Book of Abstract

I. SESSION DESCRIPTION

ID: B10a

Title of session:

Integrating ecosystems and their services in peri-urban planning and policy in Bengaluru, India

Hosts:

	Title	Name	Organisation	E-mail
Host:	Dr	Ruchi Badola	Wildlife Institute of India	ruchi@wii.gov.in
Co-host:		Sheetal Patil	School of Development, Azim Premji University, Bangalore, India	sheetal.patil@apu.edu.in

Abstract:

Urbanisation has emerged as a key driver of transformations in structure, function and services of diverse ecosystems across the globe. The global urban population is estimated to increase by more than two thirds to reach 66 per cent of the world's population by 2050 and nearly 90 per cent of the growth is expected in the urban areas of Africa and Asia (UN, 2014). India is expected to turn 50 percent urban by the year 2044, accounting for 15 percent of world's urban population (Nagendra et al. 2012). Unprecedented expansion of urban peripheries into rural landscapes has severely impacted ecosystem services (ESS) from agricultural systems and from commons such as lakes, forests and grazing lands that are vital to the livelihoods of millions of rural and urban poor. While ESS transitions are rapid and profound in urban and peri-urban geographies, the augmented urban metabolism facilitated by global trade extends the impacts of 'urban entropic black holes' to even distant hinter lands. Emerging urbanised regions in India represent a complex mosaic of land cover characterised by an interesting juxtaposition of the traditional and agricultural land uses with modern and industrial land uses and governance systems (Aguilar et al. 2003;

Seto et al. 2013; Simon et al. 2004).

The proposed session looks into the case of transitions in peri-urban ecosystems of Bengaluru, India's third most populous city that is home to nearly 10 million inhabitants. Unruly urbanisation triggered by the Information Technology revolution and the resultant increase in commercial and residential construction, pollution, and landscape fragmentation in and around Bengaluru has greatly changed many peri-urban ecosystems (D'Souza and Nagendra 2011; Nair 2005; Schneider and Woodcock 2008; Taubenböck et al. 2009). Growing demand for land and associated land use changes, changes in quantity and quality of water as well as demand for certain agricultural commodities drive the functions and services of peri-urban ecosystems in unanticipated directions. Such ESS changes have had a disproportionately huge impact on vulnerable communities, such as livestock rearers and small farmers in peripheries, whose livelihoods are closely dependent on diverse ecosystems. These marginalized groups are also the least equipped to adapt to escalating stresses owing to their resource poor nature and lack of adequate institutional and policy support. Thus ecological degradation and social inequity are equally rampant in the present urban development models and vision in Bengaluru.

Scant regard for the role of ecosystems and their services in ensuring sustainable livelihoods and human wellbeing has resulted in perverse planning and policy measures that prioritise physical infrastructure and economic growth at the cost of ecological integrity. Against the backdrop of the most recent master plan for the city (Regional Master Plan-2031) currently being drafted and revised, the proposed session attempts to consolidate the existing ESS scholarship dealing with transformations in agriculture and commons in peri-urban Bengaluru. Using the case of Bengaluru, we aim to draw the attention of global ESS community to the perils of unplanned urbanisation in the rapidly developing Asian countries. We expect the deliberations to provide valuable inputs for a reorientation of the vision underlying urban planning process in Bengaluru. The discussions will also seek to evolve mechanisms to incentivize institutions and programmes that consciously attempt to preserve and augment ecosystem service flows, in an attempt to reimagine Bengaluru as a sustainable and equitable city.

References

[UN] United Nations, Department of Economic and Social Affairs, Population Division (2014): "World Urbanization Prospects: The 2014 Revision" Highlights (ST/ESA/SER.A/352).

Nagendra, H., Sudhira, H., Katti, M., Tengo, M., & Schewenius, M (2012): "Urbanisation, Ecosystems and Biodiversity: Assessments of India and Bengaluru" Stockholm University.

Aguilar, Adrián G., Peter M. Ward, And C. B. Smith Sr. (2003): "Globalization, Regional Development, and Mega-City Expansion in Latin America: Analyzing Mexico City's Peri-Urban Hinterland," Cities, Vol 20, No. 1, pp 3-21.

Seto, Karen C., Susan Parnell, and Thomas Elmqvist (2013). "A Global Outlook on

Urbanization" In: Urbanization, Biodiversity and Ecosystem Services: Challenges and Opportunities-A Global Assessment. Pp1-12.Thomas Elmqvist, Michail Fragkias, Julie Goodness , Burak Güneralp, Peter J. Marcotullio, Robert I. Mcdonald, Susan Parnell, Maria Schewenius, Marte Sendstad, Karen C. Seto, and Cathy Wilkinson (Eds.), Dordrecht: Springer.
Simon, David, Duncan Mcgregor, and Kwasi Nsiah-Gyabaah (2004): "The Changing Urban-Rural Interface of African Cities: Definitional Issues and an Application to Kumasi, Ghana," Environment and Urbanization, Vol 16, No. 2, pp 235-248.
D'Souza, Rohan and Harini Nagendra (2011): "Changes in Public Commons as a Consequence of Urbanization: the Agara Lake in Bangalore, India," Environmental Management, Vol 47, pp 840-850.
Nair, Janaki (2005): The Promise of the Metropolis: Bangalore's Twentieth Century. New Delhi: Oxford University Press.
Schneider, Annemarie, and Curtis E. Woodcock (2008): "Compact, Dispersed, Fragmented, Extensive? A Comparison of Urban Growth in Twenty-Five Global Cities using Remotely Sensed Data, Pattern Metrics and Census Information," Urban Studies, Vol 45, No. 3, pp 659-692.
Taubenböck, Hannes, Martin Wegmann, Achim Roth, Harald Mehl, and Stefan Dech (2009): "Urbanization in India-Spatiotemporal Analysis Using Remote Sensing Data," Computers, Environment And Urban Systems, 33, No. 3, pp 179-188.

Goals and objectives of the session:

The session, encompassing four studies on Bengaluru's peri-urban ecosystems aims
-To highlight the perils of unplanned urbanisation in the rapidly developing Asian countries, using Bengaluru as a case .
-To provide inputs for a reorientation of the vision underlying urban planning process in Bengaluru, that appreciates ecosystem functions and their services
-To discuss mechanisms to incentivize institutions and programmes that consciously attempt to preserve and augment ecosystem service flows

Planned output / Deliverables:

Special issue of a peer reviewed journal/ policy brief/ article in a peer-reviewed journal

Related to ESP Working Group/Natioanl Network:

Biome Working Groups

II. SESSION PROGRAM

Date of session: Thursday, 11 October 2018

Time of session: 09:00 – 11:00

Time	First name	Surname	Organization	Title of presentation
9:00-9:10	Ruchi	Badola	Wildlife Institute of India	Session introduction
9:10-9:35	Seema	Mundoli	Azim Premji University, Bangalore	Valuing ecosystem services in peri-urban Bengaluru: Nature in the city as urban commons
9:35-10:00	Sunil	Nautiyal	Institute for Social and Economic Change, Bangalore	Structure and composition of field margin vegetation under changing environment: A case study from north corridor of Bengaluru
10:00-10:25	Chethana	Casiker	Ashoka Trust for Research in Ecology and the Environment (ATREE)	Can the current trends of urbanization in Bangalore support pollination service?
10:25-10:50	Dhanya	Bhaskar	Azim Premji University, Bangalore	Agro-ecological changes in peri-urban Bengaluru: Implications for urban planning and policy
10:50-11:00				Concluding remarks

* For all presentations, 15 minutes presentation + 10 minutes discussion

III. ABSTRACTS

Abstracts are clustered based on the last name of the authors. First authors are presenting authors unless indicated otherwise.

1. Type of submission: Invited speaker abstract

B. Biome Working Group sessions: Invited speaker abstract only : B10a - Integrating ecosystems and their services in peri-urban planning and policy in Bengaluru, India

Agro-ecological changes in peri-urban Bengaluru: Implications for urban planning and policy

First authors(s): Dhanya Bhaskar,
Other author(s): Sheetal Patil, Shwetha AR, Raghavendra Vanjari and Seema Purushothaman
Affiliation: Azim Premji University School of Development, Azim Premji University, Bengaluru, India, , India
Contact: dhanya.b@apu.edu.in

Unprecedented expansion of urban peripheries into rural landscapes has profoundly impacted agrarian systems and associated ecosystem services in the rural-urban interfaces (RUI) of Bengaluru, India's fastest growing metropolis. Growing urban demand for land, labour, water and certain commodities drive peri-urban agriculture in unanticipated directions. For small farmers in RUI, balancing the trade-offs between ecosystem services in the context of urbanization pose a serious challenge that impinge on sustainability of farming as a livelihood option.

We trace the spatio- temporal patterns in agricultural transformations and associated ecosystem service changes triggered by urbanization in Bengaluru's peripheries using a combination of spatial landuse analysis and exploratory interactions in 34 locations in RUI. Locations were sampled in two transects in North and South directions form the city, using a composite stratification index based on a) distance from city centre and b) percent built up area along the rural-urban gradient. Change in land-use during the period 1992-2016 in the transects was analysed in a QGIS platform employing multi-spectral data of Landsat TM and Landsat ETM+ with spatial resolution of 30 m for the years 1992, 2000, 2011 and 10 m for 2016-17.

The paper unravels the varying dynamics of urban built-up and agricultural land-use changes in both transects, and correspondingly varying impacts on agroecosystem services and farming livelihoods. The Southern direction was found richer in agroecological services, and prevalence of farming livelihoods compared to North. The paper attempts to elucidate biophysical and socio-economic determinants of the observed gradients in agroecosystem services. Further, we discuss agro-ecological implications of existing and proposed urban planning and policy strategies for Bengaluru and suggest potential trajectories of urbanization compatible with peri-urban agroecological integrity in Bengaluru.

Keywords: agroecosystem services, urbanisation, rural-urban interface, landuse, small farmers

2. Type of submission: Invited speaker abstract

B. Biome Working Group sessions: Invited speaker abstract only : B10a - Integrating ecosystems and their services in peri-urban planning and policy in Bengaluru, India

Can the current trends of urbanization in Bangalore support pollination service?

First authors(s): Chethana Casiker,
Other author(s): Jagadishakumara B, Sunil G M, Marco Sciaini, Kerstin Wiegand, Seena Narayanan, Priyadarsanan Dharma Rajan, Soubadra Devy
Affiliation: Ashoka Trust for Research in Ecology and the Environment (ATREE) Ashoka Trust for Research in Ecology and the Environment (ATREE), , India
Contact: chethanacasiker@atree.org

Around 75% of the world's crops are pollinated by insects, especially bees. Although pollinators have been widely studied in agricultural systems, few studies have focused on pollinator ecology in urban landscapes and services provided by pollinators. Urbanization, along with agricultural intensification has resulted in the loss of natural habitats and reduced the diversity of floral resources, leading to a decline in pollinators. Recent studies have shown that urban areas are in fact capable of supporting a surprisingly high number of pollinator species. In the light of disappearing natural habitats, it is crucial to understand how urban spaces can support these taxa. Here, we examine the relationship between landscape and bee community dynamics with respect to key variables such as degree of

urbanization, land use practices, and floral resources.

Our study focuses on the changes in bee species diversity and richness along a rural-urban gradient in Bangalore. Although biotic characteristics of habitats are undoubtedly important, incorporating a landscape analysis approach could reveal further patterns in pollinator diversity. We are sampling bees along a gradient of urbanization and trying to correlate bee community metrics with data on socio-ecological variables. Using questionnaire interviews, we are also looking at people's perception and dependence on pollinators.

As large chunks of natural and/or agricultural land is rapidly being built up, it becomes imperative to preserve pollinator diversity within human-dominated landscapes. With our study, we hope to come up with strategies for conservation of bees in urban spaces. City-scale planning and collective efforts from the community are essential for ensuring food security. Our work will offer insights on the feasibility of efforts such as `locavory' and `innovative urban gardens' that could potentially help maintain pollinator-friendly resource patches in cities.

Keywords: pollination, urbanization, bee, food security

3. Type of submission: Invited speaker abstract

B. Biome Working Group sessions: B10a - Integrating ecosystems and their services in peri-urban planning and policy in Bengaluru, India

Valuing ecosystem services in peri-urban Bengaluru: Nature in the city as urban commons

First authors(s): Seema Mundoli,
Other author(s): Professor Harini Nagendra
Affiliation: Azim Premji University Azim Premji University, , India
Contact: seema.mundoli@apu.edu.in

Ecosystem services are the benefits that people derive from nature. However, different people also assign varying values to these benefits resulting in contestations. The ecosystem services derived from peri-urban green spaces are especially contested owing to the spatial location. Contestations are most evident in the case of provisioning and cultural ecosystem services, and even within cultural ecosystem services itself. We present here findings from our research on green spaces in a spectrum of the peri-urban interface such as lakes and wooded groves in Bengaluru, one of the fastest growing cities situated in southern India, to highlight the complexities in use and access of peri-urban ecosystems. In our research, we conceptualize these green spaces as common pool resources (henceforth per-urban commons) owing to history of communal use, care and governance of these spaces. We find that the spatial and demographic expansion of the city over the decades has altered people's relationships with peri-urban commons with differential impacts. There is an increasing prioritization of commons as sites for recreation, a cultural ecosystem service, to the detriment of provisioning ecosystems services that supported traditional livelihoods and subsistence. Further, even within cultural ecosystem services there is limited acknowledgement of the sacred and cultural importance of these commons for traditional communities and for migrants. The limited focus on the peri-urban itself and failure of urban planning and city dwellers in acknowledging the importance of provisioning and certain cultural ecosystem services of these commons has resulted in exclusion of urban vulnerable groups and traditional communities. We argue for a re-conceptualization of nature in cities in order to accommodate different values that people give to ecosystem services supported by nature. Importantly, while being located in cities, we urge for a commons outlook towards governance of peri-urban ecosystems in cities.

Keywords: ecosystem services, peri-urban, commons, governance, Bengaluru

4. Type of submission: Invited speaker abstract

B. Biome Working Group sessions: Invited speaker abstract only : B10a - Integrating ecosystems and their services in peri-urban planning and policy in Bengaluru, India

Structure and composition of field margin vegetation under changing environment: A case study from north corridor of Bengaluru

First authors(s): Sunil Nautiyal,
Other author(s): Rama Rao Nidamanuri, Rahisha Thottolil, Thomas Moeckel, Andreas Buerkert, Michael Wachendorf
Affiliation: FSD CEENR, ISEC, , Netherlands
Contact: bekchanova1993@gmail.com

Field Margin Vegetation (FMV) is the interface between the agriculture and natural environment. The various species present in field boundary are characterised with greater versatility in the use of different hosts. It provides sheets for crops by preventing erosion, acting as a windbreak or barrier to the non-point sources of pollution into the field, so retaining it is important. It will clearly define the field boundary and it protects the land from the depletion of nutrients and water resources. Plethora of research works are extensively carried out on management of field margins in European countries with an aim of field level biodiversity conservation and enhancing agronomic benefits. India is lagging behind in the management strategies of field margins and extensive research has to be carried to achieve biodiversity conservation on field margins in an economical and logistical manner. Mapping of field margin vegetation and change detection of vegetation using remote sensing and geo-informatics technique is a cost-effective approach. This method can obtain a clear understanding of the land cover alteration processes due to urbanization and their consequences. This research focused on assessing landscape transformation in northern transect of Bangalore, over 27 year period (1991-2018). LANDSAT Satellite imageries (of 30m resolution) covering the area were characterized into two classes (vegetation and others) and classification performs with NDVI and SAVI (L=0.5). The result of the comparison of the four images showed that vegetation increased by 43%. Detailed analysis of FMV is undertaken in the 13.5% area of total study region. Randomly selected 109 field margin boundaries were delineated from high resolution World View 3 for the year

2017 and Google earth images for the year 2005. The vegetation area under field margin is 32.91 Ha in 2005 and decreased to 30.17 Ha in 2017. To sum up, field margin vegetation has reduced by 2.74 Ha over 12 years. In addition to that, classified the species richness and composition in the field margin and categorized into three main types of communities such as trees, shrubs and herbs based on its physical characteristics. The Phyto-sociological studies were repeated in a total of ten plots in six villages. Combining information from the entire field increased the statistical power within the field margin. To investigate the potential use of FMV, questionnaire survey has been conducted in each village. This research highlights the conservation of FMV and decreasing rate of FMV by anthropogenic activities and the need to apprehend the situation to ensure sustainable management while maintaining structure and function of vegetation composition towards ensuring sustainable agro-ecological development.

Keywords: Field Margin Vegetation, World View 3, NDVI and SAVI, Phytosociology