Climate resilience in Trento: understanding vulnerabilities and empowering adaptive resources

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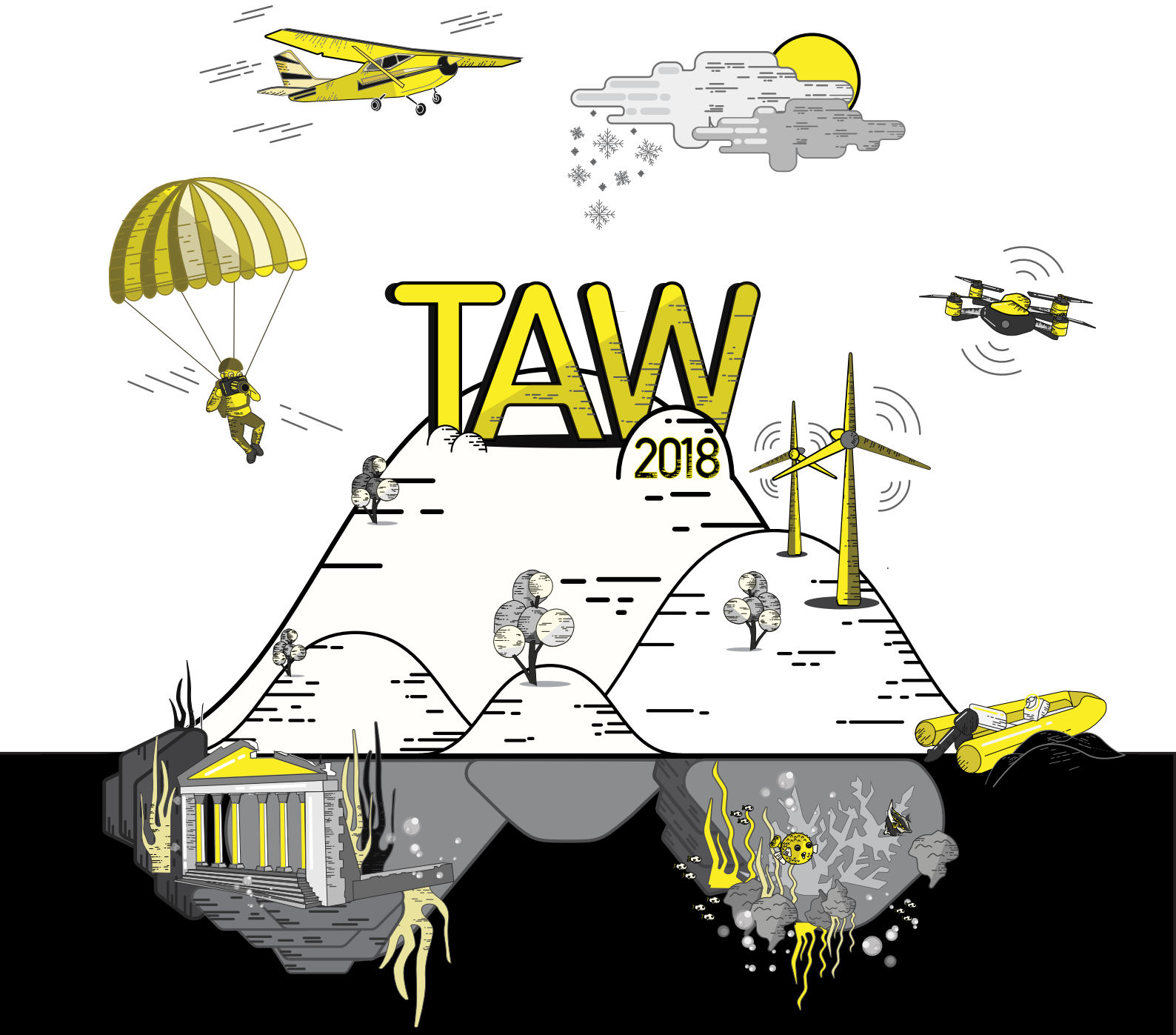

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from 20th to 23rd September 2018 / POLIS University

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[CO]HABITATION TACTICS

Imagining future spaces in architecture, city and landscape

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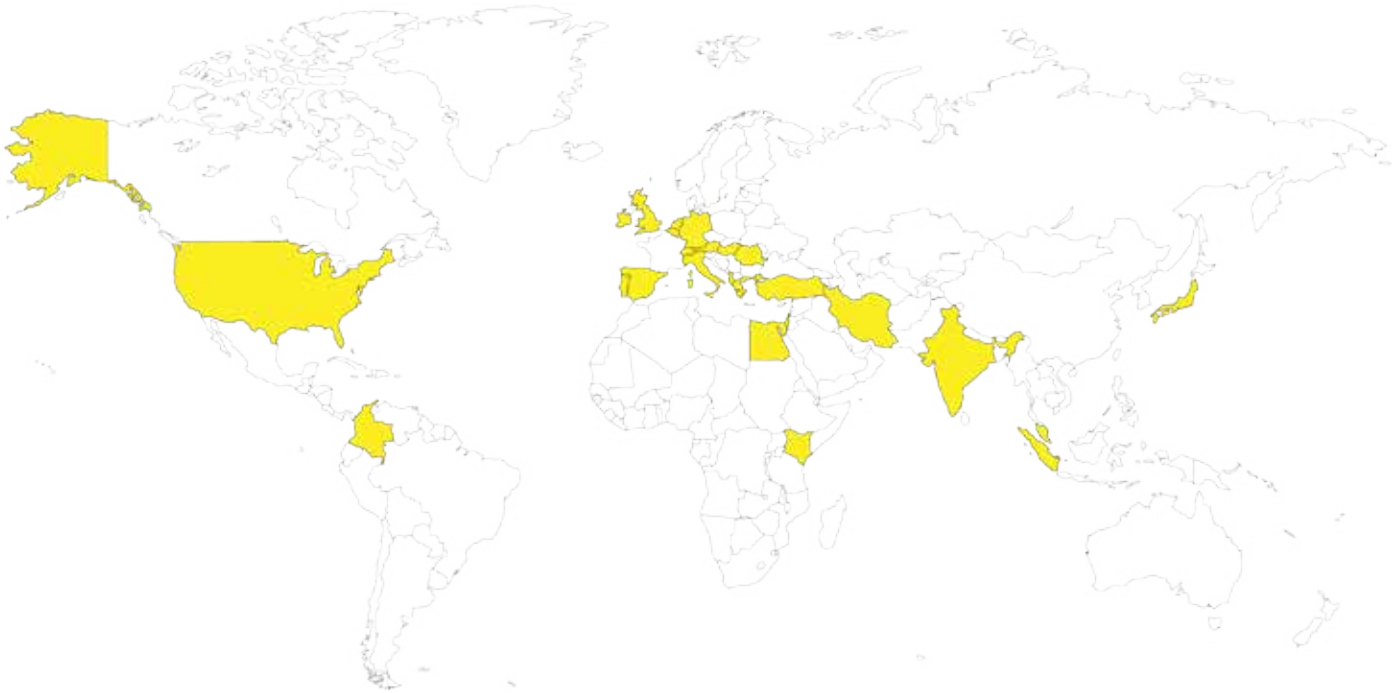
Dear participant of Tirana Architecture Week,

Thank you for joining us in TAW 2018. I stronlgy believe that all together we are making an historic step directly or indirectly related to Tirana's and Albanian's architecture, city and landscape. In addition, this is also a contribution for the region and wider on. At present time Europe is struggling with the instability of one of the worst recessions of its own history. Europeans are tired of the lack of flexibility and rigidity of overregulated societies where nothing happens. But here in Balkans and specifically in Albania, despite similar symptoms, things are still evolving, not because of delayed projections but because people here are very active, entrepreneurial spirit survivals, and the creativity of society is in a never-ending process. In Tirana, Albania or anywhere – as they say – in Western Balkans, we are still doing fine, so we might have to learn but also to offer something to the rest of the continent, despite our endless effort to join EU. This is a land of creativity where all architects and city experts feel just great: amazed, shocked, revolted, confused, enthusiastic, inspired, etc. This is due to the fact that there are layers of a real self-generative city.
Let's not forget that Tirana is an example of creativity. So, let's use such energy in a positive way and let's open a debate that might be useful for everyone. TAW is an academic event which gives you the opportunity to come and share your professional passion or nightmare. Enjoy time with us. There is not a clear recipe but there is always a solution out there to be discovered with passion and commitment. Join POLIS University, Co-PLAN Institute and our network of creative partners. I believe we all have something in common that can help to educate the new generation of architects who can re-appropriate the city and its needs, including those of real dignitary architecture. This is the point where the architect rediscovers its own place, space and meaning within society.

Enjoy TAW 2018! Enjoy U_POLIS and Tirana!

Prof PhD Besnik Aliaj
Rector of POLIS University



The papers submitted to the conference are coming from the following countries: Albania, Italy, Spain, Greece, Turkey, USA, Hungary, Belgium, Egypt, Iran, Lebanon, India, Colombia, Romania, Switzerland, Portugal, Austria, United Kingdom, Germany and Japan.

The turn of the 21st century has been marked by dramatic changes in the political, social and environmental panorama, which are deeply affecting the way we live today: terrorism, migration and global warming are certainly the most pressing issues, and they are putting at risk our very life on this planet. So far we have come to acknowledge that we must simply coexist with such problems and learn to live with their consequences in our everyday life. But while coexistence refers to the mere - and often imposed - action of living together without any productive interaction, co-habitation implies living together peacefully, while promoting some form of exchange. This is why we believe that in the future architecture, city, and landscape should approach such emergencies fostering interaction and productive exchanges between different disciplines and cultures.

Co-habitation can be achieved through tactics, which offer the possibility to generate new creative spaces within the fields of architecture, city and landscape. Tactics - a term, which evokes the ancient Greek expression art of arrangement - are actions undertaken by, or addressed towards, the actual consumers/users. Such actions are flexible, they can be continuously modified, reshaped and adapted to cope with external interferences.

The International Scientific Conference - organized in the framework of Tirana Architecture Week 2018 - aims at exploring contemporary research activities and design tactics that deal with the topic of co-habitation from different perspectives and within different fields of interest, directly or indirectly related to architecture, city, and landscape. Through the observation of different tactics adopted by researchers and professionals, the hope is to identify new research and design trajectories.

Within this broader framework, three contexts (architecture, city, and landscape) and eight topics related to the concept of co-habitation (climate change, ecosystem, energy transitions, memory, migration, mobility, technology, and tourism) have been identified. Contributes from the fields of sociology, architecture, urbanism, planning, leisure and cultural studies, geography, anthropology are welcome, as much as other sciences not mentioned above.

Laura Pedata, Enrico Porfido, Loris Rossi
TAW2018 Curators / Scientific Coordinators and Editors of TAW2018 ISC

Scientific Coordinators / TAW2018 Curatorial team

Laura Pedata is an Architect and researcher, her main interest lies in observation, analysis and representation of urban landscape conditions and environmental regeneration strategies. Her most recent design research initiatives are focused on residual landscapes in transitioning cities and on the reassessment of their role within the urban context, considering them as a potential ground for future urban development. Currently Laura is lecturer in Landscape Architecture and Sustainable Design at POLIS University, where she received her Doctoral degree in Architecture, University of Ferrara – POLIS University. She also works ad bioclimatic and landscape design consultant and takes part in EU funded research projects. Laura holds a Master in Architecture from "La Sapienza" University, Rome and a Masters of Architecture II degree (M.Arch.II) from UCLA. She was awarded a Fulbright Scholarship in 2007. Laura is a Licensed Architect since 2007 and was co-principal of the architecture office 'ungroup' until 2011. From 2009 to 2011 she was an Adjunct Professor in Landscape Architecture and Architecture at University of Rome "La Sapienza", and from 2012 to 2013 she was employed by SOM in San Francisco.

Enrico Porfido is a licensed architect graduated at Ferrara University. His research activity started in 2012, joining ClusterTheory - a multidisciplinary research group focused on theoretical approach in contemporary architecture practices. In 2013 he studied at Oslo School of Architecture (AHO), where he continued his research activity working on Santo Domingo grid. His working experience at landscape office PROAP in Lisbon, introduced him in the landscape design panorama. In 2014 he cofounded "pais(vi)agem", an independent research group that aims to develop an innovative touristic model, using it as tool for regenerating and protecting the landscape. Since 2015 he is a collaborator of the departmental research unit Sealine of Ferrara University. Now he is a researcher and lecturer at POLIS University, developing a research on tourism development in Balkan countries, with a specific focus on the Albanian coastal territory. Recently he has been invited as external expert in the Landscape Master of UPC (Polytechnic University of Catalonia) in Barcelona. He is also member of the research unit Institut Habitat Turisme i Territori, UPC Barcelona and University of Malaga.

Loris Rossi graduated in architecture in 2004 at "La Sapienza" University of Rome, Master degree in Architecture "Ludovico Quaroni". He was awarded a PhD scholarship in Architectural Composition and Theory at "La Sapienza" and he developed part of his PhD dissertation research at the Department of Architecture and Urban Planning of UCLA, in Los Angeles. He was an adjunct professor at the Five Year Master course in Architecture EU of "La Sapienza". From 2005–2011 he was co-founder of the ungroup Architecture office based in Rome. Since October 2011 he is a Full time Professor at the POLIS University in Tirana, from 2012 till 2013 he was Dean of faculty in Planning and Urban Design. In January 2015 he was Visiting Faculty Member at UCLA Department of Architecture & Urban Design, Los Angeles California. Currently he is Head of the Applied Research Department. His most recent research field is centered on observation, analysis and investigation in the context of Urban expressions, where the character of spontaneous processes is a manifestation of interrupted city images.

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William Veerbeek
PhD - UNESCO IHE Delft Institute for Water Education (NLD)

Opening lecture

Stephan Trüby is Professor for Architecture and Cultural Theory at University of Stuttgart. After studying architecture at the AA School in London, he initially worked as an architect in firms in Zurich, Berlin, and Munich, before going on to teach architecture theory from 2001 to 2007 at the University of Stuttgart, where he was a research assistant at IGMA, and from 2007 to 2009 at the Karlsruhe University of Arts and Design (HfG) as a visiting professor. From 2009 to 2014 he ran the English-language postgraduate program MAS Scenography / Spatial Design at the Zurich University of the Arts (ZHdK) and from 2012 to 2014 he was also a lecturer in architecture theory at Harvard University's Graduate School of Design. He was head of research and development for the 2014 Venice Architecture Biennale. His best-known publications are architektur_theorie.doc: Texte seit 1960 (edited with Gerd de Bruyn, Birkhäuser, 2003), 5 Codes: Architektur, Paranoia und Risiko in Zeiten des Terrors (edited by Igmade, Birkhäuser, 2006), Exit-Architecture: Design between War and Peace (Springer, 2008), The World of Madelon Vriesendorp (with Shumon Basar, AA Publications, 2008), Hertzianismus: Elektromagnetismus in Architektur, Design und Kunst (Fink, 2009), and Germania, Venezia: The German Entries to the Venice Architecture Biennale since 1991 (with Verena Hartbaum, Fink, 2016).

International Scientific Speakers

Sotir Dhamo is one of the founders of POLIS University, and currently is the Administrator of the Founding Board of this university. He is an architect and urban planner with a long experience in these fields. He participated in several research studies conducted by the Institute of Architecture and Urban Planning since the early '90s, and later he contributed in other public and non-governmental organizations such as the Ministry of Public Works, Co-Plan, etc. In addition, he has earned an Executive Master degree in public administration from the Syracuse University in US, as well as other post-graduate qualifications. He taught for some years in the Polytechnic University in Tirana as a guest professor, and currently he is teaching urban design and site planning analyses in POLIS University. Among other things, he is co-founder of Metro_POLIS, a studio acting in the field of Architecture; co-founder of Forum A+P, the scientific journal of POLIS University, the only Albanian professional periodic in the fields of architecture and urban planning, which is published only in Albanian version.

Camillo Boano is Professor of Urban Design and Critical Theory at The Bartlett Development Planning Unit (DPU). He is is Co-Director of the UCL Urban Laboratory co-Director of the Building and Urban Design in Development MSc at the DPU. Camillo's research has centred on the complex encounters between critical theory, radical philosophy and urban design processes, specifically engaging with informal urbanisations, urban collective actions, as well as crisis-generated urbanisms. He is working on a series of interconnected research projects in Latin America, South East Asia and the Middle East on urban infrastructures, habitability and city-wide upgrade. Prior to joining UCL, Camillo worked in development and architectural practice for a number of years, became a research fellow at the Refugee Studies Centre in Oxford, joined the World Habitat Research Unit in Switzerland, and the Norwegian University of Science and Technology where he worked on a number of research and consultancy projects concerned with environmental forced migration, humanitarian urbanism, temporary shelters and post-disaster housing reconstruction. He is author The Ethics of a Potential Urbanism: Critical Encounters Between Giorgio Agamben and Architecture (2017), and two edited books Urban Geopolitics. Rethinking Planning in Contested Cities (2018) with Jonathan Rokem and Neoliberalism and Urban Development in Latin America: The Case of Santiago (2018) with Francisco Vergara-Perucich.

Maria Goula is an Associate Professor at Cornell University in the Department of Landscape Architecture. For over 20 years she taught and worked professionally in Barcelona, Spain. She develops research on coastal tourism, especially in regard to the interpretation and reinvention of leisure patterns regarding coastal dynamics. Being herself a designer, she is mainly interested in translating interdisciplinary knowledge on the coast into design protocols. The spectrum of her research covers the history of Mediterranean coastal tourism and Landscape.

Thomas Dillinger studied Spatial Planning at Vienna University of Technology and completed in 2003 his PhD thesis in the field of Endogenous Regional Development. From 1993 till 2005 he was lecturer at the Institute for Urban Design and Planning. Since 2005, he is head of the Centre of Regional Planning and Development at the Faculty of Architecture and Spatial Planning, Vienna University of Technology. He was visiting Professor in Gdansk, Sofia, Novi Sad, Pristina and Tirana. He organized several joint study projects in the field of urban and regional planning. Actually he is the national coordinator of the CEEPUS Urban innovations networks. He is also involved in a Smart City Project in the context of a new build regional mobility hub in Vienna. Recently he was involved in designing the Regional Framework Plan for the area north of Vienna. In the past he also was involved in designing the Regional Masterplan for the surrounding of Bratislava. Since 2013 Vice dean for Academic Affairs in Spatial Planning at Vienna University of Technology. He is the National Representative of Austria in AESOP.

William Veerbeek is one of the founders of the Flood Resilience Group at Unesco IHE-Delft, Institute for Water Education in Delft, The Netherlands. He has a wide experience in area of urban climate adaptation in The Netherlands as well as internationally. His work was instrumental in the refinement of national flood impact assessment tools, which were tested in Dutch paradigm shifting projects like UFM-Dordrecht and Rotterdam-based projects in the Dutch Knowledge for Climate programme. He worked extensively in megacities like Beijing, Dhaka and Mumbai where his work focussed on the development of long term urban growth projections and subsequent changes in disaster risk. Strengthening IHE's mission in capacity development, William has been training many cities in climate adaption, especially in Southeast Asia. Currently he is developing a city-to-city learning network on green-blue infrastructure in the North Sea region.

Michelangelo Russo is full Professor of Urban Planning and is the head of the Laboratory of Urbanism and Urban Design at the Department of Architecture, University of Naples Federico II, where he is since 2013 the Coordinator of the PhD Program in Architecture. He is a member of several national and international research groups. Since 2014 he is President of the SIU, Italian Society of Urbanists, the Academic and Scientific Society of Italian professors of Urbanism. He is carrying out financed researches of national and international interest. His research activities, design oriented, deal with themes, knowledge and the phenomena of contemporary urban design in relation to the contemporary cities changes, urbanized areas, landscapes, and the complex interaction between environment, space, ecology.

Closing lecture

Jason Hilgefort is an urbanist|architect who studied at the University of British Columbia, University of Cincinnati, and is currently a PHD candidate at RMIT. His work experience includes working with Peter Calthorpe, Rahul Mehrotra, Maxwan A+U, and ZUS. He founded Land+Civilization Compositions, a Rotterdam|Hong Kong based design studio. He was a subcurator in the Shenzhen/Hong Kong Urbanism/Architecture Biennale. He is the Academic Director the Aformal Academy for urbanism|landscape|public art in Shenzhen. He was also a regular writer, contributing to assorted publications over the years including Volume, uncube, SITE and more. He recently founded the Institute for Autonomous Urbanism.

Notes

All papers presented at this conference have undergone a process of **double blind review** by the members of the international scientific committee. The quotation system adopted is the **Harvard Referecing System**.

As stated in the call for papers, **all copyright responsability is fully and solely on the author(s) of the text**. The coordinators, organizers and scientific committee are not legally responsible for any claims for compensation if the author(s) have included figures, tables or text which have already been published.

conference proceedings

index

[chapter 1] CLIMATE CHANGE

[chapter 2] ECOSYSTEM

[chapter 3] ENERGY TRANSITION

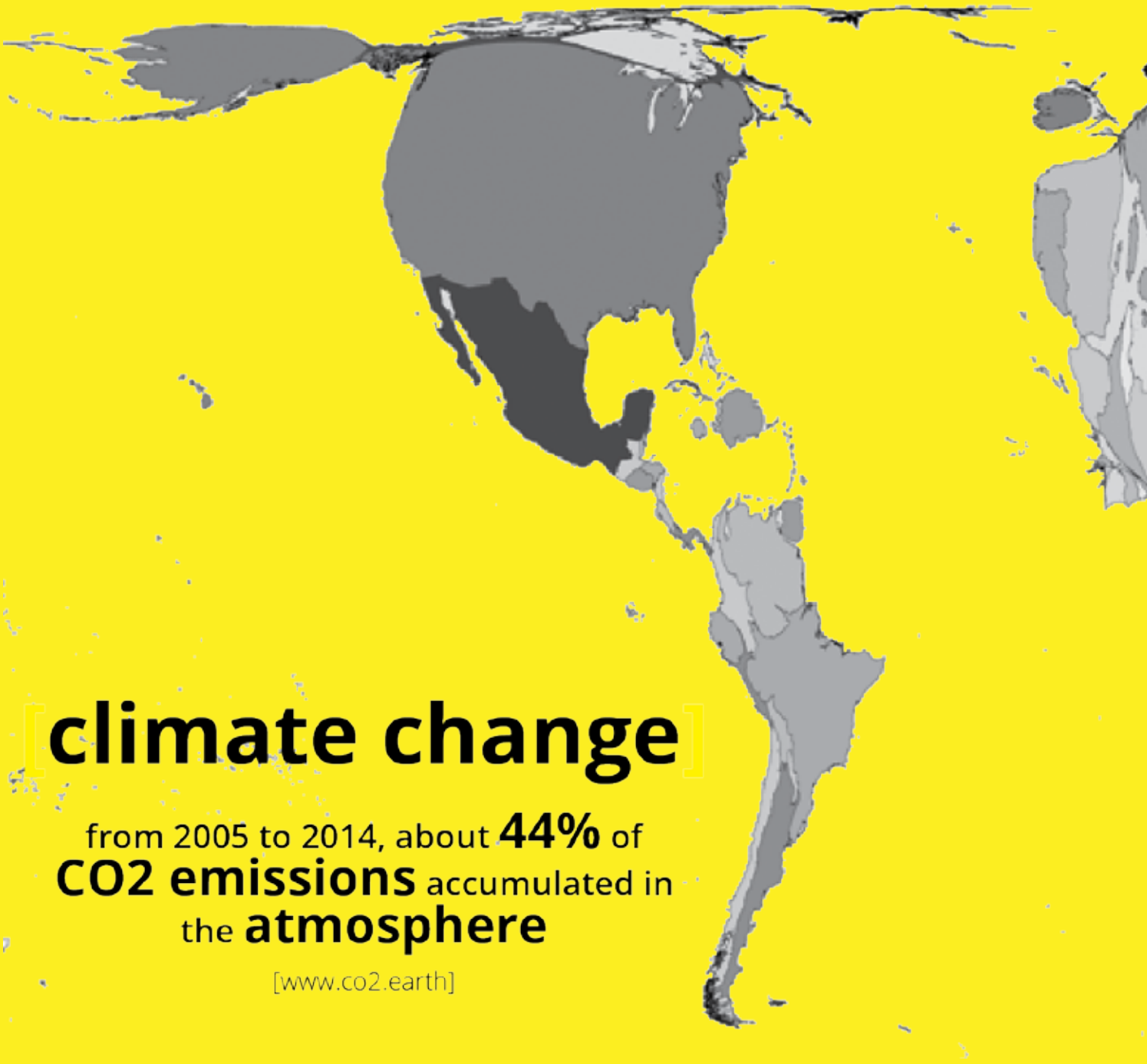
[chapter 4] MEMORY

[chapter 5] MIGRATION

[chapter 6] MOBILITY

[chapter 7] TECHNOLOGY

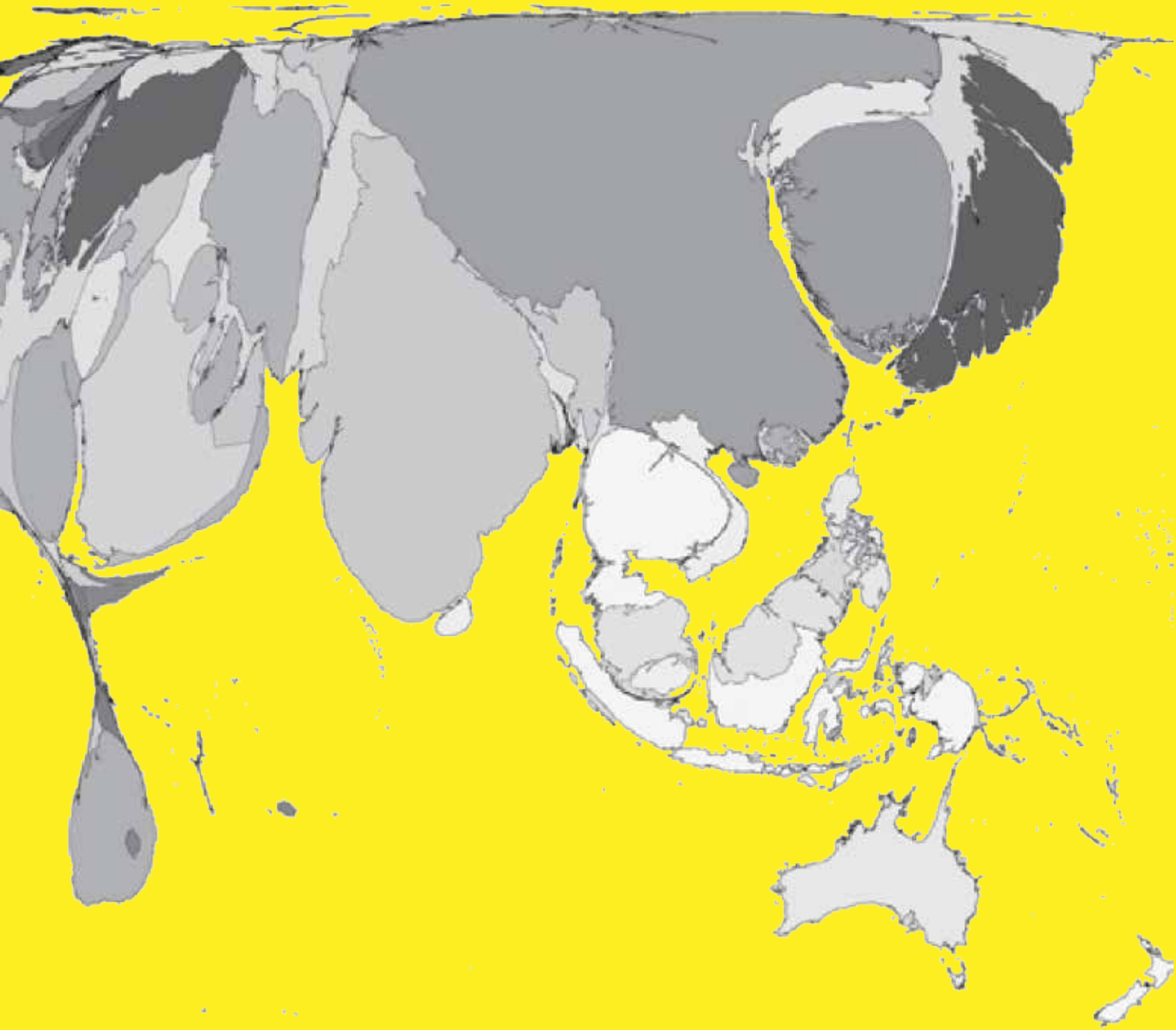
[chapter 8] TOURISM



[climate change]

from 2005 to 2014, about **44%** of **CO2 emissions** accumulated in the **atmosphere**

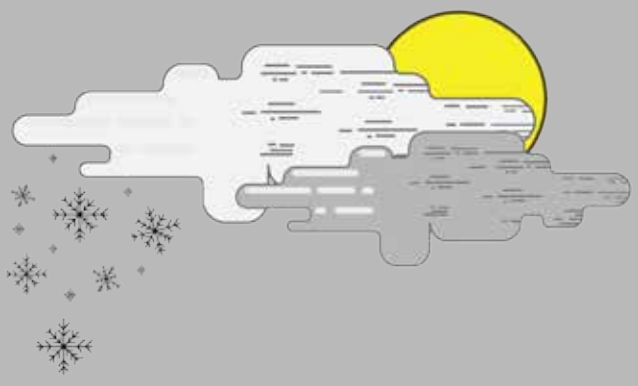
[www.co2.earth]



Map 297 'Carbon emissions increases' © worldmapper.org

Global warming, and the consequent desertification and water withdrawal, are leaving an indelible sign of men on the planet. Pollution, waste, morphological and biological alterations are activating a set of chain reactions, which are leading toward natural disasters like flooding and increasing biodiversity loss. In such a scenario, strategies of mitigation are not enough to reverse the trend. Researchers are invited to contribute to the session though relevant studies related to climate change, providing an in-depth understanding of the phenomenon and its consequences in a specific place or region - focusing on its impact on biological life, atmospheric conditions, landscape, and architecture - and proposing adaptation tactics aimed at the improvement of system's resiliency.

[CLI/02]



Climate resilience in Trento: understanding vulnerabilities and empowering adaptive resources

Anna Codemo
Independent Researcher, Italy

abstract

The impacts of climate change are causing environmental, social and economic damages and are making the planet less liveable. In addition to temperature increases and precipitation changes, climate changes increase the frequency of extreme events such as floods, heat waves and water scarcity. It is evident that actions and decisions both at the global and local level need to be taken. Impacts in the urban environment are intensified by microclimatic phenomena (e.g. Urban Heat Islands) resulting from human lifestyles, morphology and materials used in cities. They are further exacerbated by population growth in urban areas.
The paper reports the first results of the study carried out in Trento, a town of 117'000 inhabitants located in the Adige Valley. It investigates the impacts of climate change in its urban environment and focuses on the possibilities of making the town more resilient, through a solid knowledge of the vulnerabilities and the capacity of developing further the opportunities already present in the territory.
In recent years, Trento joined European programs such as the "Covenant of Mayors" and launched projects to find solutions to the afore-mentioned challenges and traced scenarios for the future decades: a general decrease in total rainfall accompanied by an increase of precipitation maxima and a significant increase of temperatures are envisaged, leading to vulnerabilities to people and ecosystems, especially in the densest residential areas.
The aim of the paper is to show a series of design practices and tests, involving the Municipality and local Research Institutes, seeking to integrate the urban components with the elements of Green and Blue Infrastructure, in order to improve local microclimate and the valorization of spaces. The guidelines provided promote the creation of multifunctional spaces and aim to define replicable solutions that contribute both to mitigation and adaptation to climate changes.

keywords Urban Planning, Urban Heat Island, Green and Blue Infrastructure, Adaptation

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Introduction

Climate change represents one of the biggest challenges that we need to address if we want to maintain our well-being and that of future generations. Its impacts are causing damages at the environmental level, but also at the social and economic ones (Carraro, 2015). Suffice it to consider the massive resources necessary after disasters to recover infrastructures, properties and human health or the increasing global migration flows with their possible consequences on human security and livelihood conflicts.

In particular, cities are increasingly feeling the effects of extreme events. On the one hand, cities are responsible for 75% of carbon dioxide emissions from energy use (IPCC,2014), on the other they are heavily vulnerable to the effects of extreme weather, in terms of damages to infrastructures and lives. In fact, according to IPCC7 (2014) and the European Reports, such as EEA (2012), the frequency and intensity of extreme weather events such as floods, heat waves and water scarcity are increasing. Moreover, approximately 50% of the world population currently resides in towns and cities and the percentage is expected to rise to 67% by 2050 (UN DESA, 2012). The impacts on human health are alarming: data confirm an overall estimated excess in mortality in the last years. For example, an excess of +11% was registered in 2015 in Italy. While the excess in winter (+13%) seems to be attributable to the peak of a flue epidemic rather than to low temperatures, the excess recorded during the summer (+10%) was attributed to the heat waves recorded in July and August 2015. Moreover, many Italian cities were struck by major flood disasters in 2015 with considerable economic damages (Michelozzi, 2016). Despite these considerations, many cities haven't addressed climate change yet. The reasons may include lack of relevant city policies and

action plans, existence of regulations on urban planning not yet adjusted, slow response to disasters, lack of public awareness. Among planners and decision-makers it is evident that a mitigation approach - referring to the global actions of reduction of emissions (e.g. burning of fossil fuels prevention) - is not sufficient, while it is necessary to promote local actions of adaptation that can make the towns more resilient. Adaptation strategies, in fact, consist of integration of climate issues into policy areas (e.g. ecosystems water management, agricultural development, etc.) and aim at limiting damages caused by extreme events. Cities need to provide adaptive and flexible approaches in decision making (Lu, 2013) and develop plans that include local actions to tackle the mentioned phenomena. Mitigation and adaptation require work in several areas: researchers and cities need to expand observations increasing the quantity and the types of data collection, in order to improve knowledge and awareness of the phenomena occurring in the cities for all the population. They also need to create new models in order to precisely define the risks for the urban areas and the way they will affect humans' well-being. Finally, it is necessary to promote actions, interventions and projects to make the town more resilient.
Thus, drawing on the review of policy documents and the re-elaboration of available data, this paper aims to understand the impacts of climate changes in the Trento's area. The paper is the result of the research carried out in the last 2 years. It began with the author's master dissertation "Trento City MicroClimate Changes" at University of Trento, supervised by Prof. Arch. M. Ricci and Prof. D. Zardi, developed between September 2015 and March 2017, focused on the mitigation of the Urban Heat Island in Trento. The research was further carried on in the second half of 2017 during the Climate KIC Urban Challenge in collaboration with University of Trento, Fondazione Edmund Mach and Hub Innovazione Trentino with the aim of finding innovative solutions for measuring, evaluating, monitoring and communicating values of marginal areas of Trento. The results of the collaboration consisted of the Bootcamp organization and the "Trento Smart Infrastructures: green and blue infrastructures for Trento: climate assessment report" publication[1].
The body of the paper is structured in three parts. The first section presents an introduction of the climatic conditions of the alpine town, based on the review of published materials from the main research centers of the territory. The second part provides an assessment of the planning strategies of the municipality related to climate change and the imagined future scenarios. The third part contains an interpretation of resilience in the environment of Trento based on the maintenance of the identity of the town.

Climate challenges of Trento

1. Context

Trento is located along the Adige Valley, which connects the Po Plain to the Brenner Pass. It has approx. 117000 inhabitants, but the inner city counts 56000 people. Since it is located in a valley, the development of the town is mainly mono-directional (N-S) and its growth in recent years has led it to incorporate all the surrounding suburbs. The town's geographical characteristics create a strong sense of identity and a feeling of territorial belonging. In fact, the mountain context shows pleasant natural views and wisely built landscapes, which is explicated in a diffuse urban system.
The sense of alpine identity and the attachment to its natural contexts have created in its inhabitants a sense of responsibility and sensitivity to wise soil consumption, the safety of hydro-geological and ecosystemic systems and the historical valorisation. Moreover, the configuration of the town and its territorial position contribute to cooperation enhancement towards efficient infrastructural and services systems at the local, regional and European level.
The geographical system consists of a slightly sloped valley, which becomes steeper in the western part of the town. The slopes on the eastern part of the town rise gently and allow for urbanisation. The main river Adige runs through the town and it is fed by a widespread and significant system of tributaries which flow into the main river in the area surrounding Trento.
The good climatic dataset boasted by the Province of Trento and its Municipality helped the Research Institutes of the territory and the Municipality itself to recognize and trace trends, resulting in a "Climatic Atlas"[2] and several reports on climate and its changes.

As an Alpine territory, the temperature regime is strictly connected to the terrain elevation: a negative gradient is evident and it is greater in the summer (Portoni, 2008). The available reports show an increasing trend of mean, maximum and minimum temperatures, which is particularly clear since the late 19th century. In fact, the most recently published climate change simulations predict a significant and continuous increase of temperatures, with a decrease of ice days and an increase of summer days (Di Piazza and Eccel, 2012).
Concerning precipitations, the annual mean value is 936 mm in the area of Trento. The trends consider the oscillations in its regime and report an increase between March and May, and values in the highest range until November with the maxima in October. The simulations show a general decrease in total rainfall and number of rainy days and an increase in mean and maxima precipitation depth, while a decrease of the number of consecutive wet days is expected (Di Piazza and Eccel, 2012).

2. Vulnerabilities and impacts

Understanding the vulnerabilities, their impacts and the risks of a territory is the first step to properly drive actions to mitigate or adapt to climate change. The collection of data and maps and the visualization of the phenomena is necessary to understand which actions are more suitable for each environment.
Trento, albeit a small Alpine town, presents some issues that if not properly treated can make the town less livable. The first vulnerability detected is the Urban Heat Island (UHI), a typical microclimatic phenomenon affecting our cities consisting of higher temperature values within urban area as compared to the surrounding rural areas and it is mainly caused by the morphological configuration of the town and human activities such as transportation and the use of heating and cooling devices. Despite the reduced dimensions of the town, the intensity of the phenomenon is typically around 3°C, with peaks of more than 6°C in particular conditions. Due to the alpine character of the town, UHI is mainly due to site morphology and topography and its values vary during the day, usually reaching higher levels during the night-time (Giovannini, 2011).
Compared to other cities, the UHI of Trento is not particularly high, but considering the synergy between this phenomenon and the predicted heat waves, it may lead to several cases of morbidity and mortality, especially for the most vulnerable categories of people (children and the elderly).
In addition to the impacts on health, a number of socio-economic and environmental impacts may result from higher temperatures and heat waves, such as problems related to higher demand for cooling causing possible energy supply deficits, water supply (especially for agriculture), failure of services.
One of the results obtained in the first steps of the research is the definition of the heat-related risk level, obtained from the combination of temperatures, population density and density of vulnerable people (Morabito, 2016). The results highlighted three priority areas that are particularly at risk due to high population density: the historical center, the areas along the river Fersina and the area of Cristo Re (Fig. 1).

Figure 1. Heat-related risk map, obtained by the combination of density, density of vulnerable people and air temperature. The red gradient represents the increasing level of heat-related risk: three main areas are at risk, the so-called "Cristo Re", "Historical Center" and "Santa Chiara and San Giuseppe" neighborhoods. Each main area contains sub-areas at higher risk, due to higher density levels.

1 / Codemo, A.; Eccel, E.; Favargiotti, S.; Gretter, A. (2018). Trento Smart Infrastructures: green and blue infrastructures for Trento: climate assessment report. [Technical report]. handle: http://hdl.handle.net/10449/47108
2 / Climatlas available on the web: https://climatlas.fbk.eu/

Trento is also vulnerable to floods, caused by the overflowing of the river Adige in cases of extreme long precipitation events (Portoni, 2008). Indeed, the water system of Trento may cause risks related in some cases to the nature of the basins, in other cases to the impervious surfaces, as they reduce the infiltration capacity of the soil. The main impacts related to hydrogeological risk could cause significant economic losses due to damages to infrastructure and properties. For this reason, the Province of Trento has adopted a General Water Usage Plan[3] to better cope with flood risk and to define the instruments for guaranteeing safety.

On the other hand, because of its agricultural vocation, water scarcity may occur during the periods of high demand. Up until today the entire Province of Trento has experienced good water availability, but water-saving measures were necessary to promote better water use and to improve monitoring actions and environmental and ecosystemic prevention.

3. Microclimates and morphology

In addition to being the places where climate change impacts are expected to be greater, cities directly influence the climatic conditions of the urban environment and the local microclimate due to their activities and their urban design. In fact, several factors influence the microclimate creating different climatic conditions: urban structure (building/street dimensions), surface covering (permeability, albedo), fabrics (materials, albedo), metabolism (human activities, e.g. traffic and cooling and heating systems) modify the climate within an area (Stewart and Oke, 2012). Due to these parameters, some microclimatic phenomena, such as UHI, may occur.

To date, reaching a better integration between urban climate knowledge with city planning could be very helpful to understanding which parameters should be considered in planning projects, both at the local and urban scale. In fact, considering the typology and the intensity of some parameters directly affecting the microclimate, we should remember that they simultaneously affect the mesoscale, the urban canopy and the surfaces (Georgiadis, 2015). This paper contains the Classification of Local Climate Zones of Trento (Fig. 2), based on the afore-mentioned parameters which identify different "climatopes" within the city, as defined by Steward and Oke (2012). The system is useful since it conveys the principles through spatial scales and design elements and it offers a "package of urban climate principles" for planners, ecologists, engineers, municipalities, which are easy to read and interpret.

Figure 2. Local Climate Zones map resulted from mapping the classification of LCZs. The result consists on typological areas based on the combination of surface structure, cover and human activity. The map was obtained with the method described in Bechtel et al. (2015) and shows the 13 LCZs present in Trento.

The mapping system provided comprises 17 standard LCZs, divided by "built systems" and "land cover types" and it is relevant to understand which bi-dimensional and tri-dimensional properties are involved in energy exchanges. As is the case for the risk maps, it is important to get a visual distribution of the climatic characteristics in order to understand the priorities of the interventions and the territorial distribution of microclimates. The results are consistent with the areas obtained in the heat-related risk calculation and show where an intervention is most urgent.

Mitigation and Adaptation in Trento

The purpose to enhance climate resilience consists in reducing vulnerabilities and invest in adaptation. The Province of Trento and its Municipality have been dealing with mitigation of climate changes and the related energy and environmental issues for more than 15 years. In 2013, for example, the Province adopted the so-called "Provincial Energy and Environmental Plan" (PEAP) plan, to meet the EU requirements and reduce carbon emissions, especially those from the civil sector and to drive a possible roadmap with actions concerning the building sector aiming at reducing their energy consumption. Indeed, most of the emissions are caused by the civil sector.

On the other hand, Trento joined the Covenant of Mayors program in 2014 and shared the European Commission's "20-20-20" Strategic Program in order to promote actions of adaptation. Such plans and actions contribute to making Trento an example for other Italian cities and encourage it to continue to work to build a plan to ensure the city's adaptation to extreme events.
In addition to the afore-mentioned actions that have an impact at a regional and metropolitan level, the city is promoting programs and projects that are consistent with a wider vision that impact on a minor scale or on particular urban components within the city. They all are part of the strategy of Trento to become a smart city, involving concepts of social inclusion, adaptation to inhabitants' needs, digital alphabetization[4].

The strategies adopted by the Municipality are the promotion of the green periurban areas as part of a green network capable of making the town more resilient (e.g. Los_Dama![5]) and the increase of awareness and involvement of inhabitant's through a digital optimization of services (e.g. Stardust)[6]. In fact, the Municipality is collaborating with Research Institutions of the territory to promote and implement projects to further develop and enhance the quality of the Green and Blue Infrastructure (BGI) of the town at the local level.
The main goal of the ongoing projects is to increase people's awareness and enhance inhabitant's health. The development of alpine peri-urban areas – an integral part of the BGI- is considered one of the main strategies to promote cooperation and achieve attractiveness and liveability, as well as new techniques and energy efficiency systems and the optimization of the Urban Mobility Plan through ICT tools.

In particular, Trento aims to re-connect the town and the big peri-urban areas through the axis created by the river Adige, where urban forests, urban agriculture and attractive riverbanks could regenerate the abandoned and marginal spaces.

Collaboration with inhabitants is considered fundamental to reach the goals of climate change and strengthen innovation and experimentation. The project "Smart city Lab in Vela"[7] is an example of the ongoing activities and it is a good example of methods to locally test solutions and develop models for resilient and smart the urban environment.
To become more adaptive and adaptable to the expected changes Trento is developing knowledge, strengthening local identity and the centrality of sustainability.

The first step of the research consisted of the definition of tactics to enhance resilience, determined by the combination of the guidelines suggested by European Commission and the plans provided by the major European cities investing in adaptation with the parameters defined by the Municipality.

The tactics regard the implementation of the green and blue infrastructure, the promotion of slow mobility and the use of clean energy and they intend to be effective not only in the phase of urban design, but in the entire system thinking. In fact, besides actions of urban design (e.g. implementation of green corridors and the increase of permeable surfaces), actions that incentive sensitisation and awareness of inhabitants (e.g. informative and educational campaigns, workshops), maintenance of plans in long terms (e.g. maintenance of trees) and governance (e.g. innovative ways of financing programs) must be considered[8].

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3 / PGUAP. Further information available at: http://pguap.provincia.tn.it/
4 / Further information available on http://www.comune.trento.it/Aree-tematiche/Smart-city and White Papers from the IEEE Smart Cities Inaugural Workshop, December 2014 in Trento, available in https://smartcities.ieee.org/articles-publications/trento-white-papers.html
5 / See at: http://www.comune.trento.it/Aree-tematiche/Ambiente-e-territorio/Parchi-e-giardini/Iniziative/LOS_DAMA and http://www.alpine-space.eu/projects/los_dama/en/home
6 / See at: http://stardustproject.eu/cities/trento/
7 / Further information available at: http://www.comune.trento.it/Progetti/Smart-city-Lab-a-Vela
8 / Detailed description of tactics, actions and implementation devices available at: Codemo, A. (n.d.). Trento City microClimate Changes. Graduate. University of Trento

New scenarios for the town

The implementation of the devices is combined with the creation of a clear vision and with the identification of scenarios. As mentioned above, the Municipality of Trento is currently updating its urban plan and drawing up the landscape plan, especially with the purpose of valorizing the public suburban green and the agricultural areas. In particular, these areas could reconnect the town with the Adige River and thus restore its central role at the urban scale, with the creation of multifunctional areas, combining recreation, water management, nature, culture, mobility (Fig. 3). Besides, they could also contribute at the regional scale, increasing the connection of the green and blue system, and thus improve the ecological and environmental network.
The use of Nature-based solutions is a key policy to tackle the challenges related to climate change, since it involves many ecosystem services to adapt their effects, but it also helps the town to attain sustainability. As a matter of fact, the provision of BGI is a tool that helps planners and policy-makers protect and restore ecosystems as well as maintain and enhance them, since they are low carbon solutions and they improve local microclimate.

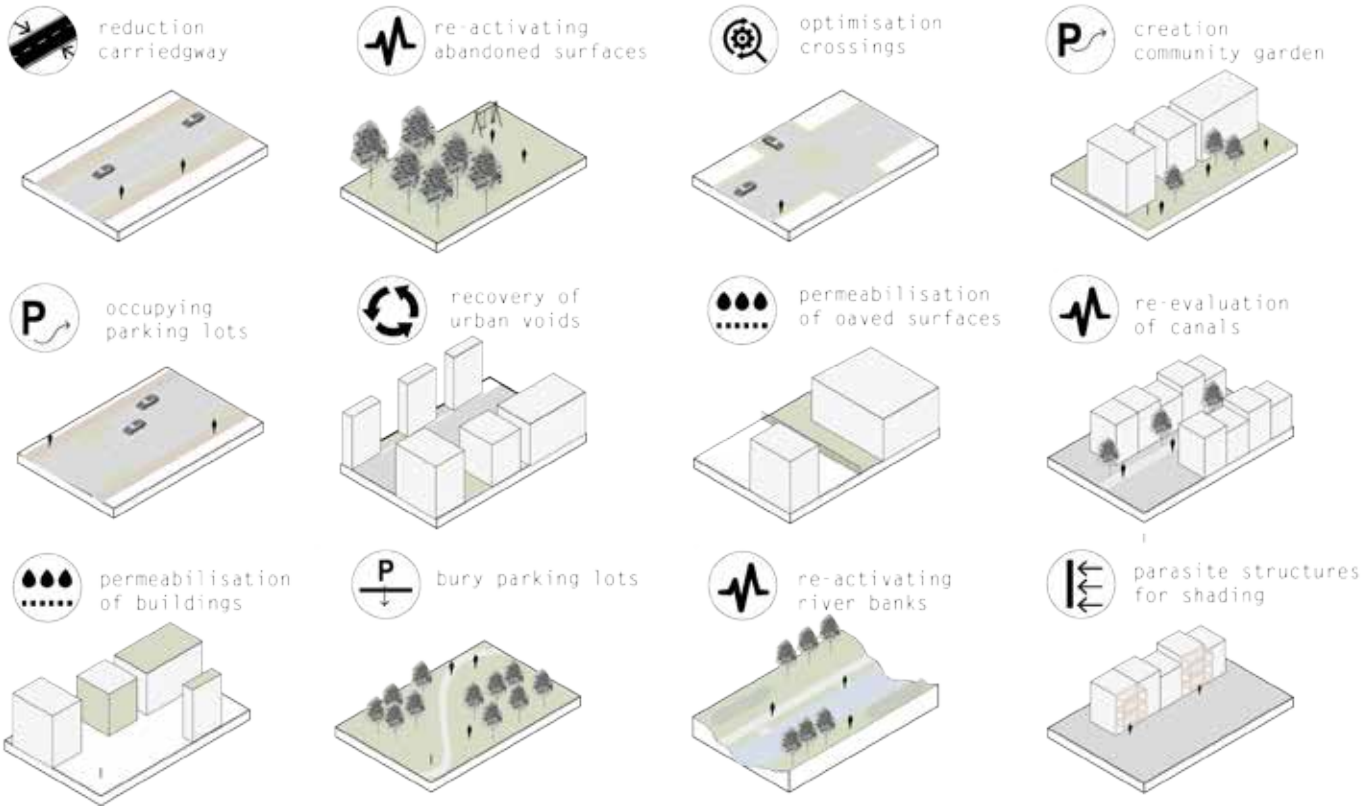

Figure 3. The image represents typologies of tactics to integrate green and blue elements within the urban fabric, considering actions of re-use, re-valorization and re-cycle of spaces.

To reach resilience, we should start to consider open spaces and other urban components of the cities, such as buildings and roads, as part of the system that contributes to face the issues related to climate change and to design them considering their contribution in the local climate.
One of the first results of the research was the definition of tactics through which to implement the four strategies of adaptation, considering both context and the guidelines provided by the Municipality. To this end a "toolkit" was provided, containing the typologies of green and blue elements that can be adopted and the type of actions (Fig.3) to be implemented for their integration in the urban environment. The proposed actions aim to rethink urban spaces in order to re-use, re-cycle and re-activate spaces and marginal areas.
The green and blue measures provide a selection of Ecosystem Services (ES) that specifically contribute to adaptation: water flow regulation and runoff mitigation (flood, drought), urban temperature regulation (heat stress) and moderation of environmental extremes (pluvial flooding, heat stress and drought). In particular, the ecosystem functions that regulate the above-mentioned services are infiltration, retention of soil, adsorption on kinetic energy, storage, evapotranspiration and rainfall interception (Voskamp, 2015).
Rethinking urban and peri-urban territories from this point of view and integrating the current facilities with elements of the Blue and Green Infrastructure could not only contribute to mitigation and adaptation of climate change and microclimate phenomena, but also enhance social and economic aspects. In fact, BGI elements are self-adaptive and produce significant co-benefits, contributing to the resilience of the city with their ecosystem services (Bozovic et al., 2017). Thus, the BGI approach produces optimized solutions and results them more efficient and cost-effective. In fact, besides contributing to the climate-related benefits, green and blue solutions

improve other environmental aspects (e.g. as air quality and noise pollution), ecological aspects (e.g. healthy watershed and land biodiversity), economic aspects (e.g. efficient energy use and land property values) and socio-cultural aspects (e.g. healthy inhabitants and community spirit)[9].

Figure 4. Scenario visualization of green and blue elements development along the river and in the inner urban areas.

The built environment is continuously changing by maintenance, modification and renewal: these change dynamics can be considered opportunities for retrofitting blue-green measures in the urban structures, such as sewer rehabilitation or other maintenance activities. Marginal areas, abandoned places, inactive fragments, which are contiguous to urban, industrial and/or productive districts should also be considered as renovation opportunities and re-activation through BGI elements as well.
Considering the climate vulnerabilities and the priorities of the Municipality, creative and innovative solutions in the field of smart mobility and climate resilience can be experimented, focusing especially on finding new scenarios for waterways and integrative solutions of green areas in the urban components. Smart combinations of solutions, innovative ways of financing and sharing the space between public and private and creative ways to test the scenarios should be part of the future programs.
The interaction between green and blue solutions and urban components requires various spatial scales analysis, since the ecosystemic functions become efficient at different temporal and spatial scales. For this reason, it is necessary to design solutions from the urban scale, canopy scale and superficial one. Moreover, if we consider the system at different scales, it is easier to obtain also other ecosystemic functions. Finally, combining different devices helps to increase efficiency and optimize functions.

Cristo Re neighbourhood: a case study

Cities that are investing in climate adaptation plans for the urban environment, such as Rotterdam[10] and Copenhagen[11], are implementing the strategies on the district scale as well. In fact, to add value to programs, coordinate solutions within communities and realize transformations, the use of urban laboratories to test measures and coordinate transitions is considered an important asset. Climate Proof ZoHo in Rotterdam[12] is an example of collaboration between the Municipality, urban offices, many stakeholders and inhabitants to implement local and resilient measures through collaboration between inhabitants and professionals. The goal is to integrate climate proofing into the physical structures of the city, with a process that moves from policy making through ideas and plans to physical realization.

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9 / The ecosystem services are divided in 4 categories: environmental, social, economic and ecological. For a full description of the services produced by BGI measures see Gomez-Baggethun, E. and Barton, D.N. (2013). Classifying and valuing ecosystem services for urban planning, Ecological Economics 86, p. 235–245, http://dx.doi.org/10.1016/j.ecolecon.2012.08.019.
10 / "Rotterdam Climate Change Adaptation Strategy", http://www.rotterdamclimateinitiative.nl/
11 / "Copenhagen climate adaptation plan", http://www.klimatilpasning.dk/
12 / Further information available at: http://www.urbanisten.nl/wp/?portfolio=climate-proof-zomerhofkwartier

At this stage of the research in Trento, the results consist of a series of solutions for urban components considering the principles stated in the above paragraphs.
In particular, the neighborhood of Cristo Re was used as a test area where different solutions were experimented -in a design phase-, with the aim of combining different devices and functions. In this way, it becomes part of a multiscale process, where the zoom drives a better awareness of the instruments defined at the urban scale and gets higher value since considered part of an adaptation plan.
The first step consisted in a deeper understanding of local meteorological and physical conditions and it was followed by the definition of typological actions of climate proofing.
Cristo Re neighborhood presents the following so-called "opportunity areas" to be rethought in a perspective of microclimate's mitigation: over dimensioned and car-driven minor streets, riverbanks, private courtyards and public impervious open spaces.
Re-designing the streets in new ways makes possible to liberate the area of a high percentage of asphalt, exchange it with more pervious surfaces and in some cases transform it into urban space for pedestrians and cyclists (Fig. 5). Re-thinking the mobility of the entire area may liberate the street along the river from cars and use it as a new ecological and social infrastructure. Front gardens and green courtyards are also a simple solution to improve the sense of community and increase the natural ventilation of the neighborhood. Finally, the optimization of the space could be an opportunity to turn urban voids and pervious surfaces such as public open spaces into rain gardens and pocket parks.
The proposed solutions were useful to trace a guideline of typological solutions applicable also in other contexts.

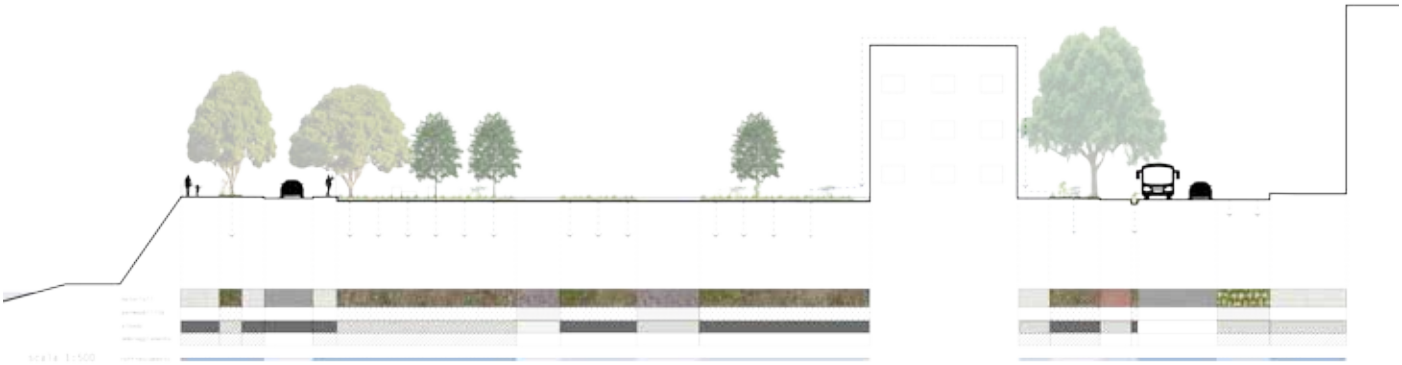

Figure 5. The section of the test area represents a scenario of integration between urban components and green elements: the roads are redesigned in order to integrate space for slow mobility and to increase permeability, albedo and tree shadow in the parking spots and in the walking path. Green carpet, trees and an educational agriculture field are integrated in the schoolyard, characterized by a paved surface, in order to improve the indoor and outdoor microclimate.

Besides the above-mentioned practices, to enhance inhabitant's wellbeing and livable spaces, collaboration between researchers, Municipality, stakeholders and third parties is required, in order to tackle the same challenges and integrate results in the urban agenda. Moreover, participation and collaboration should be part of the entire process to reach resilience, from the analysis of the context to the practices of monitoring. In fact, a clear knowledge of the current situation, trends and future threats, the involvement of inhabitants, greater awareness and expanding knowledge, capacity to monitor and maintain actions are also necessary are fundamental to reach the adaptation goals as well as designing solutions. (Lu, 2013).

Conclusion

Investing in a greater comprehension and knowledge of the phenomena occurring in our cities, as is the case for Trento, enables us to offer a contribution both to the adaptation and the mitigation of climate change. The knowledge of the place also allows long-term actions and plans to be promoted and thus set down a clear vision and scenario for the city.
However it is local actions, including community actions and collaborative projects between institutions, which contribute to making a city active, resilient and ready to tackle climate change.
The challenge of Trento, as all the cities, is to promote practices and actions of implementation to test and experiment new and creative solutions. The already planned development of multifunctional green and blue spaces and the involvement of inhabitants will pay a fundamental role in resilience. Yet, future activities should also develop actions and strategic plans to implement solutions, exploring creative collaboration models between partners, enhancing inhabitants' awareness and setting down monitoring and maintenance plans.
Researchers, policymakers, practitioners and other city stakeholders should continue to strengthen partnerships and produce knowledge together, support data platforms and actions, while sharing knowledge globally. In line

with the European goals, supporting transformation and providing devices of adaptation will contribute to the creation of a more livable and attractive as well as a more resilient town.

References

Bechtel, B.,Alexander, P.J., Boehner, J., Ching, J., Conrad, O., Feddema, J., Mills, G., See, L. and Stewart, I. (2015), Mapping local climate zones for a worldwide database of the form and function of cities. ISPRS Int. J. Geo-Inf. 4, 199-219, doi:10.3390/ijgi4010199.

Bozovic, Ranko & Maksimovic, Čedo & Mijic, Ana & Smith, K.M. & Suter, Ivo & Van Reeuwijk, Maarten. (2017). Blue Green Solutions. A Systems Approach to Sustainable, Resilient and Cost-Efficient Urban Development. 10.13140/RG.2.2.30628.07046.

Carraro, C. and Mazzani, A. (2015) Il clima che cambia. Non solo un problema ambientale, Il Mulino: Bologna.

Codemo, A.; Eccel, E.; Favargiotti, S.; Gretter, A. (2018). Trento Smart Infrastructures: green and blue infrastructures for Trento: climate assessment report. [Technical report].
handle: http://hdl.handle.net/10449/47108

Di Piazza, A e Eccel, E. (2012), a cura di Osservatorio Trentino sul clima, Dipartimento Protezione Civile, incarico Dirigenziale per la Programmazione di protezione civile. Analisi di serie giornaliere di temperature e precipitazione in Trentino nel periodo 1958-2010, Litotipografia Alcione: Trento.

EEA(2012).Urban adaptation to climate change in Europe Challenges and opportunities for cities together with supportive national and European policies, EEA technical report 2/2012.

Georgiadis, T. (2015). REBUS: isola di calore urbana e progettazione del comfort, dispensa 1.3, Bologna.
Available at: http://territorio.regione.emilia-romagna.it/paesaggio/cooperazione-territoriale-e-paesaggio/REBUS13progettazionecomfort.pdf/at_download/file/REBUS+1-3+progettazione+comfort.pdf [Accessed 15 Sep. 2016]

Giovannini L. et al., Analysis of the Urban Thermal Fingerprint of the City of Trento in the Alps, American Meteorological Society vol.50(2011):1145-1162), DOI: 10.1175/2010JAMC2613.1.

IPCC, 2014: Climate Change 2014: Mitigation of Climate Change. Contribution of Working Group III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Edenhofer, O., R. Pichs-Madruga, Y. Sokona, E. Farahani, S. Kadner, K. Seyboth, A. Adler, I. Baum, S. Brunner, P. Eickemeier, B. Kriemann, J. Savolainen, S. Schlömer, C. von Stechow, T. Zwickel and J.C. Minx (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.

Lu, P. and Stead, D. (2013). Understanding the notion of resilience in spatial planning: A case study of Rotterdam, The Netherlands, Cities 36 (2013) 200-212, http://dx.doi.org/10.1016/j.cities.2013.06.001.

Michelozzi, P., De' Donato, F., Scortichini, M., De Sario, M., Asta, F., Agabiti, N., Guerra, R., de Martino, A. and Davoli, M., On the increase in mortality in Italy in 2015: analysis of seasonal mortality in the 32 municipalities included in the Surveillance system of daily mortality, Epidemiol Prev. 2016 Jan-Feb;40(1):22-8. doi: 10.19191/EP16.1.P022.010.

Morabito et al.(2015), Urban-hazard risk analysis: mapping of heat related risks in the elderly in major Italian cities, PLoS ONE 10 (5).

Portoni M. (a cura di) (2008), Progetto clima 2008, Previsioni e conseguenze dei cambiamenti climatici in Trentino, Provincia Autonoma di Trento.

Stewart, I.D. and Oke, T.R. (2012). Local climate zones for urban temperatures studies, BAMS 93(12), p. 1879-1900, DOI: http://dx.doi.org/10.1175/BAMS-D-11-00019.1.

United Nations Department of Economic and Social Affairs/Population Division (2012). World Urbanization Prospects: The 2011 Revision. Available at: http://www.un.org/en/development/desa/population/publications/pdf/urbanization/WUP2011_Report.pdf [Accessed 12 Apr. 2018].

Voskamp, I. M. and van de Ven, F.H.M. (2015). Planning support system for climate adaptation: composing effective sets of blue-green measures to reduce urban vulnerability to extreme weather events, Building and Environment 83 (2015) 159-167.

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