

Research

Past, present, future: engagement with sustainable urban development through 35 city labels in the scientific literature 1990-2019

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SUPPLEMENTARY RESEARCH DATA A: Selection of City Labels

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Selection of City Labels

1. Selection criteria

The definition of city label used in this study is as follows:

City label (def.) *a classifying phrase that succinctly expresses essential features of urban development goals*

The following **three joint criteria** were used to select city labels for inclusion in the bibliometric analysis. These criteria were primarily derived from de Jong et al (2015)¹.

- i. The selected labels must conceptually relate to (aspects of) sustainable urban development; i.e. encapsulate one approach or another to addressing issues and challenges of contemporary urbanisation
- ii. They must have an established, conceptual presence in the academic literature, checked against manual keyword searches on Google Scholar
- iii. They must resonate in policy and practice discourse, such as reflected by policy initiatives (e.g. ‘100 Resilient Cities’ by Rockefeller Foundation; ‘Global Future Cities Programme’ by UN Habitat).

2. Existing list of city labels

A preliminary list of city labels was put together based on three previous bibliometric studies that used multiple city categories relating to sustainable-smart urban development, namely de Jong et al. (2015) (twelve categories); Fu & Zhang (2017) (five categories); and Wang et al. (2019) (seven categories)².

Baseline of 12 city labels:

- Digital city
- Eco city
- Green city
- Information city
- Intelligent city
- Knowledge city
- Liveable city
- Low carbon city
- Resilient city
- Smart city
- Sustainable city
- Ubiquitous city

¹ De Jong, M., Joss, S., Schraven, D., Zhan, C., Weijnen, M. 2015. Sustainable-smart-resilient-low carbon-eco-knowledge cities; Making sense of a multitude of concepts promoting sustainable urbanization. *Journal of Cleaner Production*, 109, 25-38.

² De Jong et al. (2015) – see footnote 1. Wang, M.-H., Ho, Y.-S., Fu, H.-Z. 2019. Global performance and development on sustainable city based on natural science and social science research: A bibliometric analysis. *Science of the Total Environment*, 666, 1245-1254. Fu, Y., Zhang, X. 2017. Trajectory of urban sustainability concepts: A 35-year bibliometric analysis. *Cities*, 60, 113-123.

Since de Jong et al. (2015) had already established and applied the three selection criteria in their original study, the resulting 12 city labels (shown above) did not require any further checks and, thus, were included automatically. (The overlapping labels identified by Fu & Zhang 2017, and Wang et al. 2019, also included in the above list, provided further corroboration).

3. Manual addition of city labels

Based upon the researchers' expertise, the following additional city labels were considered, as they meet criterion 1 (addressing aspects of urban transformation/sustainable urban development).

Re: criterion 2, the city labels were checked in Google Scholar. If it was determined that a given city label did not have a sufficiently significant presence as established category, this was marked as No (red), and the city label therefore excluded from selection (without further checking criterion 3).

Re: criterion 3, where criterion 2 was marked green (clear evidence) or yellow (borderline case), criterion 3 was used to check for resonance in policy discourse; if that, too, was marked Yes (green) then the label was selected overall.

The three authors triangulated the assessment among themselves, in order to achieve a robust basis for selection. Needless to say, this involved a degree of qualitative judgement, albeit based on factual evidence. The colour coding below indicates the assessment rationale.

(This process took place in June-August 2019.)

RESULT: 13 city labels added:

Green = both criteria fulfilled; *therefore add to list*

Yellow = criteria only partially met, therefore borderline (to discuss/decide)

Red = criteria not met; therefore to not add to list

Category	Criterion 2 (academic lit.)	Criterion 3 (policy lit.)
Circular city	YES – e.g. <ul style="list-style-type: none"> • UCL Circular City Research Lab • Circular-city.eu (Horizon 2020 programme) • Numerous papers (1.9m hit counts on GoogleScholar) 	YES – e.g. <ul style="list-style-type: none"> • McArthur Foundation • Peterborough city • Amsterdam smart city • Circle Cities platform • World Economic Forum
Compact city	Yes – e.g. <ul style="list-style-type: none"> • Numerous papers, going back 3 decades (1.4m hit counts on GS) • LSE cities (and numerous other academic initiatives) 	Yes – e.g. <ul style="list-style-type: none"> • OECD report (2012) • OECD report • World Bank (2012) • LafargeHolcim Foundation
Regenerative city	Yes (albeit less pronounced) – e.g. <ul style="list-style-type: none"> • Academy of Urbanism • RegenCities • Various papers (186K hits on GS), with Girardet, and Newman, key authors 	Yes – e.g. <ul style="list-style-type: none"> • UN Habitat • World Future Council ('Cities Commission for RC') • Biophilia Foundation

Inclusive city	Yes – e.g. <ul style="list-style-type: none"> Inclusive Cities @ Oxford University Numerous papers, going back 2 decades (2m hits on GS) 	Yes – e.g. <ul style="list-style-type: none"> Inclusiveurbanism.org World Bank Wilson Centre
Experimental city (including, as policy uses ‘urban experiments’)	Yes – e.g. <ul style="list-style-type: none"> Numerous papers, earliest in 1960s (4.5m hits on GS) 	Limited – e.g. <ul style="list-style-type: none"> Minnesota Experimental City No UN/OECD/World Bank evidence N.b. ‘urban experiments’/experimentation is frequently mentioned
Sharing city	Yes – e.g. <ul style="list-style-type: none"> Baber et al (2005) Various papers (3.4m hits on GS) 	Yes – e.g. <ul style="list-style-type: none"> Sharing Cities Alliance Sharing Cities: Eurocities initiative Sharing Cities Sweden NESTA (UK) report OECD (‘shared use city’) Smart City Expo (‘inclusive & sharing cities’) Friends of the Earth
Sponge city (n.b. regionally limited)	Yes <ul style="list-style-type: none"> Concept mainly developed in China, but also applied in Australia. Various papers, but limited (127K hits on GS) 	Yes – e.g. <ul style="list-style-type: none"> World Future Council Atkins Global Australia-China Sponge City Consortium Australian Water Partnership
Safer city (suggest leaving this out, but noting in paper)	No <ul style="list-style-type: none"> Multiple papers on ‘safer city centres’, but not as such a conceptual term ‘safer city’ 	Yes <ul style="list-style-type: none"> UN Habitat programme (launched 1996) Global Network on Safer Cities (UN)
Slim City	No	Limited (Arup @ WEF 2011)
Creative City	YES (3.4m hits on GS)	Yes <ul style="list-style-type: none"> UNESCO Creative Cities Creative Cities Index (Charles Landry)
Transition town*	Yes (2.5 m hits on GS)	Limited <ul style="list-style-type: none"> TT Network in 8 countries globally = a <u>movement</u> Can’t find much evidence of <u>policy uptake</u>
Compact city	See above	See above
Entrepreneurial city	Yes (766K hits)	Limited – e.g OECD refers to entrepreneurialism under ‘competitive city’ https://www.oecd.org/cfe/regional-policy/38747575.pdf While frequently mentioned on Google, little evidence of actual policy uptake/embrace

Competitive city	Yes <ul style="list-style-type: none"> • 2.9 mio hits on GS • Concept associated with urban regionalism and agglomeration economics • As such, deals with urban transformation 	Yes (clearly) <ul style="list-style-type: none"> • OECD report mentioned above (so association with entrepreneurialism) • Also, World Bank publications/programmes
Future city	Yes <ul style="list-style-type: none"> • 4.6 mio hits on GS, with publications dating back decades • University institutes, initiatives etc 	Yes <ul style="list-style-type: none"> • Various UK FC policies/initiatives e.g. 'FC Demonstrator' • UN Habitat: Global Future Cities Programme
Virtual city	Yes <ul style="list-style-type: none"> • 2.95 mio hits on GS, with most publications dating back to the 1990s and first half of 2000s (i.e. precursor to smart city?). So, I would expect the corresponding curve to diminish in the 2000s+ 	Limited <ul style="list-style-type: none"> • EU FP7 programme on V-City (3D modelling project) •
Global city	Limited? <ul style="list-style-type: none"> • 4.9 mio hits on GS – so, significant – but it's not about urban transformation: it's about global/world cities. 	Limited <ul style="list-style-type: none"> • Mainly about the world/global city rankings; not about urban transformation policies

**We exclude 'transition towns' as this category explicitly refers to community initiatives (https://en.wikipedia.org/wiki/Transition_town) rather than city-wide interventions; hence also the tag 'town', denoting sub-urban action.*

4. Enlarged list of 148 city labels

An additional, wider verification and selection process was carried out (in September 2019) as follows: the 12 established city labels were used as search query in Scopus to retrieve further city labels from author keywords of retrieved articles. This resulted in 148 city labels (including ones already considered above). The list was systematically checked

- for any duplicates and/or synonyms; e.g. it was thus determined that 'ecological city' is synonymous with 'eco city' and thus not selected as separate category
- against the joint criteria (see above), as basis for selecting additional city labels.

RESULT: 10 city labels added:

N.B. 'No' /red does not necessarily mean that there is no mention in Google Scholar at all. It does mean that it is (a) not used as categorical term (as 'label'), or (a) not in the context of contemporary urban transformation policies.

City Label	Criterion 2: Academic discourse	Criterion 3: Policy discourse	Selection
Accumulative city	No		
Algorithmic city	No		
Art city	No (as part of 'creative city')		
Balanced city	No ('balanced city growth')		
Beautiful city	No ('the city beautiful')		

Biodiversity-conscious city	No		
Biophilic city	Yes (GS 4.6 mio hits)	Medium (network of 16 cities)	Yes
Blue City Index®	No (index; company name)		
Blue Green Cities	No		
Blue-Green Cities	No		
Carbon free city	No (part of low-carbon city)		
Cellular city	No (cellular modelling in cities)		
Changing city	No		
Child-friendly city	Medium (exists, but low count) <i>This does not deal with urban transformation per se. It's about implementation of UN convention on the rights of the child</i>	Yes (Unicef)	
Clean and Green City	No		
Clever city	No (association with smart)		
Colonial city	No (category exists, but not related to contemporary urban transformation)		
Competitive city	Already included		Yes
Connected City	Yes (closely related to smart c)	Medium (CC Alliance/IEEE)	Yes
Contested city	No (category exists, but refers to art/public history)		
Cool city	No		
Creacity	No (low counts 'tourist creativity')		
Creationalising city	No		
Cultural city	Medium ('cultural city' as branding tool)	Yes – but is this about urban transformation?	
Cultural city base	No		
Design City	No		
Developing city	No		
Diffused city	No		
Discontinuous city	No		
Dispersed city	Medium (opposite of compact city)		
Ecological City	Yes (but closely aligned with 'eco-city'). <i>Should this be added as variant of eco-city?</i>	Medium Eco-city builders	Eco City variant
ELITE city	No		
Energic city	No		
Energy city	Low/medium	Yes (European network of >1000 local governments)	
Energy efficient city	No		
Environment-friendly city	No		
Experience city	No		
Fab city	No (however, fab labs)		
Factory city	No		
fantasy city	Low		

Fordist city	No ('post-Fordist' city)		
Fractal city	Low		
Garden city	No (GC exists, but historical perspective)		
Garden-city	No		
Gardens' City	No		
Gate city	No		
Gig city	No		
Global city	No (as this refers to global/world city, not directly linked to urban transformation)		
Healthy city	No		
High-density city	No		
High-tech city	No		
Human Smart Cities	No		
Human-centred city	No		
iCity	No		
Idealised city	No		
Incredible city	No		
Independent city model	No		
Industrial city	No (not as label)		
Infinite city	No (discussion of sprawl city)		
Inner-city	No		
Innovating city	No		
Innovative city	No		
Intercultural city	No/low		
Interethnic city	No		
Intermediary cities	No		
Just city	Yes (but more cultural; less about urban transformation)		
Km4city	No		
Learning City	Yes (related to urban transformation/challenges)	Yes (UNESCO global network)	Yes
Learning city region and learning culture	No (variant of above)		
Legible city	No		
Linear city	No		
Live city	No		
Mainstream city	No		
Marginal city	No		
Millennium city project	No		
Monocentric city	No		
Monocentric city model	No		
Multi-energy city	No		
National Park City	No		
Negotiated city	No		
Neoliberal city	No		
Network city	No		
Network City theory	No		
Networked city	No (refers to an organisation)		

New city	No - too unspecific		
Open city	Yes	Yes – e.g. World Bank ‘open cities project’ and ‘open cities Africa’ network – about open data etc	Yes
OrganiCity	No – this is a medical term discussed in medical journals		
OrganiCity (OC)			
Planning city	No – this refers to verb ‘planning’ as in ‘planning the city’		
Playful city	Yes – refers to design intervention to augment e.g. citizen participation; link to smart & computable city	Yes but limited Eg. Urbact – playful way of addressing urban challenges	Yes
Port city	No – category exists, but not explicitly about urban transformation		
Post-carbon city	Yes (but relatively minor)	Yes (but limited)	Yes
Postcolonial city	No		
Postcolonial new city	No		
Postindustrial city	No		
Post-industrial city	No		
Post-socialist city	No		
Post-socialits city	No		
Pre-oil economy city	No		
Primate city	No – limited GS hits, and literature dating back to 1960s.	No – used for ‘primate city’ (largest city in country/region) rankings	
Productive city	Yes (but minor)	Yes, some (EU, UN)	Yes
Programmed city	No		
Public city	No (high GS hits, but not explicitly about urban transformation/challenges)	No (UN Habitat has programme on Global Public Space but this is more to do with architecture/design)	
Renewable city	Yes	Yes – e.g. Carbon Disclosure Programme’s ‘world renewable energy cities’	Yes
Resource dependent city	No , 3.1 mio hits on GS, mainly Chinese related articles, about industrial cities	Weak – main programme in China	
Resource-based city	No – variation of above		
Resource-exhausted city	No – see above; not a term to denote urban transformation		
Resources-based city	Already listed above		
Safe City	Yes, 3.3 GS hits, about making cities safer	Yes – include ‘safer city’ as variant	Yes
Salutogenic city	No (minor)	No – v limited	
Sanitary city	No – limited, more historical	No – v limited	
Satellite city	No – while high hits, not directly relating to urban transf.		
Science city	No – more dated literature, on enhancing RND in cities		

Second tier city	No - this is about typology, not urban transformation		
Self-aware city	No – low GS hit count		
Self-reliant cities	No – limited GS hit count		
Self-sufficient city	No – limited GS hit count		
Sentient city	No – limited GS hit count		
Single-industry city	No – this is just typology		
Small city	No – this is about city type		
Smart energy city	Variant of ‘smart city’		
Smart human city	Variant of ‘smart city’		
Smart learning city	Variant of ‘smart city’		
Social city	No – ‘social’ used in relation to just city		
Socialist city	No		
Software city	No - v minor GS hit counts		
Solar city	Yes	Yes, medium– e.g. India	Yes
Sports city	No – not about transformation		
Super City	No – limited/irrelevant GS hit counts		
Superimposed city	No		
Sustainable heritage city	No - Variant of heritage city, or sustainable city		
Tech City	No – either Tech City London, or ‘high-tech city’		
Techno-City	No - limited		
Technology-driven city citizen co-creation	No, no a city label		
The borderless city	No – limited GS hit count; not about urban transformation		
The 'solarcity' project	No Refers to project		
Transition Cities	No – not as a label term itself, mostly ‘urban transitions’		
Tri-city	No – refers to border cities; e.g. Tricity in Poland		
Walkable city	No – limited as a label		
Wasted city	No – for obvious reasons		
Water saving city	No – not used as label		
Water-sensitive city	No – medium high GS count, but essentially confined to Australia		
Winter city	No		
Wisdom City	No		
World city	No – refers to city type		
World city network	No - network		
Zero carbon city	Yes – but lower hit count than low carbon city		Yes
Zero-carbon city	Variant of above (but low count)		

5. Overall consolidated list of 35 city labels

Based on sections 1-4 above, a final consolidated list of 35 city labels was obtained, as input into the bibliometric exercise. '[New]' denotes city labels added to the previously established list of 12.

Final selection of 35 city labels:

- Biophilic city [NEW]
- Circular city [NEW]
- Compact city [NEW]
- Competitive city [NEW]
- Connected city [NEW]
- Creative city [NEW]
- Digital city
- Eco city
- Entrepreneurial city [NEW]*
- Experimental city [NEW]*
- Future city [NEW]
- Green city
- Inclusive city [NEW]
- Information city
- Intelligent city
- Knowledge city
- Learning city [NEW]
- Livable city
- Low carbon city
- Open city [NEW]
- Playful city [NEW]
- Post-carbon city [NEW]
- Productive city [NEW]
- Regenerative city [NEW]
- Renewable city [NEW]
- Resilient city
- Safe city [NEW]
- Sharing city [NEW]
- Smart city
- Sponge city [NEW]
- Solar city [NEW]
- Sustainable city
- Ubiquitous city
- Virtual city [NEW]*
- Zero carbon city [NEW]

*=Borderline cases. We include these in the final list because, while they are relatively weak in respect of criterion 3 (policy uptake), they clearly meet criterion 2 (established academic discourse). The latter, after all, is the subject of the bibliometric analysis.