Architecture and Resilience on the Human Scale

Cross-Disciplinary Conference
Sheffield
10-12 September 2015

Proceedings
Architecture and Resilience on the Human Scale

Cross-Disciplinary Conference
Sheffield
10-12 September 2015

Proceedings
Contents

8 Welcome
   Fionn Stevenson

11 Introduction
   Architecture and Resilience on the Human Scale: Ethical and political concerns, agencies, co-production and socio-technological strategies in research and practice
   Kim Trogal and Doina Petrescu

25 Dialogue 1 Building Local Resilience: Bricks and feelings
   Building Resilience in the Built Environment
   Sue Roaf

43 Keeping Imagination Alive and Thriving in the Culture of Uncare
   Sally Weintrobe

55 Session 1 Strategies for Community Resilience
   Making Communities Disaster Resilient with High-Performance Building Technologies
   Oluwateniola Ladipo & Georg Reichard

65 Intensification as a Strategy for Resilient Rural Regeneration
   Tiziano Cattaneo, Giorgio Davide Manzoni & Emanuele Giorgi

75 Study on Sustainable Reconstruction After an Earthquake: A case study of the Ludian reconstruction project
   Xin’an Chi, Edward Ng, Kehan Li & Li Wan

85 Session 2 Co-Housing
   Building Eco-Homes for All: Inclusivity, justice and affordability
   Jenny Pickerill

93 Co-Housing Developments for Resilience in Housing: Knowledge transfer to increase the number of co-housing developments
   Glatz Zsófia & Bence Komlósi

101 Resilience: Co-fighting the crisis
   Emanuele Giorgi, Giorgio Davide Manzoni & Tiziano Cattaneo

113 Session 3 Theories for Resilience
   Greenhouse Superstructures as Social Pedestals: Displaying site-specific non-locality as a possible form of resilience
   Luis Berrios-Negrón

125 The Magical Encounter Between Resiliency and Emancipation? A whatever architecture
   Camillo Boano

137 Values, Watersheds and Justification: On the handling of water in the urban landscapes of climate change
   Katrina Wiberg
Session 4 Strategies for Mitigation

151 The PassivHaus Standard: Minimising overheating risk in a changing climate
Eleni Vogiatzi, Sofie Pelsmakers & Hector Altamirano

161 Resilient Architecture via Intelligent Stimuli-Responsive Structures
Wilfredo Méndez-Vázquez

171 Prêt-à-Loger: Zero-energy home with maximum living quality increase
Andy van den Dobbelsteen, Tim Jonathan & Josien Kruizinga

Session 5 Collective Agency 1

183 Interdependence and Sustainable Collective Action: The case of four collective housing communities in Mexico City
Marina Montelongo A. & Rafael P.M. Wittek

191 Waste Disposal Practices in Neighbourhoods facing Recurring Crises
Kristanti Dewi Paramita & Tatjana Schneider

201 Risk and Resistance: Globalization, shifting boundaries of governability and the production of new spaces of conflict and self-government
Axel Becerra Santacruz

215 The Case for a Collaborative Energy Sharing Network for Small Scale Community Microgrids
Mina Rahimian, Lisa Domenica Iulo & Daniel Cardoso Llach

Session 6 Pedagogy

225 Transition Skills
Clemens Bernardt, Alex van Spijk & Sandra van Assen

235 Learning Comprehensive Building Design through a Resilience Framework
Michelle Laboy & David Fannon

245 University-Based Rural Sustainable Development Assistance Strategies
Li Wan, Edward Ng, Xin'an Chi & Kehan Li

255 Architecture of Multiple Authorship: Beyond the academic year
Sandra Denicke-Polcher

Dialogue 2 Resilience Within the Legacy of the Modern City

265 Academy Of A New Gropiusstadt: Reality Check
Jörg Stollmann

267 The Resliency of Racism
Daniel D'Oca.

269 Cultivating Ethical Ecological-Economic Sensibilities: Strengthening resilience in Monsoon Asia
Katherine Gibson

Session 7 Modeling for Resilience

273 Analysis and Prediction of the Building Energy Consumption Under Climate Change for Xi’an, China
Li Honglian, Yang Liu, Wang Shusheng, Huo Xujie & Kong Liming

281 The Gap between Plan and Practice: Actual energy performance of the zero-energy refurbishment of a terraced house
George Xexakis & Andy van den Dobbelsteen

291 Environmental Simulation for Designing with Climate Change: Framework, experiment and reflection
Chengzhi Peng
Session 8 Community Resilience, Planning and Place

303 Interethnic and Resilient Cities: Urban planning in Italy
  Bianca Petrella & Claudia de Biase

313 Developing Community Resilience Through Active Landscape Engagement
  Karen Foley & Philip Crowe

323 The Social Value of Place: The Social Value of Place: An appraisal method for sustainable neighbourhood development
  Laura Alvarez, Katharina Borsi, Lucelcia Rodrigues & Mark Gillott

333 What Does Community Resilience Look Like in Practice? How institutions see the role of communities in responding to heatwaves in the UK
  Ben Fagan-Watson & Kevin Burchell

Session 9 Co-Production 1

343 Participatory Mapping in the Co-Design of the Future North
  Morgan Ip

353 Future Works: Stories of energy, industry and resilience
  Renata Tyszczuk & Julia Udall

363 Creating a Template for Change: A century of mapping under used spaces in Dublin
  Philip Crowe, Karen Foley & Aoife Corcoran

Session 10 Urban Resilience

377 Urbanism, Rivers and Resilience
  Laurence Pattacini

387 Correlating Urban Microclimate Modelling with Energy Use Data Analysis to Inform Site-Specific Climate Change Adaptation Design
  Choo Yoon Yi & Chengzhi Peng

397 The Social and Spatial Transformative Impact of an Urban Cable-Car: The case of Medellin
  Paul Goodship

Session 11 Collective Agency 2

413 Collective actions for local resilience: Learning from grassroots strategies in São Paulo
  Beatrice De Carli

425 Montagna Viva, The Living Mountain: Conversing with an experiment in making (the local) in common
  Fabio Franz & Bianca Elzenbaumer

435 Resilient Subjects: On Feminist Practices
  Elke Krasny & Meike Schalk

Session 12 Co-Production 2

447 Your Home, My Home: Lessons in participatory designing with older people
  Sarah Wigglesworth

455 Social Architectures of Community Resilience: Sharing and ageing in 'iconic' intentional communities
  Helen Jarvis

463 Provocateurs or Consultants? The role of Sheffield School of Architecture in the co-production of Castlegate
  Carolyn Butterworth & Rowan Mackay
Session 13  Low Carbon Living in Cities

477 Post-Occupancy Evaluation of Apartments: The use of technology and digital interfaces to amplify its efficiency
Simone Barbosa Villa, Maria Adriana Vidigal de Lima, Fernando Garrefa & Sabrina Maia Lemos

489 Technical and Social Redundancy for Low Carbon Living
Fionn Stevenson & Magdalena Barborks-Narozny

497 Climate Resilience in New-Build Social Housing: Challenges, opportunities and unintended consequences
Rajat Gupta, Mariam Kapsali & Matt Gregg

Session 14  Resilience, Vulnerability and Climate Change

509 Tackling Climate Change: Comparing studio approaches in Sheffield and Cape Town
Ranald Lawrence & Kevin Fellingham

517 Learning from New Orleans: The construction of resilient strategies for urban ecosystems
Marcella Del Signore & Cordula Roser Gray

529 Assessing the Adaptation Capacity of Riparian Vernacular Houses in the Face of Climate Change: Can local wisdom be used to improve flood resilience in Ayutthaya, Thailand?
Tharinee Ramasoot & Pratima Nimsamer

Session 15  Cultural Resilience and History

Armina Pilav

555 Looking into the Changing Rural Vernacular Dwellings with a Sustainable View: A Case Study on Bingzhongluo Township in Southwest China
Kehan Li, Edward Ng & Xin’an Chi

563 Vernacular form of the Boka Kotorska: Memory, tradition and inherent resilient thinking
Alan Derbyshire

Dialogue 3  Building Local Resilience: Can it be planned for?

579 The Making And Unmaking Of Local Resilience (and Justice)
Adriana Allen

581 Fantasy Economics and Resilience
Andrew Simms

Session 16  Co-Producing Urban Resilience

585 Co-Producing Urban Resilience
Doina Petrescu & Constantin Petcou

595 Suffocating Cities: Obstacles to urban self-organisation
Peter Merrett

607 Rebuilding Over Time: The Christchurch Convention Centre and The Commons
Timothy Moore & Barnaby Bennett
Architecture Practice Research

Designing for Resilience

St Rita: A New-Build House designed for climate change adaptation
Neil Winder

Amphibious Construction in the UK
Robert Barker

Living Architecture: Demonstrating resilience to climate change and resource depletion
Emma Flynn

Management Before Fabric: Barriers to climate change adaptation
Irena Bauman

Holzmarkt Village: Participatory neighbourhood development in Berlin
Nanni Grau, Silvia Carpaneto, Frank Schöner, Christian Schöningh

City Debate

From Home to City: Scales of Resilience

Architecture and Resilience on the Human Scale: From city municipality to the communities
Tina Saaby

Self-Made City
Kristien Ring

Sustaining Communities’ Collective Endeavours: Stories from Sheffield
Cristina Cerulli
Welcome

Dear conference colleagues,

It gives me great pleasure to welcome you to the city of Sheffield on behalf of Sheffield School of Architecture, which is hosting this exciting Conference. Our mission statement offers you some insight into what we are about:

Sheffield School of Architecture produces graduates who are entrepreneurial self-starters with an exceptional level of political and social engagement, research and business skills. Our mission is to create new knowledge, in theory, in design and practice to help restore the health of the planet and the well-being of communities and societies. We drive this forward through our commitment to building local resilience, developing architectural research practice and working on live projects.

We are one of the top five research schools of architecture in UK. Following on from excellent ratings (Grade 5) in the two previous Research Assessment Exercise, we are the only School in the UK to have achieved and maintained this level of research performance, the culmination of a long history with contributions from generations of scholars, researchers and students. With 25 active research staff and approximately 90 postgraduate research students, the School consistently attracts external funding for its research and is involved internationally with a range of research projects.

The Platform for Building Local Resilience, from which this conference was developed, is an exciting new initiative in our School. We are currently in the process of developing this project as a new ‘umbrella’ research platform. The platform builds on our pioneering socially engaged research; new forms of praxis and design; digital methodologies and building strong evidence bases in our architectural science research.

I hope you enjoy your time here in the lively heart of this post-industrial city – interestingly, despite its urban location almost three-quarters of the city is taken up by natural vegetation and waterways. More than a third of the city is also located in the Peak District National Park – no other city has a National Park within its boundary. In addition you'll find 150 woodlands and 50 public parks all within Sheffield and it is rumoured that there are 4 mature trees to every one of the 550,000 people living here. I am glad you will also have a chance to see some of our industrial heritage at the conference dinner.

Finally, if you have a moment during this busy conference, do please come and visit our School at the top of the hill in the Grade 2 listed 1965 iconic modernist Arts Tower in our main University Campus – we always welcome visitors!

Fionn Stevenson
Head of Sheffield School of Architecture
Introduction
Architecture and Resilience on the Human Scale:  
Ethical and political concerns, agencies,  
co-production and socio-technological  
strategies in research and practice  
Kim Trogal and Doina Petrescu

Introduction

Resilience will be a defining quality of the global 21st century. As we approach the unknown and unpredictable effects of climate change, and the multiple challenges of resource depletion, loss of welfare and economic crises, we know that our current ways of living are not resilient. Our urban infrastructures, our buildings, our economies, our ways of managing and governing are still too tightly bound to models of unrestrained free-market growth, individualism and consumerism. Research has shown that the crises arising from climate change will become increasingly frequent and increasingly severe. What is also known is that the effects of climate change are not evenly distributed across places and people, and neither are the resources needed to meet these challenges. We will need place specific responses that engage with, and emerge from, citizens ourselves.

This is the Sheffield School of Architecture's position paper that accompanies the ‘Architecture and Resilience on the Human Scale’ conference, held in Sheffield (UK) 10th-12th September 2015. The conference focuses on research, spatial strategies and projects that are testing how we can build local resilience in preparation for major societal challenges such as climate change, scarcity of resources, increases in extreme weather events, shifts in demographics and so on. We are interested in discussing how architecture, urban practices and related fields can make a transformative contribution at a neighbourhood scale. We are also stating that architectural thinking has the strength to allow a cross disciplinary stitching across the conventional silos of humanities, social sciences, arts, science and technology, and also across research, practice and civic activism, such as the papers in this conference demonstrate.

How then, can we help build resilience? Can we do it through new forms of design? Through new social and technical innovations? Through new economic models and forms of collective governance? Through new research methods and engaged practice? What professional skills are needed to do it? As we approach uncharted territory, we need new models of living, working and designing to help us.
Amidst these discussions, and recognising that there are numerous other components that also need to be developed, this position paper does not intend to offer a totalisation of views on resilience but takes a situated approach (Haraway, 1988) to explore some key aspects that have focus the debate in the school in the last years; namely, the possibilities of architecture and architectural research methodologies to contribute to building resilience, specifically by maintaining an ethical and political engagement dimension to it. The locatedness of practice forms an important aspect of this ethical and political engagement, as well as understanding the 'local' as an accessible, unmediated scale for civic action.

Secondly, the paper focuses on co-production as a key component for resilience activity on the human scale. Whilst this is one standpoint amongst many, we recognise that university-community partnerships and notions of “co-producing research” have been increasingly on the agenda, with the belief that knowledge needs to be directed and created with those who need it most. In the field of architecture and planning, this follows a longer tradition of participation and signals not only a move towards ethical forms of knowledge production but new opportunities for collective action in making the city. SSOA has chosen to explore co-production as a fruitful territory for linking research and practice. Also the notion of ‘agency,’ which characterises this active position and the multiplicity of relations that need to be considered in resilient practices is of importance here.

Thirdly, it is in recognition that the built environment, in both its processes of construction and use, is responsible for industrialised, large-scale ecological damage. It is from the impacts of CO2 emissions on climate change, to the effects of deforestation and mineral extraction, excessive water footprints (and more) that the paper posits questions around how to mediate the effects of climate change without recourse to those technologies and means that worsen it. Contemporary advances in architectural sciences and technology enable us to be armed with information to change these circumstances, and is a crucial location for action.

**Architecture and resilience: critical, political and ethical approaches**

Resilience has moved from being a radical term in ecology, permaculture and grassroots movements (Hopkins, 2008) to something like a catch all which “has become the preferred means of maintaining business as usual.” (Diprose, 2015: 44). It is a term that in recent years has been defined by governments and experts, externally to the communities, who should “become resilient” (MacKinnon and Driscoll Derickson, 2012). A simplified definition of resilience as simply ‘being strong’ or ‘bouncing back’ is used ubiquitously, from describing a football team’s victory, workers’ capacities to manage stress, to the Bank of England and chancellor George Osborne’s primary objective to deliver a ‘resilient economy’. This ubiquity is potentially due to the fact that ‘resilience’ itself, does not say anything about what
is good or bad; it says nothing of the political and ethical implications or motivations for action. With cities rapidly adopting resilience as framework to shape development, it is crucial to question, as underlined by Adriana Allen here, the relationship between injustice and resilience. Allen asks if cities’ new resilience enhancing measures have pre-existing injustices embedded within them? (Allen, this volume) As other papers in the conference demonstrate resilience on the human scale should focus on dimensions of political ecology (Gibson, this volume), such as justice, nature and time, issues of intergenerational equity and ‘ecological economics’ (Faber, 1998; 33).

Whilst resilience is potentially a transformative concept, it is a term that has been ‘turned upside down.’ For this reason, its usefulness in development has been questioned, with journalists noting that it has become essential to an organisations’ survival to frame whatever it is they do as resilient. If we strive in whatever capacities we can to make transformative contributions, then resilience needs to be reclaimed, reframed and practiced in radical and critical ways.

Resilience, as it was developed in systems thinking emphasised certain qualities that make a system resilient, such as diversity; redundancy; connectivity; continuous learning and experimentation; high levels of participation; and polycentric governance (Biggs et al. 2012). These are potentially transformative concepts when thinking about urban locations and development. How can we have, for instance, diversities of tenure, ownership and inclusive access to housing (Pickerill; Montelongo and Wittek; Giorgi, Manzoni and Cattaneo; Glatz and Komlosi, all this volume)? What kinds of diverse economies are being performed (Gibson, this volume) and non-market forms of collectivity and participation (Elzenbauer and Franz; Moore and Bennett, ibid)? Could we have a diversity of not only energy sources, but also modes of their control and management (Rahimian, Domenica Iulo and Llach, ibid), and what is in fact a diverse, creative and participative future for energy? (Tyszczuk and Udall, ibid). Similarly, supporting the ‘redundancy’ of a system requires a different approach to thinking about investment, and how we invest in people and places. Does resilience ‘at a human scale’ suggest supporting a citizen’s income (Trogal, 2014) or new roles for local services in citizen led production (Thorpe, 2014)?

In the field of urban resilience, there has been a recent focus on universities working with cities at an infrastructural level but the scale of the neighbourhood, as the “building block of cities” has received less attention (Moulaert et al, 2010). Recent research has suggested that place based approaches and design methodologies are key in building resilience. Researchers have highlighted a particular need for “placemaking [...] and a] basic infrastructure of public spaces” in building neighbourhood resilience, especially in areas
under socio-economic stress with retrenching local authority services (Platts-Fowler and Robinson, 2013). Others draw attention to the ways that ‘design thinking’ as a synthesising process, and their participative strategies are also key to building resilience (Waterloo Institute of Social Innovation and Resilience, 2012).

A significant part of SSOA’s research, practice and teaching (and indeed a topic for this conference) engages with issues of locality and neighbourhoods. (The Building Local Resilience research platform and the Live Works teaching enterprise at SSOA make explicitly this statement in their programme) It is in recognition that, not only can ecological loops be closed effectively at this level, that new material infrastructures can be made and claimed by citizens, but rather advocates an engaged approach. Recognising that architecture is *located somewhere*; it is in these places where change happens with people. In the age of climate change and peak oil, resilience requires qualities of ‘social capital’ – trust collaboration, cooperation and leadership- which is rooted in the place where people live (Lewis and Conaty, 2012; 26). In its more radical and critical formulations, it is the only way transformative resilience can really be achieved (Petrescu, this volume). Whilst policy frameworks are of course important, it is through the spatial, social and community practices *on the ground* that resilience is made.

We aim to recognize this more immediate form of engagement in the growing global context of mega-developments⁴, whose ‘bigness’ is not only a scale unto itself, as Koolhaas famously stated a few decades ago (1998), but is a contemporary condition for modes of production, delivery and final inhabitation, which are not resilient.³ This conference has been designed to foreground the ‘local’ and the ‘neighbourhood’ as the location which can specifically facilitate citizen action and participation. Importantly, this human-scale is the one most immediately perceptible to us at the level of everyday life. It is a key and essential location from which *resilience takes place* and has meaning. More autonomous communities are seen as the true ‘resources’⁶ for ecological transition and urban resilience (Lewis and Conaty, 2012; 28) and significantly it is the scale where democratic governance can take place (Hirst, 1993).

This focus on ‘the local,’ as contributors here highlight, does not mean ‘localising’ structural problems. Rather it is one location from which to challenge and transform them. We need “‘resilience from below’ [and to consider...] how resilience may be associated with ideas of rights, power and agency” (de Carli, this volume). Some of the papers here address this directly; Santacruz for instance, raises the indigenous rights of the Cheran (Mexico), who have moved from resistance and self-defence, to self-determination and self-government for autonomous material and social resiliency. Other key issues raised here include the rights to inclusive, affordable housing (Pickerill, ibid), with others raising questions around common property and collective action (Montelongo and Wittek; Giorgi,
Manzoni and Cattaneo, ibid). Authors pay particular attention to low-income groups and vulnerable inhabitants (de Carli; de Biase and Petrella, ibid), and to the collective agency of those in informal settlements (Paramita and Schneider, ibid). Following Lefebvre’s argument for the ‘right to the city’ (Lefebvre, 1995), we need to create the conditions for a ‘right to resilience’ (Petrescu, this volume), with projects initiating and sustaining grassroots self-organisation and management, creating new social and economic agencies for citizens (Gibson, ibid), as well as new roles for architects, other professionals and local actors (Merrett; Grau, Schoenert and Carpaneto; Moore and Bennett, ibid).

The sustainability of collective actions is also important here (Montelongo and Wittek, this volume), with others analysing the intangible qualities of sharing and mutuality in ‘enduring’ intentional communities (Jarvis, ibid). In the context of local resilience, how collectivity is constituted and what we mean by ‘community’ is important and several authors question forms of belonging and relating that are not rooted in identity and exclusion (Boano; Krasny and Schalk, ibid). They reject an ‘essence’ of community (which ‘local’ approaches risk mobilizing) and instead invite us to consider radically inclusive practices and to think through feminist perspectives on alliance building across difference. This is crucial when, as Daniel d’Oca points out, there is “no shortage of contemporary weapons of exclusion,” (d’Oca, ibid) and as Sally Weintrobe suggests we need a ‘caring imagination’ to overcome processes of ‘distancing’ others in order to build a sustainable world (Weintrobe, ibid).

**Co-Production in Practice based research and Pedagogy**

In a series of discussions on resilience held in the Sheffield School of Architecture in 2013 and since then, staff have emphasized that for them, resilience is not about accepting conditions as givens (the conditions we ‘should be resilient to’), but concerned the importance of the future and having agency in making one’s future. This agency is understood to be collective and located. We reflect on what a critical approach to our own institutional position is, particularly in relation to the city. How do we act, with and for whom, with staff questioning where future strategies for change will come from in conditions of austerity? A number of the papers in the ‘Architecture and Resilience on the Human Scale’ conference, importantly then, engage with issues of co-production in ‘practice’, both the co-production of research and knowledge, as well as co-production of projects and the city more broadly.

Elinor Ostrom and her colleagues introduced the term co-production whilst studying urban services, and used the term to describe the reciprocity between ‘producers’ and citizens involved in the delivery of many public services (Ostrom, 1976). As a practice, it has since
been actively developed in the delivery of public health care (Cahn, 2000) and in these cases co-produced services were found to provide better patient care and increase well-being. Increasing evidence over last 15 years supports this (The Health Foundation, 2008).

At the University of Sheffield, researchers across disciplines are working with co-production to specifically engage local communities in research and it is becoming increasing important for producing knowledge for sustainability and resilience (Polk, 2015). Co-production in the design, making and maintenance of space and buildings is significant in ensuring that those lived spaces actually meet the needs of those who inhabit it. Amongst the other changes we face, is that of aging populations, with authors showing not only how both market and social provision fails to meet older people’s housing needs, but how participatory design research can address these concerns and failures head on (Wigglesworth, this volume). This project, like the other practice based works in this volume, demonstrate the significance and importance of being located on the ground, working across many levels, confronting theory, policy, research with conditions in lived reality.

Whilst our approach here is to emphasise and highlight those working in located way, it is also in recognition that resilience is made through connections at multiple scales through that location. The notion of ‘agency’ foregrounded in research at SSOA (namely Spatial Agency (Awan, Schneider, Till, 2011), ‘Agency: Working with Uncertain Architectures’ books (Kossak, Petrescu, Schneider, Tyszczuk, and Walker, 2009) has also been explored by a number of papers (de Carli; Paramita and Schneider; Santacruz, this volume). Authors highlight the need for multi-agency responses and partnerships between diverse groups (Fagan-Watson and Burchell, this volume), where the intersection between scales needs to place “equal value on [different] partners expertise” (Roser Gray and Del Signore, this volume). They go on to suggest this can strengthen bottom up resilience, whilst also shaping policy collaborations.

In considering the ways universities can support communities, attention is also paid to rural contexts, questioning the way universities might best support diverse, indigenous rural development (Wan, Ng, Chi and Li, this volume). Recognising the importance of location-specific approaches for resilience, the ethical questions of difference, not only amongst ‘communities’ but between them, is as important as ever. As authors here suggest, we have an ever-greater need for understanding varied cultural approaches to climate change (and other attendant crises) and the need to understand the varying social impacts in those different contexts (Lawrence and Fellingham, ibid.). The need for different cultural understandings on the human scale, of diverse practices, customs, skills, knowledge and memories is reflected here in many ways. Authors particularly reference the vernacular (Derbyshire, ibid) and others highlight the long-standing success and capacities of vernacular approaches, for instance, in coping with flooding (Ramasoot and Nimsamer, ibid).
The importance of the vernacular is not necessarily only in reference to an architectural ‘type’ or techniques, but rather brings with it the need for those resilient practices, other knowledges and ways of being in the world.

A number of papers bring new tools for locally co-producing knowledge and research on the city, from digital civic surveys (Crowe, Foley and Corcoran, this volume), to geo-timelines to make change visible (Foley and Crowe, ibid), to locative-based social media as tool for co-producing and co-designing (Ip, ibid). Whilst the tools are all different in scope, they all point to the importance of co-produced local knowledge for planning, with authors pointing particularly to an openness of production, which can be used and developed by others elsewhere (Foley and Crowe, ibid). In many ways taking on qualities of the ‘vernacular’ as something shared and developed collectively, i.e. a commons.

A number of papers bring the possibilities for co-production through pedagogy, working in ‘live’ situations. Here university work, both research and teaching, becomes a testing ground for new social and environmental development, testing ways to foster a “common agency” and “strengthening modes of co-production with inhabitants” (Stollmann, this volume). In these initiatives universities acts as brokers between levels (Butterworth and Mackay, ibid), with authors concerned with the ethics of longevity (how to build resilient partnerships); or the building of skills for resilience, such as learning how to participate and to respect difference. These and other skills are ones that can only be developed in interaction with others (Bernardt, van Assen and van Spyk, ibid). They also enable the development of skills for self-initiated projects, with authors reflecting on how these ‘live’ pedagogical projects actions can initiate new collective activities in the long term (Denicke-Polcher, ibid).

The relationship of architecture to resilience is also being explored by practitioners through Architectural Research Practice (ARP). Practitioners are engaging with a wide range of issues and use variety of research methods to explore technical solutions for climate change adaptation of buildings (Baker, Bauman, Winder, this volume), co-production methods for designing of new neighbourhoods (Grau, Schoenert and Carpaneto, ibid), developing new forms of renewable energy within building facades (Flynn, ibid), and addressing issues of inclusion/ exclusion in urban design and strategies for resilience (D’Oca, ibid).

Not only are the kinds of knowledge and skills we develop key to resilience, so are practices of learning, which also need to become embedded. Authors bring architectural pedagogy as a site for change, whether it is creating more cohesive forms of pedagogy around ecological resilience and building systems (Fannon and Laboy, this volume) or
teaching local energy transition in ‘live’ contexts (Bernardt, van Assen and van Spyk, ibid). Initiatives enable experiential learning environments, bringing resilience into a kind of immediacy, resilience aims to be both topic and process.

Science and Technology for Resilience

In working towards more ecologically and socially just futures, we need science and technologies (new and old) to help us make sense of changes, and help inform judgments around how we build (literally) that future. Whilst ideas of ‘future’ often invokes certain images of ‘smart-ness’ and smart technologies, interestingly here a number of authors are rather concerned with the production of knowledge, which potentially uses ‘high’ or smart technology and computation for research, but the kinds of technology involved in construction are themselves varied, and culturally and socially specific. This is evident for instance in the collaborative construction undertaken in the Ludian County (Yunnan province, China), with researchers working with a family to reconstruct their home respecting traditional cultures and their autonomy, yet supported by science to ensure seismic capacity, thermal comfort and low cost (Chi, Ng, Li and Wan, this volume). Questions of autonomy, particularly in relation to energy, are raised in different ways, from work on ‘resilient homes’ and the self-provisioning of energy regardless of income (Roaf, ibid), retrofitting much loved existing dwellings for energy neutrality (Dobbelsteen, Jonathan and Kruizinga, ibid), or finding passive solutions for adaptation to climate change (Vogiatzi, Pelsmakers, Altamirano, ibid).

Yet the kinds of knowledge we can produce and how we do so is under question here too. The inevitable gap between model and reality, however dynamic ones model, must be under consideration. One path, the development of more accurate models, is the one most present here. Developments include building frameworks to simulate site-specific climate change adaptation, particularly at a neighbourhood scale (Peng, this volume), where computational modelling can help analyse performances in context. Others include developing simulations to explore urban microclimatic changes and the connected increases in energy consumption (Yoon Yi and Peng, ibid); the coupled relation between future climate change and predicted energy consumption is also under analysis here (Honglian, Liu, Shusheng, Xujie, Liming, ibid). Other authors bring examples of integrating socio-technical aspects to simulations, analysing how difference in the behaviours and practices of building inhabitants can be applied to simulate and test differences in performance (Xexakis, Dobbelsteen, ibid).

Some authors here, work not with prediction, but with the evaluation of the built, lived reality and emphasise the importance of learning from those now occupying new (or retrofitted) buildings. This is particularly important in assessing how well developments meet
their claims, to be for instance in being low carbon (Gupta, Kapsali and Gregg, ibid). There are new possibilities proposed for methods of making post occupancy evaluations (Barbosa Villa, Vigidal de Lima, Gerrefa, Lemos, ibid), as well as the evaluation of new collective housing types, here co-housing, in terms of their resilience and ‘redundancy’ qualities (Stevenson and Narozny, ibid). In these cases the knowledge of how a project meets the varying needs and preferences of inhabitants, the actual energy savings made and cost implications are important to feedback if architecture is to improve. Analysis of the built environment here, is importantly not confined to dwellings, but extends to examine urban networks, analysing social-spatial effects of connectivity and movement in building resilience (Goodship, ibid) or the effects of rivers and ‘blue corridors’ (Pattacini, ibid). Other authors explore using responsive technologies and ‘cognitive tectonics’ (Méndez-Váquez, ibid), or technologies for ‘post-event’ recovery, but again working with close evaluation of the specificity of regional climates and context (Ladipo and Reichard, ibid). Collectively, this diversity of approaches is important in meeting the complex and specific needs of different people and places.

Conclusion

We hope this conference contributes to new insights to the theory of resilience, especially by focussing on the ‘human scale’ perspective. The practical solutions and concrete suggestions presented in the conference papers might hopefully contribute to new approaches to resilience in architecture and connected fields, and have an immediate impact on communities and practices who are on the front line of dealing with the effects of global change. The new critical, political and ethical approaches and the socio-technological strategies that this conference put forward as well as the notions of Agency and Co-production as instruments for generative, active and evaluative projects should be contributing to the debate on resilience and providing innovative new forms of inquiry leading to more appropriate solutions to the current global crisis we face.

References


Notes

1 For these reasons, this paper does not mention all papers in the conference and all topics discussed, but focuses on those which are closer to what we have defined as the school theoretical position. However this is not at all an indication of quality of for the papers.


3 See for example, the ARCC-network (UK) or the FP7 Critical Infrastructures Preparedness and Resilience Research Network.

4 Here we refer to the rapid construction of mass areas of cities, such as those documented the recent MOMA exhibition, Uneven Growth: Tactical Urbanisms for Expanding Megacities. The exhibition looked at the ‘mega cities’ of Rio de Janeiro, Mumbai, Shanghai, Istanbul, Hong Kong, Lagos and New York, and in a number of cases on mega-developments, in those cities. We also refer to the large-scale (re)developments and reconstruction of ‘old’ cities such as those hinged on Mega-Events, such as the Olympics (Barcelona, Sydney, Beijing, London, Rio), and FIFA World Cups etc., which far from seeming as a ‘one-off’ set precedents for the dominant mode of delivery of urban development (Raco, 2014).

5 See for example the recent work for the MOMA exhibition: Uneven Growth: Tactical Urbanisms for Expanding Megacities.

6 We put the terms, ‘social capital’ and ‘resources’ in inverted commas as whilst they are the terms used by the authors (Lewis and Conaty), we also recognize that they derive from (and potentially perform) a particular economic way of viewing of both people and relations.

7 Please see for example Kate Pahl’s projects such as: “Ways of Knowing. Exploring the different registers, values and subjectivities of collaborative research” https://waysofknowingresearch.wordpress.com (Accessed 27.08.2015), “Imagine. The social, historical, cultural and democratic context of civic engagement: imagining different communities and making them happen.” http://www.imaginecommunity.org.uk (Accessed 27.08.2015) and The University of Sheffield’s, Research Exchange for the Social Sciences work in this area: https://www.sheffield.ac.uk/ress/coproduction.

Dialogue 1

Building Local Resilience: Bricks and feelings
Building Resilience in the Built Environment

Susan Roaf
School of the Built Environment, Heriot Watt University, Edinburgh
s.roaf@hw.ac.uk

ABSTRACT An understanding and appreciation of why resilience is important, what it means at the building and settlement level and how its tenets can be used in design and refurbishment is vital in a rapidly changing world. A range of risks and opportunities for buildings and their occupants will be outlined, referring to the Built Environment Adaptation Indicators being developed for, and with, the Scottish Government. The underlying premise developed here is that if you can’t measure it, you can’t manage it, is vital as we, as a society try and build social, economic and environmental resilience in a rapidly changing, and increasingly non-linear world. The core of the paper deals with the need to intelligently anticipate what the future holds in order to ‘Bounce Forwards’, rather than to bounce back to failed models. This talk will promote the idea that at the core of successful solutions to future building archetypes must be the striving for affordable, low impact and universally accessible comfortable places. It outlines the gradual decline of the climatically designed building, the rise of central heating and air-conditioned solutions, the deterioration of the performance of buildings themselves as climate ameliorators and the role of standards and regulations in that decline. It then briefly touches on recent attempts to reverse this decline with ideas of energy efficiency, as exemplified by the Passive House movement in the 1990s, Sustainability in the Active House model of the 2000s and the need to upgrade those models to create truly resilient homes. The resilient home, called the Ecohouse model, promotes buildings that are run for as much of the year as possible on free natural energy from local eco-systems, generate their own heat and power and provide safe havens even in the most extreme weather for their occupants regardless of income.

Introduction

We live in a non-linear and unpredictable world, a world of boom and bust, of war and infra-structural collapses, where rapid change and uncontrolled growth is driving the collapse of established systems. Cavalier debt markets have driven top-down macro-economic failures even in the so-called regulated economies. The bottom up collapse of the housing markets in the USA in 2007-2010 caused an economic maelstrom fuelled by debt and the current collapse of the Chinese stock market appears on the verge of triggering a global economic crisis at least equal to the scale of the 2008 – 2010 global economic crisis. These events are also happening against a the unedifying backdrop of a gradual trend in the degradation of the physical, social and environmental infra-structures of nations, that included the systemic increase in the wealth gap between the top 5% and the rest of the 95% of earners across many societies. The phenomenon of the disappearing middle classes...
is one that will inevitably be exacerbated in the current evolving global economic climate. Such trends are set against the atmospheric backdrop of a warming climate and significant increases in the scale and intensity of extreme weather events.

Fig. 1. The warming of the climate will exacerbate the nature and rate of collapse of the whole gamut of our social and physical systems we operate in within the built environment (Roaf et al. 2009).

How can we reinforce our societies against such trends and the many complex systems we operate in to secure a safer future for ourselves and our children? How can we increase our resilience to the exigencies of unpredicted events in this non-linear world? This paper promotes the idea that a critical factor in building stronger societies is, rather than concentrating on increasing the wealth of the top five per cent, to concentrate within individual communities on reinforcing the economic viability of those at the bottom of the social stratum – and the buildings they live in. By identifying the most vulnerable groups in our societies and enhancing their ability to achieve acceptable and affordable lifestyles the social bedrock of our systems will be stabilised providing more solid and secure foundations on which to building a truly sustainable society.

**Resilience**

It is important to understand what we mean by Resilience. It is variously described differently by engineers, ecologists or system scientists and it is, indisputable, an attribute of
social and physical systems that is increasingly discussed (Zolli and Healy, 2012) and sought by planners, architects, engineers and politicians alike. The technical definition of resilience for material scientists is the property of a material to absorb energy when it is deformed elastically and then, upon unloading, to have this energy recovered - the ability to bounce back to normal after a testing event. Systems all around us are visibly failing from Syria to Greece and currently in the South East Asian, and consequently global financial markets. It is proposed here that our fundamental understanding of the idea of resilience and its implementation is key to creating affordable and achievable reinforcement to systems.

The amount of resilience in a system is defined by material scientists as the maximum energy (stress) that can be absorbed per unit volume without creating a permanent distortion as can be calculated for metals, for instance, by integrating the stress-strain curve from zero to the elastic limit (Campbell, 2008). Stress is placed on the material which reaches a yield point, then there is the bandwidth of strain it can absorb before it reaches its maximum strength and then fractures. With a metal, as with socio-economic systems, the fracture points also changes with the temperature of the material.

One premise of this paper is that we need to be able to define the amount of stress in a system that can be absorbed before it begins to yield to that pressure. If we use as an analogy the housing sector a key stress factor might be associated with rising energy prices that within certain households may no longer be paid in full and the system has to yield, with lifestyles no longer being able to be maintained at the same standard. The extent to which the ensuing stress can be tolerated within the system will depend on a range of factors like how many savings a person has, how old or sick or fit a person is.

Such factors will define the bandwidth of the adaptive opportunities available for people to exploit to take the extra strain before the system collapses and does not ‘bounce back’ and so suffers permanent distortion. This may involve people getting ill or being hospitalised. At some point the system will fracture. No more stress can be tolerated. People die. Without being able to define those three properties of the system: yield behaviours of the system, adaptive capacity bandwidths and fracture points, planners, designers and politicians have not sufficient information to be able to intervene to enhance adaptive capacity and prevent system fracture and collapse.
Fig. 2. shows the characteristics that are involved in this definition. Stress is placed on the material which reaches a yield point, then there is the bandwidth of strain it can absorb before it reaches its maximum strength and then fractures. With a metal, as with socio-economic systems, the fracture points also changes with the temperature of the material.

The metallurgist’s definition: Resilience is the area under the linear portion of a stress-strain curve is the resilience of the material (Campbell, 2008).

The rate at which stress is applied to an inanimate non-learning metal does not affect the strain at which it fractures because the metal simply mechanically performs to its limits. In ‘learning’ ecological systems the rate of change, a product of the rise (scale of the stress) and the run (scale of the strain) of the process over time, can be significant. Berkes et al. (2008) point out that in a rapidly changing world socio-ecological systems either evolve or do not survive. The function of that evolution is to increase the strain the system can absorb before collapse occurs.

The risk of a system breaking in relation to climate change in the built environment has been disaggregated and characterized by Crichton as having three vectors (Crichton, 1999; Roaf et al., 2009):

- **Hazard:** how bad is it going to get? How large is the stress placed on the system?
- **Exposure:** where are people situated in relation to that Hazard? How exposed is the system to the hazard and how likely is it to happen, how often and how hard?
- **Vulnerability:** how likely is the combination of the above to prove lethal? What strain can the system take? What are the adaptive opportunities and potentials of the system? What properties of the system can be strengthened to reduce the risk of system failure?
The idea of resilient systems can also provide capacity for renewal and innovation in the face of rapid transformation and crisis' (Berkes et al., 2008). Here the idea of innovation being a key tool for those trying to build resilience into the system is important, but innovation is needed not only in the economic landscapes of for instance the housing system but also in the development of physical innovations and the re-setting of the way in which we view the problem in relation for instance to the design of buildings.

Wilson (2012) proposed a definition of resilience as:

‘The capacity of a system to absorb disturbance and reorganize while undergoing change to still retain essentially the same function, structure and identity, and feedbacks... resilience is measured by the size of the displacement the system can tolerate and yet return to a state where a given function can be maintained.’

Holling (1978) noted that ‘Placing a system in a straightjacket of constancy can cause fragility to evolve’ and all too often in recent years this fragility, or brittleness, of the fabric of the built environment has proved lethal in terms of the thousands of lives and buildings lost to flood, heat, cold or winds as well as proving catastrophic for the livelihoods and communities involved. It appears short sighted to consider it acceptable to repair a system to a state where it can return to the point at which it failed previously and rational to support investment in systems that ‘bounce forwards’ to more resilient states, capable of withstanding the next event of a similar magnitude.

System complexity and vested interests often confound pundits and politicians alike and nowhere more so than in the field of climate change legislation, where the overwhelming power of lobbying groups to impede the development of resilience is widely recognised as a core problem. Lazarus (2009) points out that the building of resilience is a ‘Super Wicked’ problem in which additional barriers to the evolution of the system are imposed by those with vested interests in a non-evolving system. He proposes, for instance, that to be successful over the long term, climate change legislation will need to include institutional design features that significantly insulate programmatic implementation from the undue influence of powerful political and economic interests propelled by short-term concerns.

Hardin (1968 and 1994) developed the idea of the Tragedy of the Commons to describe the dilemma that arises from the situation in which multiple individuals, acting independently and rationally consulting their own self-interest, will ultimately deplete a shared limited resource, even when it is clear that it is not in anyone's long-term interest for this to happen. His ideas were taken up by many attempting to rationalise why in the face of our growing knowledge base decisions were being made that appear to push progress into socially, environmentally damaging directions. All of us wanting and having more would inevitably push local ecosystems, and in turn, economies, beyond their capacities.
(2012) highlighted the profound dangers of ‘asymmetric information’ where some individuals have access to privileged information that others don’t causing unfair advantage that can result in system collapse in itself. The Planning Gain payments to local councils described above is an example of the ‘Perverse Incentives’ fostered within the system to the benefit of the privileged few who can play the system, to the cost of the many who don’t know the rules. Increasing numbers of authors suggest that the internal mechanisms of neoliberal and turbo-capitalism, devoid in such ways of values of fairness, trust and civil responsibility are to blame and will inevitably take us to the cliff edge highlighted by Hardin and Stiglitz and others (Stiglitz, 2012 and Jackson, 2011; Heinberg, 2011).

Many authors point to the confounding nature of the high level of complexity of the systems in play and their feedback loops, and the problems associated with our reliance on trend extrapolating models in forecasting and predicting the performance of systems. Ayres (1999) specifically points out that to forecast ‘turning points’ it is necessary to get away from trend based models as were used in extrapolation but goes on to point out the weakness of trying to characterise too many complex non-linear interactions with limited differential equations such used since the early year of Ecological modelling and in the original Limits to Growth model by Meadows et al. (1972). Ayres claimed that simple quantifiable models will not be adequate to identify timings and other attributes of Turning Points but that ‘naive intelligence and intuition may be the best tool for coping with a very complex and non-deterministic future’.

**Adaptive Capacity**

In the background documents for the third report of the International Panel on Climate Change (IPCC, 2001) the concept of Adaptive Capacity, was developed in relation to the Vulnerability of populations. At a national level Vulnerability is determined by factors such as economic wealth, technological opportunities and infrastructural resilience, information and knowledge, and equity and social capital. In published literature explored, both the determinants of and indicators for Adaptive Capacity are typically given at a country level, rather than in relation to the risk level of an individual sector, person or household (Metzger, Rounsevell et al. 2006) and definitions for key adaptation terms are not often associated with methods for their quantification (Stadelmann et al., 2011, IPCC, 2007; Levina and Tirpak, 2006). Key data collection and analysis methods for adaptation typically deal on one hand with high level measures such at Gross Domestic Product (GDP) or are specific to local community level factors (Wilson, 2012).

While adaptive capacity can potentially cushion the impacts of climate hazards, Berrang-Ford, Ford et al. (2011) and others have noted that adaptive capacity does not necessarily translate into adaptation not least because of the Wicked complexity of the issues involved.
A point in case can be presented as recent trends in house design and development. To what extent do they offer home owners secure and affordable comfort, for instance in the future.

The idea that adaptive capacity is maximised in richer populations and regions is flawed. A study dealing with the housing crisis of Arizona in 2007 – 2010 (Roaf, 2014) concluded that value led and market driven choices had led people in the Arizona Valley to live in homes too large, too far from work and run on inefficient air-conditioning systems run on increasingly expensive energy. These choices contributed largely to their inability to pay their mortgages when energy costs doubled in a few months and the fact that in greater Phoenix and Maricopa County some 265,000 homes were recorded as empty in the 2010 Arizonan census. It was argued that if people had been willing to settle for smaller, less ‘flashy’ homes that were run on abundant and increasingly dominant (Aanesen et al., 2012; Kirkegaard, 2010) solar energy potentials the number of foreclosures could have been significantly reduced. The adaptive capacity that failed here was demonstrated to be the ability of local homeowners to absorb the accelerating costs of energy into their daily budgets – the Macawber factor. Overnight they began to spend more than they earned and the housing system failed, toppling the first domino in the largest global economic crisis for a century.

The Importance of Comfort building success

Comfort is a very costly business. Around 40% of global GDP is spent on buildings, for their construction, operation and demolition. Most goes in keeping buildings cool or warm enough to occupy - using air-conditioning and central heating systems. That was fine in the age of cheap 20th century energy but as fossil fuels run out - how will we afford to stay comfortable in the increasingly extreme weather systems we occupy?

The IPCC’s 5th Report on climate change rings lots of alarm bells, providing clear evidence of the often devastating impacts of a warming world (www.ipcc.ch/report/ar5/). In 2014 alone, many people died as Southern Australia sweltered in the grip of an unprecedented heat wave in January and when North America experienced a catastrophic freezing period in November. How can people stay warm / cool in their own homes in such extremes if they can’t afford to pay for heating and cooling energy in ordinary weather?

In the 1990s – as concerns about climate change began to impact designers became aware of the need to mitigate the impacts of global warming and became obsessed with Energy Efficiency as did the author (Roaf and Hancock, 1993). In Europe movements like Passive House (www.passivehouse-international.org) started that were suited largely to European climates and required several simple steps to be taken to include:
• Insulation
• Good Windows
• Air Tight construction
• No thermal bridging
• Heat recovery systems.

Then in the 2000s came the rise of concerns of the broader subject of Sustainability (Roaf et al., 2004). In Denmark the Active House (www.activehouse.info) group rose to the challenge and had a model that included a wider range of design features including:

• Thermal Storage
• Natural Ventilation
• Adaptive Envelope
• Active solar / renewable energy systems

This was a huge step forward from the flawed Passive House model that all too often promoted over-sized and fixed windows, and inherent in the design mix was the important of adaptive opportunities. But like the Passive House homes, some features in particular like the concentration on roof lights and over-large windows regardless of orientation, they did not account for issues of overheating for more extreme hot weather events.

The advantage of the parallel British Ecohouse movement (Roaf et al., 2012) was that from the get go it understood that buildings must, and will increasingly have to be, design not only to minimise their impacts on climate change but also to adapt to more extreme weather in a rapidly changing climate in a warming world. Eco-buildings are often designed to include Climate Refuges where occupants can find safe and comfortable havens, however extreme the weather outside. Ecohouse design promoted:

• Climate Ready & Future-Proofed buildings
• Run on Solar / Renewable Energy with Storage of heat and coolth within them
• A wide range of adaptive opportunities & easily usable controls
• Buildings in which behaviours are deemed part of the Solution – not a problem

Many architects and engineers today are hampered in their design of resilient buildings because they systematically use complex and inaccurate building models that are not capable of designing low energy buildings with embedded thermal and electrical storage, complex natural ventilation systems and unpredictable behaviours. This is why we have come up with a more simple approach to the design of resilient buildings that disaggregates the design process to stages in orders of magnitude of impact on the both comfort and energy use to show a new way forward for future facing design.
Designers need to work on three different design levels in three distinct stages:

**Design Level 1: Everything you cannot change about a building**

This includes Form (footprint in two D and section in 3D) – Orientation – Openings – Height in Sky – Depth in Ground – Floor to Ceiling Heights – Structural / Roof Overhangs – Materials / Mass1 – Emissivity / Absorbance of surfaces etc. These are what determine the basic ‘pulse’ of a building, how coupled to, or de-coupled from, the outside weather the internal climate is.

Fig. 3. Level 1 design determines how ‘Well-Behaved’ a building is in terms of its internal climate.

These three examples show UK buildings that if they are good have very stable indoor climates, if they have too much glazing and tend to overheat are So / So buildings and if they are glass boxes are very bad Level 1 buildings.

**Design Level 2: Adaptive Opportunities - Things about a Building that you Can Change.**

These may include U-values / Occupancy / Internal Loads / Opening Windows / Infiltration / Furnishings / Clothing / Local-Central Heating /Cooling systems / Shades / Curtains / Blinds / Conservatories / Porches / Landscape. Comfort often results from peoples behaviours that take advantage of these Adaptive Opportunities to improve their comfort.

The problem today is that many building designers only know how to use energy consuming heating and cooling systems to improve comfort and have forgotten all the old ways of passively achieving comfort with behaviours. Thus you might have the same type of Level 1 So / So building but it can either be a good or a bad building depending on whether
the full palette of adaptive opportunities are taken advantage of or not as shown in Figure 3. The trend to mechanisation of buildings was driven by Building Standards with only a very narrow acceptable temperature band that made air-conditioning a necessity. However good designers now use Adaptive thermal Comfort Standards with broader temperatures ranges suited to local climates (Nicol et al., 2012 and Humphreys et al., 2015). Many modern architects are also poorly trained in issues of building performance and more keen on Wow Factors than Comfort when designing as dealt with in our Design Level 3 and Figure 5 below.

Fig. 4. Too many HVAC Engineers and Architects no longer know how to use the full range of passive opportunities to achieve comfort but just rely on energy expensive mechanical systems.

*Design Level 3: This level is all about the Mind*

How we perceive or sense or feel the building. Just imagine you are walking into a room for the first time and you will develop an instant first impression on just how comfortable it will be or how happy or well you will feel inside it. These feelings may be to do with a View – Art - Sounds - Scents –Style - Colour – Light - Formal Composition of Shapes - Decoration - Furnishings - people / events associated with the building and so on.
Paradigm Shifts in Concepts of Comfort enable the use of Natural Energy

Only once one has established an effective and locally appropriate building archetype that is capable of producing a well-behaved and climate safe Level 1 building that is appropriate for the local climate and social and economic context is it then time to move on to explore the Level 2 Adaptive Opportunities that will help fine tune it energy efficiency in relation to its core function of providing an acceptable, comfortable or even delightful thermal environment. Comfort, without machines, here is the measure of the success and resilience of a building as well as its mechanical energy efficiency.

Integral to a truly low energy building is the need to naturally ventilate it for as much of the year as possible – and to allow this to happen a revolution in comfort approaches is necessary. Fortunately this is happening fast. In the 2014 Windsor Conference on the subject of Counting the Cost of Comfort in a Changing World (Roaf et al., 2015a) a whole new spectrum of strategies for the provision of real, local, comfort were presented, designed to promote the well-being of people within buildings and spaces at low or negative carbon costs. The 20th Century concepts of comfort were predicated on a dated model that involved the using of cheap fossil fuel energy to run ubiquitous, mono-functional, climate conditioning systems as shown in the high energy Level 2 building in Figure 3. This increasingly financially and environmentally unaffordable model is now being rapidly superseded by a
new 21st century comfort approach with very different trends including (Roaf et al., 2015b; Brager et al., 2015):

1) **From Active to Passive:** Only heat / cool buildings when absolutely necessary - naturally ventilate them for as much of the year as possible. Architects and Engineers will have to re-learn the skills they lost in this field when they fell into the thrall of high energy machines. The myth of ‘efficiency’ is pervasive - but why use machines at all if you don't need to?

2) **Heat / Cool the people not the building:** A strong move is back to using what the Californians call Personal Environmental Technologies (PETs) – like small heaters, fans or air-conditioners to provide local comfort for individuals within low (or high in cold climates) background temperatures. Crucially small local PETs used to heat / cool people during extreme events also negate the need to over-size mechanical systems to meet peak loads.

3) **Adaptive Behaviours are a key part of the comfort equation:** Include lots of opportunities for people to adjust themselves and their buildings to achieve comfort - including shutters, curtains, shades, screens and the ability for people to move around spaces in buildings.

4) **From still to breezy air movement:** Most of the early work in comfort was done in climate chambers in northern Europe and the whole 20th comfort approach defines air movement as ‘draughts’ – a very bad thing. In fact breezes are very different and can be harnessed to enhance comfort and people really do like ‘fresh air’.

5) **From Neutrality to Delight:** Stop thinking that the only way to provide comfort is to put people in a uniformly warm / cool room soup. Re-learn how to make people sense ‘thermal delight’. A cosy fire in winter or a cool breeze can trigger sensual pleasure and enhance happiness and well-being – so why do so few designers design for delight today?

6) **Design Climate Refuges into buildings:** Every home should have a cool / cosy corner so that people (particularly the old and the young) can stay warm / cool there during extreme weather. You just need one room to be safe during such periods.

7) **Time and Place are key - Harvest comfort from the micro-climates in and around buildings:** Every place, site, aspect, room will have its own micro-climate that, once understood, can be used to provide more or less comfortable locations for different activities over a year. The thermal landscaping of a city, site or building can be done effectively with the many tools available from planting and shading to sun trap walls and sun-catching bay windows. *The building is not a box* plonked on the site but a complex intervention in the flows of people, resources and climate, in and around it.
Resilience means doing more for less and minimising vulnerability to extreme events, with comfort.

**Measuring Adaptation and Resilience**

‘If you can’t measure it you can’t manage it’, as the old maxim goes. But how to measure such issues in practice as increasingly being required of the professions and governments alike in their drive to to develop designs and policies that can effectively reduce and manage the impacts of change on their social, economic and physical systems. Scotland has pioneered the development of locally appropriate Adaptation Indicators within the framework of a Scottish Climate Change Adaptation Programme (SCCAP) (Beckmann and Roaf, 2015). A critical set of indicators relate to impacts on populations in the contexts of the built and natural environments and are being developed to expand the Scottish programme of Climate Adaptation Planning and ‘Informed Decision Making’. To do this requires a focus on deliberative policy making to formulate both Policy Targets and Action Plans aimed at:

a) Reducing our exposure and vulnerability to the risks inherent in a changing climate.

b) Exploring ways of exploiting any opportunities that may emerge with climate change.

c) Developing a sound adaptation policy framework as is increasingly understood as being critical to the encouragement and enablement of countries to bring about planned adaptation that will build resilience in their populations over time.

This part of a planned *evolutionary* process developed to accommodate and drive timely adjustments, as and when necessary, to enable populations to cope with, and adapt to, new landscapes, buildings and lifestyles in an increasingly rapidly changing climate. It will also be used to identify investment opportunities that might enable Scotland to continually ‘bounce forward’ to positions of greater resilience.

The built environment, being developed at Heriot Watt University, are derived from a risk based approach as this is the basis of adaptation policy making in Scotland (and the UK) with the SCCAP responding to the Climate Change Risk Assessment. It also fits well with the decision making contexts in which the indicators are to be used as many decision makers are already working with risk management processes. Indicators need reliable and replicable data sets behind them and examples of some *Scottish Adaptation Indicators* for the Built Environment, now numbering over twenty include:

a) **Indicator: Flooding** (Data sources: Scottish Environmental Protection Agency SEPA; Ordinance Survey Master Maps). Eg. Risk of flooding to residential and non-residential property and to cultural heritage / proportion of properties/assets at risk. Action: e.g. proportion of properties at risk benefiting from flood defences and extent of impermeable surfaces in urban areas.
b) **Indicator: Increasing damp and mould in buildings** (Data sources: Scottish House Condition Survey). Eg. Risk: Extent of the damp etc. Actions: New policies on standards for rented homes etc.

c) **Indicator: Energy Demand**: (Data sources e.g. Official Energy Efficiency Ratings; General Register Office Scotland; Scottish House Condition Survey). Eg. Opportunity: Milder winters will reduce energy demand for heating; Risk: e.g. property energy efficiency and average household size; Action: proxies: extent of insulation measures in housing; extent of energy monitoring by occupants.

d) **Indicators for Transport and Flooding**: (Data sources e.g. SEPA, Transport Scotland/local authorities, Scottish Flood Defence Asset Database; Network Rail; Scot Rail). Eg. Risk of flooding of roads, disruption due to flooding of roads, flooding of railways.

e) **Indicators for Transport and Landslides** (Data sources include SEPA floods/flows; Transport Scotland and Local Authorities). Eg. Risk: landslides affecting roads; scour of road and rail bridges.

A new Indicator set for Overheating in Buildings in Scotland is currently being considered (see Ruddell, 2012), and not before time as isobars rapidly creep northwards and it is only a matter of time before the 2003 event when 72,000 people died in Europe in one heatwave event (Larson, 2006) will inevitably be repeated. Once the means to measure policy outcomes are in place then the policies to alleviate anticipated adaptation actions will inevitably follow.

**Conclusions**

In our search for socio-economic resilience in a rapidly changing world both the measures and motivations matter enormously. There is a need for a deeper understanding of where populations stand in relation to economic, physical and social stressors, their ‘Adaptative Capacity’, how much extra physical / economic strain they be tolerated in the real context before system collapse and or degeneration occurs. A basic understanding of the importance of adaptive capabilities is crucial. For instance, when governments need to ratify spending hikes by private and public bodies such as 5-10 percent hikes in transport, water or energy costs do they know the extent to which the ‘Macawber Factor’ will kick in, the point at which the system breaks? Do they even consider the cumulative effects on citizens groups? Do they care if certain sectors actually go over a fracture cliff? We know from Stiglitz (2012) and Lazarus (2009) that excessive concern about such end points may not be in the interests of the ruling classes, and their lobbyists, in many countries. But perhaps this is exactly the time when Paradigm Shifts can and must occur, when millions of citizens turn to running their lives on solar energy, rely increasingly on natural ventilation and turn their
back on market driven solutions to withstand the growing stresses and strains within our economic systems. Who knows?

This exploratory chapter has identified that we need to understand functionalise and maximise our Adaptive Capacity, to identify Fracture Points in our socio-economic systems, to consider long term energy solutions like solar —power, to relearn how to design truly resilient buildings and to identify and measure our own ability to adapt in a rapidly changing world and act accordingly. The choices we have to make about the future are increasingly value driven too - who matters to us in the long run? And who makes that decision? Quis Custodiet Ipsos Custodes? Who Guards the Guardians?

References


Notes

1 http://icarb.org/energy-workshop/
The New Imagination in a Culture of Uncare

Sally Weintrobe
British Psychoanalytical Society

ABSTRACT We all rely on imagination when undertaking new projects, architects particularly so with their potential to imagine perhaps being their most essential creative asset. Sally Weintrobe argues that the present culture of uncare is damaging to the caring creative imagination and because of this it is vital to understand more about this culture, its aims and its effects. Resilience is being able to withstand the pressure of the culture of uncare to unduly influence how we think and feel; also to understand how and why we collude with a culture that currently promotes such extensive disavowal of climate change. She explores the psychology of imagination, disavowal, and the culture of uncare; also what is needed for ‘the new imagination’ that can envision a sustainable world.

Introduction

Sue Roaf, in a wonderful phrase, called for architects to “reengineer their dreams” to build for a sustainable future. This means nothing less than restructuring the architectural imagination.

The imagination needed for our climate crisis is a caring imagination. My argument is a culture of uncare in the global north actively works to break our felt links with the part that cares. It does this to block change and promote carbon intensive business as usual. I suggest we are all, more or less, influenced by the culture of uncare.

Roaf’s phrase, ‘reengineering a dream’, resonates with a psychoanalytic way of seeing: here thinking is an inner, psychic, dynamic building project in which we maintain links with care by keeping those we care for near by us in the internal world of the imagination, close enough to feel touched by them. A main way we break links to care is by spatially rearranging our relationships in the inner world of the mind in order to keep people at a distance. As ‘distanced others’, we do not care as much for them. An internal world with uncare in charge is an internal world in which our relationships have been reengineered spatially in this kind of way. My argument is the culture of uncare works to promote this kind of rearranging which can lead to a distorted inner representation of the external world.

I will look at what sort of caring imagination we need to dream of and to build a sustainable world. I call it the ‘New Imagination’. Embracing the New Imagination involves repairing broken links with care, and forging new links with care. This can be difficult and painful to do, but can also expand the experience of self and of feeling alive.
A concept I will emphasize is frameworks of care. The capacity to care is not just part of individual character, but depends on these frameworks of care. Architects build them when they build sustainably.

The culture of uncare

A culture of uncare has gained ascendency in the period of globalization since the late 1970’s. It has, by now, been extensively studied by social and psychosocial scientists, with each scholar naming it in turn the narcissistic, perverse, consumerist, extractive, entitled, arrogant, psychopathic, instrumental and manically triumphant, culture. All these are aspects of uncare, and together these aspects cohere to form a mindset, which I have called the uncaring mindset. It is organized, narrow minded, short-term minded, avaricious, and it tends to be set and tenacious.

The uncaring mindset is at the heart of the culture of uncare. It is driven by a powerful undermining phantasy which is that the earth is an idealized indestructible breast/toilet mother, there solely to provide endlessly for us and to absorb all our waste.

The project to globalize the economy was driven by this phantasy. ‘Grab, grab, grab, now, now, now; undermine as many restraining trade barriers as possible, hide the true costs and let tomorrow go hang’ was the order of the day. Laws were framed and trade agreements put in place to facilitate deregulation. Naomi Klein (2014) has described this process in her latest book on climate change, This Changes Everything as has Joel Bakan in The Corporation. Deregulation means people working to undermine frameworks of care that hold excessive greed and entitlement in check.

The only possible outcome of globalization driven by a mindset that sees the earth as a breast/toilet mother was a pileup of social and environmental damage and the biggest problem for drivers of the global economy was how to get people to cooperate with an immoral and inherently unsustainable project. Happy carefree consumers were needed to boost profits. The problem was people care. The need was to reverse the human climate so that people would care too little, not too much. To date, trillions of dollars have been spent on undermining care through working to shift peoples’ bedrock ego ideals of caring behaviour. Undermining care has been brought about through political framing, mass media, the academe, general culture and advertising. It has led to a change in the culture of our social groups towards greater disregard for science, more materialistic values and the idea that to feel as free of care as possible is most desirable, rather than being a warning sign that one is living in a gated community, a psychic retreat, within the mind. All this money would not need to have been spent, and would not have been spent, if people were basically uncaring by nature. Instead, people are caring and uncaring by nature.
The global economy’s business plan was to drive uncare and to disable care, specifically in relation to our behaviour as consumers. The need was for people happily to consume ever more products produced in the cheapest possible way to maximise profits. The true cost was climate change and rising social inequality. People’s moral qualms, their feelings of responsibility, their anxiety that it would all end very badly, their sense of guilt and their impulse to resist taking part, all stood in the way of the willing cooperation needed.

The new culture that came in had the ideological function of helping people find ways not to care too much about living in a way they knew deep down was morally wrong and unsustainable. The culture’s aim was promoting an uncaring mindset. This mindset has trickled down from corporate power, to governments, to social groups, to the individual psyche.

Lawrence Summers’ leaked memo

Here is an example of the mindset at a corporate level. In 1991, Lawrence Summers, then President of the World Bank, confided in a leaked confidential memo, “I think that dumping a load of toxic waste in the lowest-wage country is impeccable and we should face up to that. ... Just between you and me, shouldn’t the World Bank be encouraging more migration of the dirty industries to the Least Developed Countries?” Here is the uncaring mindset writ large: outsource environmental damage to those who are far away and without power. Let them bear the suffering.

When this email was exposed, Summers said he was only joking. Presumably this was because he did not want either the bank or himself, as the bank’s leader, to be judged immoral. The problem is people care. They feel guilty and ashamed at having their uncare exposed, and even if they do not, they know others will. This is the main reason why damaging and inequitable trade treaties are negotiated in secret, away from public scrutiny.

Like others, I was shocked to read of Summers’ memo, but I too outsource environmental damage I cause, albeit obviously on a far smaller scale. Here is an example where I saw this clearly.

At the bus stop

I was waiting for the bus, having decided to travel more by public transport to reduce my carbon emissions. It was spitting rain, blowy and cold, and I thought, “I hate waiting for the bus. I wish I’d taken the car”. Suddenly, spontaneously, I imagined my grandchildren overhearing my thought. They were now young adults, not children. In my imagination their world, a future world, was right up close to my world. In my imagination, we were all close enough to hear, see and touch each other; close enough for me to see the extreme weather
they were in and close enough to feel their suffering.

I felt ashamed. Part of my shame was feeling I was so much less of a person than I wished I was, and felt I can be. I felt trivial, fatuous and grumpy, like a spoiled entitled brat. I had heard myself in a different way and with a different perspective. I think this was because I felt a direct loving, empathic, link with my grown up grandchildren. And, because I felt this direct link so keenly, I managed to stay in touch with what I had understood, despite this being painful.

This was that I had, without being consciously aware of it, relocated my own grandchildren to in a faraway place in my imagination, a place I had labelled 'the future', and I had done this in order to sever a caring, loving, link with them. I had moved them from being close to distant so I would not have to feel guilty, ashamed and anguished about my carbon behaviour. Here I was, in an uncaring mindset, outsourcing suffering. In my imagination my grandchildren were now 'distanced others' far enough away to be outside the area of my love and concern. I had broken my caring link with their actual future experience so as to assuage my guilt.

I have often thought climate change will affect the lives of my grand children. I now realized this was with real empathy cut off. I had never felt affected like this. Here I believe I had repaired the loving, caring link between us. I had reversed mental distancing and brought them back close to me where they properly belong. This is the sort mental reengineering that I think is required.

The mechanism I have described – that of actively breaking loving links to avoid mental pain - is an ordinary human defence mechanism that can usefully protect us from being too emotionally overwhelmed. My point is that the culture of uncare boosts breaking caring links and boosts mental distancing on a daily basis. It does this in many ways and through different branches of the culture. For instance, take our social groups. Mine would be more likely say, “don’t be so hard on yourself Sally; give yourself a break. Don’t be omnipotent. Do you really think that your one tiny action of taking the bus is going to save the world?” They would be less likely to say, “Yes, it’s unpleasant waiting for the bus, but stick at it. Perhaps give yourself a break if you are tired or not feeling well. Face how helpless and enraged you can feel that government is not stepping up to tackle climate change.” Or, take our newspapers. They mostly airbrush out references to climate change. For example, at his last inauguration as President, Obama spoke about climate change. The main headline across the mass media that day was did Beyonce lipsync the national anthem? Or, take advertising and general culture. These relentlessly exhort and seduce us to feel entitled to idealized conditions. They encourage the uncaring part of us that I heard in my inner voice at the bus stop.
The aim of this culture is to break links with care and encourage spatial distancing of the victims of our uncare in the internal world of the psyche. The aim is to keep us defended against feeling conflicted and anguished at our collectively damaging way of living.

**Disavowal**

These distancing strategies are part of disavowal, which is seeing reality but finding ways to remain blind to reality at a feeling level. Disavowal can leave us with highly distorted inner pictures of reality, with people we love far away or in the shadows, with important issues seen as tiny and trivial issues seen as big, with time’s steady march arrested to the present tense only, and with the environmental and social violence that we do carefully airbrushed out of the picture. We sanitize our inner landscapes through psychic reengineering and we do this to protect ourselves from emotional discomfort and pain. The culture, rather than help us face reality, invites us repeatedly to engage in disavowal. In this culture it is very difficult to resist being drawn in.

**Omnipotent thinking**

One particularly destructive aspect of disavowal is that it attempts to solve problems omnipotently, i.e. through an act of thought, rather than through making repairs in the real world. This is magical, ‘as if’, not rational thinking. My mental distancing is an example of ‘as if’ thinking. It was ‘as if’ I could rid myself of guilt and anxiety through an act of thought. I cut my links to care by locating my grandchildren far away, as if this would solve the problem. At one level it does solve the problem in that it gets rid of consciously experienced guilt. The cost is rationality itself. And, ‘as if’ thinking only leads to problems getting worse, because damaging behaviour is not addressed in reality.

Genuine care involves mourning the phantasy that the earth is an idealized breast/toilet mother, and attempting to address the damage this phantasy has caused. ‘As if’ care is setting ambitious climate targets one knows will not be kept, or apparently minimizing the danger, or believing in miracle techno quick fixes, or avoiding hearing any news about the damage, or rubbing the climate science community, or locating the damage in some future far off place, or preferably doing all these at the same time. All these magical repairs work by cutting felt links with care.

‘As if’, omnipotent, fake, solutions can be rustled up in an instant. They require no inner psychic work, which is needed to reconnect with care. Connecting and reconnecting with care is the only kind of work that will lead to real repairs being undertaken in the external world. The true aim of omnipotent solutions is to enable business as usual to proceed. Omnipotent thinking is now so widespread in relation to climate change that any
troublesome aspect of the problem can apparently be dismissed instantly through an act of thought.

At the bus stop I was in disavowal, operating in ‘as if’ thinking mode. I think its purpose was to avoid guilt while still feeling apparently good and virtuous. In a state of disavowal I could write about the effect of climate change on my grandchildren without taking greater care to reduce my own emissions and I could push my guilt about this, and push them, to the edges of my mind.

The New Imagination

The New Imagination is made up of elements that are very old and also very new. It is the caring imagination that we need for now\textsuperscript{22}. It is very old, because the ongoing struggle between care and uncare is as old as human kind. Homer described this struggle in The Iliad:

\begin{quote}
destructiveness, sure-footed and strong, races around the world doing harm, followed haltingly by … (care), which is lame, wrinkled, has difficulty seeing and goes to great lengths trying to put things right.
\end{quote}


In the New Imagination, care no longer appeases uncare. It is no longer led by the nose by uncare like an ineffectual parent clearing up after a self-centered, triumphant, toddler running amok. Care, in the New Imagination has come of age. It stands up to uncare. It represents the moment when the human race matures, starts to grow up and face reality.

The New Imagination recognizes that because of our environmental and carbon crisis, we are a unique generation, tasked with a particularly heavy burden of care about climate change. The last generation did not have the full picture and if we leave taking care to the next generation or even to ourselves tomorrow, it will be too late.\textsuperscript{23} The New Imagination recognizes that we face a full-blown emergency but also knows we can address it, and with existing technology.

One strand of the New Imagination is very new historically because only now, with scientific and technological advances and satellite pictures, can we more fully appreciate Earth in her otherness, her majesty and also as fragile and with limits. We now can see that she comprises complex interconnecting dynamic systems that support life. All this enables us to love her more fully and in a more mature way, and be very concerned when we see her damaged. The New Imagination helps us face our true dependency on and indebtedness to the earth. It helps us give up and mourn the narrow-minded phantasy of her as an idealized breast/toilet mother to exploit and think we can control. It opens our eyes to the need to share resources with other humans and other species living now and in the future.
The other strand we need for the New Imagination to flourish is a deeper understanding of the mind and of culture. This enables us to take a more sympathetic and a more critical look at ourselves. It helps us to recognize that care is not best understood just at an individual level. Care flourishes when frameworks of care are in place and it withers without these frameworks. I now move to frameworks of care.

**Frameworks of care**

A framework of care is a structure designed by people who care. It is a sign of background mindfulness. It does two things. It keeps destructive uncaring social behaviours in check, and it actively supports caring social behaviours. Frameworks of care exist at all levels, from laws that prohibit violence and theft, to social groups that disapprove of certain behaviours while also helping people face life’s difficulties, to parents who understand how their child feels and also provide discipline where necessary, to the individual inner moral code we have internalized that regulates our behaviour. Frameworks of care help us maintain our living, direct, links with felt care. They also help us mend caring links when these have become severed. They can do this in many ways. We vitally depend on our frameworks of care, and are often not even aware they are in place, only noticing their effects when they start to break down. A civil society depends on them.

When architects build sustainable buildings they build physical structures to keep people safe. With these structures they are also building frameworks of care and this is a profoundly important aspect of their work and the role they play. The frameworks of care they build are vitally necessary for mental health by keeping uncare in check in psychological as well as practical ways. If we live in a passive or active haus, and travel on carbon ultra-light transport, our carbon emissions drop right down. If our buildings are designed to better withstand ravaged elements, we are safer. This enables us to feel that our survival is cared about. An important insight from psychoanalysis is that to be caring we need to feel cared for. This starts in babyhood with parental care.

Architectural frameworks of care can bring us closer to people, nature and beauty in a way that helps keep our links with care alive. They help us reconnect with being citizens not just consumers in the way they arrange social space. All this expands our sense of self, boosts our creativity and connects us to others in a caring way. All this disrupts the self-idealizing idea that we are somehow superior to some other people and to other species, and entitled to live cut off from them.
References


Homer. The Iliad, Book 9: lines 502ff, translation by Michael Brearley, quoted in Engaging with Climate Change: Psychoanalytic and Interdisciplinary Perspectives).


Notes


2 Culture includes mass media, government messaging, advertising, cinema, the arts and our social group culture.

3 I use the term ‘culture of uncare’ rather than ‘uncaring culture’ to emphasise the active way in which this culture seeks to uncouple us from care, i.e. to ‘un-care’ us. This culture is not just uncaring in a descriptive sense. It breaks links with care.

4 A culture widely called ‘American’ or ‘Western’ or ‘of the global north’, is increasingly recognised as largely responsible for rising carbon emissions. However, given its rapid spread to all corners of the globe in the period of financial deregulation since the early 1980’s, and given recent shifts in global power relations, it is no longer accurate to talk of a global north/south divide. A huge poster hanging on the wall of the hotel of the Indian government delegation to the 2014 World Economic Forum in Davos highlights this. It said: “India. World’s Largest Middle Class Consumer Market by 2030. Join India. Lead the World.”

5 Cutting felt links with care was written about by psychoanalyst Wilfred Bion in his (1959) paper Attacks on Linking. In Bion’s model, links involve directly felt experience of a relationship with the other. The other can include reality. My discussion focuses on the way that severing links with experience leads to dissociation, or more properly, ‘dis-association’ from the part that cares. One might ask if dissociation is present in Ben Van Beurden’s interview with Alan Rusbridger, then Editor of the Guardian newspaper. Van Beurden is CEO of Shell. In the interview he acknowledged climate change and the need to reduce emissions, but simultaneously endorsed Shell’s expansion of fossil fuel extraction, including tar sands and drilling for oil in the Arctic. He said, “I think about climate change all the time and I think about it not at all”. Guardian May 2015.

6 Locating the other far away in the imagination so as not to feel touched by them was described by sociologist Stanley Cohen as creating the ‘distant other’. I have looked at dehumanising prejudice as one example of distancing the other through spatially rearranging the other as living apart (apart-heid), on the other side of the mental tracks, and through scapegoating and vilification techniques in order to avoid guilt and shame.

7 I have written of how the culture drives us to split our internal world into near and far landscapes, in which we relate to ‘inferior them’ from a separated-off position of ‘superior us’. Weintrobe (2012a).

8 There are many examples of creating the distant other to stay in a psychic retreat. For instance, when economist Nicholas Stern wrote the Stern Review – which he has now acknowledged did not take the problem of climate change seriously enough - he used an economic model that gave inadequate entitlement to future generations. This is spatial distancing of ‘those in the future’ tucked away and hidden behind the equations. Stern is hardly alone in using the assumptions he did. There is widespread disavowal of genuine consequences for future generations in the models used by economists.

9 I find psychoanalyst Melanie Klein’s (19 ) concept of the internal world very useful to understand the way we form an internal representation of the external world, one that can be heavily influenced by phantasy. In Klein’s view, relationships feature prominently in the internal world. This is because we are primed to relate and are
primarily social as a species. She sees the internal world as literally ‘peopled’ by figures made up of realistic representation and distorting phantasy. My emphasis is on the representation of space internally, often envisioned as inner landscapes.

Psychoanalyst John Steiner (1993) discussed the way that we can form what he called a psychic retreat in the mind. This is an area, often imagined as a sectioned off place, in which we ‘arrange’ the internal world so as not to be troubled by various sorts of anxiety or feelings of loss. Here I am suggesting our culture helps foster a collective psychic retreat from anxieties and psychic pain about our damaging environmental and social behaviour.

Sociologist and psychosocial theorist Michael Rustin (2001) has written on structures needed to facilitate care. He says, “In what containing social environments, can human beings tolerate recognition of the truth, and thus of each other’s states of mind, desires, needs and sufferings? This is a rather fundamental question for political and social thought, and is one to which psychoanalysis still has a large contribution to make.” Rustin (2001) Reason and Unreason. p. 6.

Social psychologists have called this mindset ‘instrumental’ (Kasser, Crompton, Darnton and Kirk). Sociologists and social commentators have called it ‘consumerist’ (Z. Bauman, N. Klein, Hamilton, Alexander) and ‘extractive’ (N. Klein). A lawyer has called it pathological and institutionally psychopathic. He distinguishes between a psychopathic corporate culture and individuals who work for it. Psychoanalytic authors have given the mindset various names: ‘narcissistic’ (Lasch), ‘narrow-minded’ (Brenman), one of ‘arrogant greedy entitlement’ (Weintrobe), ‘perverse’ (Long; Hoggett) and involving a sense of ‘manic triumphalism’ (Segal).

Fantasy spelled phantasy indicates the phantasy is or is mostly unconscious.

See Keene (2012) for discussion of the earth as a breast/toilet mother phantasy.

As Freud sagely put it, people may not be as moral as they would like to think they are but they are more moral than they realize.

Strictly speaking ‘global warming’ refers to the long-term trend of a rising average global temperature and ‘climate change’ refers to the changes in the global climate, which result from the increasing average global temperature. However, the two terms tend nowadays to be used interchangeably. For a discussion see http://www.skepticalscience.com/climate-change-global-warming.htm.


See Weintrobe (2012) for a discussion of how people came to realise after the failed Copenhagen climate summit that governments did not care about them at the level of their survival. It was traumatic to feel this uncared for.

See for example BBC news 31 Jan 2013. Beyonce admits to inauguration lip syncing

Hanna Segal has distinguished between ‘as if’ and ‘what if’ thinking. The latter seeks to test a phantasy against reality, by asking what if the phantasy were true. The former ignores reality and proceeds as if the phantasy were true.

Argued by Hoggett (2012).

Pope Francis’s basic argument in his recent encyclical on climate change is that we need to care.

“We are the first generation to feel the impact of climate change and the last generation that can do something about it.” Obama Guardian 4.7.15. But Obama does not appear to have embraced the New Imagination. At the same time as saying this, he gave Shell Oil the go ahead to drill for oil in the Arctic. The danger is this is the ‘as if’ disavowing imagination.
Session 1

Strategies for Community Resilience
ABSTRACT Climate change is exacerbating natural disasters, and extreme weather events increase with intensity and frequency. This requires a more in-depth evaluation of regional climates and locations, where natural hazards, vulnerabilities, and potential impacts will vary. At the community level, private residences are crucial shelter systems to protect against disasters, and are a central component in the greater effort of creating comprehensive disaster resilient built environments. In light of recent disasters such as Superstorm Sandy, there is an increased awareness that residential buildings and communities need to become more resilient for the changing climates they are located in, or will face devastating consequences. There is a great potential for specific high-performance building technologies to play a vital role in achieving disaster resilience on a local scale. The application of these technologies can not only provide immediate protection and reduced risk for buildings and its occupants, but can additionally alleviate disaster recovery stressors to critical infrastructure and livelihoods by absorbing, adapting, and rapidly recovering from extreme weather events, all while simultaneously promoting sustainable building development. However, few have evaluated the link between residential high-performance building technologies and natural disaster resilience in regard to identifying and prioritizing viable technologies to assist decision-makers with effective implementation. This paper presents the research objective and methodology to create a process of effectively prioritizing residential building technologies that encompass both high-performance and resilience qualities that can be implemented for a variety of contexts at an individual, or combined community level. Interdisciplinary variables critical to prioritizing natural disaster risks must be identified and evaluated. Additionally, attributes for resilience and high-performance have to be defined and quantified for judicious selection of high-performance resilient building technologies that can provide solutions for the identified risks. Decision-makers can utilize the completed process to evaluate building natural disaster risks and communicate strategies to improve building performance and resilience efficiently.

KEYWORDS: Disaster resilience; residential buildings; high-performance building; climate change.

Introduction

Over the past 100 years, research has shown that the surface temperature on Earth has risen by more than 0.8°C (1.4°F) with much of that increase having taken place over the last 35 years (National Research Council, 2012). This increase will, and in some cases has already led to various changes in the environment, which will continue to exacerbate the
intensity and frequency of extreme weather events and subsequent impacts on the built environment within the United States (National Research Council, 2012). This outlook holds true for other developed and underdeveloped locations across the world facing similar circumstances and high risk to climate change and extreme weather. Nations such as the Philippines that was struck by Typhoon Haiyan in 2013, and European countries devastated by the 2003 heat waves are examples of vulnerability and tragic losses to extreme weather that has been occurring. Between 1994 and 2013, over 15,000 extreme weather events around the world directly resulted in over 530,000 deaths and economic losses totaling USD 2.17 trillion (Kreft et al., 2015). Climate change is our reality, and it has become increasingly important to become more aware of the many implications it will have on our lives, our buildings, and our infrastructures. Disaster resilience, as an integrated approach across the various construction domains and practices addressing the different performance mandates, ranging from structural to thermal, moisture, visual, and environmental performance will be necessary to overcome the changes we will inevitably face. At the local level, private residences can be viewed as crucial systems to protect and provide shelter against extreme events, and become a pivotal part towards the greater effort of creating comprehensive disaster resilient built environments.

Many definitions and interpretations of resilience exist across multiple disciplines making it a difficult concept to quantify, evaluate, and gain clarity for what it means and how it applies to different industries (Hassler and Kohler, 2014). According to the U.S. Department of Homeland Security (DHS) (2015), resilience can be defined as: “the ability to prepare for and adapt to changing conditions, and withstand and recover rapidly from disruptions.” In a review of several definitions of resilience used by multiple disciplines, three key principles and three verbs were derived that represent resilience holistically (Patterson et al., 2013. These principles are to reduce risk, decrease recovery time, and foster adaptation, while the key verbs are to absorb, adapt and recover. There is a great potential for specific high-performance building technologies (technologies with energy efficient and other enhanced systems performance qualities) to play a vital role in creating resilience to natural disasters for individual buildings, or through their application on a community or neighborhood scale to alleviate disaster recovery stressors to critical infrastructure and livelihoods. For example, compared to conventional residential enclosure systems, a high-performance building enclosure such as it can be found in a PassivHaus, can provide long-lasting shelter against dangerous rapid temperature drops due to power outages, which could otherwise force occupants from their homes (Leigh et al., 2014). Similarly, co-generation systems incorporated into a community to produce and store combined heat and power for neighborhoods could offset the power demand and disaster threat levels by acting as a buffer, and allowing for self-sufficiency in the event of utility failure and/or disconnect. A
prevalence of high-performance enclosure systems in this scenario could reduce the overall power demand for a community that generates energy; energy that could then be utilized for priority based distribution on a local neighborhood scale, while simultaneously working to alleviate power recovery stressors and expenditure on a larger city, county, or regional level. Nevertheless, while viable high-performance building technologies exist that can simultaneously provide disaster resilience, not every high-performance technology automatically supports disaster resilience, and may specifically reduce resilience in some aspects, depending on the type of impact. What is currently not well known and requires further study, is a broader evaluation of desired results and impacts that can be expected, as well as their applicability in diverse locations for a variety of disasters. This is especially true when considering the interactions and relationships between differing climates, vulnerabilities, communities, and technologies.

A review of background literature has revealed a promising connection that exists between high-performance building technologies, disaster resilience, and climate change adaptation. Sustainable building practices by way of reducing negative environmental impacts (e.g. fossil fuel use and greenhouse gas emissions), economic impacts (e.g. energy consumption), and social impacts (e.g. safety and security) were also found to be links in this research domain. However, the highly interdisciplinary field of resilience remains a challenge and reveals a research domain filled with unknowns as a result of existing gaps in knowledge, gaps in research, and effective application of strategies. The following section outlines the challenges that have been identified in our investigation, and then discusses the required steps and tasks to enhance the integration of design strategies around high-performance buildings, disaster resilience, and climate change adaptation as the overarching goal.

Natural Disaster Resilience through High-Performance Buildings

Different climates around the world can induce various types of naturally occurring hazards, commonly referred to as extreme weather events. When these events cause catastrophic damage and loss of life, they become classified as natural disasters. The devastation that can occur to the built environment as a result of natural disasters has become all too familiar, and is an unfortunate and mostly uncontrollable product of our Earth’s nature. In recent years, climate induced natural disasters, which includes hazards such as hurricanes, droughts, and extreme temperatures have risen in frequency and intensity, and consequently, so have the detrimental impacts of the aftermath associated with these events.
Some initial research indicates that unsustainable development by building in locations vulnerable to natural hazards and giving minimal regard to future environmental, economic, and social impacts, is the root cause for increasing costs and devastation from natural disasters (Federal Emergency Management Agency, 2000). Increasing resilience to disasters by reducing risks and absorbing, adapting, and rapidly recovering from a natural disaster event can be done so through enhancing environmental, economic, and social aspects of communities, and thus making them more sustainable in the process (Federal Emergency Management Agency, 2000; Mileti, 1999). This is an approach that can be achieved through high-performance buildings, which can mitigate natural disaster risks by absorbing hazard impacts and reducing recovery time, while also using resources more responsibly and efficiently. The notion of using high-performance buildings as a way to adapt to climate change through resilience, and as a result also contribute to sustainability, is a popular topic of discussion (Asprone et al., 2014; Cutter, 2013; Hassler and Kohler, 2014). Though some strides have been made and achieved some progress regarding this issue, few have investigated the individual utilized technologies comprised of this connection, and there is a growing need for more research in this area.

**Past Research Efforts Integrating High-Performance Buildings and Resilience**

In a recent study, an attempt was made to examine future, regional level climate change impacts throughout the U.S., and identify green building and sustainability strategies and LEED credits that have the potential to provide resilience to the risks identified by the various impacts (Larsen et al., 2011). This study can serve as an initial guide and basis for builders to begin thinking about sustainability and green building strategies that can achieve disaster resilience specific to a project locations region. However, this is a first step, and there is still much more research required to strengthen the decision-making process in this area. The research gaps identified by the authors include the fact that the broad generalized categorization of the utilized climate data requires downscaling to the local level to better understand direct impacts on neighbourhoods and buildings. Additionally, while the before mentioned study was able to rank basic sustainability strategies for resilience as they apply to the broad eight U.S. climate regions by giving high, low, or N/A priority classifications, this analysis remains coarse and vague in providing explicit details and performance metrics for informing decision makers in selections due to the method and scale used.

There are examples of high-performance building technologies that have been implemented successfully in order to provide resilience to natural disasters, such as the exemplary demonstration of integrating high-performance, resilience, and climate for the Schiestlhaus, a PassivHaus standard building in an alpine climate located on the Hochschwab Mountain in Austria. This facility was built to withstand extreme low
temperatures, provide shelter and refuge to hikers and climbers, and essentially operate year round off the grid. In Boston, Massachusetts, the LEED Gold certified Spaulding Rehabilitation Hospital implemented high-performance building technologies in response to prior flood devastation caused by Superstorm Sandy and the potential for the building’s location to see a rise in sea level in the future. All critical mechanical and electrical systems required for the hospital to remain operational in the event of a flood were placed on the penthouse floor. In addition to this, a dedicated cogeneration plant produces power and generates heat for hot water and heating loads, and due to its independent capabilities from the grid, allows the facility to maintain functionality should there be regional power outages. This provides robustness to the building systems in place, and thus increases facility and community resilience.

It is important to mention that an understanding for the potential risks that could impede the results of high-performance building technologies on resilience and other aspects of building performance should not be overlooked. A report released by the Federal Emergency Management Agency (FEMA) provided some insight into the various interactions between green/high-performance technologies and buildings that may require caution when implementing common green building practices to achieve resilience from natural disasters (Gromala et al., 2010). Green building ratings, such as LEED for Homes, were evaluated for their positive or negative interactions with a building structure in order to identify areas that could compromise a building’s resistance to a natural disaster. For example, PV cells placed on a building in a location with large solar gain potentials may be a very good solution to generate energy during grid wide power outages due to overload (e.g. heat waves). Yet, if this location were also subject to harsh weather-related events such as intense hail and windstorms that could severely damage the system, this solution would not be a practical system alone in terms of achieving resilience. Interactions such as this are important to explore and assess for effective decision-making and implementation of high-performance building and disaster resilience for specific locations. The inclusion of such interaction assessments is an important factor that should be included in green building standards and decision-making tools to aid in climate change adaptation.

Furthermore, the DHS has been developing a performance-based tool to aid in the construction of high-performance buildings, which takes into account resilience to multi-hazards (National Institute of Building Sciences, 2011). The tool allows for building owners to identify and set performance targets based on the attributes of high-performance defined in the 2007 Energy Independence and Security Act for high-performance building. However, this tool does not identify prescriptive or other tangible technologies to achieve the levels of performance desired by the owner using this model. This additional but most critical task is
left to the design team to identify and decide which technologies to use that will ultimately achieve the desired results.

\textit{Research Needs Towards Creating Disaster Resilient Communities}

While we have found concerted research efforts and discussions linking the domains of high-performance buildings, resilience, and climate adaptation, there are still gaps in these efforts, which present an opportunity for further investigation. First, there is the area of re-discovering and re-evaluating local level building characteristics, which historically have encompassed resilience practices, and integrating these characteristics with market area and demographic data, as well as climate model data to identify natural hazards and vulnerabilities that may exist for communities and locations in immediate need. Secondly, there is a lack of consensus regarding resilience definitions that exist for the residential high-performance building sector, as well as classifications of the attributes of performance related to them. This creates significant challenges when comparing and prioritizing high-performance technologies and communicating research outcomes to stakeholders. Thirdly, resilience research in response to natural hazards such as seismic activity has historically garnered the most attention, and consequently has made significant progress in terms of defining resilience metrics. Integrated resilience practices in response to “climate induced” natural hazards such as extreme heat and cold, or blizzards, and intense winds from hurricanes are missing in these efforts. Similarly, the focus has also been directed more so towards infrastructure and large buildings such as hospitals, overlooking the significant economic and social impacts on residential buildings. Fourth and lastly, according to our literature review, a decision-making process of judiciously selecting residential construction technologies that incorporate qualities of both high-performance building and disaster resilience for climate induced natural disasters and vulnerabilities at the local scale could not be identified. Our proposed research attempts to address and fill the above-identified gaps.

\textit{Developing a Risk and Technology Prioritization Process for Decision-Making}

Our research investigates the question of how high-performance building technologies can effectively provide residential buildings resilience towards local level climate induced natural disaster risks that are currently experienced and can be further anticipated throughout diverse climate regions. To answer this question, we will develop a process to prioritize applicable high-performance residential building technologies for homes and communities, which can consider immediate and future local climate impacts, local building and community factors, and performance and disaster resilient capabilities of existing technologies for a variety of context specific decisions. In developing this process, climate-
induced natural disaster risks, their respective hazards, impacts, and vulnerabilities in regards to residential buildings, as well as the high performance resilient building (HPRB) technologies that can be implemented as solutions need to be identified, evaluated, and ultimately categorized for the next level of impact modelling and decision-making. Fig. 1 provides an overview of the important facets of this research that need to be integrated to identify and evaluate an inventory of “HPRB Technologies”.

Fig. 1. Qualities of HPRB technologies.

Identifying and Evaluating Risks and Technologies

In our research we analyse a multitude of variables that contribute to high-performance technologies at one side and resilience at the building scale on the other. Subsequently we can use this approach to expand and improve resilience at the community scale. To develop these evaluation methods we first identify immediate and future climate-induced natural disaster hazards for differing locations, and then categorize and inventory specific high-performance building technologies (i.e. HPRB technologies) that can provide effective disaster resilience to the hazards and the risks posed by the respective impacts. Failure mode, effects, and criticality analyses (FMECA) as well as fault tree analyses (FTA) are conducted to reveal relationships between HPRB technologies and climate induced natural disaster risks. FMECAs identify the impacts that result from various hazards, as well as the potential effects and levels of criticality they can impart on various building systems. Extensive case reviews of prior natural disaster occurrences and impacts to residential buildings will be used to compile detailed accounts to develop metrics for prioritizing the data. The top down approach of FTAs in contrast to FMECAs bottom up method analyses the identified impacts until chains of potential causes and contributing vulnerabilities are
traced to the source. It is there that HPRB technologies can then be assigned to address the
tree of vulnerabilities and impacts identified. And where technologies do not exist as
countermeasures, this process additionally reveals research and development needs for
new HPRB technologies.

Fig. 2. Natural disaster housing vulnerability indicators.

All attributes for variables in the above discussed domains must then be defined and given
numeric values and weights so that they can be included as metrics for quantification and
prioritization of technology performance and resilience, as well as hazard impacts and
vulnerabilities. Each attribute can then be used for multi-criteria decision making (MCDM),
assessing applicable measures of context specific decisions with the goal of efficiently
increasing resilience as well as building performance. For example, while assessing the
vulnerability of a building to natural hazards can be primarily related to the type, quality, and
operation of various building systems, vulnerability can also stem from many other
interdisciplinary variables not directly associated with the building. As listed in Fig. 2, this
includes proposed variables that must be assessed to localize the decision space, e.g.
individuals or communities burdened with poverty, or barriers impeding the availability of
various resources.

The stakeholders we envision to utilize and embrace this design and decision-making
process includes designers, building auditors, retrofitters, surveyors, but also facility
managers and disaster mitigation officials who may want to assess entire building portfolios
towards their performance level in regards to natural disaster risk. We believe that these are
the professionals that can profit from such an approach most and utilize it as a tool to
evaluate residential buildings and communicate strategies to homeowners, government
agencies, homebuilders, and community planners to educate them on how to improve
building performance and resilience most efficiently for their particular situations.
Conclusion

While this research is currently targeted to the residential building scale, future research efforts can expand the scale to communities or commercial buildings by evaluating the effects of high-performance buildings as interconnected systems used for increasing disaster resilience. An expansion to larger system links within such a panarchy will analyse how building systems influence resilience across multiple scales (Walker and Salt 2006).

References


Intensification as a Strategy for Resilient Rural Regeneration

Tiziano Cattaneo, Giorgio Davide Manzoni & Emanuele Giorgi

ABSTRACT In the time of global recession words like “reorganize” and “minimize” are now keywords for urban human landscape design. In Europe and in the world the main debate deals with: regeneration, consumption, reconversion, aggregation, accessibility, sustainable growth and restoration. In a question: How can we build resilience? not only for single buildings and objects but also for entire territory-systems such as for example the rural areas.

The crisis in rural areas is essentially a planetary problem: depopulation and ageing of the population, abandonment and decay of small town centres, difficulty in keeping existing businesses, exhaustive agricultural practices to the detriment of biodiversity, pollution, a lack of infrastructures and services for tourism, as well as a shortage of job opportunities for the population, etc.

The research addresses the specific cultural and productive features in the European areas in which this phenomenon it is processed and has reached significant levels of deprived neighbourhoods. Thanks to the analyses of a huge collection of projects and data, the authors have been able to define the core of the research framework, which is called Rural Architectural Intensification, setting out four broad categories of intervention for the rural landscape. RAI Strategies represent a metric for projects evaluation, a set of indicators to measure sustainable intensification to create rural resilience.

KEYWORDS: Rural resilience; evaluation process; intensification as a strategy; resilience actions.

Introduction
The current climatic contingencies and environmental emergencies require us to reflect deeply on the landscape development. Thus, even architecture and territorial planning are called upon to re-evaluate their role and their tools, thus the regeneration of rural territory and aiming to create environments that are more orientated toward self-sufficiency, which have lower environmental impacts, and can produce part of the resources that they consume. In this scenario, the countryside returns to the centre of the debate on the ecological and sustainable boost, in the wake of the crises in Western countries and in the wake of the numerous environmental catastrophes perceived as imminent and from effects that are beyond our control. “The future is in the countryside, in small towns with a human dimension. It matters little that they are physically apart from each other” (Bucci, 2012) the interactions between the two entities, already today not completely separable, are destined to intensify.
Resilience regeneration

According to Richard Sennett (2013), if you want to design an open city you need to create ambiguous edges between different parts of the city, generating incomplete forms in buildings, and planning for unresolved narratives of development.

The word resilience, invoked as a universal remedy in the recent economic crises and interpreted in sociology as the art of mediation in conflicts and thus as social resilience in situations characterized by difficult challenges, is now held in high regard in the field of architecture, city planning and landscape design too, having become one of the prime objectives in operations carried out following dramatic natural events, in particular those produced by the action of water. (Nicolin, 2015)

Resilience and sustainability require the ability to persist, to adapt and to maintain a dynamic stability in chaotic environments, given that it is becoming increasingly necessary to cope with calamities linked to the action of natural forces and to action with the main task of architecture and urban design with actions linked to the revitalization of the rural and the difficult edges of our territory. So the challenge for new strategies will be to develop those characteristics of “strategic suppleness” that are able to combine a fluidity of approach with the setting of aims and values, in the knowledge that many of the aspects of resilience are linked to a specific context. (Nicolin, 2015)

Methodology

The aim of this study is to identify a sort of indicators to measure intensification outcomes, which can be assessed in a qualitative and quantitative way for resilient rural regeneration. In this Paper we introduce how we built a metric for measuring the sustainability of architectural design actions. The methodology is built on the groundwork laid in previous research by the authors called Rural Architectural Intensification (Cattaneo, De Lotto, 2014) through the semantic analysis of a wide range of literature and documents (e.g. the priorities issued by EU on urbanisation matter). With the method of semantic analysis it is possible to analyse a large typology of sources (texts, video, interviews, photos, sounds) and uncover relationships between a set of documents and the terms they contain by producing a set of concepts related to the documents and terms (M. De Alba 2012). The methodology used to achieve that objective is a combination of two complementary and well known software tools, such as, for example: Atlas.ti, a tool used to carry out a semantic analysis of several documents.

Rural Architectural Intensification: definition of the Design Strategies and Architectural Goals

The Strategies and Goals set out below have been identified trough the semantic analysis of a wide range of literature and documents and in particular through the analysis of the
priorities issued by European Community for the rural development for the years 2007-2013 and the new framework recently published for the years 2014-2020. The EU strategic guidelines aim at the integration of major policy priorities and for each set of priorities, illustrative key actions are presented as follow:

1. Improving the competitiveness of the agricultural and forestry sector.
2. Improving the environment and the countryside.
3. Improving the quality of life in rural areas and encouraging diversification of the rural economy.
4. Building local capacity for employment and diversification.

**Fig. 1. RAI strategies and goals.**

| ENVIRONMENTAL ASSESSMENT | ENVIRONMENT AND BIODIVERSITY PROTECTION | Protect the biodiversity of the environment, the growth of agri-food systems and high-value natural forest.
| ENVIRONMENT AND HERITAGE | Protect the local natural environment as unique cultural heritage.
| ENVIRONMENT AND WATER | Protect the quality of surface and deep water resources, providing know-how and use for energy purposes.
| SOIL AND ENVIRONMENT | Protect the quality of soil resources by counteracting the processes of erosion, desertification of the countryside and salinization.
| ENVIRONMENT AND ANIMALS | Protect the native animal species, endangered species.
| ENVIRONMENTALLY SUSTAINABLE OPERATIONS | Protect the natural environment by promoting sustainable building operations.
| LIMIT CONSUMPTION OF THE ENVIRONMENT | In building operations, limit the consumption of natural resources, water, soil, and vegetation.
| BIODEGRADATION | Exploit natural resources to reduce energy dependence from traditional fuels.
| ENVIRONMENTAL RESOURCES | Redevelop and strengthen the natural reaping in the areas and the main farming ecological services and connections between these different areas.
| ENVIRONMENT AND URBAN SPACE | Environmental protection of urban space and land in the case of urban settlements, villages.
| ENVIRONMENT AND INFRASTRUCTURE | Development, integration and environmental infrastructure.
| ENVIRONMENT AND WASTE | Reduce waste.
| ENVIRONMENTAL RISK | Prevent the hydrogeological instability of the land (hazards, floods, etc., flooding, contamination).
| ENVIRONMENT IN DISADVANTAGED AREAS | Protect and promote sustainable farming practices in disadvantaged areas.
| DIVERSIFIED ENVIRONMENTAL REDEVELOPMENT | Ensure multiple redevelopment areas within the same territory.

| DEVELOPMENT OF CULTURAL AND TOURIST ACTIVITIES | TOURISM AND ARCHITECTURAL HERITAGE | Recognize new roles and functions for the architectural heritage, enhancing the development of tourist and cultural activities.
| TOURISM AND ENVIRONMENT | Recognize new roles and functions for the environmental heritage, enhancing the development of tourist and cultural heritage.
| SMALL SCALE TOURISM SERVICES | Enhance the infrastructure provided for tourist services, with small-scale interventions.
| COUNTRYSIDE VS SEA AND MOUNTAIN | Integrating rural tourism with traditional tourism under the value and sustainability, developing the additional capacity of the territory.
| TOURISM AND WATER | Promoting plans, diversification of water resources also for tourist and recreational purposes.
| TOURISM AND INFRASTRUCTURE | Improving the connectivity of businesses (also touristic), by improving the conditions of the infrastructure needed for development.
| TOURISM IN LESS FAVOURABLE AREAS | Enhance sustainable tourism activities in less-favourable areas (mountains, rugged coast, etc.).

Thanks to the synthesis operated on all the documents analyzed, the authors have been able to define the core of the research framework setting out four broad categories of intervention for the rural landscape. Then, for each category we have defined several Design
Strategies, and for each strategy have been possible to identify Architectural Goals which might represent the design actions.

The Design Strategies have been outlined as plan of actions or directions designed to achieve a major or overall aim. In other words, Rural Architectural Intensification (RAI) Strategies represent a method (or a plan) chosen to bring about a desired future on a certain territory, such as achievement of a goal or solution to a problem or to give value at the resources of that territory.

The Architectural Goals have been described in consequence of the aims or desired results planned through the Strategies framework. In other words, the goals represent the intensification of an activity or a plan set out for a certain territory.

As a first statement of this research phase we can affirm that RAI's Strategies and Goals represent a metrics for program evaluation; a sort of indicators that attempt to “measure” intensification's outcomes. The four categories of intervention for the rural landscape are detailed represented in the Figure 1.

The Rural Architectural Intensification Matrix

The output of this analysis is the construction of a RAI Matrix, which the main structure derives from the Categories, Strategies and Goals.

The RAI Matrix it is divided in four main columns, which are representing the four categories. Each columns of each category is divided in sub-columns, which are the Strategies and which refer to the Goals. All the data have been collected in Indexed Database, which is useful to fulfil easily the single project features. Hence, the final phase of the research is represented by a Best Practice Report (which is composed by the RAI Matrix and description of 140 cases study and more then 500 data sheets) and by a website, http://www.raintensification.com (designed by authors), which illustrates partial results of the bibliographic research. The output is a collection of semantically indexed datasheets that represent built projects that apply the theme of RAI concerning the four specific categories.

Through the Matrix of intensification, we analysed all the architectural cases study, which generate resilience in the territory. The overall framework has been interested in terms of quality and design’s behaviour for creates sustainable density of activities for citizens in which the natural environment and the rural-urban environment coexist harmoniously. In Figure 2 is illustrated the Matrix of 41 selected case studies within the RAI Best Practice Report earlier mentioned.
Visualization and ranking of the RAI performance

In this section is introduced the process of investigation adopted to put in relationship the case studies of rural intensification with the concept of resilience. After a series of analysis, interpretation of data and comparisons, the authors have developed some graphs (Figs. 3, 4, 5, 6) with the aim to systematize and visualize the parameters that have been most satisfy by the case studies and the parameters that are low or not satisfied.


Fig. 4. (Right) Category: Culture+tourism. Parameters satisfied: 1. Tourism and architectural heritage, 2. Tourism and environment. 4. Countryside vs sea and mountain. LLRP: 6. Tourism and infrastructure. 7. Tourism in less-favourable areas.
The results are particularly significant: indeed at this stage of the research we can state that the parameters on which the projects of rural intensification have been focused are related to the aspects concerning tourist use, heritage conservation and those concerning the bioeconomy and green energy. Effectively, in the last decades, the main architectural and urban design topics were linked with energy efficiency and with the development of existing buildings, in touristic and heritage terms.

On the opposite side, we can point out that the parameters not or low satisfied are related to infrastructure, to accessibility, to intensification in disadvantaged areas or the ones linked to environmental risk factors. These typology of parameters are deeply linked with the concept of resilience hence, the topics that we have to investigate from now forward are the ones less satisfied that could be called LLRP, Low Level Resilience Performance.

**Selected case studies**

As mentioned above, the parameters less satisfied are the ones more related to the concept of resilience. For that reason we have selected the three following case studies as strategic examples.

**Volcano quarry theatre, Montpeloux Saillant, France**

The volcanic caves are a widespread presence in this region. Those scrap landscapes can become an opportunity for the territory: with this frame of mind the open–air theatre in the Monpeloux volcano cave has been realized. This project proves how the reuse of forgot
landscape heritage can become a promoter action for the growing of tourism and for the environmental redevelopment.

![Fig. 7. Regeneration of Volcano quarry with public function, 2005-06, Itineraire Bis.](image)

**Accessible Ribadero, Ribadero, Lugo, Spain**

It has been developed to solve the problem of the great difference of floor level which had caused so far a strong detachment between the areas of marina and city. Through a soft infrastructure, which well integrates with the surrounding, the aim of the project is to bring accessibility to these places and to allow their full use also to the weaker sections of population. This small-scale intervention regenerates the context and revitalizes the touristic attractiveness.

![Fig. 8. Vertical connection between the historical center and the coast, 2009, Abalo Alonso Arquitectos.](image)

**Vineyard landscape, Oltrepò Pavese, Italy**

Developed by Universities, associations and citizens to control the devastating
phenomenon of land precariousness and to identify the connections between instability and cultivation practice. Typologies of vineyard able to combine identity, landscape and stability, have been proposed. Low-impact farming practices restore a natural damaged environment and protect the quality of soil by counteracting the phenomena of hydrogeology instability.

Fig. 9. Guidelines for new typology of vineyard cultivation against hydrogeological instability, 2009.

Conclusions and discussion

Even though the research is still in progress we can define what may be the strategies of sustainable intensification that create resilience in certain European rural contexts.

The strategies are: consolidation of the landscape, renewal of leftover landscape, accessibility and space connections. These concepts are already well known, however they acquire new significance and impetus if juxtaposed to the concept of resilience. Pending further developments of the research we can identify the priorities and illustrative key action on which to focus for give a future to the forgotten rural areas:

- **Urban infrastructure and connections with slow and fast mobility**: Upgrade infrastructure and connections with slow and fast mobility paying attention to the impact on the aesthetic perception and the environmental impact;
- **Regeneration of environment for recreational and sports activities**: Take advantage of the special environmental conditions for tourist leisure, sports, cultural and educational activities; seek maximum adaptation to the needs of the environment with minimal impact;
- **Seismic safety**: building systems and materials that ensure seismic safety;
- **Environmental regeneration areas**: Biodiversity conservation areas; Refuge areas for wildlife; Areas of connection between different habitats, ecological corridors; Filter areas against potential polluting elements; Barrier areas against wind and water erosion;
- **Re-naturalisation interventions**: Intensifying renaturalisation interventions of agricultural, uncultivated and infested land, spaces resulting at the edge of construction sites, abandoned
quarries, production areas by developing: forests, parks, also agricultural;
- Agriculture and tourism: Improve the quality and the economic value of forests and valuable crops (olive groves, vineyards, etc.) by means of interventions simultaneously compatible with development: tourism, commercial, industrial;
- Preventive measures against natural hazards: Restore natural environments damaged by disaster and take appropriate preventive measures against natural hazards: hydrogeological instability, landslides, mudslides, volcanic flows, pest infestations, diseases, etc.

References

ABSTRACT Ludian County (Yunnan province, China) suffered a shallow earthquake with a moment magnitude of 6.1 on 3 August 2014. The earthquake killed at least 617 people and injured at least 2400 others. Over 12,000 houses collapsed and 30,000 were damaged. The villagers were worried about their traditional rammed-earth buildings, 90% of which were destroyed during this earthquake. Given the increase in reconstruction needs and the poor traffic conditions that had resulted after the earthquake, the price of building materials rapidly increased and exceeded the acceptable budget limit for most local villagers. For them, brick-concrete structures are earthquake-resistant. Thus, the villagers wanted to build brick-concrete structures instead of traditional rammed-earth buildings during the reconstruction period. However, transporting large amounts of disused earth is difficult.

Taking the situation in Ludian as an example, our research team decided to use the “local technology, local materials, and local labour (3L)” strategies to participate in the reconstruction project. The traditional rammed-earth technology was be improved by using the “high science and low technology” theory, which mainly focuses on the seismic capacity, thermal comfort, and cost of construction. We supported a family to build a rammed-earth building according to the “3L” strategy. This demonstration project fully respected the traditional cultures and the autonomy of villagers and also made rational use of local materials and local technology to rebuild the rural communities. The concept of “collaborative construction” not only provided an opportunity for the local labour force to learn new skills but also reduced the economic pressure on house construction. The demonstration project considered the reduction of environmental and ecological damage in the entire process. It will also provide a reference for the local government to make rules for the reconstruction project.

KEYWORDS: Sustainable reconstruction, earthquake, local technology, local materials, local labour.

Introduction

Ludian County is located between 568 and 3356m above sea level in Zhaotong Prefecture, Northeast Yunnan. Its total area is 1519 square kilometres, of which 87.9% is characterized by mountains and valleys. Such terrain makes transportation inconvenient and impedes the development of the area. Ludian has a low latitude upland monsoon climate. No significant temperature difference exists among the four seasons. The annual average
temperature is 12.1 ºC, and the annual average rainfall is 923.5 mm. The 2014 Ludian earthquake with a moment magnitude of 6.1 struck Ludian County, and with a focal depth of 12 km on 3 August 2014. The earthquake claimed 617 lives. A total of 112 people were reported missing, and a lot of people were injured. Over 80,900 houses collapsed and 129,100 were severely damaged (2014 Ludian earthquake, 2014). After the earthquake, the challenges of reconstruction work include:

- bad anti-seismic performance of traditional rammed-earth buildings
- significant increase in the price of construction materials
- how to deal with the construction waste of damaged buildings in earthquake
- poor thermal performance of brick-concrete buildings
- lack of local labour

The villagers have lost confidence in the performance of traditional rammed-earth buildings. They are now eager to have their houses that are anti-seismic, cheap, and comfortable. In collaboration with Professor Emily So of Cambridge University and Professor Bai of Kunming University of Science and Technology, our team launched a Village Rebuilding Assistance Programme in Guangming Village since October. We aim to use the “local technology, local materials and local labour (3L)” strategy to design an anti-seismic building with traditional features at low cost but enhanced and comfortable living environment. In addition to rebuilding, we also hope to provide a basis for the local government to formulate reconstruction strategies.

The progress of reconstruction project

Before the initiation of the design work, the team conducted a series of survey and investigation in the village to find an appropriate solution. We then chose a family for the first demonstration building in Guangming village. The owner is a woman with two children and their living condition was poor. She must work hard to support her daughter’s study in the university. Mrs Yang agreed with our reconstruction concept and also gave us her suggestions about the building design. Finally, we designed a main house with rammed-earth and a kitchen with adobe brick (Fig. 1 and 2). The project started in November 2014.

Construction Preparation and Foundation Construction

Before construction, the villagers should spend half a month to sieve the soil of the damaged building and make it moist in the site. At the same time, two adobe bricks of the kitchen were constructed during this period. These adobe bricks must be maintained for 20 days so that their performance will be optimized. The foundation of the main house and the kitchen was a C15 rubble concrete structure with a cement: sand: stone: water proportion of
50:124:221:33 (Fig. 3 and 4). This structure was similar with the brick-concrete building in the village so that the villagers can build it by themselves.

**Main Structure Construction**

After 5 to 7 days of maintaining the foundation, we started to construct the main house. Steel bars inside the wall became an important part of an effective anti-seismic design because it connected the foundation and enhanced the integrity of the houses. We changed the components of the wall (soil: sand: cement: grass: fibre proportion of 100:100:7:0.2:0.2) to make the wall more stable (Norton, 2001). The using of local materials have solved the construction waste problems of damaged buildings in earthquake. Some concrete belts were added into the wall to improve structural integrity and to avoid vertical cracking. In this project, we used electrical rammed tools which were improved according to local manual technology to promote efficiency (Fig. 5). Several kinds of rammed head were provided to fit
the different parts of the wall. According to the height of formwork, the villagers needed to ram the wall six times for every floor (Fig. 6-8).

After the rammed-earth work, we spent four days to build the C20 cast-in-place concrete floor (Fig. 9). Given that the weather was not cold during these days, the villagers can easily finish the work. During the construction of the second floor, we encountered some difficulties in terms of operating efficiency. The villagers must pay attention on construction safety because the platform was high and the building materials were not easy to transport (Fig. 10 and 11). Thus, these concerns must be addressed. The construction of the main house was completed in January 2015. In the following half month, we finished constructing the kitchen before Chinese New Year of 2015 (Fig. 12).

Fig. 5-12. Main structure construction.

Shaking Table Test

To verify the improved technology that we used in the reconstruction project, a shaking table test on a single-layered rammed-earth house pilot project was conducted in Kunming (Fig. 13). The EL-Centro earthquake and the Ludian earthquake were used to simulate the conditions in the test. The sequence of the shaking table test included two selected earthquake acceleration records with peak values at 0.1, 0.22, 0.4, and 0.62g. After the test, only several small cracks could be observed on the rammed-earth wall (Fig. 14) (YNEERI, 2015). The results indicate that the anti-seismic performance of the improved technology is better than that of the traditional one. Based on the analysis of test results, several improvements can still be done.
Performance Evaluation

Cost Analysis

We chose a brick-concrete building with the same area near our demonstration building in Guangming village to compare the cost in terms of three aspects: total cost, material cost, and labour cost. The details are shown as follows (Fig. 15):

As seen in the chart, the average cost per square meter of the rammed-earth building is less 34% than that of the brick-concrete building, thereby indicating the cost advantage of the rammed-earth building. However, the material cost of the rammed-earth building is only half of that of the brick-concrete building and the labour cost is 1.4 times. Thus, the cost can still be reduced by optimizing manpower during the construction. In the following project, we should improve the technology in terms of two aspects:

1) Reduce the manpower cost by improving the technology to enhance the construction efficiency as well as by encouraging collaborative construction among villagers.
2) Reduce the material cost. Based on the reports of shaking table test, the proportion of cement and steel bars can still be further reduced.

**Materials Cost Analysis**

As seen in the chart (Fig. 16), the proportions of cement, steel bar, sand, colored steel tile, and metallic tile constitute the largest amount in terms of total cost. Specifically, the metallic tile and colored steel tile of roof materials account for 25.6% of the total cost. Thus, looking for cheap alternatives for these components can reduce the construction cost. The cement bricks of partition wall in stairwell will also be replaced by rammed-earth wall when the technical problems are solved in the following project.

**Manpower and Time Need Analysis**

The brick-concrete building with the same area was also compared with the demonstration rammed-earth building in terms of manpower and time needed to finish. The details are shown as follow:

![Manpower analysis](image1)

![Time need analysis](image2)

From the two charts (Fig. 17 and 18), the foundation of the two buildings is almost the same. However, a significant difference was observed in terms of manpower and time needed between first and second floor constructions, and this difference is also reflected in the project cost. The slope roof of the rammed-earth building is more complicated in terms of...
structure and construction technology than the flat roof of brick-concrete building. Thus, the manpower and time it took to finish the former were higher compared to those of the latter. In terms of construction preparation, sieving and ensuring the moisture of the soil in rammed-earth buildings took a little more time but did not need a lot of manpower. Preparing and transporting the brick and steel bar in brick-concrete buildings requires a lot of effort but only needs a short amount of time. Thus, the manpower and time needed to finish the brick-concrete buildings can be reduced by optimizing the design and the choice of rammed tools during the construction.

Summary

Therefore, from the previous analysis, we will improve the design and technology by the following aspects:

1). Construction tools and technology: To improve the efficiency of the rammed tools and formwork. The durability of the rammed tool head is also an important issue so that the construction can proceed smoothly. The improvement of the formwork will be considered in terms of its being lightweight, its good impact resistance, and ease in assembly (Taylor, & Luther, 2004).

2). Building materials ratio: Based on the results of shaking table test, we can reduce the usage of cement, or an alternative (for example lime) will be used to reduce the project cost. Treated local bamboo can also be considered to replace the steel bars in walls.

3). Building design: To study and optimize the form of the foundation, floorslab, and roof with rammed-earth buildings to save cost and time needed to finish the buildings to improve their anti-seismic performance. New technology and building materials should be considered into the system which respect the traditional cultures.

4). Manpower: After improving the above aspects, the “collaborative construction” concept should be promoted in rural villages. It can increase the enthusiasm of villagers and also reduce the cost by promoting exchange labour instead of hired labour.

Further study

Because this is the first demonstration building of the reconstruction project, there is still enough room for improvement. In particular, we want to build Guangming village as an overall reconstruction project of a community and its supporting facilities (i.e., construction of village centre, setting up ecological toilets, and promoting public health awareness) will be built which can achieve good social effects (Wan et al., 2011). The reduction of environmental and ecological damage, embodied energy of the entire process and thermal
comfort will also be calculated in next steps. From the above analysis, those ideal performance can be achieved in the following buildings and community constructions.

Conclusion

However the Ludian case study show that local materials and local technology should be made rational use of in the reconstruction project, especially in such kinds of poor rural areas. The project fully respected the traditional cultures and the autonomy of local villagers which means the core of local community development. The concept “collaborative construction” not only provided an opportunity for the local labour force to learn new skills but also reduced the economic pressure on house construction (Chi & Ng, 2014).

The “local technology, local materials, and local labour (3L)” strategies emphasizes the concept of sustainability and focuses on the importance of local humans living in poor rural areas. The strategy suggests a self-sufficient, regional characteristics-based model that is suitable to the reconstruction situation of poor rural areas, which have poor transportation and backward economy. It can also reduce the communities’ dependence on external assistance by emphasizing the use of local resource and traditional core values. The discussed 3L strategies could provide a systemic way to further study sustainable reconstruction and community renewal in such kinds of poor rural areas.

References


