CITY BIO DIVERSITY INDEX & ITS LINKAGE TO REAL ESTATE PRICING

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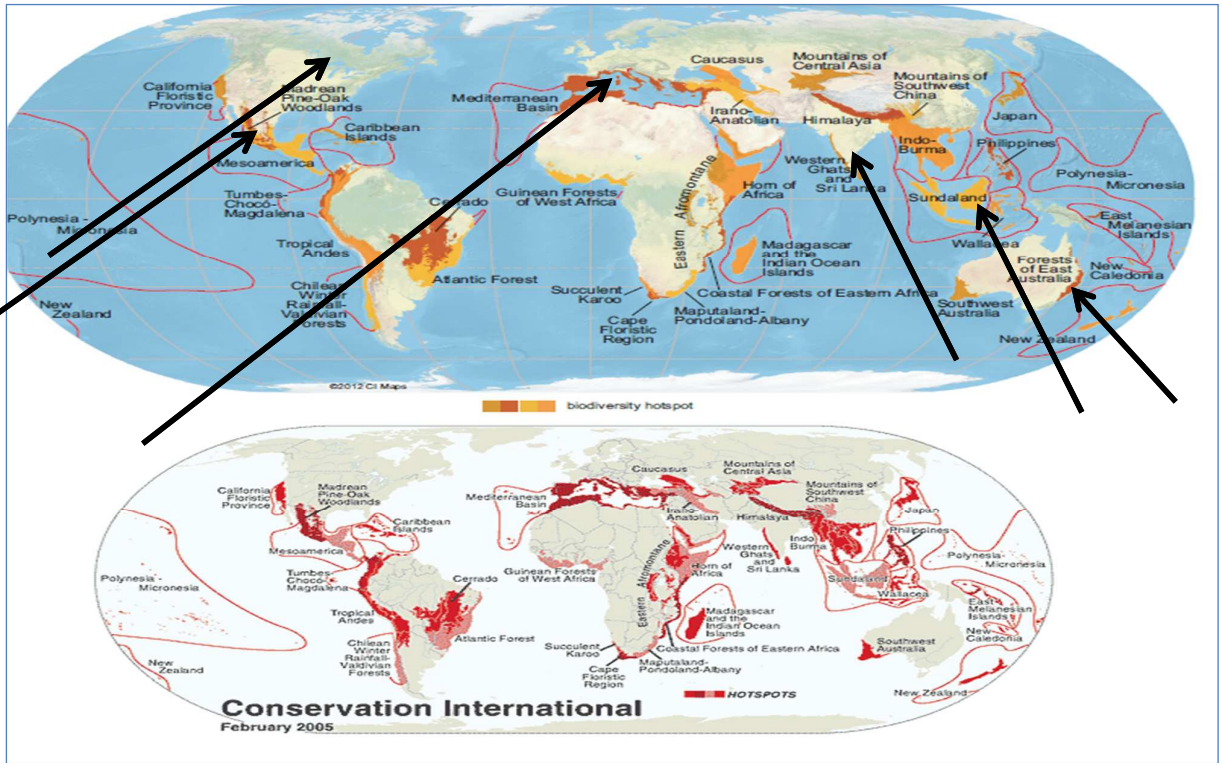
The term 'biodiversity' is a short form for biological diversity and includes all life forms - mammals, birds, reptiles, amphibia

SCOPE

- To understand direct impacts of biodiversity degradation on commercial real estate.
- A quantification method by linking biodiversity indices to real estate market indices
- To analyze prices in global real estate market

BIODIVERSITY HOTSPOTS - GLOBE



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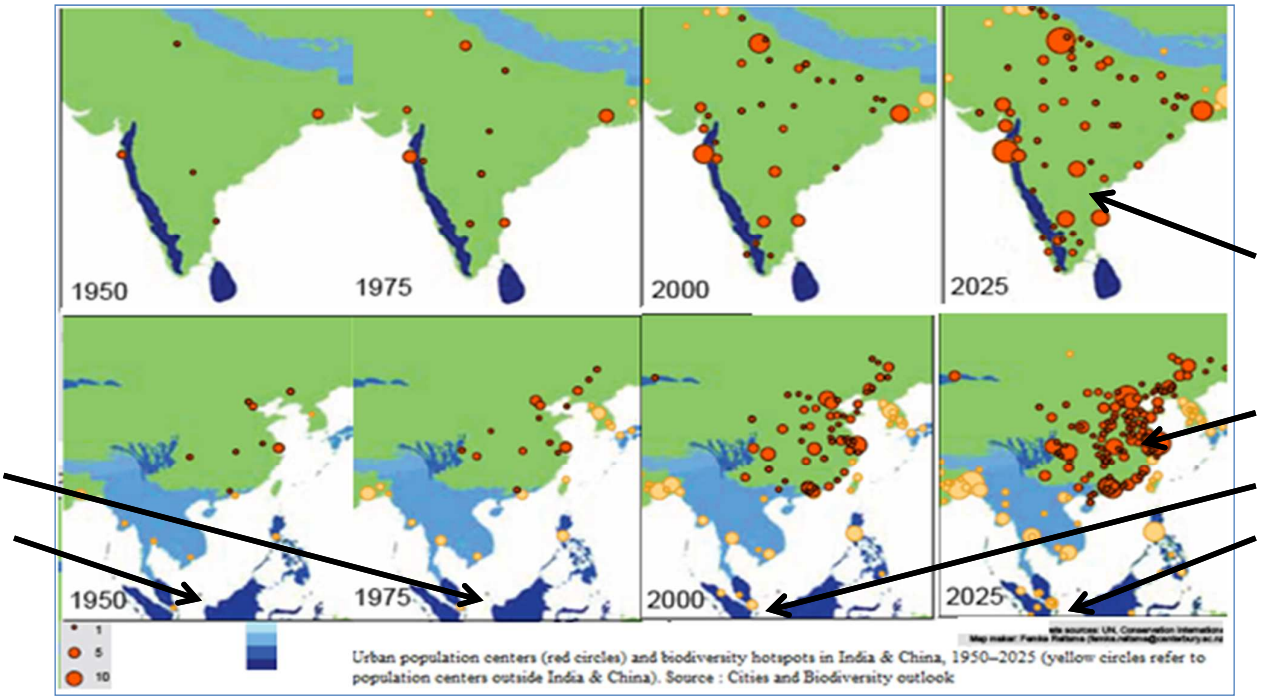
BIODIVERSITY HOTSPOTS - ASIA



Urban population centers (red circles) and biodiversity hotspots in India & China, 1950–2025 (yellow circles refer to population centers outside India & China). Source : Cities and Biodiversity outlook

CITY BIODIVERSITY INDEX - SINGAPORE

- The index is not restricted to cities and can be applied at different scales.

For example Singapore has used the index at the sub-city level, in the master planning of the new districts.

Master planning of the country like Singapore also supported its real estate market representatives to comprehensively in development of real estate pricing index.

There were 23 indicators that were considered in the development of the Singapore's city biodiversity index. (COP11, 2012; Lena chan 2012)

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Cities which have provided their results for the Singapore Index

1. Belgium: Brussels Capital Region
2. Brazil: Curitiba
3. Canada: Calgary
4. Canada: Edmonton
5. Canada: Montreal
6. Estonia: Tallinn
7. France: Montpellier
8. Germany: Frankfurt
9. Germany: Heidelberg
10. India: Mira Bhayandar
11. Indonesia: Bandung
12. Japan: Chiba
13. Japan: Fukuoka
14. Japan: Hiroshima
15. Japan: Kawasaki
16. Japan: Kitakyusyu
17. Japan: Kobe
18. Japan: Kyoto
19. Japan: Nagoya
20. Japan: Osaka
21. Japan: Sapporo
22. Japan: Sendai
23. Japan: Tokyo
24. Japan: Yokohoma
25. New Zealand: Auckland
26. New Zealand: Hamilton
27. New Zealand: Waitakere City
28. Portugal: Lisbon
29. Singapore
30. South Africa: Durban
31. Thailand: Bangkok
32. Thailand: Chiang Mai
33. Thailand: Krabi
34. Thailand: Phuket
35. United Kingdom: Edinburgh
36. United Kingdom: London

Cities which have agreed to apply the Singapore Index

1. Australia: Joondalup
2. Cambodia: Phnom Penh
3. Cambodia: Siem Reap
4. Canada: Calgary
5. Canada: Ottawa
6. Canada: Vancouver
7. China: HePing
8. China: Hong Kong
9. European cities participating in the European Capitals of Biodiversity Competition (from five countries – France, Germany, Hungary, Spain and Slovakia)
10. Finland: Helsinki
11. France: French Regions
12. France: Paris
13. Guatemala: Guatemala City
14. India: Hyderabad
15. India: Thane Municipal Corporation
16. India: Visakhapatnam
17. Indonesia: Padang
18. Indonesia: Pekanbaru
19. Israel: Jerusalem
20. Lao PDR: Luang Prabang
21. Lao PDR: Vientiane
22. Lao PDR: Xayaboury
23. Malaysia: Kuantan
24. Malaysia: Sibu
25. Mexico: Mexico City
26. Netherlands: Amsterdam
27. New Zealand: Plymouth
28. New Zealand: Wellington
29. Philippines: Iloilo City
30. Philippines: Puerto Princesa City
31. Philippines: Quezon City
32. Portugal: Porto
33. South Africa: Johannesburg
34. Spain: Barcelona
35. Spain: Ourense
36. Sweden: Stockholm
37. Sweden: Malmo
38. USA: New York
39. Viet Nam: Danang
40. Viet Nam: Hanoi

CITY BIO DIVERSITY INDEX - 23 INDICATORS

Indicator 1: proportion of natural areas in city	**Indicator 15: budget allocated to biodiversity**
Indicator 2: connectivity measures or ecological networks to counter fragmentation	**Indicator 16: number of biodiversity projects implemented by the city annually**
Indicator 3: native biodiversity in built-up areas bird species	**Indicator 17: policy, rules and regulations – existence of local biodiversity strategy and action plan**
Indicators 4-8: change in number of native species vascular plants, birds, butterflies, reptiles, fresh water fishes	**Indicator 18: institutional capacity: number of essential biodiversity-related functionaries in the city**
Indicator 9: proportion of protected natural areas	**Indicator 19: institutional capacity: number of city or local government agencies involved in inter-agency cooperation pertaining to biodiversity matters**
Indicator 10: proportion of invasive alien species (as opposed to native species)	**Indicator 20: participation and partnership existence and state of formal or informal public consultation process**
Indicator 11: regulation of quantity of water	**Indicator 21: participation and partnership number of agencies/ private companies/ ngos/ academic institutions/ international organisations with which the city is partnering in biodiversity activities, projects and programmes**
Indicator 12: climate regulation: carbon storage and cooling effect of vegetation	**Indicator 22: Is biodiversity or nature awareness is included in the school curriculum (e.g. biology, geography, etc.)**
Indicator 13: recreational and educational services (area of parks with natural areas and protected or secured natural areas)*/ 1000 persons)	**Indicator 23: Number of outreach or public awareness events held in the city per year**
Indicator 14: recreational and educational services (number of formal educational visits per child to parks)	

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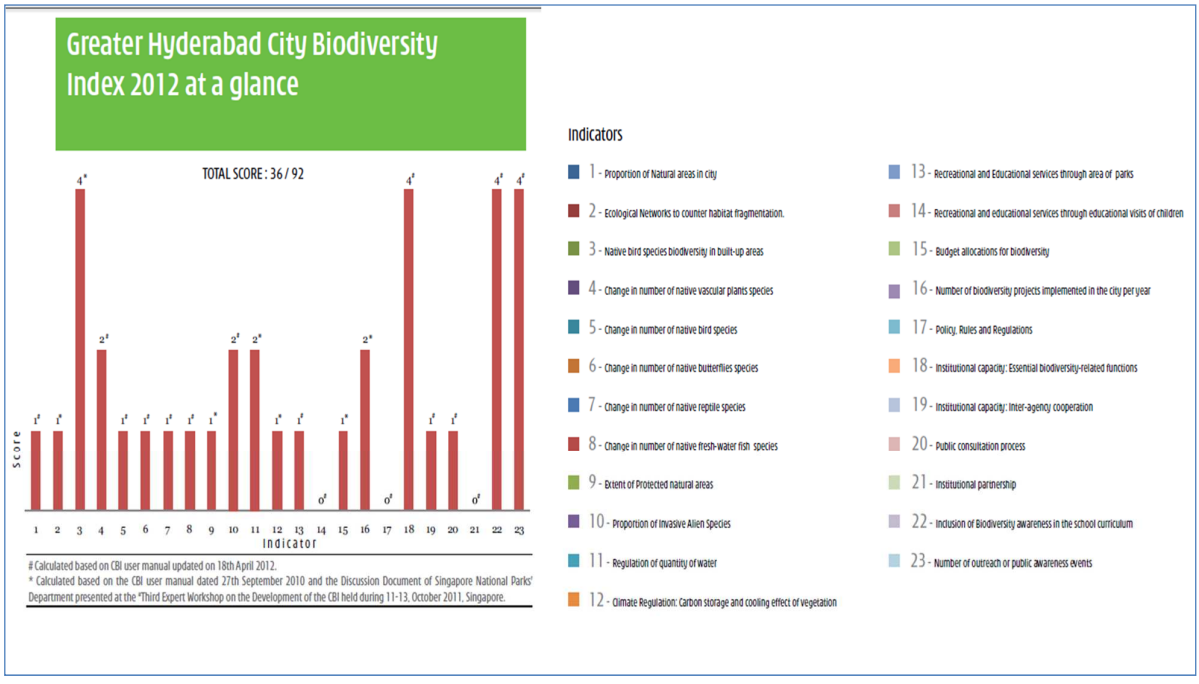
CITY BIODIVERSITY INDEX - HYDERABAD



CITY BIO DIVERSITY INDEX (CBI)INDICATORS – REAL ESTATE INDEX PRICING

Indicators of city biodiversity index (CBI) that have direct or indirect linkage to real estate prices are

•Indicator 1 – proportion of natural areas in the city
•Indicator 3 – native biodiversity in built-up areas
•Indicator 9 – proportion of protected natural areas
•Indicator 11- regulation of quantity of water
•Indicator 12 – climate regulation carbon storage and cooling effect of vegetation that aids corporate sustainability strategy of a company.
•Indicator 13-14 : recreational and educational services
•Indicator 15 – budget allocated to biodiversity in cities
•Indicator 17 – policy, rules & regulations : existence of local biodiversity strategy & action plan.

•Declining trends in overall ecosystem health is of direct concern to businesses not only because many depend on related services, either directly or indirectly, but also because the degradation of ecosystems can present some of the following risks or opportunities. (Carolyne Lane, 2009)

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RISKS AND INDICATORS

Operational	**Regulatory and legal**
Risks: Indicator 11- regulation of quantity of water leads to risks such as higher costs for services as regulations in quality of water whenever the quantity of water is scarce. Opportunities: Planning for water use efficiency and cost savings	Risks: Fines, new user fees, etc to companies Opportunities: Indicator 17 – policy, rules and regulations : existence of local biodiversity strategy and action plan upon which a company depends
Marketing and Sales	**Finance**
Risk: Change in the purchasing patterns as companies being targeted by non-governmental organizations that result in degradations to natural systems, Customers switching to other suppliers that offer products with lower ecosystem impacts. Opportunities: Indicator 16: Number of biodiversity projects implemented by the city annually as it is a measure of communicating sustainable practices participating in innovative programs that focus on sustainability	Risks: Banks implementing rigorous lending requirements Opportunities: Indicators 20-21: Participation and partnership is a measure of banks or government agencies offering incentives to those companies that adopt initiatives that reduce environmental impacts or are aimed at enhancing degraded ecosystems.

TOTAL ECONOMIC VALUE - BIODIVERSITY

• Total economic value of an environmental resource (ecosystem) consists of its use value (UV) and non-use value (NUV).

• A use value (UV) is a value arising from an actual use made of a given resource.
• Use values are further divided in to direct use values (DUV), which refer to actual uses ;
• Indirect use value (IUV) which refer to the benefits deriving from ecosystem functions
• Option value (OV) which is a value approximating an individual's willingness to pay to safeguard an asset for the option of using it at a future date, like an insurance value.

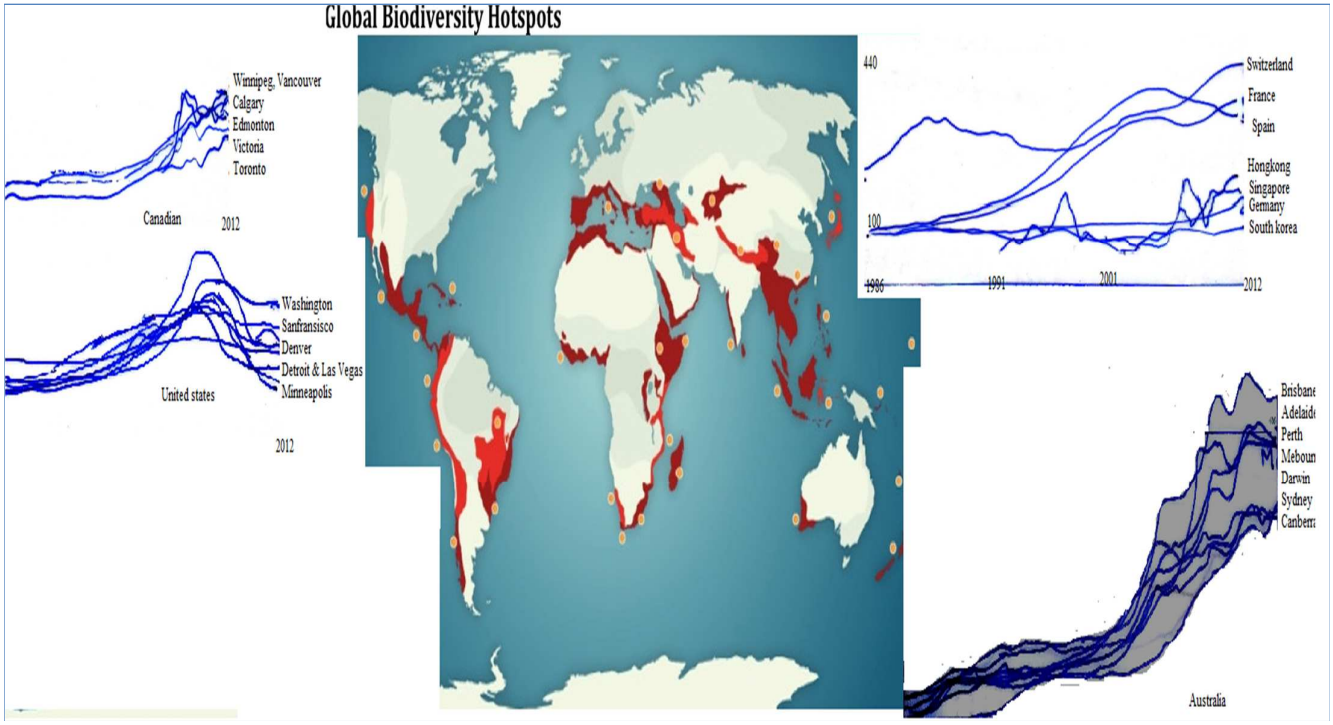
• NUV are usually divided between a bequest value (BV) and an existence or 'passive' use value (XV).

• The total economic value : TEV = UV+NUV=(DUV+IUV+OV)+(XV+BV)

TOTAL ECONOMIC VALUE - BIODIVERSITY

•The ecosystem valuation methods that relates to real estate are hedonic methods that consider housing market and the extra amount paid for higher environmental quality.
•The price of a house is related to the
characteristics of the house and property itself,
characteristics of the neighborhood and community,
environmental characteristics.
•Some of the indicators of CBI can be directly linked to the quality indicators in the real estate pricing index.

GLOBAL BIODIVERSITY HOTSPOTS – REAL ESTATE PRICING



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CONCLUSIONS – FURTHER RESEARCH

Studies in North America also confirmed that biodiversity affects real estate value "the Halstead Property Company, the single amenity that added the most value to a Manhattan apartment was a good park or river view. Based on the study, a view above the tree line allowed identical apartments to sell for as much as 20 percent higher" (Patrick L.Phillips, 2000)

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