121, 160	4, 22, 29, 35, 39, 40, 41, 81, 97, 168, 169, 170, 171, 172, 173, 174, 188, 259
II	Decentralization	105, 106, 107	175, 176, 177, 178, 257
III	Digitalization	19, 26, 54, 55, 96, 97, 124, 140, 141, 142, 143, 144	2, 17, 26, 74, 129, 134, 135, 136, 137, 138, 139, 140, 151, 188, 206
IV	Efficiency	54, 99	2, 3, 15, 149, 150, 151, 152, 153, 154, 155
V	Information Integrity & Transparency	14, 21, 27, 35, 46, 61, 108, 109, 131, 136, 144	52, 53, 124, 169, 179, 180, 181, 182, 183, 184
VI	Risk	21, 22, 63, 101, 102, 146	23, 32, 35, 161, 162, 163, 164, 165, 166, 167, 259
VII	Scale	2, 4, 26, 35, 43, 46, 48, 61, 100, 111, 149, 154	26, 33, 37, 156, 157, 158, 159, 160, 177, 256, 259
VIII	Uncertainty	7, 21, 23, 98	35, 38, 141, 142, 143, 144, 145, 146, 147, 148, 259

System Approach Levels

12	Finance (Investment & public procurement)	2, 8, 17, 18, 19, 20, 24, 29, 38, 40, 106, 137, 138, 139, 144, 145, 146, 147, 148, 149, 151, 159	10, 12, 19, 23, 24, 25, 26, 27, 28, 29, 31, 32, 124, 147, 165, 166, 249, 250, 251, 252, 253, 254, 256, 257, 258, 259
11	Governance & Multilevel Partnerships	9, 17, 18, 24, 34, 44, 47, 48, 49, 61, 107, 134, 135, 136, 139, 140, 143, 145, 150, 156, 157, 158	3, 4, 5, 8, 10, 14, 25, 27, 30, 32, 34, 164, 128, 176, 177, 240, 241, 242, 243, 244, 245, 246, 247, 248, 257, 258, 259
10	Culture (Community, Heritage, Art & History)	4, 11, 13, 26, 29, 30, 31, 32, 38, 43, 58, 132, 133, 155	1, 4, 5, 9, 12, 39, 236, 237, 238, 239, 258, 259
9	Infrastructure & Housing	2, 3, 74, 129, 130, 131, 148	1, 2, 3, 7, 17, 53, 123, 127, 129, 149, 226, 227, 228, 229, 230, 231, 232, 233, 234, 235
8	Waste	14, 25, 54, 126, 127, 128, 153	11, 20, 22, 222, 223, 224, 225
7	Mobility	11, 75, 123, 91, 124, 125, 129	17, 18, 149, 215, 216, 217, 218, 219, 220, 221, 256, 259
6	Energy	29, 54, 60, 120, 121, 122	1, 2, 3, 6, 15, 16, 123, 149, 206, 207, 208, 209, 210, 211, 212, 214, 256

5	Food	27, 118, 119	12, 13, 203, 204, 205
4	Water	54, 75, 115, 116, 117	6, 11, 123, 199, 200, 201, 202
3	Health (Human and Environmental)	1, 5, 38, 39, 40, 41, 110, 113, 114, 153, 155	18, 195, 196, 197, 198, 259
2	Biodiversity	1, 4, 5, 27, 59, 62, 112, 130	7, 11, 24, 75, 167, 190, 191, 192, 193, 194
1	Geography	11, 27, 34, 44, 47, 48, 52, 110, 111, 124	22, 25, 94, 185, 186, 187, 188, 189
Pillars of Justice & Equity			
i	Access & Reliability	17, 29, 49, 60, 92, 93, 141	16, 25, 122, 123, 124, 125, 126, 127, 128, 129, 259
ii	Climate Change Adaptation & Mitigation	2, 8, 10, 15, 17, 21, 24, 27, 35, 41, 42, 45, 54, 55, 73, 74, 75, 101, 102, 155	1, 2, 7, 8, 9, 10, 12, 13, 14, 36, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 190, 258
iii	Conflict & Crisis Response	1, 51, 71	259
iv	Engagement & Participation	4, 13, 31, 36, 51, 53, 94, 95, 140, 147, 152, 158, 159, 160	1, 4, 5, 25, 26, 31, 32, 36, 40, 41, 81, 97, 130, 131, 132, 133, 223, 255, 257, 258, 259
v	Gender	51, 55, 88, 89, 90	25, 105, 106, 107, 108, 109, 110, 111, 112, 113, 114
vi	Indigenous Knowledges & Decoloniality	1, 33, 46, 51, 85, 86, 87, 158, 159, 160	25, 39, 99, 100, 101, 102, 102, 103, 104
vii	Informality	12, 13, 14, 15, 16, 91, 149, 150, 152, 153	5, 25, 39, 115, 116, 117, 118, 119, 120, 121, 255
viii	Intergenerationality	5, 13, 31, 33, 51, 55, 78, 79, 148, 149, 157	25, 39, 89, 90, 91, 92, 93, 255, 258
ix	Sufficiency	80, 81, 82, 83, 84, 149	94, 95, 96, 97, 98, 256, 258
x	Sustainable Consumption & Production	3, 4, 26, 27, 28, 29, 37, 42, 55, 60, 76, 77, 145, 147, 149, 151, 152, 154, 157	6, 19, 20, 21, 22, 27, 84, 85, 86, 87, 88, 229, 255, 256, 257, 259
Delivery Approaches			
Foundation	Empowering Cities to Take Action	4, 19, 34, 44, 48, 52, 53, 56, 59, 60, 65, 66, 154	8, 9, 10, 29, 36, 37, 40, 41, 42, 43, 45, 46, 47, 49, 50, 257, 258
Elevator	Co-Production of Knowledge	33, 59, 67, 68, 69	39, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 138, 255
Elevator	Partnerships for Long-Term Collaboration	16, 30, 46, 61, 70, 71, 72, 142	39, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 254, 255, 259

Table 3: Knowledge Gaps and Action Priorities by GRAA level

2. Knowledge Gaps and Action Priorities

The full listings of research gaps and action priorities presented in summary through the high-level GRAA Structure illustration (Figure 13) and the summarizing directory provided in Table 3 are detailed in Tables 4 and 5 below.

Table 4	GRAA 2024 Priority Knowledge Gaps (#1-64 derived from I4C21, #65-138 added from I4C24 synthesis)	Corresponding GRAA topic(s)
1	Research is needed to better understand the benefits and diverse values of urban nature, including for health and wellness, and how these vary by socio-economic groups, including Indigenous peoples, within and across cities. Then building from this understanding further research is needed on how utilizing nature-based solutions can maximize benefits for climate, nature and people as well as how improving this understanding can reduce conflicts that may arise around approaches to conservation and restoration.	Biodiversity Conflict & Crisis Response Health (Human & Environmental) Indigenous Knowledges & Decoloniality
2	Further research is needed to develop full cost benefit analysis of the built, blue and green infrastructure solutions to adaptation and mitigation, that includes financial and economic implications and social/societal co-benefits (e.g. – green jobs (C40, 2021), economic savings, reduced energy bills, cleaner air/water, etc.), at scale and across different urban environments.	Scale Finance (Investment & public procurement) Infrastructure Climate Change Adaptation & Mitigation
3	An improved understanding of lifecycle costs of blue/green infrastructure is needed to support planning for projects, better justify additional measures for green and resilient design and ensure maintenance can be sustained throughout the project lifetime to maximize outcomes and benefits.	Infrastructure Sustainable Consumption & Production
4	Research is needed on ways in which communities can be empowered to lead on nature-based solutions for wide scale public participation and long-term support and sustainability of projects.	Scale Culture (Community, Heritage, Art & History) Biodiversity Engagement & Participation Sustainable Consumption & Production Empowering Cities to Take Action
5	Further research/guidance is needed from urban ecologists that helps planners, designers and architects to mainstream urban nature in a way that is scientifically robust and leads to specific species and urban ecosystem regeneration and/or specific health or air quality benefits.	Health Biodiversity Intergenerationality
6	Further research and understanding are needed on how synergistic, and systems based urban planning and climate resilient development and design have been and can be enacted in cities, especially in different city contexts and planning practices, with a view to future urban growth.	Infrastructure Governance & Multilevel Partnerships Engagement & Participation Climate Change Adaptation & Mitigation Empowering Cities to Take Action
7	Further exploration is needed of how possibilities of ten- and 100-year weather/climate events should shape overall planning strategies of cities. Additionally, with climate hazards becoming more frequent, it is also important to gain a better understanding of how short-term uncertainty can be better incorporated into long-term planning.	Uncertainty

#	GRAA 2024 Priority Knowledge Gaps (#1–64 derived from I4C21, #65–138 added from I4C24 synthesis)	Corresponding GRAA topic(s)
8	Further research into how climate change can be mainstreamed into city decision making, particularly within the context of integrating mitigation and adaptation considerations into comprehensive planning, and into capital investment plan/capital improvements programming of a city is needed.	Finance (Investment & public procurement) Climate Change Adaptation & Mitigation
9	Research is needed on best practices for how local government budgets can be climate smart, aligned and sensitive, and how this would vary based on the context of different cities.	Governance & Multilevel Partnerships
10	There is a need for documentation and evaluation of early attempts to adapt cities to the impacts of climate change, including efforts at both fortification and retreat and different approaches to adaptation. This could include models for successful relocation from areas that will be uninhabitable due to climate change as well as methodologies for assessing and evaluating the effectiveness of adaptation options with the changing severity of impacts.	Climate Change Adaptation & Mitigation
11	Better understanding is needed of the relationships between urban form and urban design and transportation systems in the context of greenhouse gas emissions. Land use patterns drive what is possible in terms of vehicle miles traveled, transit modal split, and bikeability/walkability. The implications of different density patterns, subdivision regulations, and street/corridor design in terms of transportation behaviors must be understood in different cultural and climate contexts as well as projected urban growth.	Culture (Community, Heritage, Art & History) Transportation Geography
12	More research is needed, using evidence from the ground, based on experiences during the COVID-19 pandemic, on how informal work can be more vulnerable and more resilient to shifts in the global and urban context like those seen during the COVID-19 lockdown periods and successive economic downturns and how this resilience may be translated to shocks and stresses caused by climate change.	Informality
13	Further study is needed on cases of effective community participation and models in informal settlement planning in the context of climate change, especially involving youth and children who make up a large proportion of populations in cities in developing countries.	Culture (Community, Heritage, Art & History) Engagement & Participation Informality Intergenerationality
14	Further information and data are needed on how the work of informal waste collectors contributes to low-carbon and resilient cities and the costs and benefits of these systems.	Information Integrity & Transparency Waste Informality
15	Research is needed to understand and document how potential technologies, for example drones, can inform planning within informal settlements, especially self-enumeration, and incorporate current and future impacts of climate change to improve adaptation efforts.	Informality Climate Change Adaptation & Mitigation

#	GRAA 2024 Priority Knowledge Gaps (#1–64 derived from I4C21, #65–138 added from I4C24 synthesis)	Corresponding GRAA topic(s)
16	Further understanding of how partnership networks that are inclusive of informal settlers and those working in the informal economy can be designed so that implementation and data collection are done from the bottom up and top down, and how methods and planning informed from the bottom up and top down could result in design solutions that are equitable and people-centered, support development needs and build resilience to climate change.	Partnerships for Long Term Collaboration Informality
17	Further research is needed to better quantify the adaptation finance gap in cities and understand issues of finance accessibility at the local level. This could include an analysis of useful metrics for classifying and identifying urban adaptation finance at the local level for comparability of adaptation finance across cities, regions and globally, and best practices for financial mechanisms to effectively distribute across various levels of governments.	Finance (Investment & public procurement) Governance & Multilevel Partnerships Access & Reliability Climate Change Adaptation & Mitigation
18	Further exploration of best practices for public procurement, and other available tools as well as the potential for tools that would unlock finance for local governments to increase implementation is needed.	Finance (Investment & public procurement) Governance & Multilevel Partnerships
19	Scoping for a better understanding of the potential for digital finance, crowdsourcing and digital green bonds for urban climate change projects is needed. Analysis is needed on how the availability of climate finance in developing and developed countries has been affected by the COVID-19 pandemic and the subsequent impact on climate plans and climate actions taken in cities.	Digitalization Finance (Investment & public procurement) Empowering Cities to Take Action
20	Investigation and further understanding of business models that could make innovation possible is required. How to enhance the confidence of potential investors in climate initiatives in cities should be considered.	Finance (Investment & public procurement)
21	Research is needed on how to maximize the use of already existing local data and information within climate models, as well as the identification of additional localized data and information that are critical to understanding locally specific risks and uncertainty and tailoring locally appropriate adaptation measures.	Uncertainty Risk Information Integrity & Transparency Climate Change Adaptation & Mitigation
22	Increase understanding about how risk management and disaster planning data can best be used and developed by and within cities in the face of constantly changing conditions.	Risk
23	More research is needed on innovative climate models and the emissions (savings) potential in each model as well as uncertainties in these emissions projections.	Uncertainty
24	Further research is needed on how to best develop national government policy to fit the needs of local governments to maximize the potential for public procurement in building urban climate solutions. Exploring what options exist in terms of evaluation criteria that are not only based on lowest cost, for example, indicators to quantify mitigation and adaptation co-benefits included in project requirements/assessments.	Finance (Investment & public procurement) Governance & Multilevel Partnerships Climate Change Adaptation & Mitigation
25	There is a need for a better understanding of waste value chains and how they can contribute to low-carbon and circular economy transition, particularly in developing cities.	Waste

#	GRAA 2024 Priority Knowledge Gaps (#1–64 derived from I4C21, #65–138 added from I4C24 synthesis)	Corresponding GRAA topic(s)
26	Further research is needed on how sustainable consumption habits can be fostered, and how local availability and potential for sharing can be better understood and supported through digital platforms. This could include how digital platforms can support growth of sustainable consumption habits from an individual scale to influence the community and city scales and beyond through personal relationships, friendly competition with neighbors etc.	Scale Digitalization Culture (Community, Heritage, Art & History) Sustainable Consumption & Production
27	Further research and information are needed to determine locally specific plans and the benefits of urban agriculture for climate mitigation, food security, local production, ecosystems and biodiversity.	Information Integrity & Transparency Food Biodiversity Geography Sustainable Consumption & Production Climate Change Adaptation & Mitigation
28	Research is needed on how circular economic principles have affected consumption and production in regions where this concept is most prevalent, and how this framework may need to be tailored for best impact in addressing climate change in cities where it has not been integrated in climate planning.	Sustainable Consumption & Production
29	There is a need to further investigate the potential of community based sustainable energy production to identify the best source(s) of energy production for the contexts of particular cities and communities, the impact that energy production can have in reducing emissions as well as the contributions it could have to other social and development dimensions at the local level (employment, community resilience, securing access to energy and reducing energy poverty).	Finance (Investment & public procurement) Culture (Community, Heritage, Art & History) Energy Access & Reliability Sustainable Consumption & Production
30	Research across fields and disciplines to bring together experts on past and current culture and heritage of a particular city with urban planning and climate experts for collaborative research is needed.	Partnerships for Long Term Collaboration Culture (Community, Heritage, Art & History)
31	Further understanding is needed on how urban participatory planning processes to devise and implement climate change solutions can be shaped by culture, heritage and history and how these inputs can be considered in the participatory process to ensure that traditionally marginalized communities are included and past injustices recognized.	Culture (Community, Heritage, Art & History) Engagement & Participation Intergenerationality
32	Research is needed on how culture and heritage can better inform place-based responses to climate change which better serve the needs of the community.	Culture (Community, Heritage, Art & History)
33	Further incorporation and representation of oral histories—inclusive of Indigenous oral traditions—in research and the generation of urban climate knowledge and data.	Co-Production of Knowledge Indigenous Knowledges & Decoloniality Intergenerationality
34	Research is needed to better understand how to effectively design urban climate goals and actions that take on a systems approach by incorporating the multiple, locally specific climate and societal problems and pressures and the perspectives of different actors in cities.	Governance & Multilevel Partnerships Geography Empowering Cities to Take Action

#	GRAA 2024 Priority Knowledge Gaps (#1–64 derived from I4C21, #65–138 added from I4C24 synthesis)	Corresponding GRAA topic(s)
35	Further information is needed on how city systems and systems of cities operate at different scales from the neighborhood scale to metropolitan regions and how this impacts regional and national scale decision-making and the implementation of climate change mitigation, adaptation and resilience solutions.	Scale Information Integrity & Transparency Climate Change Adaptation & Mitigation
36	Further work is needed to bring together different ways of thinking which currently contribute to how cities are built and shaped such as ecological placemaking, design and participatory planning to build new creative approaches and ways to think and plan a city system which increase resilience to climate change while also providing important co-benefits particularly for marginalized and vulnerable groups.	Engagement & Participation
37	Exploration of how thinking using a circular economy and systems approach framework can open new possibilities, and allow for conceptualization about the future city, the different ways it may operate and the necessary solutions to achieve sustainable and resilient cities is needed.	Sustainable Consumption & Production
38	Further research is needed on ways to account for benefits to health and wellbeing of urban greenspace, including urban regeneration projects, in financial and other terms and there is a need to explore how accounting for these benefits can influence urban planning, especially in cities under-represented in existing research. Particular attention should be paid to effects on traditionally marginalized and vulnerable communities as they may have distinct benefits and trade-offs.	Finance (Investment & public procurement) Culture (Community, Heritage, Art & History) Health
39	Further assessment of the benefits and best practices of integrating local air quality and climate change plans is required to understand how to maximize impacts and benefits for health and climate.	Health
40	Research is needed on which innovative financing mechanisms can be utilized by cities to advance health and climate solutions.	Finance (Investment & public procurement) Health
41	Research is needed to better understand the co-benefits of climate and health policy, and a further understanding is needed on how to mitigate misalignment of these policies to promote synergies.	Health Climate Change Adaptation & Mitigation
42	Further research is needed on how to calculate short- and long-term benefits of climate solutions and how factors such as cost, inclusivity, difficulty of implementation, effectiveness in increasing mitigative and adaptive capacity and sustainability of solutions should be weighed against the timelines for benefits (or the consequences in not acting) in order to prioritize implementation options.	Sustainable Consumption & Production Climate Change Adaptation & Mitigation
43		
	Increased learning from effective small-scale projects with significant community support is needed to better understand how community support can be built for projects with larger scale implementation potential.	Scale Culture (Community, Heritage, Art & History)
44	Further understanding is needed of the implications of delaying or accelerating climate action in cities, both within the city and how local government decisions would impact on territories and people outside of city boundaries.	Governance & Multilevel Partnerships Geography Empowering Cities to Take Action

#	GRAA 2024 Priority Knowledge Gaps (#1–64 derived from I4C21, #65–138 added from I4C24 synthesis)	Corresponding GRAA topic(s)
45	Further understanding is needed of upstream and downstream impacts of adaptation projects in cities and how regional approaches could be employed to create more effective climate solutions.	Climate Change Adaptation & Mitigation
46	There is a need for information and research to support the co-creation of new models of collaboration at the urban scale, bringing in local and Indigenous experiences, as well as those with potentially different perspectives such as the private sector and industry.	Partnerships for Long Term Collaboration Scale Information Integrity & Transparency Indigenous Knowledges & Decoloniality
47	Further research is needed on innovative governance models which are most effective for cities who are prioritizing circular economic principles.	Governance & Multilevel Partnerships Geography
48	There is a need for further research on how land governance is influenced by extractive and exclusionary principles and models, and how this affects decision making on climate change action at the local scale. Exploration of alternative models which include innovative ways to address property tax, different forms of property rights regimes, ways to de-fiscalize land use and enable broader horizontal distribution of resiliency are needed.	Scale Governance & Multilevel Partnerships Geography Empowering Cities to Take Action
49	Research is needed on the barriers and blockages that prevent local governments from accessing capital to implement climate change initiatives as well as potential changes to governance models and other societal structures that could facilitate that access and how to address political issues and corruption, to facilitate flows of capital.	Governance & Multilevel Partnerships Access & Reliability
50	Increased understanding of how overlapping jurisdictions and agencies, adjacent jurisdictions, and special-purpose districts interact to devise strategies to move climate change policy.	Communication Centralization Governance & Multilevel Partnerships Engagement & Participation
51	There is a need to understand the best tools for public consultation and consensus building, public participation, and conflict management as well as potential new, inclusive organizational structures. In particular, it is important to know how these methods work in varying contexts of gender, age, race, ethnicity, religion, Indigenous status, and (dis)ability.	Conflict & Crisis Response Engagement & Participation Gender Indigenous Knowledges & Decoloniality Intergenerationality
52	Further research is needed on how national level climate change and regional development policies and strategies can incorporate a territorial or landscape perspective to support urban climate change action.	Geography Empowering Cities to Take Action
53	Deep analysis of structural barriers preventing action are needed – for example examining short term political cycles, budget allocation, autonomous cities lacking engagement with the regional level etc. and how combinations of these factors prevent action, and how overcoming barriers or changing paradigms could enable it.	Engagement & Participation Empowering Cities to Take Action
54	Further research is needed on how Digitalization of city-level data and solutions can improve key urban functions (water, waste, electricity management) increasing efficiency and contributing to mitigation, in addition to building adaptive capacity and resilience and providing other societal co-benefits.	Efficiency Digitalization Waste Energy Water Climate Change Adaptation & Mitigation

#	GRAA 2024 Priority Knowledge Gaps (#1–64 derived from I4C21, #65–138 added from I4C24 synthesis)	Corresponding GRAA topic(s)
55	Exploration of how digital technology can support the creation of a co-produced database with innovative solutions and a function to sort and prioritize solutions according to criteria such as, transferability, scalability, replicability, circularity, sustainability, timeliness, mitigative and adaptive potential, evidence-based, inclusivity, gender and age-sensitive and fit for purpose in the context of a particular city to learn from past experiences and best practices in order to select the best solutions for local needs.	Digitalization Gender Sustainable Consumption & Production Intergenerationality Climate Change Adaptation & Mitigation
56	Research is needed on how dynamic climate action planning, which relies on crowd sourced, tailored and real time big data can be effectively used, and streamlined for the contexts of different cities around the world.	Empowering Cities to Take Action
57	A better understanding of how historical inequities and intergenerational issues of justice and equity in cities are compounding current climate and environmental justice issues is needed.	Communication Culture (Community, Heritage, Art & History) Engagement & Participation Gender Indigeneity & Decoloniality Intergenerationality
58	Further research is needed on how inequality is built into current urban planning cultures and norms and how reorienting towards an urban planning framework which takes a human rights approach could impact justice and equity issues in urban climate change planning and ensure a just transition.	Culture (Community, Heritage, Art & History)
59	Knowledge is needed on how interspecies impacts can be better included in urban climate action. Further understanding and knowledge to inform who should speak on behalf of other species in urban climate change decision making is also called for.	Co-Production of Knowledge Biodiversity Empowering Cities to Take Action
60	Research is needed to better understand the synergies between climate action, development and poverty reduction in cities, especially access to sustainable energy that would increase energy security as part of a low-carbon development pathway.	Energy Access & Reliability Sustainable Consumption & Production Empowering Cities to Take Action
61	Further support is needed for local governments and partners to capture small scale case studies and research is needed on how these can be integrated and shared to inform decision making, providing information on best practices, barriers, failures, challenges and innovations in individual solutions which may apply across different contexts within different cities.	Partnerships for Long Term Collaboration Digitalization Scale Information Integrity & Transparency Governance & Multilevel Partnerships
62	Further research is needed on the potential for urban forests to contribute to mitigation efforts, inclusive of location, species specificity and how future climate conditions will affect growth and sequestration potential.	Biodiversity
63	Research is needed on how mobile phone data can be used to understand exposure and citizen response to climate disasters and risks and inform policy to reduce future risk.	Risk Communication Scale Uncertainty Digitalization Information Integrity Geography Climate Change Adaptation & Mitigation

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64	Location specific data are needed on how the integration of particular topographical, geological, structural, social contexts influence the risk from climate hazards and how they may affect potential to respond to risk.	Scale Uncertainty Risk Digitalization Information Integrity Geography Climate Change Adaptation & Mitigation
65	Rapid urbanization and associated challenges are not adequately understood in the context of how risk is being centralized in cities without corresponding capacity to mobilize effective response to increasing system demands.	Empowering Cities to Take Action Scale Uncertainty Risk Centralization Access & Reliability
66	Decentralized access to context-specific tools for dealing with scenarios faced by cities in developing regions, including knowledge/resource-sharing tools and adaptive regulatory review/revision processes for underserved populations.	Empowering Cities to Take Action Communication Access & Reliability Empowering Cities to Take Action
67	Methodologies are needed that harmonize varied perspectives and ensure inclusive, data-informed climate action strategies for systems approach considerations and multi-sectoral collaboration between stakeholders.	Co-Production of Knowledge Digitalization Information Integrity & Transparency Communication Governance & Multilevel Partnerships Empowering Cities to Take Action
68	Existing international research and funding partnerships have not effectively bridged the knowledge gap between research findings and local implementation to support urban transitions.	Centralization Communication Governance & Multilevel Partnerships Infrastructure Engagement & Participation Empowering Cities to Take Action
69	Current efforts to scale urban climate and biodiversity projects often fail to consider system dynamics, resulting in isolated successes rather than broader, integrated impacts.	Co-Production of Knowledge Scale Centralization Biodiversity Climate Change Adaptation & Mitigation
70	Transitions to sustainable consumption patterns require innovative governance structures and understanding of challenges faced by existing public-private partnerships (PPPs) to design effective PPPs going forward.	Governance & Multilevel Partnerships Partnerships for Long Term Collaboration Sustainable Consumption & Production Climate Change Adaptation & Mitigation
71	Cities experiencing ongoing disruptions, such as human conflict, suffer from poorly coordinated regulation of formal policies, necessitating robust formal and informal partnerships to prioritize immediate and long-term climate challenges.	Climate Change Adaptation & Mitigation Communication Conflict & Crisis Response Governance & Multilevel Partnerships Partnerships for Long Term Collaboration

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72	Understanding how the size and design of cross-sector partnerships impact their effectiveness in achieving net-zero climate goals, and integrating green transition policies with workforce development across all sectors to enable local decision-makers to effectively utilize climate data and maps for enhancing resilience and disaster adaptation.	Scale Partnerships for Long Term Collaboration Climate Change Adaptation & Mitigation
73	There is a significant need for rapid adaptation measures, integration of local knowledge, and support for community-led initiatives, especially in regions where current adaptation tools fail to address broader complexities, preventing disadvantaged communities from accelerating climate adaptation through better integration of scientific evidence, and targeted approaches to vulnerabilities in rapidly growing regions.	Climate Change Adaptation & Mitigation
74	Understanding forced migration, housing deficits, urban heat islands, and declining green spaces as consequences of climate change requires comprehensive, dynamic approaches that integrate both climate adaptation and mitigation strategies, moving away from static emission reduction efforts.	Climate Change Adaptation & Mitigation Infrastructure & Housing
75	Discrepancies between data sources may inhibit data-driven decision making in formulating/prioritizing climate action plans concerning; urban flooding, improving pedestrian accessibility, and developing tools for integrated urban planning that enhance resilience and spatial justice.	Climate Change Adaptation & Mitigation Mobility Water
76	Improved lifecycle analysis of the place-based value of biodiversity/natural capital in supply chains both within and between cities is needed to operate local economies within sustainable environmental and social system parameters.	Sustainable Consumption & Production
77	Understanding circularity of material resource utilization requires innovative methodologies to link productive use of all resources to a 100% recovery model of all post-consumption waste materials, in consideration of impacts on water and energy systems.	Sustainable Consumption & Production
78	Urban design, planning, and policy do not adequately consider impacts on future generations, and methodologies for quantifying avoided future costs must be strengthened and mainstreamed to replace current regulatory environments which still allow profit extraction-driven practice.	Intergenerationality
79	Inadequate climate change education for youth leads to a lack of preparedness for designing effective adaptations in both environmental and social contexts.	Intergenerationality
80	Sufficiency measures aimed at both reducing natural resource demand and ensuring adequate, equitable resource access by all are often overlooked in climate policies, without measures to prevent social and economic injustices and ensure long-term sustainability of societies both within and across cities globally.	Sufficiency
81	Current land demands for sufficient resources complicate cities' efforts to equitably manage the sustainability transition, and sufficient system capacity surrounding cities must consider urban sprawl and degradation of urban ecosystems in designing comprehensive management approaches that balance urban expansion/development with the preservation of natural resources and ecosystem services.	Sufficiency

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82	Traditional climate solutions often emphasize emission reduction, neglecting broader systemic changes and cross-sectoral innovations required for long-term sustainability, effective decarbonization, and climate justice.	Sufficiency
83	In rapidly growing cities, increasing demand for resources is not met with necessary research on sufficiency in consumption patterns and growth management, with sustainable practices in urban planning and community involvement to achieve environmental sustainability.	Sufficiency
84	Cities require comprehensive evaluation of resource consumption patterns for optimization, as existing frameworks lack the depth needed to effectively assess sufficiency and resource utilization/distribution inefficiency/inequality.	Sufficiency
85	Ineffective and culturally insensitive solutions persist through failure to adequately recognize and integrate Indigenous knowledge into policy and practice across sectors at all levels and fully address historical injustices through promoting decolonial approaches that enhance resilience and sustainability.	Indigenous Knowledges & Decoloniality
86	For First Nations communities, barriers such as institutional constraints and lack of control can impede the implementation of renewable energy projects. Incorporating Indigenous perspectives into energy policies and projects is essential for overcoming these challenges and ensuring community benefits.	Indigenous Knowledges & Decoloniality
87	Most current formal top-down governance praxis inadequately acknowledges or values indigenous perspectives, which are vital for developing inclusive, diverse climate strategies and emissions regulations, creating gaps in effective community-level governance.	Indigenous Knowledges & Decoloniality
88	In the context of climate-smart practices, particularly in agriculture, women and youth often face barriers in accessing knowledge and education – these disparities limit their participation and effectiveness in climate resilient farming and other adaptive practices.	Gender
89	Methodologies for recognizing and resolving gender disparities in climate action and urban development are required for effective participation in unequal outcomes where gender-sensitive policies that ensure equitable participation in climate adaptation strategies and urban sustainability effort is assured.	Gender
90	Marginalized groups encounter barriers in accessing safe and inclusive public spaces, further emphasizing the need for gender-specific considerations in urban design of all systems to resolve persistent inequities through targeted strategies and community engagement.	Gender
91	Informal mobility modes, common in informal/underserved settlements, contribute to poor/dangerous working conditions and high emissions, and research into solutions requires local knowledge and community engagement to devise socially appropriate sustainable solutions which reduce hazard and cost burdens on individuals in informal mobility arrangements.	Informality Mobility

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92	Insufficient monitoring and feedback systems affect cities' ability to assess and improve the effectiveness of access & reliability for ongoing evaluation, informed decision-making, and successful climate adaptation efforts required of their infrastructure and services.	Access & Reliability
93	Enhancing access to actionable, high-quality data is necessary for addressing these urban challenges and ensuring that climate initiatives are both efficient and equitable.	Access & Reliability
94	Highlighting the need for structured frameworks to foster meaningful engagement and communication with local governments, youth and marginalized communities often excluded from decision-making processes, innovative tools and methodologies must facilitate greater participation in climate action, urban planning, and sustainable development.	Engagement & Participation
95	Key stakeholders in the private sector, such as real estate developers and other actors, require collaborative, active roles in implementing climate resilient practices with policymakers, and communities to support sustainable urban growth and resilience to climate impacts.	Engagement & Participation
96	"Smart city technologies" and their impact on urban management are not fully understood, and this underscores the necessity for further research into how digitalization can influence urban governance and sustainability outcomes, highlighting the need for systematic evaluation of how digitalization influences value creation, resource management, and climate adaptation efforts.	Digitalization
97	Current digital transformation strategies often fail to prioritize citizen well-being, raising social and ethical concerns, and addressing the need for empathetic, human-centered technologies is essential to ensure digitalization benefits all urban residents.	Digitalization
98	Spatial and dynamic modeling, including exploratory scenario planning of multiple potential futures, were highlighted as essential tools for managing uncertainty in climate strategies.	Uncertainty
99	Inefficiencies in both data-driven decision-making and operational requirements overwhelm local authorities and lead to human and environmental and health risks. There is a pressing need for improved resource/energy management and recovery mechanisms and explore viable community awareness initiatives to address these issues with utility providers and consumer good producers.	Efficiency
100	Climate initiatives in sectors like housing, transportation, and urban greening often struggle to scale due to fragmented project-based planning and insufficient data, financial access, and coordination where a shift to a portfolio approach could attract diverse funding sources and facilitate broader implementation.	Scale
101	Comprehensive risk assessments, disaster management tools, and innovative technologies, such as digital twins, are needed to address exposure and vulnerability of cities, for example in coastal regions facing greater climate risks which are often exacerbated by urbanization.	Risk Climate Change Adaptation & Mitigation

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102	Understanding uniquely urban vulnerabilities requires tools that integrate complex data for informed, strategic risk management and climate resilience planning to ameliorate the concentration of risk that occurs in centralized habitats.	Risk Climate Change Adaptation & Mitigation
103	Poorly coordinated formal and informal policies require cross-sectoral communication mechanisms to bridge gaps and enhance cities' ability to tackle both immediate and long-term challenges in the face of prevailing consumption-driven communication.	Communication
104	Urban rewilding efforts face challenges around conveying goals and outcomes due to socio-cultural and ecological perceptions which inhibit greater community participation and support for urban climate initiatives which improve long-term environmental/human health and socio-economic performance.	Communication
105	Urban development initiatives often overlook the complexities of integrating tribal perspectives into planning frameworks. There is a pressing need for decentralized approaches that incorporate governance and partnership dynamics to allow ontological and epistemological diversity to rapidly respond to local needs.	Centralization
106	Research is required to better understand how access modalities for international climate finance—currently challenged by issues such as inadequate sovereign guarantees, high-interest rates, and inflexible multilateral mechanisms—can be overhauled for local governments to engage with finance in the same manner as national governments.	Centralization Finance
107	Addressing the constraints posed by fragmented governance structures is crucial for enhancing urban resilience – research into organizational design must examine how to successfully decouple decentralization efforts from disorganized results, particularly where centralized decision-making doesn't bring disparate issues into collective focus.	Centralization Governance & Multilevel Partnerships
108	Research and action plans are required concerning the role of advertising in information systems and the degree to which sustainable consumption and production models are being undermined by profit-driven practices, and mechanisms for regulating and modifying marketing behavior with local-level regulations to prevent perverse incentives from resulting in unsustainable outcomes.	Information integrity & Transparency
109	The role of information integrity & transparency in actor theory requires significant examination for city stakeholders to understand how origination and transmission of ideas can either aid or inhibit climate response, and how accountability mechanisms may be structured to curb negative outcomes associated with bad faith actors misusing information transmission systems.	Information integrity & Transparency
110	Targeted research on urban geography is needed for effectively redesigning green spaces to enhance microclimatic conditions for local biodiversity and system health, involving evaluation of the effects these redesigns have on thermal comfort and air temperatures to optimize urban environments across diverse geographic contexts.	Geography Health (Human & Environmental)

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111	Understanding how geographic factors significantly influence urban climate vulnerabilities and adaptation strategies underscores the need for geographically informed approaches that account for local conditions and variations, which must be communicated to allow comparison of similar conditions across locales globally in the interest of identifying common challenges and potential solutions.	Geography
112	There is a need for further research to assess the effectiveness of green buildings and nature-based solutions in understanding the interplay between urbanization, land-use patterns, and green infrastructure.	Scale
113	Urban areas are increasingly facing health risks associated with climate change, and existing heat action plans have shown varied effectiveness due to differences in governance, implementation, and capacity across cities, so vulnerable populations require strong early warning systems, an understanding of effective water management regimes, and beneficial agrobiodiversity practices.	Biodiversity Health (Human & Environmental) Governance & Multilevel Partnerships
114	Strategies that enhance community well-being while preserving ecological integrity are essential, requiring development and integration of avoided cost methodologies to prevent profit-driven development impacts from undermining city health.	Health (Human & Environmental)
115	Sustainable, decentralized methods for effectively managing water resources are urgently needed in cities, where water scarcity and the inadequacy of water and sanitation systems in peri-urban areas create significant challenges.	Water
116	A unified approach is essential to address water-related vulnerabilities, including supply, treatment, and distribution challenges, furthered by an understanding of how maintenance and enhancement of green infrastructure amidst declining urban forests and increasing urban heat is critical for supporting water systems for urban resilience.	Water
117	Understanding subsurface water dynamics, concerning both aquifers and freshwater lens extraction boundaries and thresholds, must be better documented and communicated to prevent overharvesting of water resources and prevent intrusion from saltwater, mineral deposits, and other contaminants or depletion threats.	Water
118	Research is vital into examining/developing methods for abandoned/underutilized sites which may be remediated and utilized for sustainable food production facilities to support urban food security, particularly given threats urban green spaces face from both climate change and human development demands.	Food
119	Understanding successful integrated approaches and strategies that include gender inclusivity in urban farming will improve local food systems and support sustainable urban development, ensuring that food systems contribute to the overall resilience and health of urban communities if properly documented and replicated.	Food

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120	Research regarding accelerating the energy market transition and properly capturing externalized costs to completely phase out fossil fuels in city economies across the world must be consolidated and communicated to governance and finance professionals suffering from aversion to institutional/infrastructural transitions.	Energy
121	Communicating the robust findings around the sunk costs of how heavy reliance on fossil fuels exacerbate greenhouse gas emissions, increase risk, and deplete natural capital, and which energy sector actors are culpable for inaction enabling our current 1.5°C overshoot scenario.	Energy Communication
122	Indigenous communities face barriers to implementing renewable energy projects due to institutional, financial and systemic capacity constraints, where policies and support mechanisms require collaborative empowerment of these communities to overcome obstacles and benefit from renewable energy initiatives.	Energy Indigenous knowledges & decoloniality
123	Research into the negative health and productivity impacts of mobility systems in cities must be coupled with innovative solutions in alternative mobility methods and effective urban design to reduce congestion, emissions, sedentarism, and improve accessibility and reliability within cities.	Mobility
124	Inefficiencies and high pollution levels in urban mobility systems highlight the need for effective GIS-based indicators to improve spatial efficiency and equity through design of public and active transport initiatives to enhance mobility while devising incentives for the rapid drawdown in private vehicle use within cities globally.	Mobility Digitalization Geography
125	The role of airports and seaports in the connectivity between cities—and distribution of land use within their boundaries—requires further consideration concerning decarbonizing mobility systems, including the sustainability of the aircraft and vessels they accommodate.	Mobility
126	Research into the most effective management of diverse waste streams from various industries necessitates effective policies and cross-sector Extended Producer Responsibility (EPR) mechanisms to enhance recycling efforts and reduce environmental impacts.	Waste
127	As urban areas contend with preserving and expanding green spaces amid population growth and land use changes, innovative methodologies must be researched and deployed for quantifying and valuing waste reduction and resource recovery practices at a community level that allow compensation for engaging in circular economy practices within cities.	Waste
128	Research into unlocking sustainable waste through Multilevel governance reforms is needed.	Waste

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129	There is a huge research & development application gap between what we know of energy-efficiency technologies for affordable individual/multi-person active/electric vehicle (EV) energy economy and the land transport infrastructure required with the current paradigm in overdeveloped economies being inequitably deployed in cities globally (i.e. – many cities afford disproportionate space for automobiles of increasing size despite their existence being at odds with all sustainable design principles); decarbonized private transport can be regulated into being, ensuring equitable participation in the e-mobility transition if current knowledge is synthesized and applied across sectors with regulatory guidance.	Infrastructure & Housing Mobility
130	A lack of structured methodologies for effective environmental management persists, with preservation and expansion of urban green spaces challenged by land-use changes, population growth, and inadequate management, which threaten ecosystem services and urban resilience. Land is still being developed/degraded without appropriate research being undertaken as due diligence prior to its utilization/exploitation – effectively integrating ecosystem services into urban planning at cultural, governmental, and financial levels.	Infrastructure & Housing Biodiversity
131	City-level participatory action research case studies are needed in which urban infrastructure zoning, land use allocation, design, construction, maintenance, decommissioning, and site renewal are examined in the context of delivering justice & equity across the various city systems for transparency around good governance in cities' sustainable development process.	Information Integrity & Transparency Infrastructure & Housing
132	The depth of cultural context required for effective community engagement and motivation towards climate action requires sensitivity to worldviews, motives, and methodological practices in each locale.	Culture (Community, Heritage, Art & History)
133	Research is needed on regulatory and planning mechanisms to intercede in peri-urban planning & design typified by homogeneity and sprawl outside of urban centres, undermining just & equitable access to sufficient cultural engagement within sustainable systems parameters.	Culture (Community, Heritage, Art & History)
134	Current governance structures are often fragmented, with insufficient coordination between national and local governments, between formal policies and informal practices, hindering effective urban management and sustainability efforts without coherent systems-focused methodologies.	Governance & Multilevel Partnerships
135	Cities frequently grapple with fragmented governance structures and a lack of integrated academic resources, necessitating improved governance frameworks across sectors and multilevel partnerships to tackle urban resilience, equity, and biodiversity challenges, fostering transformative change through strategies that build trust and collaboration among policy actors.	Governance & Multilevel Partnerships
136	Research investigation and analysis of policy incoherence, capacity support issues, and structural governance barriers (i.e. – lack of capability/motivation, or corruption) need to be addressed to improve governance frameworks and multilevel partnerships, ultimately supporting transparent, integrated, and effective climate strategies.	Governance & Multilevel Partnerships

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137	Further research is needed to understand the functions and features of cities' systems in the context of annual internal rate of return (IRR) and long-term return on investment (ROI) in the context not only of operational profitability but avoided cost attributable to the investment annually and over the project lifespan of the investment, as accessing climate finance, securing investments, and scaling up infrastructure projects require methodologies to avoid externalizing costs and fully integrate the economics of ecosystems & biodiversity (TEEB) into funding decisions.	Finance (Investment and Public Procurement)
138	Cities must build upon the body of research concerning grassroots financing models to provide appropriate methodologies supporting financial literacy across sectors, with individuals in communities provided opportunities to design and structure funding proposals independently or in partnerships to create an index of climate-related projects for cities to offer in their portfolios for investment, increasing exposure of otherwise unstructured attempts at critical access to climate financing, enabling municipalities to both take action and gather findings on the most effective way to manage and implement their sustainability initiatives through delegated deployment of investments.	Finance (Investment and Public Procurement)
139	Within the limited ambition of the Paris Agreement and current NDCs, cities are not being equipped with finance and governance instruments at national level to prepare at local level for 1.5°C overshoot.	Finance (Investment and Public Procurement) Governance & Multilevel Partnerships
140	Local governments need guidance and support to incorporate digital technologies into broader, systemic approaches that include anticipatory policies, civic engagement, and multi-stakeholder collaboration. In this way, the goal is to support cities with digital transformation rather than the implementation of single point digital solutions.	Digitalization Engagement & Participation Governance & Multilevel Partnerships
141	Many digital initiatives are isolated, with limited exploration on how these technologies can be embedded into broader urban systems that address multiple sustainability goals, including environmental, social, and economic dimensions.	Access & Reliability Digitalization
142	Research is needed on how local governments can ensure interoperability between various digital platforms and tools used across city departments and services to create integrated systems for sustainable development.	Digitalization Partnerships for Long-Term Collaboration
143	AI has the potential to optimize urban systems, but research is needed to understand how it can be responsibly deployed in public governance, especially in balancing technological solutions with public interest and sustainability goals. There is a research gap in exploring how local governments can effectively use AI and machine learning to enhance decision-making processes for sustainable urban development.	Digitalization Governance & Multilevel Partnerships
144	There is a research gap in understanding how digital finance can enhance transparency, efficiency, and accessibility in funding urban climate action, particularly in improving resource flow and risk management in cities.	Digitalization Finance (Investment and Public Procurement) Information Integrity & Transparency

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145	There is a need for more research on how local governments can better engage the private sector in urban sustainability efforts. Specifically, understanding the conditions that attract private capital to sustainable urban development projects remains underexplored.	Digitalization Finance (Investment and Public Procurement) Information Integrity & Transparency
146	Research is lacking on effective strategies and financial models to de-risk investments in urban sustainability projects, particularly in high-risk regions and sectors.	Finance (Investment and Public Procurement) Risk
147	Most financial research focuses on environmental or economic returns, while the social impacts of financial mechanisms, especially in ensuring inclusivity and social justice, are often overlooked. There is limited research on how finance mechanisms can be designed to address social equity concerns in urban sustainability. Studies are needed to explore how financial models can ensure equitable distribution of benefits across urban populations, particularly marginalized communities.	Engagement & Participation Finance (Investment and Public Procurement) Sustainable Consumption & Production
148	Understanding how to align financial interests with long-term sustainability goals is a key challenge. Research is needed to develop and evaluate long-term financing models that support urban resilience projects, particularly those that span decades, such as infrastructure for climate adaptation.	Finance (Investment and Public Procurement) Infrastructure & Housing Intergenerationality
149	There is a research gap in understanding how frugal innovation, driven by necessity in informal settlements, can inform sustainable urban development processes. There is a lack of longitudinal studies on the sustainability and scalability of these innovations. Research is needed to determine whether such innovations can contribute meaningfully to long-term urban sustainability goals or if they are simply temporary survival strategies.	Finance (Investment and Public Procurement) Informality Intergenerationality Scale Sufficiency Sustainable Consumption & Production
150	There is limited research on how informal settlements can be systematically integrated into formal urban planning and governance frameworks. While there is recognition of informality's significance, more studies are needed to explore the mechanisms by which cities can incorporate informal systems into formal decision-making processes without marginalizing communities.	Governance & Multilevel Partnerships Informality
151	While the informal economy is recognized for providing livelihoods to many urban residents, more empirical research is needed to quantify its economic contributions to urban sustainability and development. Studies that link informal economic activities to sustainability metrics are still limited.	Finance (Investment and Public Procurement) Sustainable Consumption & Production
152	There is a gap in understanding how the strong social networks and mutual support systems in informal communities contribute to urban resilience. Further research could explore how these informal systems can inform the design of more inclusive, community-centered sustainable development strategies.	Engagement & Participation Informality Sustainable Consumption & Production
153	More research is needed on the intersection of health, environmental sustainability, and informality. Studies on how informal settlements can address public health risks, waste management, and environmental degradation in the context of sustainable development are still relatively sparse.	Health (Human and Environmental) Informality Waste

#	GRAA 2024 Priority Knowledge Gaps (#1-64 derived from I4C21, #65-138 added from I4C24 synthesis)	Corresponding GRAA topic(s)
154	Most innovation in cities focuses on optimizing existing systems, but there is limited understanding of how cities can effectively adopt transformative approaches that shift the paradigm of urban development and sustainability. There is a need for research on how cities can move beyond incremental improvements to adopt transformative, agenda-driven innovation that addresses systemic challenges and reshapes urban sustainability.	Empowering Cities to Take Action Scale Sustainable Consumption & Production
155	Much of the focus on innovation has historically been driven by economic or technological factors, but there is limited research on how a human-centered approach can reshape the goals of innovation for sustainability and equity. Research is required to explore how grounding innovation in human needs can lead to more equitable and sustainable outcomes in areas such as health, environment, and climate adaptation.	Climate Adaptation & Mitigation Culture (Community, Heritage, Art & History) Health (Human and Environmental)
156	While local governments play a crucial role in shaping climate policies, there is limited understanding of how they can implement transformative governance frameworks that enable systemic change rather than incremental improvements.	Governance & Multilevel Partnerships
157	Many studies on multilevel governance focus on short-term coordination and policy implementation, but there is limited understanding of how these governance models contribute to sustained, long-term urban transformation. More research is needed to examine the long-term impacts of multilevel governance models on urban transformation, particularly in the context of sustainability and resilience.	Governance & Multilevel Partnerships Intergenerationality Sustainable Consumption & Production
158	While Indigenous knowledge holds valuable information on local ecosystems and climate patterns, there is limited research on how to systematically incorporate it into formal climate policies and strategies. While Indigenous knowledge is valuable, policy frameworks often do not recognize or make provisions for incorporating this knowledge into formal governance processes, leading to its exclusion.	Engagement & Participation Indigenous Knowledge & Decoloniality Governance & Multilevel Partnerships
159	Indigenous knowledge is often excluded from financial systems because it does not fit into existing frameworks of asset representation, leading to a lack of funding for initiatives based on this knowledge. Research is lacking on how financial mechanisms, such as climate finance or asset-based funding models, can be adapted to include Indigenous knowledge and its value in climate resilience efforts.	Engagement & Participation Finance (Investment and Public Procurement) Indigenous Knowledge & Decoloniality
160	While there is recognition of the value of Indigenous knowledge, there are limited models for fostering meaningful collaboration between Indigenous and scientific communities to jointly develop climate solutions.	Communication Engagement & Participation Indigenous Knowledge & Decoloniality

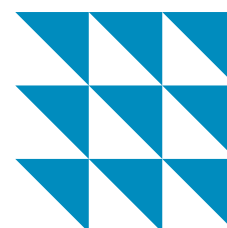


Table 5

	Action Priorities (#1–39 derived from 2021 CRIA Priorities, #40–254 onward newly added from I4C2024 Conference)	Corresponding GRAA topic(s)
1	Identifying a strategic approach to retrofitting city building stock based on building typology to reduce emissions.	Culture (Community, Heritage, Art & History) Infrastructure & Housing Energy Engagement & Participation Climate Change Adaptation & Mitigation
2	Quantify emissions and energy savings potential for deep energy retrofits of all buildings within the municipality and incorporation of digital tools to support emission reduction and boost systems' efficiency.	Efficiency Digitalization Infrastructure & Housing Energy Climate Change Adaptation & Mitigation
3	Develop policy to set new building standards and accelerate uptake of efficiency benchmarks.	Efficiency Governance & Multilevel Partnerships Infrastructure Energy
4	Use of social science in engaging a broad group of stakeholders in new initiatives from planning through implementation.	Communication Governance & Multilevel Partnerships Culture (Community, Heritage, Art & History) Engagement & Participation
5	Incorporate informal settlements and their residents in urban planning strategies through active consultation and co-creation.	Governance & Multilevel Partnerships Culture (Community, Heritage, Art & History) Engagement & Participation Informality
6	Explore connections between water, energy, and materials to develop sustainable solutions in urban areas.	Energy Water Sustainable Consumption & Production
7	Quantify potential and chart implementation pathways for blue/green infrastructure and nature-based solutions to reduce emissions, build adaptive capacity and resilience, provide co-benefits, and address issues of biodiversity.	Infrastructure & Housing Biodiversity Climate Change Adaptation & Mitigation
8	Assess planning policies and prioritize action to help mitigate urban heat island effect.	Governance & Multilevel Partnerships Climate Change Adaptation & Mitigation Empowering Cities to Take Action
9	Explore adaptation and resilience in cities through culture and history to better understand their impact on climate action today.	Culture (Community, Heritage, Art & History) Climate Change Adaptation & Mitigation Empowering Cities to Take Action
10	Mainstream climate change action planning into city decision making, integrating mitigation and adaptation into comprehensive planning and budgeting processes.	Finance (Investment & public procurement) Governance & Multilevel Partnerships Climate Change Adaptation & Mitigation Empowering Cities to Take Action

#	Action Priorities (#1–39 derived from 2021 CRIA Priorities, #40–254 onward newly added from I4C2024 Conference)	Corresponding GRAA topic(s)
11	Assess solutions to address the urgency of water-scarcity, pollution, and allocation in cities and their related ecosystems.	Waste Water Biodiversity
12	Support community-based and entrepreneurial innovation in climate smart food systems.	Finance (Investment & public procurement) Culture (Community, Heritage, Art & History) Food Climate Change Adaptation & Mitigation
13	Further understanding is needed on potential for urban agriculture in terms of climate change mitigation and local food security.	Food Climate Change Adaptation & Mitigation
14	Understand the impact of scope 3 emissions, urban mitigation planning, and how this can be best incorporated into local and subnational climate plans.	Governance & Multilevel Partnerships Climate Change Adaptation & Mitigation
15	Assess energy efficiency increase through use of micro grids.	Efficiency Energy
16	Evaluate balance between connected vs. distributed renewable systems based on access and reliability.	Energy Access & Reliability
17	Explore how digital infrastructure can be built into transit systems to connect public and private transit technology.	Digitalization Infrastructure Transportation
18	Explore how urban plans can be shaped to reduce vehicle miles traveled and support active/shared transit.	Transportation Health
19	Explore potential for a circular economy approach throughout city systems, and how these may differ in developed and developing cities.	Finance (Investment & public procurement) Sustainable Consumption & Production
20	Evaluate benefits of diversion and recycling considering supply and demand.	Waste Sustainable Consumption & Production
21	Better understand how sustainable consumption habits can be fostered.	Sustainable Consumption & Production
22	Communicate community benefits of controlled landfilling to build understanding and buy-in of waste collection systems.	Communication Waste Geography Sustainable Consumption & Production
23	Collaboration and capacity building to develop bankable projects and increase creditworthiness to de-risk investment.	Risk Finance (Investment & public procurement)
24	Increase focus on understanding the finance adaptation gap for cities, including short- and long-term financial needs for nature-based solutions.	Finance (Investment & public procurement) Biodiversity

#	Action Priorities (#1–39 derived from 2021 CRIA Priorities, #40–254 onward newly added from I4C2024 Conference)	Corresponding GRAA topic(s)
25	Governance landscapes (considering formal and informal actors) to support greater generation of local and subnational revenue and which support groups marginalized due to gender, age, race, ethnicity, religion, indigenous status and disability.	Finance (Investment & public procurement) Governance & Multilevel Partnerships Geography Engagement & Participation Access & Reliability Informality Gender Indigenous Knowledges & Decoloniality Intergenerationality
26	Increase understanding of potential for digital financing—including crowd-sourcing, digital green bonds, and others—to fund city-scale projects.	Scale Digitalization Finance (Investment & public procurement) Engagement & Participation
27	Strategic methods for awarding projects which prioritize sustainability, circular economy, and resilient low-emission roadmaps in urban solutions.	Finance (Investment & public procurement) Governance & Multilevel Partnerships Sustainable Consumption & Production
28	Develop flexible and distributed/networked solutions that can be expanded or changed as innovation progresses or financing allows.	Finance (Investment & public procurement)
29	Calculation and communication of economic and health effects of action vs. inaction.	Communication Finance (Investment & public procurement) Empowering Cities to Take Action
30	Evaluate combinations of high-tech and low-tech innovation.	Digitalization Governance & Multilevel Partnerships
31	Measures to evaluate a wide range of climate and societal co-benefits of climate solutions.	Finance (Investment & public procurement) Engagement & Participation
32	Explore incentives for local and subnational employees to innovate and take risks with transformative decisions.	Risk Finance (Investment & public procurement) Governance & Multilevel Partnerships Engagement & Participation
33	Investigate emerging social innovations in cities that could be exported globally to scale solutions.	Scale
34	Explore effective governance frameworks to facilitate city-led research and innovation, including creating space for learning-by-doing and learning-from-failure.	Governance & Multilevel Partnerships
35	Communication of uncertainty and risk of climate hazards for cities.	Uncertainty Risk Communication

#	Action Priorities (#1–39 derived from 2021 CRIA Priorities, #40–254 onward newly added from I4C2024 Conference)	Corresponding GRAA topic(s)
36	Understand the mitigation and adaptation potential of city actions, including implications for social equity and justice.	Climate Change Adaptation & Mitigation Empowering Cities to Take Action Engagement & Participation
37	Generate city scale data for development of specific observation, models, and scenarios/ Develop and implement an interactive mapping platform to assess and improve urban natural infrastructure, focusing on benefits, risks, and equitable access across cities.	Scale
38	Reduce the gap in climate relevant data on vulnerable communities.	Uncertainty
39	Equitable development and dissemination of knowledge and data inclusive of co-design and co-production through collaborative partnerships across public and private sectors, and civil sectors (including youth, indigenous populations, residents of informal settlements, and other marginalized individuals).	Communication Culture (Community, Heritage, Art & History) Engagement & Participation Informality Indigenous Knowledges & Decoloniality Intergenerationality
40	Open innovation challenges/inducement initiatives to engage communities and encourage cities experimenting with new governance/resource management models.	Empowering Cities to take Action Communication Engagement & Participation
41	Support design of gamification and monetization tools for public participation in sustainable resource management, fostering greater awareness in residents and institute benefit-sharing mechanisms based upon avoided costs.	Empowering Cities to take Action Communication Engagement & Participation
42	Institute both cross-departmental and cross-sectoral fora to effectively incorporate systems approach thinking, city-level data (geospatial, climate downscaling, etc.), and justice & equity into dialogues and decision-making, supported by mayors and public sector personnel.	Empowering Cities to take Action
43	Empower and incentivize cities, showcasing successful practices through media content to inspire others.	Empowering Cities to take Action
44	Empower and incentivize cities by showcasing successful practices through media content to inspire others, with a focus on promoting people-centered development principles.	Empowering Cities to take Action
45	Neighborhood Adaptation Plans to empower local communities to respond to climate challenges effectively, with special attention to the needs of vulnerable populations to extreme climate, like heat and flooding.	Empowering Cities to take Action
46	Capacity building, training programs for local communities to acquire new skills & jobs related to a local impacts of climate change, especially marginalized communities, allowing them to lead conversations and projects most relevant to them.	Empowering Cities to take Action
47	Regional hubs to provide support and guidance, develop tools and guidelines, build capacity, and enhance local and subnational climate action plans for significant emissions reduction and climate resilience.	Empowering Cities to take Action

#	Action Priorities (#1–39 derived from 2021 CRIA Priorities, #40–254 onward newly added from I4C2024 Conference)	Corresponding GRAA topic(s)
48	Advocacy support for cities' roles in national and multilateral forums, e.g. multilevel governance.	Empowering Cities to take Action
49	Strengthen partnerships between cities and other civil society groups – e.g. youth, workers, unions, businesses, and other organizations for city climate action.	Empowering Cities to take Action
50	Support or establish boundary spanning organizations to bridge scientific evidence and decision-making, supporting cities make better investments for climate resilience and adaptation.	Empowering Cities to take Action
51	Find opportunities to bridge the gap between research and practice inclusive of diverse knowledge types and cross-sectoral/intersectional insights into urban planning and policies.	Co-Production of Knowledge
52	Utilize participatory planning methods and stakeholder-facing web platforms for system modeling, complemented by simplified, graphic representations to enhance transparency and encourage community involvement.	Co-Production of Knowledge Information Integrity & Transparency
53	Integrating socio-demographic indicators into assessment tools for housing affordability and climate resilience empowers communities to play an active role in urban renewal if transparently managed to avoid further unsustainable capture and commodification of housing markets.	Co-Production of Knowledge Information Integrity & Transparency Infrastructure & Housing
54	Co-design, with local communities and governments digital base maps to address local climate challenges supported with targeted training and support.	Co-Production of Knowledge
55	Utilizing real-world living lab research and challenge-based learning fosters collaboration among stakeholders, enhancing the collective knowledge on urban sustainability.	Co-Production of Knowledge
56	Highlight the importance of collecting, filtering, and recording non-scientific knowledge, fostering dialogue, and co-creation of knowledge based on community experiences, including unsuccessful experiences.	Co-Production of Knowledge
57	Engage in joint action research, focusing on specific urban challenges through data-driven processes.	Co-Production of Knowledge
58	Launch a Community of Practice, utilizing university campuses as testbeds for innovation, and organizing interdisciplinary research projects.	Co-Production of Knowledge
59	Facilitate discussions among local governments, experts, and Indigenous peoples to develop localized knowledge frameworks and explore community-centered responses.	Co-Production of Knowledge
60	Knowledge integration is critical, combining soft skills (communication, collaboration) with technical expertise (data analysis, technology). This capacity-building approach empowers communities in climate action.	Co-Production of Knowledge
61	Analyze and integrate individual mindsets and capacities into urban coalitions, using case studies to develop gender-responsive and inclusive approaches.	Co-Production of Knowledge Partnerships for Long Term Collaboration

#	Action Priorities (#1–39 derived from 2021 CRIA Priorities, #40–254 onward newly added from I4C2024 Conference)	Corresponding GRAA topic(s)
62	Facilitate a workshop on innovative methodologies, demonstrate the use of open-source digital technologies, gather feedback from stakeholders, and enhance the UESI tool for improved practical application.	Partnerships for Long Term Collaboration
63	Open innovation challenges/inducement initiatives to engage communities and encourage cities experimenting with new governance/resource management models.	Partnerships for Long Term Collaboration
64	Public-Private Partnerships (PPPs) and other financing mechanisms, such as green bonds, energy performance contracting, and crowdfunding may be vital in ensuring cities have the necessary resources for sustainable transitions.	Partnerships for Long Term Collaboration
65	Expand the tripartite consultation model involving local governments, provincial governments, and universities to facilitate collaborative management, flexible governance, and knowledge sharing allowing municipalities to benefit from broader networks capable of delivering locally tailored key performance indicators (KPIs) in climate planning.	Partnerships for Long Term Collaboration
66	Flexible funding models must be designed in response to limitations of existing procurement systems, designing open training programs that foster continuous engagement and knowledge transfer to enable civil society partnerships with the public and private sector.	Partnerships for Long Term Collaboration
67	Foster regional cooperation for climate action through a single-data system for climate monitoring and cross-sector collaboration. Ensure strong support from key actors in collaborative partnerships, and establish multi-tiered structures for local climate action planning with political buy-in.	Partnerships for Long Term Collaboration
68	Conduct a qualitative cross-case comparison of various partnership types to design effective cross-sector partnerships for equitable climate mitigation.	Partnerships for Long Term Collaboration
69	Effective strategies must focus on energy-efficient building solutions, cooling systems, and sustainable urban resilience methods tailored to local conditions and resources available across the systems in place.	Partnerships for Long Term Collaboration Climate Change Adaptation & Mitigation
70	Key actions emphasizing coordination between mitigation and adaptation efforts within urban areas include water harvesting, promoting solar energy, preventing soil erosion, and developing hydroponics for endangered plants.	Partnerships for Long Term Collaboration Climate Change Adaptation & Mitigation
71	Nature-based solutions (NBS), including mangrove restoration, urban tree management, daylighting buried urban streams, are critical for climate adaptation, carbon sequestration, and increasing biodiversity.	Partnerships for Long Term Collaboration Climate Change Adaptation & Mitigation
72	Participatory and bottom-up methods for quantifying GHG emissions and other environmental impacts yield more precise data, and should be incorporated into city-level practice to guide climate action that reflects local needs.	Partnerships for Long Term Collaboration Climate Change Adaptation & Mitigation
73	Develop and implement improved measurement systems and standardized indicators to advance local and subnational monitoring and disclosure for climate budgets.	Climate Change Adaptation & Mitigation

#	Action Priorities (#1–39 derived from 2021 CRIA Priorities, #40–254 onward newly added from I4C2024 Conference)	Corresponding GRAA topic(s)
74	Utilization of GIS and AI to integrate socio-economic variables into climate vulnerability assessments, enhancing adaptation strategies.	Climate Change Adaptation & Mitigation Digitalization
75	Increase the use of nature-based solutions to reduce heat stress, improve water management, and increase urban biodiversity, to reduce climate inequality and increase resilience in frontline communities.	Climate Change Adaptation & Mitigation Biodiversity
76	Use the 'Return of Experience' approach to gather data on past floods, creating resilient development scenarios to enhance local and subnational resilience projects. Utilize "stretch and transform" strategies to challenge energy institutions and implement the UN Declaration of the Rights of Indigenous Peoples (UNDRIP) in energy policy.	Climate Change Adaptation & Mitigation
77	Consider co-benefits of initiatives that incorporate both adaptation and mitigation, and require governance and finance to be part of decision making for these projects.	Climate Change Adaptation & Mitigation
78	Conduct research on place-based decarbonisation approaches and develop the Place-Based Retrofit & Regeneration Models project.	Climate Change Adaptation & Mitigation
79	Implementing targeted greening initiatives, including pocket greens, vertical greening, and roof greening, in interstitial open spaces to mitigate urban heat and support climate adaptation in vulnerable urban areas.	Climate Change Adaptation & Mitigation
80	Implement climate resilient drainage and flood mitigation measures, improve solid waste management, and upgrade targeted communities.	Climate Change Adaptation & Mitigation
81	Put boundary organizations in place to help communities accelerate adaptation to climate change, including training and workshops to develop community adaptation strategies through participatory approaches.	Climate Change Adaptation & Mitigation Engagement & Participation Communication
82	Analyze city and energy strategy documents to identify equitable models of energy development.	Climate Change Adaptation & Mitigation
83	Develop and implement climate resilience strategies that include diverse groups, such as local policymakers and marginalized communities.	Climate Change Adaptation & Mitigation
84	With appropriate training and oversight, advanced data analytics and AI-driven data extraction and textual analysis from documents can effectively monitor city policies, enabling governments at all levels to refine place-based approaches and manage sustainability initiatives more efficiently, improving their capacity to address consumption and production challenges.	Sustainable Consumption & Production
85	Reimagining consumption of space in terms of positional value and occupancy may enable sustainable management of community spaces through sustainable practices catering to both environmental and social needs.	Sustainable Consumption & Production
86	Strengthen policies, promote sustainable practices, and support community-led initiatives to combat plastic pollution.	Sustainable Consumption & Production
87	Implement interlocal and subnational consortia for efficient solid waste management, allowing economies of scale to reduce costs.	Sustainable Consumption & Production

#	Action Priorities (#1–39 derived from 2021 CRIA Priorities, #40–254 onward newly added from I4C2024 Conference)	Corresponding GRAA topic(s)
88	Implement strategic measures for sustainable agriculture, including installing heaters for greenhouses and using biomass for production.	Sustainable Consumption & Production
89	The emphasis on long-term partnerships and coalition building for climate action inherently involves future generations, highlighting the importance of including diverse age groups in decision-making processes.	Intergenerationality
90	Creative expression through storytelling and art in both traditional and new media serve as powerful tools for intergenerational education and mobilization in addressing climate change and grappling with long-term planning on narrative timelines beyond the scope of conventional policy discussions to ensure future generations can articulate what resilient systems they require to inherit.	Intergenerationality
91	Designing upskilling/training environmental civil employment programs to prepare youth and other insufficiently supported groups for climate action jobs will ensure those most affected by the transition have critical capacity for ensuring climate policies support individual and societal needs across generations.	Intergenerationality
92	Use the (GCOM / Student Energy) Youth Impact Framework to engage youth in climate and energy solutions, fostering their participation through pilot projects, and to measure the success and impact of their involvement through the indicators of this framework	Intergenerationality
93	Establish Urban Youth Councils, ensuring gender equality, followed by capacity-building workshops and mentorship to empower youth in governance.	Intergenerationality
94	There is a significant inadequacy in the funds allocated under the Paris Agreement for vulnerable regions like Africa, the Middle East, and Latin America, highlighting the urgent need for sufficient, well-targeted funding to address climate change challenges in the Global South in recognition of disproportionate distribution of benefits under the existing market paradigm.	Finance Sufficiency Geography
95	Innovative approaches focused on 'sufficiency' must emphasize resource efficiency at all societal levels – particularly targeting the incompatibility of overdeveloped economies and unsustainable cultural consumption practices which undermine sufficient resource access in locales across developing economies – requiring methodologies to guide consumption reduction, promoting minimalism, in fostering sustainable communities able to meet their needs without generating unnecessary losses.	Sufficiency
96	Incorporating resource-efficient urban tree management and soil improvement into city planning exemplifies how sufficiency can be integrated into urban resilience strategies. Such measures reflect an adaptive, bottom-up approach that prioritizes resilient infrastructure over extensive urban redevelopment.	Sufficiency
97	Raise awareness about sufficiency, identifying existing measures and opportunities in cities climate action plans.	Sufficiency Engagement & Participation Communication

#	Action Priorities (#1–39 derived from 2021 CRIA Priorities, #40–254 onward newly added from I4C2024 Conference)	Corresponding GRAA topic(s)
98	Developing business models that focus on providing what people need with lower or no emissions emphasizes the importance of sufficiency in urban planning.	Sufficiency
99	Initiatives focused on land and sea-based climate resilience and long-term sustainability that emphasize the integration of Indigenous knowledges into urban governance and sustainability practices.	Indigenous Knowledges & Decoloniality
100	Institutionalize Indigenous knowledge, particularly regarding ocean preservation, to strengthen climate resilience through cultural practices providing invaluable insights into sustainability with a decolonial approach to climate action, highlighting the importance of restoring and maintaining cultural and environmental integrity.	Indigenous Knowledges & Decoloniality
101	Emphasize the need for tools that encourage community participation and ensure local voices are heard in planning and compliance processes related to sustainability, with the integration of Indigenous knowledge systems into decision-making processes promoting equity and resilience in the face of contemporary challenges.	Indigenous Knowledges & Decoloniality
102	Implement and evaluate the LCR Approach through Phase I and II pilot programs involving municipalities and First Nations communities.	Indigenous Knowledges & Decoloniality
103	Integrate Indigenous Knowledges into curricula and policies to promote climate change adaptation and recognition of indigenous rights in governance.	Indigenous Knowledges & Decoloniality
104	Collaborate with Indigenous cultural and design representatives to integrate their knowledge into development guidelines.	Indigenous Knowledges & Decoloniality
105	The theme of inclusivity and equity is integral to the discussions around community-based solutions and ensuring that climate action benefits all members of society, with gender dimensions specified and participatory processes that actively involve women and marginalized genders may contribute to the development of more inclusive and equitable climate adaptation strategies.	Gender
106	Engaging women and marginalized groups of varied gender identities in ecological restoration and urban planning ensures that diverse perspectives shape the future of cities to safely accommodate all community members	Gender
107	Urban resilience planning that integrates socio-demographic indicators, including gender, allows cities to address the diverse needs of their populations, with a specific focus on jobs, re-skilling, and the equitable distribution of benefits among women and vulnerable groups across the gender spectrum.	Gender
108	Empower women's collectives to assess home resilience and advocate for climate resilient urban planning.	Gender
109	Recognizing diverse forms of leadership, including the prominent role of women in communities, is crucial for fostering collective climate action.	Gender

#	Action Priorities (#1–39 derived from 2021 CRIA Priorities, #40–254 onward newly added from I4C2024 Conference)	Corresponding GRAA topic(s)
110	Acknowledge the challenges of extreme heat, particularly affecting women in vulnerable communities, and support their needs through research and action initiatives.	Gender
111	Address gender-sensitive issues in governance and capacity building, empathetic neighborhoods also consider gender perspectives, ensuring that women's voices and needs are central in planning and decision-making processes.	Gender
112	Promote inclusive design principles to demonstrate benefits for market expansion and societal equity, integrate different mindsets and capacities into urban coalitions to develop gender-responsive approaches to local finance initiatives.	Gender
113	Enhance access to climate finance for local and gender-responsive adaptation by employing collaborative approaches and strengthening knowledge brokers' capacity.	Gender
114	Analyze and iCo-create and implement the Gender Responsive Resilience Planning Framework, utilize innovative techniques such as photovoice, integrate local perspectives, and develop tailored resilience strategies to foster sustainable development and disaster preparedness.	Gender
115	Address informal systems through formalization pathways for access to essential resources, involving informal communities in decision-making to achieve more equitable and sustainable resource management practices which recognize and integrate practices to enhance the resilience and inclusiveness in city systems.	Informality
116	City officials must acknowledge the role of informal community initiatives, formalizing and supporting their development, to ensure lasting benefits can be achieved. Informal community efforts, such as self-organized environmental clean-ups, play a significant role in promoting urban sustainability. Therefore, cities need to recognize and support these grassroots initiatives by providing formalized resources and assistance.	Informality
117	Collaborative Neighborhood Networks facilitate informal engagement between communities, planners, and city stakeholders in mediation to foster social inclusion in decision-making processes and provide models for coordination across cities.	Informality
118	Develop mechanisms for equitable access to funds supporting informal settlement communities in achieving New Urban Agenda commitments.	Informality
119	Establish informal, virtual mediation spaces for community engagement in emission reduction strategies. Support informal solutions and leverage community engagement to ensure inclusive responses to urban challenges.	Informality
120	Investigate and apply scenario planning in informal communities to improve disaster management and resilience.	Informality

#	Action Priorities (#1–39 derived from 2021 CRIA Priorities, #40–254 onward newly added from I4C2024 Conference)	Corresponding GRAA topic(s)
121	Highlight the reality of climate impacts on informal settlements, discuss the central role of informality in urban climate action, and explore ways to reframe the narrative and improve action, finance, and research on climate change and informality.	Informality
122	Making climate-related data accessible to the public and cities is crucial for fostering effective climate action.	Access & Reliability
123	Ensuring reliable access to resources such as clean energy and water is vital for sustainable development; therefore, cities must prioritize the creation of infrastructure that is resilient and accessible to all, particularly marginalized communities.	Access & Reliability Infrastructure Water
124	Governance innovation plays a significant role in the process of establishing monitoring systems that track the implementation and consequences of local climate action plans. These systems utilize both publicly available data and information reported by municipalities, ensuring transparent and reliable access to climate information.	Access & Reliability Governance
125	Improving access to reliable data on climate action remains a priority. Digital platforms that deliver real-time information on environmental indicators and climate performance across cities enable more informed decision-making, ultimately supporting the development of robust climate strategies.	Access & Reliability
126	Develop a joint monitoring system using publicly available data to support local governments in fulfilling reporting obligations and enhance decision-support.	Access & Reliability
127	Develop site-specific recommendations for charging infrastructure to enhance accessibility and reliability for low-income communities.	Access & Reliability Infrastructure
128	Discuss and implement multi-level climate action through policy actions and integration into NDCs.	Access & Reliability Governance
129	Develop inclusive digital infrastructure and enhance digital capacities to support local innovations.	Access & Reliability Digitalization Infrastructure
130	Putting local communities at the forefront of climate projects ensures that initiatives are sustainable and grounded in cities' real needs. Tools such as creative storytelling and residential community building initiatives can enhance engagement and participation at the grassroots level.	Engagement & Participation
131	Community engagement, bottom-up participatory approaches that integrate local knowledge and GIS technologies into urban planning processes must provide citizens ownership of projects, such as managing urban green spaces, fosters active participation and long-term commitment.	Engagement & Participation
132	Gamified engagement tools and digital platforms enhance public participation in climate actions, further supporting the development of inclusive and effective climate strategies.	Engagement & Participation

#	Action Priorities (#1–39 derived from 2021 CRIA Priorities, #40–254 onward newly added from I4C2024 Conference)	Corresponding GRAA topic(s)
133	Involve diverse groups in developing climate resilience strategies, emphasizing peer-to-peer learning and citizen participation, participatory approaches to risk mapping inclusive of diverse voices.	Engagement & Participation
134	Digital tools, such as app-based sustainability tracking and geospatial data simulations, can support the monitoring and implementation of climate action at both the individual and city levels. By providing a platform for efficient data sharing and communication, digitalization enhances decision-making processes.	Digitalization
135	Innovations in digital tools, including Lidar data, GIS, and AI-driven analytics, significantly improve climate action planning. By automating greenhouse gas calculations and policy assessments, cities can streamline decision-making and adopt more accurate, data-driven approaches to sustainability.	Digitalization Co-Production of Knowledge
136	Digital tools like AI-powered climate risk assessments and platforms that track greenhouse gas emissions index data allow cities to integrate advanced technologies into urban planning, enabling effective monitoring, assessment, and adaptation of climate strategies.	Digitalization
137	Create digital base maps and utilize open-source technologies for local decision-making.	Digitalization
138	Develop a Knowledge and Innovation Exchange, a digital marketplace that matches climate innovation projects with investors.	Digitalization
139	Focus on digital tools, such as Digital Twins for data collation, can enhance coastal resilience strategies. Utilize GIS and geo-information modeling to analyze spatial-temporal data for assessing urban sprawl impacts and develop comprehensive greenhouse gas inventories.	Digitalization
140	Develop AI models to revolutionize urban planning, such as AI-assisted textual analysis methodologies to policy, planning, and reporting documents while ensuring ethical use.	Digitalization
141	Scenario modeling and data-driven simulations may further assist cities in navigating uncertainties related to climate change impacts, particularly when incorporating climate-morphological modeling for various future scenarios.	Uncertainty
142	Cities grappling with uncertainty, particularly during post-disaster recovery, must adopt flexible frameworks that facilitate adaptive and participatory planning.	Uncertainty
143	The integration of climate risk assessments and monitoring mechanisms is vital, ensuring cities are better equipped to handle uncertainties associated with climate change. Together, these strategies create a robust framework for addressing the complexities and unpredictabilities of climate impacts.	Uncertainty
144	Embrace uncertainty and complexity by adopting a mindset that welcomes experimentation, failure, and continuous adaptation.	Uncertainty
145	Utilize Dynamic Risk Assessment (DRA) methodology to analyze risks and interdependencies in urban contexts.	Uncertainty

#	Action Priorities (#1–39 derived from 2021 CRIA Priorities, #40–254 onward newly added from I4C2024 Conference)	Corresponding GRAA topic(s)
146	Employing spatial network analysis and local datasets helps urban planners understand uncertainties in transportation systems, guiding future developments.	Uncertainty
147	Innovative financial instruments can help address uncertainties related to climate financing.	Uncertainty Finance
148	Utilize environmental scanning, scenario planning, and community engagement methods to develop resilient and inclusive urban living environments.	Uncertainty
149	Cities must prioritise the optimisation of resource demands across all systems to minimize waste, particularly focusing on integrating renewable energy into transit and active transport solutions (which build upon water, food, and energy systems), including simplified graph-based transit modeling to efficiently design and test projects, ensuring cities can implement proven improvements with minimal delays.	Efficiency Infrastructure Energy Mobility
150	Develop the CityRetroFit tool to ensure efficient energy usage and stakeholder engagement.	Efficiency
151	Implement Green BIM in architectural projects to optimize resource usage and promote energy-positive design.	Efficiency Digitalization
152	Smart grids allow for greater efficiency and resilience in energy networks, requiring closer collaboration between businesses and regulators.	Efficiency
153	Standardize data collection and analysis processes to improve the efficiency and quality of emission monitoring and climate action plans.	Efficiency
154	Implementing enhanced monitoring systems for drought and land use changes improves the efficiency of resource allocation and management in urban environments. Develop advanced mobility modeling methodologies to enhance urban mobility solutions.	Efficiency
155	Develop and implement a carbon budget framework, including emissions quantification, reporting, and adjusting budgets based on equity and accountability principles.	Efficiency
156	Scaling approaches such as the clustering framework, which identifies urban typologies based on climate-morphological peers, allows cities with similar characteristics to implement replicable models, enhancing the scalability of local projects.	Scale
157	Research on, and deployment of, nature-based solutions, such as mangrove restoration and ecological restoration projects, offer scalable options for cities adapting to climate change, and expanding initiatives across regions requires interdisciplinary collaboration to ensure that they are effectively tailored to different urban contexts at the relevant scale necessary.	Scale
158	City-to-city knowledge transfers and resource pooling are also critical for scaling climate adaptation strategies. By sharing best practices and solutions, cities can collectively enhance local-level efforts to address climate challenges on a larger scale.	Scale

#	Action Priorities (#1–39 derived from 2021 CRIA Priorities, #40–254 onward newly added from I4C2024 Conference)	Corresponding GRAA topic(s)
159	Aggregate and analyze global city climate project data, assess project needs, provide technical assistance and matchmaking support, and collaborate with city networks and other organizations to enhance project readiness and implementation.	Scale
160	Differentiating the scale of interventions between cities and regions enables tailored responses to urban challenges, addressing specific local needs. Scale up the Carbon Monitor Cities 2.0 approach to multiple cities, particularly in low-and-middle-income countries, for real-time emissions data.	Scale
161	Innovative risk modeling, such as integrating climate data with urban tree growth predictions, helps cities anticipate and manage long-term risks. Incorporating risk management into participatory, community-driven city planning is crucial, particularly when addressing climate risks.	Risk
162	Cities must implement monitoring frameworks like the Sendai Framework and align with the Sustainable Development Goals (SDGs) at the local level to track and reduce climate risks, ensuring that vulnerable populations are adequately protected.	Risk
163	Risk must be viewed in the context of the threat posed by inaction, not in the context of risk to existing institutional structures and practices, which has previously created a dialogue of aversion to risk when it means taking on the responsibility of tackling transformative change.	Risk
164	Address political risks by fostering cooperation among different municipalities and political leaders for shared infrastructure projects.	Risk Governance & Multilevel Partnerships
165	Unlock financing by addressing the logics behind risk perceptions, leveraging place-based transition funds with a holistic understanding of risk and impacts.	Risk Finance (Investment & public procurement)
166	Blended finance can reduce investment risks, making climate action projects more viable.	Risk Finance (Investment & public procurement)
167	Developing a management framework using the Ecosystem Services Provision Index (ESPI) helps in assessing and managing risks associated with ecosystem services.	Risk Biodiversity
168	Innovative approaches, such as storytelling through art, film, music, dance, and writing, are needed to help simplify complex climate challenges and counter unsustainable narratives, making solutions accessible and engaging for diverse audiences beyond the scientific community.	Communication
169	Participatory planning processes and collaborative governance structures ensure transparency, build trust, and create open dialogues that support the success of climate actions – achieving transparency around the money behind unsustainable messaging and who is benefiting from inequitable unsustainable systems will help target which levers of change require more force to move.	Communication Information Integrity & Transparency

#	Action Priorities (#1–39 derived from 2021 CRIA Priorities, #40–254 onward newly added from I4C2024 Conference)	Corresponding GRAA topic(s)
170	Gamified tools and public-private partnerships further enhance engagement by breaking down complex climate goals into understandable actions for communities, facilitating a shared understanding of urban sustainability efforts.	Communication
171	Protocols that curate case studies and web-based platforms/fora for stakeholder engagement are needed to promote knowledge sharing and best practices across regions, strengthening collaborative efforts to share solutions and build solidarity.	Communication
172	Implement positive communication strategies to engage and collaborate with communities in contextually appropriate climate resilience initiatives.	Communication
173	Utilize podcasts to facilitate discussions and share innovative solutions and policies among urban leaders and other stakeholders to promote climate resilience and action.	Communication
174	Strengthen communication with citizens to enhance understanding of flood risks and involve them in resilience planning.	Communication
175	Better coordination among city teams responsible for climate mitigation and adaptation requires centralized structures, such as cross-departmental committees, provide a coordinated approach to sustainability planning of decentralized stakeholders, checking alignment of adaptation, mitigation, and sustainability strategies and ensuring that climate actions are consistent and cover all relevant sectors and their interactions with each other.	Centralization
176	Multi-level governance models are another form of centralization that support coordination between municipalities, national governments, and various sectors to allow localized flexibility, fostering an environment of shared responsibility and empowerment.	Centralization Governance
177	While central governance can help organize large-scale climate actions, cities benefit greatly from decentralized initiatives involving grassroots innovation, balancing centralized coordination with local-level engagement. This dual approach ensures that climate strategies are both scalable and deeply rooted in community needs.	Centralization Governance Scale
178	Decentralizing decision-making processes enables local authorities to tailor solutions to their unique social and economic conditions.	Centralization
179	Ensuring the accuracy and reliability of climate-related data emerged as a key priority, particularly for smaller municipalities that face challenges in managing and analyzing sustainability documents effectively. Accurate, verifiable, replicable information is critical for informed decision-making, transparency, and accountability in climate action.	Information integrity & Transparency
180	Tools like net-zero trackers and climate scorecards further support the integrity of data by offering transparent, accountable records of climate plans and progress. Technologies such as IoT and digital twins also play a crucial role in ensuring data accuracy, enabling cities to monitor climate impacts and base their policies on solid, reliable information. These advancements ensure that climate actions are grounded in trustworthy data, allowing cities to track their progress effectively and respond to emerging challenges with confidence.	Information integrity & Transparency

#	Action Priorities (#1–39 derived from 2021 CRIA Priorities, #40–254 onward newly added from I4C2024 Conference)	Corresponding GRAA topic(s)
181	Information integrity should continually be examined in the context of its manipulation, and the potential beneficiaries and victims of this manipulation, understood in the context of how justice & equity are inhibited by existing/ emerging information systems and the ways in which bad data can take hold in the perspectives and practices of communities in cities globally.	Information integrity & Transparency
182	Enable the use of grey literature on urban action in the development of the AR7 IPCC Special Report Climate Change and Cities to enhance the policy relevance of the report.	Information integrity & Transparency Information integrity & Transparency
183	Explore the integration of AI and machine learning tools in climate data analysis to improve information integrity and transparency.	Information integrity & Transparency
184	Develop a clear definition and guidelines for NPCs, reviewing methodologies for implementation to ensure information integrity.	Information integrity & Transparency
185	Cities need tailored strategies to reflect their distinct geographical and ecological realities, with geographic information systems (GIS) enabling understanding of what climate actions may be suited to unique physical environments, helping cities develop place-based resilience strategies that are more effective and contextually relevant.	Geography
186	Coastal areas, in particular, face unique vulnerabilities, such as rising sea levels and ecosystem degradation, which necessitate targeted nature-based solutions like mangrove restoration. Inland cities, on the other hand, may prioritize water conservation strategies that reflect their own geographical challenges. In all instances, bespoke solutions must be built around geographic system constraints.	Geography
187	Utilizing geo-referenced data allows for better understanding of the spatial scales of studies related to urban sustainability, linking local actions to broader regional goals.	Geography
188	Integrate mobility modeling into infrastructure planning to develop accessible web applications.	Geography Digitalization Communication
189	Utilize high-resolution geo-data to conduct detailed coastal hazard modeling and vulnerability assessments. Conduct comparative analyses of land-use patterns and green infrastructure to identify opportunities for enhancing urban biodiversity and resilience.	Geography
190	Innovations in nature-based solutions, such as the daylighting of streams, demonstrate how cities can mitigate climate impacts while simultaneously enhancing the resilience of urban ecosystems – restoring natural waterways not only supports biodiversity but also improves urban environments by creating greener, more adaptive spaces.	Biodiversity Climate Change Adaptation & Mitigation
191	Ecological restoration and urban forest management are key strategies for bolstering biodiversity. By prioritizing soil health and tree canopy growth integrated within infrastructure planning, cities can create thriving ecosystems that are better equipped to adapt to climate change and remain biodiverse and sustainable.	Biodiversity

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192	Incorporating advocates for biodiversity into governance structures, such as civic assemblies, ensures that ecological considerations are fully integrated into urban planning and climate action – agency for non-human species must be elevated in city-level stakeholder dialogues.	Biodiversity
193	Develop and rehabilitate eco-friendly tourism trails, such as the Bee Trail, to enhance biodiversity and local livelihoods.	Biodiversity
194	Implementing nature-positive engineering focuses on integrating biodiversity considerations in urban planning, promoting sustainable practices that protect local ecosystems.	Biodiversity
195	Urban planning efforts must demonstrate how to incorporate clean air, water, and green spaces into directly improving public health and mitigating the adverse effects of climate change on communities, and environmental impact assessment of developments must involve valuation of ecosystems services.	Health (Human & Environmental)
196	Cities restoring natural ecosystems, such as mangroves and urban forests, support biodiversity and promote public health by improving air and water quality – investment in ecological restoration sees return through multiple health benefits for their residents alongside environmental gains.	Health (Human & Environmental)
197	Promoting clean fuel alternatives, such as using coconut for cooking, reduces health risks associated with traditional fuels while contributing to environmental sustainability.	Health (Human & Environmental)
198	Enhance community-based initiatives to improve health outcomes while addressing climate resilience, such as heat action plans, mental health benefits from water sensitive, nature based solutions.	Health (Human & Environmental)
199	Managing urban water systems through measures such as the restoration of natural waterways, ecological landscape design, and micro-catchment designation, is critical for climate adaptation and mitigation, as water resilience strategies must be centralized in city planning.	Water
200	Rainwater harvesting and similar water-sensitive urbanism techniques are vital for ensuring sustainable water use. They allow cities to manage water supply during droughts and mitigate the risk of flooding during periods of heavy rainfall, offering a comprehensive approach to urban water resilience.	Water
201	Implement strategies for improving access to potable water and address related vulnerabilities in urban communities.	Water
202	Develop digital solutions for climate resilience, including smart water meters and flood scenario modeling.	Water
203	Sustainable food systems are crucial for climate resilience, and cities can encourage local food production and consumption through community involvement in urban agriculture, forestry and land management, which reduces the carbon footprint of food supply chains and enhances food security.	Food

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204	By integrating food security into urban planning, cities develop shared platforms for evaluating food sustainability to track local supply chains and ensure resilience against climate impacts through practices that require local production and waste reduction.	Food
205	Facilitate local and sustainable food access initiatives through improved transportation systems for food delivery.	Food
206	City-scale understanding of decarbonized energy systems, diversified power generation strategies, and passive design standards are critical for achieving fully decarbonized energy, and grid reliability will be contingent upon improved research and application of digital technologies and demand-side management strategies to address these reliability and resilience challenges.	Energy Digitalization
207	Maximizing renewable energy, efficiency, and distributed energy systems to decrease reliance on centralized power grids and enhance energy resilience.	Energy
208	Develop neighborhood-scale emission-based tools for community governance and compliance.	Energy
209	Digitalization of the electric grid is essential for resilience and efficiency in energy transition.	Energy Digitalization
210	Adapt regulation to phase out fossil fuel use and promote clean energy solutions.	Energy
211	Develop a global dataset of renewable energy clusters to identify effective transitions.	Energy
212	Use cost optimization models to evaluate impacts on renewable energy investments.	Energy Finance
213	Supporting the use of solar panels in urban communities through partnerships with local NGOs encourages renewable energy adoption and reduces reliance on fossil fuels.	Energy
214	Develop and implement ecodistricts focusing on zero-carbon energy transition and energy efficiency standards, including smart lighting, innovative collaborations with building owners or tenants.	Energy Partnerships for Long-Term Collaboration
215	To effectively reduce emissions in urban areas, cities must prioritize the development of multimodal transport systems that decrease reliance on cars, maximize road utilization while minimizing land use, requiring significant investments in public transport, cycling, and walking infrastructure.	Mobility
216	Utilize innovations in transit systems, such as simplified graph-based modeling, enable cities to efficiently design, test, and implement transportation projects aimed at reducing emissions.	Mobility Energy Infrastructure

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217	Examine potential impacts of fleet downscaling and electrification across modes, utilizing technological advancements for modeling transit systems, facilitating stakeholder engagement and creating efficient, decarbonized mobility options.	Mobility
218	Expand railway systems to encourage sustainable transportation and reduce reliance on private vehicles.	Mobility
219	Develop methodologies using traffic models to calculate GHG emissions, improving transportation-related emission reduction strategies.	Mobility
220	Establish and manage a public bike-sharing system, develop cycling infrastructure, leverage big data for planning, and implement a Training of Trainer approach to promote safe cycling and engage youth in climate action.	Mobility
221	Identify neighborhoods for EV charging infrastructure and engage residents in capacity-building.	Mobility
222	Efforts to reduce waste, particularly through community-driven initiatives, play a significant role in enhancing urban sustainability. Zero-waste programs and the promotion of circular economies should be central to waste management strategies, ensuring that both energy and material resources are used efficiently to minimize environmental impact.	Waste
223	Sustainable waste management practices are crucial for urban resilience, necessitating the implementation of systems that reduce waste and promote recycling, particularly inducing participatory processes that engage private sector operators to reduce waste materials in their supply chains and compensation communities for engaging in waste management as consumers of what they produce.	Waste Engagement & Participation
224	Working with waste management companies to localize and quantify methane emissions is crucial for effective waste management.	Waste
225	Scale up infrastructure for waste treatment and establish interlocal and subnational consortia for efficient management.	Waste Finance
226	Building resilient infrastructure that can withstand the impacts of climate change across its lifespan under local conditions is essential for long-term urban sustainability.	Infrastructure & Housing
227	Using sustainable and local materials in construction reflects a commitment to eco-friendly infrastructure, sustainable construction practices and creating spaces that serve multisystem purposes, built to deliver within local system capacity.	Infrastructure & Housing
228	Long-term infrastructure planning, informed by strategic foresight and cross-sectorally inclusive urban design, is critical for building resilient cities capable of adapting to climate risk under a holistic systems approach aligned with sustainability goals and every community's needs.	Infrastructure & Housing
229	Implement circular and bio-based building technologies using sustainable materials.	Infrastructure & Housing Sustainable Consumption & Production

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230	Transform campuses into living laboratories for experimentation and testing of new sustainable technologies.	Infrastructure & Housing Co-Production of Knowledge Partnerships for Long term Collaboration
231	Analyze tree line and urban forest data to develop indicators for sustainable forest management, enhancing urban livability.	Infrastructure & Housing Biodiversity
232	Use the Climate Innovation Readiness Navigation (CIRN) encourages the development of innovative infrastructure projects.	Infrastructure & Housing Energy
233	Propose innovative infrastructure solutions that integrate community needs and resilience strategies, like self-sovereign land approaches to support regenerative urban communities.	Infrastructure & Housing Co-Production of Knowledge Partnerships for Long term Collaboration
234	Developing a Green Cities Guarantee Fund to attract capital for urban infrastructure projects ensures long-term sustainability and climate resilience.	Infrastructure & Housing Finance
235	Enhance existing environmental audit systems to regulate heat emissions from buildings.	Infrastructure & Housing Energy
236	Cultural expressions, such as storytelling and art, play a pivotal role in educating communities about climate action, and cities must incorporate cultural heritage into their sustainability strategies to preserve local identities while addressing climate challenges. By engaging in participatory planning and storytelling, cultural and community engagement strengthens local resilience. This integration ensures that climate action solutions are grounded in local identity and history, fostering community ownership and long-term success.	Culture (Community, Heritage, Art & History)
237	A city is only sustainable as long as it remains an active, vibrant community, so governance models must recognize cultural values, advocates, and contributors to sustainable discourse that ensure the diversity of community values and heritage are represented in urban planning and efforts to create a more inclusive and resilient urban landscape across all systems and inclusive of all local species.	Culture (Community, Heritage, Art & History)
238	Facilitating interdisciplinary research tours, eco-tourism, and collaborative art projects promotes heritage sites, cultural engagement and raises awareness about sustainability issues within communities.	Culture (Community, Heritage, Art & History) Finance
239	Integrate cultural philosophies into sustainability practices, fostering community engagement.	Culture (Community, Heritage, Art & History) Co-Production of Knowledge Partnerships for Long term Collaboration Indigenous knowledges & decoloniality
240	A shift is needed from traditional top-down governance models to participatory and inclusive systems that engage all societal stakeholders, particularly marginalized groups, in decision-making processes under a lens of just & equitable participation in systems with equitable access to information.	Governance & Multilevel Partnerships
241	Models of decentralized control are required to navigate the complexities of multilevel governance, promote equity, and support the integration of nature-based solutions into urban planning, especially in rapidly urbanizing areas.	Governance & Multilevel Partnerships Centralization

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242	A strong focus on governance highlights the need for better coordination among teams responsible for climate mitigation and adaptation. Partnerships across multiple levels of governance, including regional and international collaboration, are crucial for cities like Macul and Menjez to effectively address climate challenges.	Governance & Multilevel Partnerships
243	Establishing an ongoing forum to facilitate multi-level governance structures that allow cities to coordinate across different sectors with national governments, regional organizations, and international institutions.	Governance & Multilevel Partnerships
244	Flexibility in governance, such as permitting municipalities to develop their own key performance indicators (KPIs) supported by collaborative benchmarking, empowers local authorities to take ownership of their climate strategies and foster collaboration between city governments, communities, and non-profits, prioritising flexible funding and adaptive policies that can evolve with changing climate conditions.	Governance & Multilevel Partnerships Finance
245	Intranational committees are essential for policy development and financial strategies across governance levels.	Governance & Multilevel Partnerships Finance
246	Employing a multi-level governance approach to analyze urban development processes ensures collaboration and coherence in addressing sustainability challenges.	Governance & Multilevel Partnerships
247	Investigate multilevel diplomacy through international conferences to enhance environmental governance.	Governance & Multilevel Partnerships
248	Facilitate multi-level governance through experimentation and agility.	Governance & Multilevel Partnerships
249	To support large-scale climate projects, innovative financing mechanisms such as green bonds, public-private partnerships, and energy performance contracts are essential to offer blended finance across sectors.	Finance (Investment & public procurement)
250	AI-driven policy analysis can enhance city-level climate action by providing data-driven insights into emergent patterns for effective planning of funding allocations to generate the greatest climate response with targeted investment to reduce climate risk and potential losses across city systems.	Finance (Investment & public procurement)
251	Sustainability of financing options should be evaluated against system impacts under a lens of justice and equity, with flexible public procurement tools to support the adaptive nature of climate projects, ensuring they are both inclusive and sustainable.	Finance (Investment & public procurement)
252	Sharing financial resources across departments and ensuring procurement alignment with climate goals will facilitate the effective implementation of action plans, and provide avenues for collaborating with community organizations over dimensions of any city-level systems.	Finance (Investment & public procurement)
253	Workshops focused on concept note development and funding opportunities to secure climate finance and improve project plans.	Finance (Investment & public procurement)

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254	Continued engagement with private companies for technology solutions is vital for conducting feasibility studies and completing projects.	Finance (Investment & public procurement) Partnerships for Long-Term Collaboration
255	Collaboration between governments, businesses and training institutions to design upskilling/training environmental employment programs to prepare the population (youth, disadvantaged groups, unemployed, people working in the FF sector, etc.) for climate action/green jobs. This is important not only to ensure those who needs the jobs the most are able to access them, but also to ensure that climate action is not further delayed because of an unprepared workforce.	Co-Production of Knowledge Engagement & Participation Informality Intergenerationality Partnerships for Long-Term Collaboration Sustainable Consumption & Production
256	Quantify the workforce gaps across sectors (e.g. building electrification, retrofits, electric vehicles, etc.) and cities, and the investments needed on training and skills development to prepare the workforce for the transition.	Energy Finance (Investment & public procurement) Infrastructure & Housing Mobility Scale Sufficiency Sustainable Consumption & Production
257	Examine policy design for a just transition in decentralizing and distributing job creation in climate action across the population, understanding associated unsustainable job losses to ensure opportunity for participation in the transition and inequalities are not being increased.	Decentralization Empowering Cities to Take Action Engagement & Participation Finance (Investment & public procurement) Governance & Multilevel Partnerships Sustainable Consumption & Production
258	Local governments should plan all action in accordance with 1.5°C overshoot scenarios expected within the next generation, financing local level development across all sectors at speed and scale exceeding that of the national-level multilateral dialogue.	Climate Change Adaptation & Mitigation Culture (Community, Heritage, Art & History) Engagement & Participation Empowering Cities for Action Finance (Investment & public procurement) Governance & Multilevel Partnerships Intergenerationality Risk Sufficiency Uncertainty
259	An understanding of the implications of civil conflict and crisis of both natural and anthropogenic origin in terms of both economic, social, and environmental cost (including displacement, loss and damages, and misattribution of resources towards unsustainable practices) is imperative in fostering sustainable local governance free of conflict-related losses.	Access & Reliability Communication Conflict & Crisis Response Culture (Community, Heritage, Art & History) Engagement & Participation Finance (Investment & public procurement) Governance & Multilevel Partnerships Mobility Health (Human & Environmental) Partnerships for Long-Term Collaboration Risk Sustainable Consumption & Production