

# BOOK OF ABSTRACTS

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## I. SESSION DESCRIPTION

**ID:** B10a

Climate regulation of urban environments – From models to policies

**Format:** Hybrid

**Hosts**

	<b>Name</b>	<b>Organisation</b>	<b>E-mail</b>
<b>Host</b>	Daniele La Rosa	University of Catania (Italy)	dlarosa@dar.unict.it
<b>Co-Hosts</b>	Massimo Palme	Universidad Tecnica Federico Santa Maria	massimo.palme@usm.cl

### Abstracts

Over the past decades, intense urbanization processes have produced a severe contraction of green and open spaces in cities, decreasing the potential of urban environments to mitigate the climate changes negative effects of climate changes. Urban heat island and global warming represent hazards for human health and with the increasing urban population, more and more people will be soon exposed to risk of urban heat related illnesses. Urban energy consumption is predicted to raise worldwide, growing up to 500% in tropical countries and generating an unsustainable snow-ball effect of increasing in outdoor temperatures by final energy dissipation into heat. Urban ecosystems play a relevant role, among others, in regulating the local microclimate and mitigating the Urban Heat Island effect by different natural processes such as shading, evapotranspiration and wind breaking. However, despite the growing efforts made at international level to develop urban policies focusing on climate regulation, the effective mainstreaming of climate regulation in police appears still limited and deserving more attention by urban policies, spatial planning. This limited implementation is related to the still limited knowledge among policy makers and practitioners, the lack of binding policies at local scales (i.e. urban scale) and missed or less known recognition of the economic values related to the climate regulation.

### Goals & Objectives

This session aims to discuss the different modelling approaches and policy making related to climates regulation. It welcomes inter-disciplinary contributions presenting the state of the art in methods, models, plans and policies proposals to assess and reduce urban heat island and other related urban issues. The session is envisioned for building and environmental engineers, architects and urban

planners, ecologists, urban physicists, and all other scholars interested in the understanding of the entangled complex relations among climate, buildings, and people.

### Planned Output

The session aims at producing a joint article bringing together and comparing case studies in Latin America and Europe, with a specific focus on current policies on climate regulation developed and promoted by different countries and regions.

### Session Format

The session will be open to short presentations that will be grouped into thematic focuses and followed by discussion rounds, moderated by one of the presenting authors. Wrap-up general discussions will close the session where moderators of discussions rounds will present key points of each thematic focus.

### Acceptance of voluntary contributions

Yes, I allow any abstract to be submitted to my session for review.

### Relation to ESP Working Groups or National Networks

Biome Working Groups: BWG 10 – Urban systems.

## II. SESSION PROGRAMME

**Date of session:** Wednesday, 8<sup>th</sup>, November

**Time of session:** 16.00 – 18.00

### Timetable speakers

Time	First name	Surname	Organization	Title of presentation
16.00	Daniele Massimo	La Rosa Palme	University of Catania Universidad Técnica Federico Santa María	Introduction to session
16.05 – 16.20	Anna Giulia	Castaldo	Polytechnic of Milan, Italy	Understanding Urban Ecosystem Services provided and supported by Nature-Based Solutions in Latin American Cities: Insights and Future directions from literature review.
16.20 – 16.40	Pamela	Muñoz Ossandón	Departamento de Arquitectura, Universidad Técnica Federico Santa María, Chile	Estrategias de intervención para el control del clima urbano: Integración de soluciones basadas en la naturaleza en el barrio

Time	First name	Surname	Organization	Title of presentation
				histórico-patrimonial “el Almendral” de Valparaíso
16.40 – 17.00	Celina	Aznarez	Institut de Ciència i Tecnologia Ambientals (ICTA)- Universitat Autònoma de Barcelona / Basque Centre for Climate Change (BC3), 48940 Leioa, Spain	Modelling supply-demand mismatches in ecosystem services for urban heat island mitigation and heat vulnerability
17.00 – 17.20	Carolina	Ganem-Karlen	Instituto de Ambiente, Hábitat y Energía. Consejo Nacional de Investigaciones Científicas y Técnicas (INAHE – CONICET), Argentina	Microclimate assessment through the radiant heat exchange experienced by their inhabitants
17.20 – 17.40	Daniele	La Rosa	University of Catania, Italy	Planning criteria of Green Infrastructure for climate regulation in hot Mediterranean climates
17.40 – 18.00	All authors		Conclusions and possible outcomes of the Session	

### III. ABSTRACTS

#### 1. *Type of submission:* Abstract / Resumen

B. Biome Working Group sessions / Sesiones del Grupo de trabajo sobre Biomás: B10a –  
Climate regulation of urban environments – From models to policies

Understanding Urban Ecosystem Services provided and supported by Nature-Based Solutions in Latin American Cities: Insights and Future directions from literature review.

*First author(s):* Anna Giulia Castaldo

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Research on Urban ecosystem services (UES) in Latin America is rapidly gaining traction. This paper aims to contribute to ongoing reflections on UES in Latin American cities by presenting results from a systematic literature review concerning the use of Nature-based solutions (NBS) in Latin American cities and the associated UES. The research is part of a broader scoping effort on the use of NBS in the Global South, focusing on challenges such as rapid and uncontrolled urbanization, as well the effects of climate change. The analysis focuses on the most studied and utilized NBS in this macro-region, their associated ecosystem services, and evaluation methods. By identifying existing gaps and emerging themes, the research highlights trends and areas for further exploration.

Our results show that studies on Latin American cities have a strong emphasis on the issues of rapid urbanization and social inequalities, while recognizing the significance of ecosystems protection and the mitigation of environmental degradation. Moreover, the vulnerability of these cities to climate-related risks, such as flooding, has been a major concern, generating a growing attention towards ecosystem-based solutions.

The results also indicate that certain UES, particularly regulating ES, are currently receiving more attention than others, leading to a polarized research landscape. This demonstrates the need for a more balanced examination of all UES, especially cultural and supporting services, to address the social challenges prevalent in Latin American contexts. Such a focus can lead to the integration of social and economic aspects and ecological concerns, which in future research could inform the development of NBS that contribute to creating more sustainable and resilient urban environments in Latin America.

*Keywords:* Urban Ecosystem Services, Latin America, Nature-based solutions

2. *Type of submission:* Abstract / Resumen

B. Biome Working Group sessions / Sesiones del Grupo de trabajo sobre Biomas: B10a –  
Climate regulation of urban environments – From models to policies

Desigualdades en la distribución y el acceso a las áreas verdes y los servicios ecosistémicos en la ciudad de Bogotá

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Las áreas verdes urbanas y la biodiversidad que albergan, juegan un papel crítico en la prestación de diversos servicios ecosistémicos fundamentales para el bienestar humano de aquellos que habitan hoy mayoritariamente en ciudades. Algunos de esos servicios están relacionados con la regulación del clima o la oferta de oportunidades para la recreación y el bienestar físico y mental de los habitantes urbanos. En la medida en que la expansión urbana lleve a reducir la cobertura de estas áreas verdes y sus beneficios, la calidad de vida de las ciudades y su sostenibilidad se verán fuertemente afectadas. Una situación que puede ser especialmente sensible en regiones como América Latina donde las ciudades albergan más del 80% de la población, buena parte de ella, enfrentando fenómenos de pobreza y desigualdad. Este hecho ha generado un interés por determinar en esta región como las áreas verdes urbanas y sus servicios ecosistémicos se distribuyen espacialmente, así como el acceso que las personas pueden tener a ellos. Un interés enfocado hacia establecer la equidad que en estos aspectos existe entre grupos humanos bajo diferentes condiciones demográficas, sociales y económicas. Presentamos los resultados de un proyecto en que abordamos estos aspectos en una ciudad de 8 millones de habitantes como Bogotá. Se encontraron significativas asimetrías en la distribución en cantidad y calidad de las áreas verdes y su capacidad de regulación climática, especialmente hacia la zona centro y sur de la ciudad. Esta asimetrías afectan a poblaciones en estratos socioeconómicos medios como bajos, con gran variabilidad en la medida que se analizan diferentes escalas, tanto de ciudad y grandes unidades de planeación, como en agregaciones de manzanas con condiciones similares. Esta tendencia se hace más aguda en estratos bajos, cuando se integró el nivel de accesibilidad definido a través de una matriz de resistencia a la movilidad de las personas. Este conocimiento obtenido será fundamental para promover procesos de planificación que

permitan cerrar brechas sociales persistentes en torno a los beneficios que ofrecen las áreas verdes a la calidad de vida urbana.

*Keywords:* Infraestructura verde, Justicia ambiental, regulación climática, ciudades

3. *Type of submission:* Abstract / Resumen

B. Biome Working Group sessions / Sesiones del Grupo de trabajo sobre Biomas: B10a –  
Climate regulation of urban environments – From models to policies

Microclimate assessment through the radiant heat exchange experienced by their inhabitants

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Mendoza is located in a semi–arid continental climate with low percentages of atmospheric relative humidity and high heliophany. The city's urban checkered structure intermingles three types of meshes that overlap in space: a water network, a green mesh and a regular orthogonal grid that supports dwellings. Vernacular architecture presents intermediate spaces as an adaptation to daily thermal variations that can reach 20°C. Courtyards, terraces and balconies combine to form green centers in each block, that, in addition with the city structure conform a unique urban ecosystem that regulates the local microclimate.

Nowadays, this livable city is slowly losing its valuable microclimatic strengths. This is due to new architecture that do not follow the system logic and the dimensional relationships between components. Another negative impact factor is the intense urbanization process that is producing a severe contraction of green and open spaces.

The aim of this work is the comparison between case studies in which the conditions of urban microclimatic moderation are still maintained, and new cases in which the particular imprint of this city has not been observed. An analysis of the microclimatic conditions of intermediate spaces will be carried out, focusing on the radiant heat exchange experienced by their inhabitants.

Methodologically, from a geometrical approach, a panoramic thermogram is assembled combining thermal images in all directions. This provides precise information on the influence of each visible surface at the measurement point, allowing the quantification and better understanding of the mean radiant temperature in each case.

Results are enlightening of the phenomena and validate the methodology. Case studies demonstrate the importance of preserving Mendoza's unique urban ecosystem today, and even more for the future facing climate change. As the behavior of the infrared component is

not intuitive, this non-invasive method is a useful tool for decision makers and urban planners.

*Keywords:* MICROCLIMATE ASSESSMENT, INTERMEDIATE SPACES, RADIANT HEAT EXCHANGE, THERMOGRAPHY



4. *Type of submission:* Abstract / Resumen

B. Biome Working Group sessions / Sesiones del Grupo de trabajo sobre Biomasa: B10a –  
Climate regulation of urban environments – From models to policies

Estrategias de intervención para el control del clima urbano: Integración de soluciones basadas en la naturaleza en el barrio histórico-patrimonial “el Almendral” de Valparaíso

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Actualmente la necesidad de desarrollar nuevas estrategias de intervención para la mitigación de los efectos del cambio climático es primordial. Si bien existen significativos avances en esto, aún se está muy lejos de lograr los objetivos de desarrollo sostenible propuestos a nivel mundial. Uno de los sectores de mayor impacto en cuanto a emisiones de CO<sub>2</sub> es la industria de la construcción, por lo que tiene un gran potencial para el desarrollo de mejoras sustanciales, no solo respecto a las nuevas construcciones y urbanizaciones. Los edificios históricos, el patrimonio construido siempre han estado asociados a la conservación y preservación, sin embargo, hoy en día toman una nueva importancia desde la sustentabilidad, la integración de estrategias de mitigación para la disminución de emisiones de CO<sub>2</sub> y de consumo energético, pueden generar impactos significativos para el control del clima urbano, ligando así lo ambiental a los vínculos tradicionales de conservación histórica y patrimonial. La incorporación de servicios ecosistémicos (tales como la regulación climática, la provisión de entornos visuales y acústicos atractivos, la habilitación de espacios para actividades culturales y recreativas) en la rehabilitación del patrimonio abre nuevas líneas de investigación para el diseño urbano y la ecología del territorio.

Esta investigación estudia el potencial de mejora a través de la implementación de estrategias de intervención en sectores históricos, para esto se ha seleccionado un sector del barrio “el Almendral” de Valparaíso, perteneciente a una zona de conservación histórica, considerando intervenciones tanto en los edificios como en el espacio público. Las propuestas de intervención consideran la normativa y estándares para la conservación de edificios y zonas históricas, planteando la integración de soluciones basadas en la naturaleza, en particular, la integración de vegetación para el control del clima urbano y la recuperación y puesta en valor de edificios históricos. Para el estudio de las distintas

propuestas de intervención se ha utilizado el software ENVI-met para la simulación de las distintas situaciones para el análisis y comparación de estas, en orden de identificar la mejor propuesta bajo la mirada de la provisión de servicios ecosistémicos, en particular la regulación climática del sector analizado.

*Keywords:* Clima urbano, estrategias de mitigación, estrategias basadas en la naturaleza, zonas históricas, patrimonio construido.

5. *Type of submission:* Abstract / Resumen

B. Biome Working Group sessions / Sesiones del Grupo de trabajo sobre Biomas: B10a –  
Climate regulation of urban environments – From models to policies

Planning criteria of Green Infrastructure for climate regulation in hot Mediterranean climates

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Urban Ecosystems represent the main providers of ecosystem services in cities and play a relevant role, among the many services, in the regulation of the urban microclimate and mitigation of Urban Heat Island effect.

The amount, localization and spatial configuration of vegetation (i.e. urban trees) are key factors for planners and designers aiming at maximizing the climate regulation potential and therefore extending the related benefits to the higher number of residents and city users.

Different factors and constraints determine the potential of the cooling effects of vegetation and the way these effects can actually benefit both the elements of urban environment (i.e. streets, sidewalks, squares, parks) and people that makes a daily uses of these elements.

This paper investigates on these factors by identifying high resolution scenarios of new urban greenery that are able to maximise the cooling benefits for people and local residents. For the case study of Mediterranean metropolitan areas of Catania (Italy), scenarios are derived by modelling physical and socio-economical factors as spatial constraints for the localization of new urban vegetation, with the UMEP model and GIS spatial analysis. Results show that new greenery should be located in public areas that are mostly used.

Built on results obtained in the case study analysed, the paper also proposes some general planning criteria for the localization of new urban greenery, to be extended to other geographical urban contexts.

*Keywords:* High resolution, UMEP, urban planning, socio-ecological systems, benefits

6. *Type of submission:* Abstract / Resumen

B. Biome Working Group sessions / Sesiones del Grupo de trabajo sobre Biomasa: B10a – Climate regulation of urban environments – From models to policies

Modelling supply–demand mismatches in ecosystem services for urban heat island mitigation and heat vulnerability

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Land surface temperatures tend to be higher in densely built urban areas compared to suburban–rural borders, creating urban heat islands (UHIs) which have become one of the main environmental hazards for city dwellers. Impacts range from heat mortality, air quality degradation and exacerbated heat stress on biodiversity and ecosystems. However, due to the heterogeneous nature of urban landscapes and socio–spatial inequities driving landscape attributes like impervious surfaces and vegetation cover, UHI burdens are not evenly distributed. To mitigate UHIs, urban green infrastructure can provide critical ecosystem services (ES). Therefore, to understand the relationship between users’ access and dependence on these benefits, we propose a modeling approach integrating remote sensing, field and socio–demographic data with Artificial Intelligence for Environment and Sustainability (ARIES) and GIS tools. Our approach incorporates the following components: i) indicators of UHI exposure and urban heat vulnerability indices; ii) spatial quantification of the supply and demand of urban green infrastructure related to ES for UHI mitigation; iii) spatially explicit (mis)matches of ES supply and demand balance; iv) coupled modelling; and v) considerations for management and decision–

making. We applied this approach in the 'green' city of Vitoria-Gasteiz, in the Basque Country as a case study. Our findings reveal the unequal distribution of UHI burdens, with individuals vulnerable to heat experiencing disproportionate impacts, including higher exposure and limited access to temperature-regulating ES. This mismatch between the supply and demand of ES particularly affects disadvantaged communities. Incorporating environmental justice principles into UHI mitigation strategies is essential to ensure equitable outcomes for all residents. By considering the socio-spatial inequities associated with supply-demand mismatches in ES and their impact on vulnerability to heat, our approach enables evidence-based decision-making and spatial prioritization to address the specific needs of vulnerable populations.

*Keywords:* Urban heat islands; ES mismatch; Vulnerability; Environmental justice