

International Workshop

TOWARDS SCENARIOS FOR URBAN ADAPTATION PLANNING Assessing seawater intrusion under climate and land cover changes in Dar es Salaam, Tanzania



ASSESSING URBAN SPRAWL Rome, 22 April 2013





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Urban Sprawl Definition (1/2)

 Urban Sprawl is the incremental urban development in suburban and rural areas outside of their respective urban centres, characterised by a low density mix of land uses on the urban fringe, often accompanied by a lack of redevelopment or re-use of land within the urban centres themselves. Even if planned, urban development outside a city's boundaries results in land take and soil sealing, but normally causes less environmental burden (European Commission, 2012).



Urban Sprawl Definition (2/2)

 Urban Sprawl happens when population growth and the physical expansion of a city are misaligned (UN -Habitat, 2010)









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Urban Sprawl Main Drivers (EU)

- New housing, industry, business locations and transport infrastructure
- Better quality of life and living standards
- Changing lifestyles and consumption patterns
- Urban development model based on city expansion
- Increased use of private vehicles lack of good public transport
- Urbanisation fees and levies
- High land prices within city boundaries
- Agricultural land surrounding cities is often under-priced
- Weaker regulatory protection for agricultural land than for forests and natural areas
- Lack of appreciation for the value of soil as a limited resource



Scheme of Migration within Dar es Salaam Region





Percentage of landscape (PLAN)	Sudhira, 2004				
	McGarigal et al., 2002; Hai & Yamaguchi, 2008; Ji, 2008 Huang, 2007, W.Yue et al. 2013, Wu				
Largest patch index (LPI)	2004				
Centrality (CENTRALITY)	Huang, 2007				
Fractal dimension (FRAC)	Torrens & Alberti, 2000; McGarigal et al., 2002				
Compactness index of the largest patch (CILP)	Li & Yeh, 2004; Huang, 2007				
Shape index (SHAPE)	McGarigal et al., 2002				
Linearity (LINEAR)	McGarigal et al., 2002				
Area Weighted Mean Shape Index (AWMSI)	Xin Li et al. 200, Malinverni et. al. 201, Wei Wei et. al. 2009, Fei 2011				
Area Weighted Mean Patch Fractal Dimension					
(AWMPFD)	Xin Li et al. 200, Wei Wei et. al. 2009				
Related circumscribing circle (CIRCLE)	McGarigal et al., 2002				
	Li & Yeh, 2004; Sudhira, 2004; Bhatta et al., 2010; Verzosa & Gonzalez, 2010, W.Yue et al.				
Shannon's entropy (Hi)	2013, Wu 2004, Wei Wei et. al. 2009				
Relative entropy (H'i)	Bhatta, 2010				
Mean Nearest Neighbor (MNN)	Xin Li et al. 2001				
Ratio of open space (ROS)	Huang, 2007				
Interspersion and juxtaposition (IJI)	Torrens & Alberti, 2000, Xin Li et al. 2001				
Number of patches (NP)	Herold et al., 2003; Hai & Yamaguchi, 2008; Ji, 2008				
Patch density (PD)	Eiden et al., 2000; Ji, 2008, Wu 2004				
Edge density (ED)	Eiden et al., 2000; Herold et al.,2003; Hai & Yamaguchi, 2008, Fei 2011				
Mean patch size (MPS)	Torrens & Alberti, 2000, Xin Li et al. 200, Malinverni et. al. 201, Wei Wei et. al. 2009, Fei 2011				
Division (DIVISION)	Jager, 2000; McGarigal et al., 2002				
Effective mesh size (Meff)	Jager, 2000; McGarigal et al., 2002				
Density of roads (L)	EEA, 2011				
Urban fragmentation index (uFI)	Romano, 2002				
Infrastructural fragmentation index (IFI)	Romano, 2002				
Simpson's diversity index (SIDI)	McGarigal et al., 2002				
	Eiden et al., 2000; Torrens & Alberti, 2000; McGarigal et al., 2002 W.Yue et al. 2013, Wu 2004,				
Shannon's diversity index (SHDI)	Wei Wei et. al. 2009				
Number of classes (NC)	Eiden et al., 2000; McGarigal et al., 2002				
Patch Size Standard Deviation (PSSD)	Malinverni et. al. 2011				
Evenness (Es)	Torrens & Alberti, 2000; McGarigal et al., 2002				
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 Aree interessate da *urban sprawl*: aree in cui la popolazione sparsa è in aumento e la SAU in diminuzione o in aumento meno che proporzionale (Istat, 2013). In 1985 the Corine programme was initiated in the European Union. Corine means 'coordination of information on the environment' and it was a prototype project working on many different environmental issues. The Corine databases and several of its programmes have been taken over by the EEA. One of these is an inventory of land cover in 44 classes, and presented as a cartographic product, at a scale of 1:100 000. This database is operationally available for most areas of Europe.











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Population Estimation: Results

- Population estimates in Dar es Salaam from 2002 to 2011
- Comparison between estimates and census: margin of error ±15%
- Comparison between estimates and projections



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Population Estimation: Results at Municipal Level

Comparison between estimate and census: margin of error ±25%



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Increase of built-up LC classes

	Area 2002 [ha]	Area 2011 [ha]	Growth (%)
Continuously Built-up	8,415	14,808	+76
Discontinuously Built-up	8,098	23,678	+192

• LCC from 2002 to 2011

Land Cover Change Class	Area [ha]
Discontinuously Built-up converted to Continuously Built-up (2002-2011)	2,856
Non-urban converted to Continuously Built-up (2002-2011)	5,550
Non-urban converted to Discontinuously Built-up (2002-2011)	15,580

Urban Sprawl Indicator

IIrhan Snrawl Indice	$tor = \frac{Dis}{m}$	Discontinuously Built – up area * 100					
0 1 b an op 1 an t 1 have		Total Urban area					Rome
Year	2002	2004	2007	2009	2011		(2006):
Urban Sprawl Indicator [%]	49.0	47.7	54.5	58.3	61.5		35.0

Thank you



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