Initiating and sustaining action: Experiences building resilience to climate change in Asian cities

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A R T I C L E   I N F O

A B S T R A C T

Across Asia, and more widely, significant investment is being made by donor organisations to catalyse awareness about climate change impacts in dynamic urban environments. This investment has initiated processes that enable cities to adapt and become more resilient, thereby reducing risk to rapidly growing urban populations – notably those that are most vulnerable or marginalised. The key question is to what extent such donor funded programs are able to create the foundations for sustained action that ultimately results in the integration of urban climate change resilience (UCCR) in future policy, development plans and everyday decision making. At present there is limited evidence to inform either what those foundations might look like, or the pathways to putting them in place.

This paper draws on the experiences of 10 Asian cities participating in the Rockefeller Foundation funded Asian Cities Climate Change Resilience Network (ACCCRN) identifying key areas for action – stakeholder engagement, generating credible knowledge and integration in policy and planning at a local, regional and national level – whilst recognising the importance of influencing city budgets and attracting private sector funding.

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1. Introduction

Significant investment is being made by donor organisations, such as the Rockefeller Foundation,[1] UN-HABITAT[2] and Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ),[3] to catalyse awareness about climate change impacts in urban environments and to initiate processes that enable cities to adapt and become more resilient, thereby reducing risk; a process referred to as urban climate change resilience (UCCR) (Brown et al., 2012; da Silva et al., 2012). Whilst these types of programs are valuable, they are constrained by finite budgets and timescales (typically a few years), and the scale of funding involved is minor in relation to urban investment funds that are held by city, state and national governments (Brugman, 2012). The long term impact of such programs will depend on the extent to which this early investment influences future funding and investment patterns and leads to climate risk being integrated into everyday decision making, policies and planning; ultimately resulting in more resilient cities.

Experience emerging from cities such as Durban and Quito, that are innovators in tackling climate change, suggests that in the absence of national policy, established best practice or external drivers, funding alone is insufficient to fuel the type of transformative change at the city level that is required to mainstream UCCR (Carmin et al., 2012; ISC, 2012). Local champions and civil society groups play a critical role in initiating action by advocating for change and influencing local governments; peer-to-peer networks within and between cities enable information and ideas to be shared; and the involvement of municipal leaders can help to legitimise such activity. Nevertheless, municipalities are only likely to be motivated to sustain and ultimately mainstream UCCR if this process advances existing agendas, responds to civil society pressure, and/or creates a competitive advantage and opportunity to demonstrate leadership (Carmin et al., 2012; Parker et al., 2012). In response to these motivators, donor funding may be used most effectively to create the conditions for long term change in how policies, plans and ultimately decisions are made.

To explore how these conditions might be achieved, this paper analyses and reflects on the experiences and actions being taken in 10 Asian cities participating in the Rockefeller Foundation-funded Asian Cities Climate Change Resilience Network (ACCCRN). The particular focus is on the activities and approaches employed by local partners to sustain action on UCCR beyond the timeframe of the ACCCRN program funding which ends in 2016. The hypothesis emerging from the diversity of activities and approaches taken by ACCCRN partners, supported by academic papers relating to pioneering new urban agendas, is that in addition to funding, sustained action is founded on the ability to engage a diverse group of stakeholders, generate credible knowledge, and integrate UCCR in policy and planning at a local, regional and national level.

Twelve key factors are identified that collectively contribute to sustained action, which might be used to inform the design, implementation and evaluation of future programs and investment by donors to combat changing climate risk (Fig. 2). The authors recognise that the paper's findings and conclusions are influenced by the programmatic approach taken on ACCCRN, and may be less applicable in the context of other change models; for instance, social mobilisation to generate political pressure on governments.

The term urban climate change resilience (UCCR), which is used throughout this paper, has emerged in the course of the ACCCRN program (Brown et al., 2012; da Silva et al., 2012). UCCR embraces climate change adaptation (CCA) whilst recognising the complexity of rapidly growing urban areas and the uncertainty associated with climate change predictions (da Silva, 2012). Greater emphasis is placed on considering cities as dynamic systems where building urban resilience is a process of evolutionary transformation in response to changing circumstance as well as specific hazards (Davoudi, 2012). For ACCCRN – unlike in much of the existing literature – resilience does not refer to 'bouncing back' to a pre-existing state, rather the ability of institutions, infrastructure, ecosystems and knowledge networks to evolve and adapt so that urban populations can survive and thrive even when faced with a wide range of unpredictable shocks and stresses (Brown et al., 2012; da Silva et al., 2012; Tyler and Moench, 2012; Folke 2006). This transformative process is fuelled by the capacity of

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[1] Asia Cities Climate Change Resilience Network (www.acccrn.org).
[2] Climate Change and Cities Initiative (http://www.fukuoka.unhabitat.org/programs/ccci/index_en.html).
[3] PAKLIM (http://www.paklim.org/about/about-paklim/).

people to learn from their experiences and to consciously incorporate this learning into their interactions with the social and physical environment (Pelling, 2011; Maguire and Cartwright, 2008; da Silva et al., 2012; Brown et al., 2012).

2. ACCCRN background

Since 2008, the ACCCRN program has been active in ten cities undergoing rapid growth across four countries – Vietnam, Indonesia, India, Thailand – 'testing local approaches to building climate change resilience for institutions and systems serving poor and vulnerable communities' (Brown et al., 2012). Similar principles were adopted in the 10 'core' cities (see Fig. 1), and throughout the program information and lessons learned have been shared between the local organisations leading work in each city. Notably, and distinct from UN-HABITAT and GIZ approaches, there has been no intention to create a 'one size fits all' methodology, process or set of steps that result in building UCCR. Instead the program seeks to identify a diversity of approaches that might inform future action in these and other rapidly urbanising cities in Asia and beyond (Brown et al., 2012; da Silva et al., 2012; Tyler and Moench, 2012). The rationale for this approach is that the impacts of climate change are unique to local conditions, as are the capacities, governance structures and availability of resources which will determine a city's ability to act.

The ACCCRN program has been carried out in four phases, commencing in 2008 with city selection (Phase 1). From 2009–2011, city level engagement and capacity building were initiated through local partners to raise awareness of climate risk and understand the factors contributing to vulnerability (Phase 2). This process enabled the 10 cities to develop city resilience strategies, and identify and develop proposals for projects that would build climate change resilience at multiple scales within the city. Funding from the Rockefeller Foundation has been committed to over 30 of these projects since 2011 and implementation is expected to continue up until 2016 when the program ends (Phase 3) (Brown et al., 2012). In parallel to Phase 3, a further and final phase of the program is focussed on
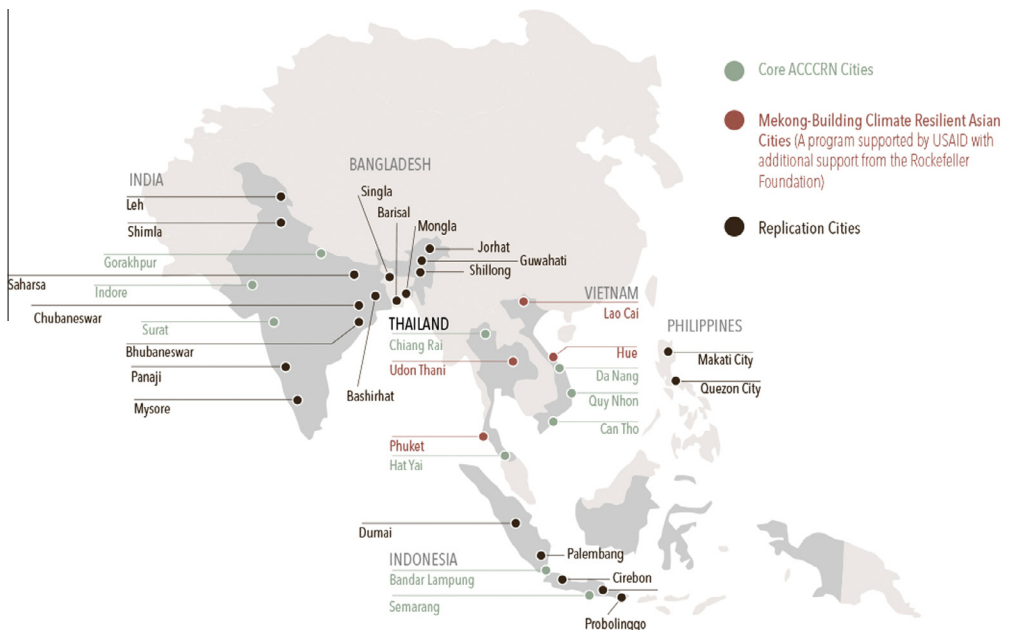

Fig. 1. Map of ACCCRN 'core' cities.

the action needed to capture the learning and build on the experiences in these ten cities, leading to sustained action within these cities and wider replication nationally and regionally (Phase 4).

Developed by each ACCCRN City in Phase 2, the city resilience strategies were informed by a number of studies (urban growth projections, climate impact and vulnerability assessments, sectoral studies), multi-stakeholder processes (shared learning dialogues, scenario planning and visioning exercises), and action planning. The preparation of these strategies – a city-wide holistic action plan for increasing resilience – was led largely by the city working groups established through the ACCCRN program (Moench and Tyler, 2011; da Silva et al., 2012). In addition to advocacy at the city, state and national level, the city resilience strategies have been used by Rockefeller Foundation to substantiate the funding of intervention projects (Brown et al, 2012).

In each country, engagement with cities and other actors was initiated by locally based organisations: MercyCorps-Indonesia, Thailand Environment Institute, the Institute of Social and Environmental Transition – Vietnam, and Taru Leading Edge (India). Additional technical support was provided by a number of regional partners: APCO, Arup International Development,[4] Asian Disaster Preparedness Centre, Institute of Social and Environmental Transition, International Institute for Environment and Development, and Verulam.[5]

Arup's role as a regional partner included developing a strategic approach to knowledge management which responded to the needs and issues raised by ACCCRN partners from each country and city. This approach recognised that knowledge at the city-level is created through a process of 'learning by doing' which generates experiences, information and new ideas, but that it is only through a process of sharing and reflection within a wider, trusted community that knowledge is created which partners are willing to disseminate (Hawley and Serventi, 2012). A key component of the ACCCRN knowledge management strategy was the six-monthly knowledge forums. Over the three-year span (2011–2013) Knowledge Forums varied in format and attendees; however they were typically 2–3 day events, attended by 25–40 participants, with representatives from city, national or regional level. The primary objective of these Knowledge Forums was to provide an environment which encouraged partners to share and reflects on their experiences. Secondly, to create a community with common interest in UCCR as the foundation for direct exchange of information and ideas on an online knowledge platform. This combination of face to face and online knowledge management processes generated debate, discussion and materials which provide a valuable resource for understanding the issues and challenges faced by local partners in seeding and promoting a UCCR agenda.

3. Method

We undertook an initial literature review in order to understand the processes by which innovative agendas are adopted and mainstreamed within cities, thereby resulting in behavioural change (Section 4.1). Based on the themes emerging from the literature review, a hypothesis was formed that there are a number of critical themes relevant specifically to sustaining (as opposed to initiating) action on UCCR. Within each of these critical themes a number of underlying factors also emerged which provided further definition around sustaining city action. Further evidence was then obtained from a detailed review and analysis of the evolution of ideas and knowledge on ACCCRN based on the materials and outputs from five Knowledge Forums (Section 4.2). This review of ACCCRN-specific literature was used to test and refine the initial critical themes and underlying factors.

Using the themes and factors which emerged from the literature, and review of knowledge forums, an analysis was undertaken of current action on the ground and plans for the future in each of the 10 ACCCRN cities (Section 5). This included a review of: (a) National Engagement Plans which identify activities that have been prioritised by national partners in the final phases of the ACCCRN program (Phase 4); and (b) key achievements as identified in the formal monitoring of the program (Verulam, 2011, 2012). The purpose of this third step was to understand to what extent the key themes and

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[4] Arup International Development is a specialist, not-for-profit business within Arup – a globally recognised leader in the built environment – which partners with development and humanitarian organisations, to help strengthen the impact of their work www.arup.com/internationaldevelopment.

[5] For more information on each of these organisations please go to www.acccrn.org.

factors emerging from the literature review were reflected in the current activities of ACCCRN partners, and identify activities they might be employing to sustain action in the future. The analysis also served to provide a deeper understanding of 'on the ground realities' that might inform a framework for considering the actions needed to mainstream UCCR in future donor-funded programs (Section 5).

The authors note that this paper relies heavily on ACCCRN program-related documentation, and qualitative data emerging from face to face interactions among diverse individuals and groups across many nationalities. Despite efforts to verify we acknowledge that this paper is based on our own interpretation of the available data and documentation.

4. An emerging framework for sustaining action on UCCR

4.1. Literature review

The pathways to creating transformational change in cities, specifically the way cities adapt and respond to the local impacts of climate change, is relatively uncharted compared to efforts focused on climate change mitigation. Emerging literature on the experiences of cities that are pioneers in this field suggests that the journey towards UCCR has typically been conceived in three distinct steps. Firstly initiating action through a variety of government and non-governmental entry points, then sustaining activity for sufficient time to enable widespread buy-in and engage political leaders, ultimately leading to UCCR being mainstreamed – defined as the "integration of climate change related policies and measures into developmental planning process and decision-making" (TERI, 2011; pp. 6).

Pioneering cities such as Durban and Quito benefitted from the presence of local champions who agitated for action by effectively linking climate change risk to local agendas (Carmin et al., 2012). These local champions achieved legitimacy by operating within, or in close association with, the municipality and engaging the interest of a wider group of stakeholders. Elsewhere, incentives or imperatives for initiating action have resulted from external factors: an extreme event such as Super storm Sandy in New York (NYS 2100 Commission, 2013), or technical and financial support from donors or development agencies promoting this agenda (such as the Rockefeller Foundation).

Other literature also recognises the role of city champions and diverse stakeholders in initiating action on UCCR (Parker et al., 2012). This research suggests that the political buy-in required to initiate action can be achieved by: (i) Building on 'now' issues that are already priorities the city is already facing (e.g., flood risk, health issues or coastal subsidence) and researching and analysing how climate change might increase these risks; (ii) Enabling key stakeholders (including government, community, academia and business) access to new information, and opportunity to reflect on its relevance to their activities, how it is useful to them and how it can be acted on; (iii) Generating a city-wide strategy which engages both decision makers and vulnerable populations in determining how best to respond to and manage changes in climate; and (iv) Implementing specific pilot activities at the city, sectoral and community level to build understanding and develop tangible examples of how to respond.

Sustained commitment by local officials is likely to result from alignment with existing agendas, ability to achieve competitive advantage, or demonstrate national, regional or global leadership (Carmin et al., 2012) which is a potential driver for cities to sign up to global initiatives such as the UNISDR Making Cities Resilient[6] campaign, the Durban Adaptation Charter[7] or the Rockefeller's 100 Resilient Cities initiative.[8] Advocacy from wider stakeholders represented by civil society or community-based organisations can also play an important role, particularly in helping to navigate the ebbs and flows of government interest and engagement, as can a city-wide action plan that engages multiple actors (Parker et al., 2012; Brown et al., 2012; Carmin et al., 2012).

The field of urban sustainability can also provide a relevant and useful reference point for trends related to urban governance and sustaining and mainstreaming change. Based on interviews and

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[6] http://www.unisdr.org/campaign/resilientcities/.
[7] http://durbanadaptationcharter.org/.
[8] http://www.rockefellerfoundation.org/our-work/current-work/100-resilient-cities.

discussions with over 100 city leaders in the United States, the Institute of Sustainable Communities' (ISC) research identified five factors that enabled cities to move beyond 'random acts' to systematically institutionalising sustainability (ISC, 2012). These five factors are: (i) concrete actions to create a foothold, maintain relevance and continue to attract funding (such as establishing a formal office, or officer); (ii) building relationships within and across multiple departments so as to persuade stakeholders to make significant change in the context of their own goals and motivations; (iii) champions continuing to deliver and demonstrate viability and value to their governments and the community; (iv) identifying opportunities to build on success, scale-up activities and multiply their impact; and (v) incorporating sustainability goals and objectives into visioning processes, goal setting, policies, codes, accounting systems.

Cities leading the way in mainstreaming new urban agendas, whether in relation to sustainability or climate change risk, also exhibit the entrepreneurial characteristics of early adopters who are on the lookout for new ideas that provide relative advantage, and are able to think creatively about their application (Carmin et al., 2012). This notion of early and late adopters originated from the 'Diffusion of Innovation' theory (Rogers, 2005) which explains how, why, and at what rate new ideas and practices ('innovations') spread through cultures and become integrated into conventional practice. When introduced to 'innovations' different people respond to the proposed change in different ways; a key factor is the adoption decisions of peers – people the early adopters respect and listen to. Early adopters embrace new ideas on the basis of emerging evidence, aligning this with their own objectives, and integrating change into policies and plans. For early adopters, the credibility and legitimacy of new ideas is based on a demonstration of what does (or does not) work in the local context, supported by peer-to-peer exchange with those who have done it. In contrast, late adopters follow new ideas based on a desire to achieve legitimacy derived from prevailing norms (Rogers, 2005).

Rogers' theory, while not uncontested particularly when applied to social change rather than consumer behaviour where it originated (Darnton, 2008), provides a useful model for considering the transformation required from initiating interest in urban climate change action, to sustained action at the city level that achieves the ultimate outcome of mainstreaming UCCR. Champions – individual or organisational – exhibit similar characteristics to 'innovators' in terms of their openness to new opportunities and their eagerness to define and develop new practices and ideas (Rogers, 2005). Their challenge is inspiring 'early adopters' who will in turn champion the momentum for change in their local context. It is reasonable to assume that knowledge exchange through individual relationships and wider networks might play an important role.

The literature review provided the foundation for the hypothesis that there are four critical themes with 10 underlying factors relevant to sustaining action on urban climate change resilience (see Table 1). The critical themes are: knowledge based on local experience, supported by engagement in wider networks; the presence of champions and engaged stakeholders from across Government; enabling policies and plans at city, state and National level; and access to financing through donors or city budgets.

Table 1
Emerging themes and factors identified in key literature.

Theme	Factor	ISC, 2012	Carmin et al., 2012	Rogers, 2005	Parker et al., 2012
Knowledge	Local activities	✔	✔	✔	✔
	Mechanisms for learning/exchange	✔			✔
	Wider network engagement		✔	✔	
Policies and Plans	City wide and departmental goals/plans	✔	✔		✔
		✔	✔		
	National policies/plans		✔		
Stakeholders	Local champions/early adopters/entrepreneurs	✔	✔	✔	✔
	Engaged city government stakeholders	✔		✔	✔
Finance	City budgets	✔	✔		
	Donor finance		✔		✔

4.2. Knowledge forums

As a first step in finding evidence to support the proposed framework, evidence was gathered from practitioner interaction at the ACCCRN Knowledge Forums. The agenda for these forums was set by the participants, with the key issues and discussions focussing on current practical challenges that were being faced in the cities. The topics for the five forums were focussed on lessons learned from practice and evolved as follows: (1) Knowledge exchange; (2) Mainstreaming climate change adaptation; (3) Governance; (4) Impact of project implementation on UCCR, and (5) Sustaining city action. The specific agenda of each Knowledge Forum was determined by participants, reflecting the key issues and practical challenges that were being faced in the cities at the time. The forums followed a structured format employing a range of tools and techniques in order to facilitate knowledge sharing and discussion. These interactions were captured and shared as raw data (photos, presentations, notes) and synthesis papers. The issues discussed by participants at each knowledge forum are captured in Table 2, organised around the four themes emerging from the literature review.

Analysis of the materials emerging from the forums, captured in Table 2, revealed that the recurring issues discussed at all five forums over a two year period were: (i) the importance (and challenges) of creating and sustaining multi-stakeholder groups; (ii) the value and need for strong and on-going knowledge management through mechanisms for knowledge exchange and learning; (iii) the need to align city resilience strategies with city goals in order to influence budgets; and (iv) the challenges associated with engaging with and influencing state and national policy in relation to urban risk and climate change impact. These four themes have a strong overlap with those emerging from the wider literature review (Section 4.1).

Other factors emerged in one or more Knowledge Forums, providing further insight into the issues ACCCRN partners felt were important at different stages of the process. Those factors emerging repeatedly or later in the process are potentially the most critical to sustaining action including: the need for capacity building at city government level, particularly in relation to urban planning in the context of climate change uncertainty (Vietnam and Indonesia); the role of the private sector in funding and implementing urban climate change resilience, including the role of corporate social responsibility (India and Indonesia); the need for wider engagement of urban professionals (engineers, architects, planners) through universities and professional institutions as the technical actors charged with implementing a range of built environment interventions (India and Vietnam); and the importance of learning and engagement through networks and formalised institutions, particularly keeping in touch with global emerging practice and developing local language communities of practitioners and/or academics (Indonesia and Thailand).

Table 2
Recurring issues discussed at knowledge forums.

Relevant themes	Recurring knowledge forum issues	Knowledge forums				
		KF 1	KF 2	KF 3	KF 4	KF 5
Knowledge	Multi-stakeholder groups	✔	✔	✔	✔	✔
	Capacity building		✔		✔	✔
	Knowledge management	✔	✔	✔	✔	✔
	Engaging with wider networks	✔	✔		✔	✔
Policies and plans	City resilience strategies				✔	✔
	City goals and plans		✔	✔	✔	✔
	State and national policy	✔	✔	✔	✔	✔
Stakeholders	City champions		✔			✔
	City govt entry points ('now' issues)	✔	✔	✔	✔	
	Formalising city working groups		✔		✔	✔
	Multi-stakeholder engagement		✔		✔	✔
	Engaging with planners/academics/civil society practitioners	✔	✔		✔	✔
Finance	City/municipal budgets		✔	✔	✔	✔
	Donor funding					✔
	Private sector engagement (CSR)	✔	✔	✔		✔
	Business finance			✔	✔	✔

Table 3
Themes and factors emerging from the literature review and knowledge forums.

Factors from literature review	Recurring knowledge forum topics	New or amended factors resulting from knowledge forum analysis	Themes
Local experiences/actions	Capacity building	Local experiences/actions	Knowledge
Mechanisms for learning/ exchange	Multi-stakeholder groups Knowledge management	Mechanisms for learning/exchange	
Wider networks	Engaging with wider networks	Wider networks	
City wide and departmental goals/plans	City resilience strategies City goals and plans	City wide and departmental goals/ plans	Policies and plans
State	State and national policy	State policy and plans	
National		National policy and plans	
Local champions/early adopters/Entrepreneurs	City champions	City champions/entrepreneurs	Stakeholders
Engaged city government stakeholders	City govt entry points ('now' issues)	Engaged government leaders	
	Formalising city working groups		
	Multi-stakeholder engagement	Academia, private sector, and civil society	
	Engaging with planners/ academics/civil society practitioners		
City budgets	City/Municipal budgets	City/municipal budgets	Finance
Donor finance	Donor funding	Donor finance	
	Private sector engagement (CSR) Business finance	Private sector participation	

Through this analysis of Knowledge Forums, the factors contributing to UCCR identified from the literature review were largely reinforced, with some factors widening in scope, and two new factors emerging (see Table 3). Table 3 shows how the combination of factors identified in the literature review has evolved following analysis of the Knowledge Forums. Many factors have remained constant, for example 'local experience and actions' did not need to change to cover the discussions around capacity building through 'learning by doing'. The factor on 'engaged city government stakeholders' has evolved to focus more on 'leaders' rather than 'stakeholders', as higher level buy-in within government was considered necessary to sustain action beyond donor funding. Two new factors also emerged – first, 'Academia, private sector and civil society' emerged as the wider stakeholder groups that Knowledge Forum participants were identifying as important stakeholders to engage with beyond Government, and secondly the role of 'private sector participation' emerged in terms of human and financial resources. Neither of these latter two factors was evident in the literature.

This analysis substantiated the four themes arising from the literature review, reinforced common factors contributing to sustaining city action and identified new or amended factors which were then grouped in relation to these themes providing the basis for an initial framework for testing against emerging practice and future plans across the core ACCCRN cities (Section 5).

5. Testing the framework: ACCCRN National Engagement Plans and Program Monitoring

In order to test the relevance of the framework against practice, an analysis (Table 4) of the four-country National Engagement Plans and Program Monitoring (Verulam, 2011, 2012) documents was undertaken in relation to four themes and 12 factors arising from the literature review and Knowledge Forum analysis (Section 4). Table 4 distinguishes between actions to sustain activity that are currently being implemented, and those that are proposed. Notably, in all four countries (India, Indonesia, Vietnam and Thailand) there is action in progress or proposed in relation to all four themes. Sections 5.1–5.4 provide further detail for each of the critical themes with reference to specific ACCCRN examples.

Table 4
Summary analysis of current and proposed action on sustaining action.

		India			Indonesia		Vietnam			Thailand	
		Surat	Indore	Gorakphur	Semarang	Bandar Lampung	CanTho	QuyNhon	DaNang	HatYai	ChiangRai
Knowledge	Local experiences/actions	■			■	■					■
	Wider networks	■	■		□	□	■	■	■	■	■
	Mechanisms for learning/exchange	■		□	■	■	■	■	■	■	
Stakeholders	City champions/entrepreneurs	■		■	■	■	■	■	■		■
	Engaged government leaders	■		■							
	Academia, private sector, civil society	■		■			■	■	■		
Policies/Plans	City wide & departmental goals/plans	□		□	■	■	■	■	■		□
	State policies/plans		□	□							
	National policy/plans	■	■	■	■	■	■	■	■		
Finance	City/municipal budgets		■		■	■	□	□	□	■	
	Donor finance			■							
	Private sector participation	■			□	□	□	□	□	■	

Legend: ■, 'Sustaining' action in progress; □, 'Sustaining' action proposed.

5.1. Knowledge

On-going mechanisms for learning and exchange have been established within seven of the 10 ACCCRN cities, including Gorakhpur developing plans for a Climate Change Resilience Resource Centre, which seeks to ensure on-going learning from the successes, challenges, tools and approaches, associated with building resilience to climate change. Networks which operate beyond the city level, linking actors at the national, regional or global level are a popular means to promote sustained action. Academic (Thailand) or practitioner (India and Vietnam) networks are underway across seven of the 10 ACCCRN cities. In Indonesia, nascent communities of practice at the city level are complemented by a proposed policy network (the Indonesia Climate Alliance, led by MercyCorps-Indonesia) which would bring together donors, government and practitioners. In India an existing knowledge sharing network known as the India Urban Portal or PEARL (Peer Experience and Reflective Learning) is proposed to include climate change adaptation as a new focus area. However as this network covers only the largest 60 cities in India under the Jawaharlal Nehru National Urban Renewal Mission (JNNURM) Gorakhpur, unlike Surat and Indore, is not covered by this network as it falls under the 2nd tier National Mission on Sustainable Habitat (NMSH).

ACCCRN's USD$20million fund to implement projects identified in the city resilience strategies, has provided opportunity to generate knowledge based on local experiences and action which in some cases has led to sustained action. An example is the Urban Services Monitoring System (UrSMS), which uses mobile phone short messaging service (texting) technology to improve the monitoring and complaint redress system for urban health and other municipal services. Initiated as a pilot project in 2009, the project tracks diseases that are potentially linked to climate change (such as dengue), enabling a fast response to peaks at the city scale system, and providing the data required for Surat City to demonstrate progress on service indicators required by national government. In Indonesia, with the support of MercyCorps-Indonesia, city governments have taken successful ACCCRN projects to scale; localised flood mitigation approaches in Bandar Lampung and rainwater harvesting in Semarang with the rainwater harvesting approach in Semarang being replicated in 17 further communities across the city.

5.2. Stakeholders

Multi-stakeholder groups, working to coordinate UCCR building activities at the city level, have been a core part of the ACCCRN approach in each city. The effectiveness of these diverse approaches has led to seven cities of the 10 cities formalising this group of engaged city stakeholders to coordinate and implement climate change resilience action into the future. The Surat Climate Trust, is made up of stakeholders including representatives from the Surat Municipal Corporation, the Chamber of Commerce, and the Gujarat State Disaster Management Authority. In Vietnam, the Climate Change Coordination Office (CCCO) – which emerged from local partner ISET–Vietnam's engagement in the three Vietnamese cities – is now the operational arm of the Climate Change Adaptation Steering Committee mandated by the People's Committee and national legislation has been passed to provide planning approval for any climate change strategy emerging from Vietnamese cities. The CCCO in each of three Vietnamese cities also provide an entry point for non-governmental stakeholders to engage with the government on climate change related strategies and action. In Indonesia, MercyCorps-Indonesia and the cities have looked into legal mechanisms for formalising city teams, through establishing City Climate Change Resource Centres (CCCRC) to act as a focal point for national and donor funding of climate change adaptation, and coordinate UCCR activities at a city level.

The catalytic 'entrepreneur' or champion role has been key to establishing momentum and ownership of the ACCCRN agenda in eight of the 10 ACCCRN cities. These champions are either individuals, such as the City Clerk in Chiang Rai and President of the Chamber of Commerce in Surat, or organisations such as the Gorakhpur Environmental Action Group (a local NGO) in Gorakhpur and the CCCOs in all three Vietnamese cities. Although, mayoral level agreement was obtained to work in each of the cities initially, there is limited evidence to suggest that government leaders have been taking ownership of this agenda. The exception being Surat where the Municipal Commissioner has taken a

particular interest in the implementation of ACCCRN strategies and projects (Bhatt, 2012), and the Surat Municipal Commissioner is a Trustee in the newly formed Surat Climate Change Trust.

5.3. Policies and plans

The analysis in Table 4 indicates that action is underway to change or influence policy and planning at the city level in five of the 10 core ACCCRN cities. In Indonesia, the focus is on ensuring that City Resilience Strategies are integrated into city-level mid-term (five year) development plans, whereas in Vietnam, the National Target Program on Climate Change requires cities to prepare climate change adaptation plans, so the focus is on adapting city resilience strategies so that they meet this requirement.

At State or Provincial level the evidence is less clear, although in India there have been efforts made to engage with the Gujarat State Disaster Management Authority through both the Surat Climate Change Trust, and the 'Surat end-to-end early warning system' which aims to improve the management of an upstream dam to reduce the impacts of flooding in the city (ACCCRN, 2013b).

There are active strategies to engage and influence national policy relating to specific sectors. The National Institute of Urban Affairs (NIUA) in India is working with Taru Leading Edge to embed urban climate change resilience into guidelines for City Development Plans. Similarly, the Vietnam Institute of Architecture, Urban and Rural Planning (VIAP) is working with ISET-Vietnam to develop a set of climate change resilience-driven urban-planning guidelines and providing training to support a nationally coordinated initiative to develop the capacity of local government actors involved in developing urban plans across Vietnam. In Indonesia, MercyCorps-Indonesia are focusing on the education sector working in city elementary and high schools testing methods that raise awareness of climate change amongst teachers and students, with the longer term objective of embedding climate change teaching into the national curriculum (ACCCRN, 2013a).

5.4. Finance

The cities of Gorakhpur and Hat Yai are among those directing finance, either external or their own, towards UCCR building activities. In Hat Yai, the city is investing their own funds in a Climate Resource Centre, and has allocated a further 50% contribution on top of Rockefeller Foundation funding towards the Community-based Flood Preparedness and Institutional Coordination Systems project that is being initiated under ACCCRN (ACCCRN, 2013a). Of the ten cities, only Gorakhpur has attracted funding from donors other than the Rockefeller Foundation to sustain UCCR building activities. In Gorakhpur additional funds have been committed by the Climate and Development Knowledge Network (CDKN) towards identifying practical measures for integrating disaster risk reduction and climate change adaptation into planning in the city (CDKN, 2012).

Although the knowledge forums identified private sector funding as important to sustained action, there is limited activity in this area. In Hat Yai and Surat, the Chambers of Commerce have committed time and resources to on-going resilience building efforts. As a result of combined efforts by the Chamber of Commerce in Hat Yai and the Thailand Environment Institute, local businesses have provided technical support to establish a flood monitoring system. This involves a network of cameras at multiple points along the main rivers, with information streamed live through a public website so that individuals and businesses can assess flood levels and potential risks for themselves.

The National Engagement Plans and Program Monitoring documents have also provided a basis for interrogating whether evidence from what is actually happening on the ground would substantiate the factors that emerged from the literature review and analysis of the Knowledge Forums. For instance, 'mechanisms for learning and exchange' needs to embrace the variety of knowledge management processes being undertaken across all the four countries, from local knowledge forums to city-based resource centres. The analysis also identified a wider range of stakeholders including city university technical departments (particularly supporting project implementation), think tanks with speciality in climate change, and professional institutions responsible for particular sectoral capacity (such as urban planning). These factors have been clustered into themes, and proposed as the building blocks for sustaining action on UCCR (Fig. 2) for discussion in Section 6.

Fig. 2. 12 building blocks of sustaining urban climate change resilience.

6. Testing the building blocks in practice

This section seeks to interrogate further the extent to which the 12 factors proposed in Fig. 2 are reflected in efforts by ACCCRN core cities to sustain city action on UCCR as Rockefeller Foundation program funding declines.

6.1. Knowledge: local experiences and actions, mechanisms for learning and exchange, and wider networks

Local initiatives and projects can be effective in initial learning, building capacity and visibility of implementing partners, and demonstrating value (ISC, 2012; Carmin et al., 2012). A feature of the ACCCRN approach has been early investment in pilot projects designed to test ideas and forge relationships. Early engagement with cities also built on 'now' issues such as floods in Surat, Quy Nhon, Hat Yai, and Semarang; health epidemics in Can Tho, Surat, and Bandar Lampung; increasing urban development in floodplains in Da Nang; and waterlogging in Gorakhpur (Parker et al., 2012). Considering these priority issues through a UCCR lens generated new ideas and actions, and the ACCCRN funding enabled cities to begin testing responses which contributed to resilience building at the ward, community or city wide level (Brown et al., 2012).

At the city level mechanisms for learning and exchange enable stories, successes and failures to be shared, thereby contributing to increasing the depth of knowledge and wider awareness of challenges associated with building UCCR. The ACCCRN Knowledge Forums have contributed to creating a trusted peer-community across the four countries and 10 cities. Sub-groups with specific interests have self-generated around programmatic issues such as dissemination, network development and monitoring, but also technical issues such as flood risk and shelter. Individual relationships and knowledge of each other's activities have triggered country-country exchange visits – a delegation from Semarang City in Indonesia, for instance, visiting Surat, India specifically to discuss urban health issues (TARU, 2012). The level of openness amongst participants at the knowledge forums, and success in creating a safe environment without fear of criticism or competition where there is as much to learn from 'moderate' success as 'high' impact, was illustrated at the 4th Knowledge Forum in October 2012. When asked to reflect on the impact of the project interventions they were implementing in building resilience, ACCCRN partners felt that: 27 projects (11%) were self-assessed as having 'moderate' impact; 12 (or 44%) 'discernible'; and 12 (44%) as 'high' impact (ACCCRN, 2012).

There is also evidence that external networks have played an important role in the uptake of urban agendas such as sustainability and climate change mitigation by providing new ideas and opportunity

to share experiences and test approaches against wider emerging practice (Arup, 2011; ISC, 2012; Bicknell et al., 2009; Bulkeley et al., 2011). As ACCCRN cities and partners were beginning to find areas of common interest through the knowledge forums, most cities were also engaging with a wider group of actors, nationally and internationally, and attending relevant conferences and network meetings: city resilience (ICLEI Resilient Cities 2010–13), climate change (Planet Under Pressure, 2011), adaptation (Community Based Adaptation 2011–13 and Asia Pacific Adaptation Forum 2011–13), shelter (Asia Pacific Housing Forum, 2011) and knowledge management (CDKN Climate Knowledge Brokers Workshop, 2011).

6.2. Stakeholders: city champions/entrepreneurs, engaged government leaders, and academia, private sector, and civil society

Individual champions within government have emerged from the ACCCRN process as playing an increasingly influential role in driving change, giving credence to the findings of Rogers (2005) and Carmin et al. (2012). City working groups involving city and State/regional government leaders have proven crucial to continued commitment to UCCR whether from a sectoral perspective as with the urban management department (BAPPEDA) in Semarang, or a political perspective as with the Municipal Commissioner in Surat. Further, local academia, such as the university technical departments in Can Tho, Da Nang, Hat Yai, Bandar Lampung, and Semarang cities have been increasingly motivated to engage with the UCCR agenda, and potentially provide centres of technical excellence with potential for continuity that transcends political cycles. For instance, the Da Nang University of Technology is leading the development of hydrological models which project how climate change and urban planning scenarios will interact over the next 30 years in order to inform urban growth decisions now and in the future (ACCCRN, 2013a).

Conversely, the involvement of the private sector has been limited, with Hat Yai, and Surat making breakthroughs that demonstrate the potential for private sector engagement in UCCR. Notably in Surat, it has been the Chamber of Commerce – recognising the dependence of much of the city's business upon migrant work – that has lobbied successfully for greater government action in support of those migrants living in informal housing on marginal land, at risk of river flooding (ACCCRN, 2012).

A common response to the challenge of sustaining a multi-stakeholder approach at the city level has been to institutionalise the city working groups mentioned above (Section 6.2). The Surat Climate Change Trust evolved out of an informal climate watch group created through ACCCRN in 2009 and has evolved into a formal Trust over 2½ years, governed by a board of trustees who are appointed on the basis of the position they hold (Municipal Commission, Chairman of Chamber of Commerce, etc.) in order to reduce reliance on specific individuals over the longer term. Comparable versions of the Surat Climate Change Trust are present in the three ACCCRN Vietnam cities (known as CCCO's), albeit locally driven and housed within the formal government structure, and are proposed in Semarang and Bandar Lampung. A key driver in setting up the Surat Climate Change Trust, as in Vietnam and Indonesia, was the need for a mechanism that would allow the city to receive funding directly from donors, and to attract, control and implement projects with external finance.

ACCCRN partners have expressed a number of challenges in creating the kinds of engaged city stakeholder groups identified above, including the length of time needed to build relationships, lack of time or resources to take on new activities (due to existing roles and responsibilities), and limited incentives for collaboration among government departments and with other stakeholders, including competition for scarce funding between departments. Early on, effort was focussed on the need to increase local capacity around technical issues, but over the life of the ACCCRN program issues similar to those of US cities seeking to institutionalise sustainability offices (ISC, 2012) have emerged including a real and on-going need for 'soft skills' such as leadership, coordination, facilitation, and knowledge management was also required among these city stakeholder groups.

6.3. Policies and Plans: city wide and departmental goals and Plans, and State and National Policy and Plans

Policy and plans relating to urban resilience and sustainability essentially need to address multiple sectors and dimensions including: land use planning, energy management, ecosystem services,

Table 5
Entry points for mainstreaming resilience at various levels of government (TERI, 2011).

National level	Sub-national/state level	City level
National missions as part of the national action plan on climate change	State agendas and action	Master plans
Sectoral policies (water, transport, buildings, energy, etc.)	Plans on climate change	City development plans
Five year plans	Sectoral policies	Disaster management and resilience plans
	State five year plans	City mobility plans
		City sanitation plans

housing and transport, water supply and sanitation, health services, education and waste management (TERI, 2011). The challenge with UCCR, as with any new agenda at city level, is to ensure these strategies are relevant and to 'weave' them into existing discourse by identifying common themes between the climate change adaptation agenda and city priorities (ISC, 2012; Carmin et al., 2012). In Indonesia, MercyCorps-Indonesia has led a process of integrating city resilience strategies into local five-year medium-term development plans. Conversely, four years after completing the city resilience strategies in India, these strategies remain as an ACCCRN program tool to catalyse engagement rather than being a vehicle to integrate UCCR into city policy and decision making. Despite this, some of the actions identified in city resilience strategies in India are being implemented, and the document itself is a useful advocacy tool. In Gorakhpur, an external consultancy (TERI, 2011) was commissioned to look specifically at how the recommendations of the city resilience strategy could be institutionalised within the existing local, state and national policy structure (see Table 5).

The federal structure of policymaking and planning process in India, and existence of several agencies and stakeholders working on similar policy issues offers multiple entry points for mainstreaming resilience planning in India (TERI, 2011). Notably, the National Mission for Sustainable Habitat (NMSH) and the Jawaharlal Nehru National Urban Renewal Mission (JNNURM), both of which set out the guidelines for how urban development strategy and planning occurs at city level (through city development strategies). These national-level guidelines include performance measures (service-level benchmarks) such as the percentage of water supply coverage that cities must achieve in order to receive national funding. Embedding climate change within these guidelines is one national strategy to motivate cities to think about building climate change resilience in order to gain comparative advantage and benefit from additional funds.

6.4. Finance: city and municipal budgets, donor finance, and private sector participation

Significant funds have been committed to date by the Rockefeller Foundation initiating action within cities. The end of programmatic funding in 2015/16, however, requires that cities look for alternative sources of funds in order to sustain action in the future. The role of donors in creating incentives for action at the city level is reinforced by Carmin et al. (2012) who argue that support from development banks and Foundations through the provision of monetary and technical assistance is one of few external drivers of urban climate change adaption action (alongside national climate regulations and sector-based policies). As discussed previously, cities in India and Vietnam have created institutional mechanisms that have the potential to attract donor funding, with Indonesian cities currently investigating a similar approach. To date, only Gorakhpur has secured donor finance for this purpose, suggesting that attracting funds towards this agenda may be difficult. While details are still emerging, the proposal for a new trust fund designed to scale up urban climate change resilience in 25 Asian cities has the potential to create a more positive funding outlook. The Urban Climate Change Resilience Trust Fund (UCCRTF), created by the Rockefeller Foundation together with the UK Government's Department for International Development (DFID) and the Asian Development Bank (ADB), will be used to fund planning, projects and knowledge sharing to help secondary cities in Bangladesh, India, Indonesia, Pakistan and Vietnam mitigate the risks of increasing urbanization and climate change on their population, particularly the urban poor.

Existing city or municipal-budgets are the primary long-term source of funds (whether derived from national or state funds, municipal bonds or local taxation) to support on-going coordination, pilot testing and large scale implementation (Schuttenbelt, 2013) towards UCCR. Now five years into the engagement from ACCCRN, there are examples of public finance being committed by cities themselves to replicate and expand existing resilience building pilot activities, including the introduction of tax-based incentives, and national funding mechanisms. In Indore, India, the Municipal Corporation is providing incentives to individual property owners who implement urban greening techniques such as planting trees, introducing solar panels and other building-related energy-saving technologies. This incentive provides the individual property owner with the opportunity to receive a 5% rebate on property taxes in the first year, and is intended to reduce the overall and peak energy load that Indore Municipal Corporation needs to plan for and reduce the likelihood of energy supply failures across the city. Indore, along with Bandar Lampung in Indonesia, have also been the first of the ACCCRN cities, to create a municipal budget line for climate change resilience action – a long term goal of ACCCRN advocacy to embed and mainstream climate change action within the city.

The private sector provides another emerging source of finance, particularly where opportunities to leverage shared motivations such as improving business continuity, or where more tangible public private partnerships are present (Schuttenbelt, 2013). ACCCRN has seen the engagement of Hat Yai and Surat Chambers' of Commerce in the process, particularly where business continuity seems to be directly linked to climate-related hazards as with floods in Hat Yai or public health in Surat. Individuals from these business communities have been motivated to engage in the process of multi-stakeholder engagement, and act to improve the resilience of the city to shocks and stresses rather than focus solely on 'climate proofing' their own business operations or property. However there remain limited tangible resources committed by the private sector emerging from ACCCRN cities.

7. Conclusions

Over the past five years, the ACCCRN program has initiated action to build UCCR, and made clear progress by engaging a variety of stakeholders at city level, developing and implementing city resilience plans, identifying and implementing actions to improve urban resilience, whilst also establishing a range of knowledge generating and sharing mechanisms to exchange experiences, successes and failures within and beyond the ACCCRN cities.

As the Rockefeller Foundation programmatic funding tapers off, there is emerging evidence that ACCCRN cities are taking steps towards ensuring that the action initiated by ACCCRN can be sustained beyond this immediate funding horizon. The key factors relating to sustained action have been captured in Fig. 2, which provides a framework to inform future investment, particularly donor funded programs. Some of these factors relate specifically to action that can be taken at the city level, providing opportunities to test ideas and build city level experience and expertise. However, the majority relate to the need to create a wider enabling environment.

At the city level the key factors are:
(1) Learning by doing which is achieved through local experiences and action; (2) Mechanisms for learning/exchange which provide opportunity for reflection and sharing; (3) City champions and/or entrepreneurs whodrive the process and may be individuals or organisations; (4) City goals, and departmental policies and plans that create legitimacy, and ensure sectoral strategies are aligned with broader visions; and (5) municipal budgets which provide the primary long-term source of funds (whether derived from national funds or local taxation) that enable on-going coordination, pilot testing and large scale implementation to occur.

Beyond the city level the key factors in the framework are:
(6) external networks that bring wider experience and enable dissemination; (7) engaged government leaders (at all levels) who provide a mandate for on-going action; (8) wider stakeholder engagement, including private sector, academia and civil society who bring deeper practical expertise and widens the base of actors driving change in the city beyond political processes supportive and/or directive policy from (9) state/regional and (10) national levels that provide an incentive for city level

action; (11) donor funds to catalyse this agenda, to provide technical support, and to leverage public finance; and finally (12) unlocking private sector funding by aligning their interests and motivations with local objectives.

The combination of these elements provides an initial framework for sustaining city action so that UCCR is ultimately adopted as a mainstream agenda. As a framework, it goes only as far as identifying the ingredients rather than a recipe; the extent to which each element is needed or the relative importance of each is likely to vary from city to city. Equally, the efficacy of these factors is not yet proven and will be determined by the extent to which UCCR gains momentum in these pioneering cities (and is taken up more widely in these countries) over the next decade.

Funding is likely to be the most critical issue, particularly in the highly contested and dynamic urban environment where climate variability is typically a low priority for city officials (and their budgets) compared to other issues such as economic development or poverty reduction (Mertz et al., 2009). Donor funds are valuable in catalysing interest and action, and loan financing plays an important role in infrastructure implementation, but the pool of money available is limited and often not always accessible to cities. While the proposed Urban Climate Change Resilience Trust Fund may change this dynamic, Schuttenbelt (2013) currently argues that only three out of 15 international climate change funds can be directly accessed by cities (Global Climate Partnership and bilateral funds – EU, Japan).

However, the issue is not only limited access to international funds or lack of private sector engagement, but rather the scale of funding relative to the problem. Even the most ambitious estimates for climate change resilience funding from the global donor community would have a negligible impact on urban climate risk reduction according to Brugman (2012). Therefore any effective adaptation finance strategy requires substantial leveraging of local public and donor resources to change the way in which private investment and expenditure is made in urban areas.

The Rockefeller Foundation and other donors have provided significant funds to initiate action, and this paper provide evidence that donor-led funding can lead from initiating to sustaining action in the short term. Longer term, however, it is the role that this donor investment plays in leveraging other funding sources – creating the opportunity for further activity through redirecting city budgets or attracting private sector financing – that will determine whether action is sustained at the city level and ultimately creates the opportunity for mainstreaming UCCR in the future.

Acknowledgements

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