## Cities of Opportunity 7: Definitions & sources

### Intellectual capital and innovation

<table>
<thead>
<tr>
<th>Libraries with public access</th>
<th>Definition:</th>
<th>Number of libraries within each city that are open to the public divided by the total population and then multiplied by 100,000.</th>
</tr>
</thead>
</table>
| Sources:                    |             | OBA Amsterdam Public Library  
International Federation of Arts Councils and Culture Agencies  
World cities culture forum  
City of Chicago  
San Francisco Public Library  
Dubai Culture and Arts Authority  
NPP National Libraries of Indonesia  
Kuala Lumpur Public Library  
PwC Nigeria  
Secretary of Culture, Mexico  
National Institute of Statistic and Geography, Italy  
Seoul Metropolitan Government |

<table>
<thead>
<tr>
<th>Math/Science skills attainment*</th>
<th>Definition:</th>
<th>Top performers’ combined mean scores on the math and science components of the Program for International Student Assessment (PISA), an Organisation for Economic Co-operation and Development (OECD) assessment of 15 year-olds’ academic preparedness. Top performers are defined as those students who achieved in the top two proficiency levels (Level 5 and Level 6) on the math and science portions of the test. Comparable examinations are used wherever possible to place cities not included in the OECD assessment.</th>
</tr>
</thead>
</table>
| Sources:                       |             | OECD PISA Database  
TIMMS 2011 Data Release  
WEF Global Technology Report 2013 |
### Percent of population with higher education

**Definition:**
Number of people who have completed at least a university-level education divided by the population aged 15+. A university-level education is set equivalent to a Bachelor’s degree or higher from a US undergraduate institution.

**Sources:**
- Economische Verkenningen Metropoolregio Amsterdam
- 2013 China National Sample Survey on Population Changes
- Statistisches Bundesamt (2014): Bildungsstand der Bevölkerung
- DANE – National Department of Statistics (Departamento Administrativo Nacional de Estadística)
- U.S. Census Bureau, 2014 American Community Survey
- Government of Dubai
- Hong Kong Census and Statistics Department
- Dinas Kependudukan dan Pencatatan Sipil Provinsi DKI Jakarta
- Statistics of South Africa
- Euromonitor
- Office for National Statistics (UK)
- Ayuntamiento de Madrid. Dirección General de Estadística
- INEGI - Instituto Nacional de Estadística y Geografía
- Comune di Milano
- Russian Statistical Service from 2010 census
- Census India 2011
- Institut National de la Statistique et des Etudes Economiques
- IBGE - Instituto Brasileiro de Geografia e Estatística
- Statistics Seoul
- Ministry of Education Singapore
- Statistics Stockholm
- Australian Bureau of Statistics
- Statistics Japan
- Statistics Canada

### World university rankings

**Definition:**
The *Times Higher Education World University Rankings 2014-2015* powered by Thomson Reuters are the only global university performance tables to judge world class universities across all of their core missions - teaching, research, knowledge transfer and international outlook. The top universities rankings employ 13 carefully calibrated performance indicators to provide the most comprehensive and balanced comparisons available, which are trusted by students, academics, university leaders, industry and governments.

**Sources:**
The *Times Higher Education World University Rankings 2014-2015* powered by Thomson Reuters
### Innovation Cities Index

**Definition:**
The 2thinknow Innovation Cities™ index is composed of 445 cities selected from 1,540 cities based on basic factors of health, wealth, population, geography. The selected cities had data extracted from a city benchmarking data program on 162 indicators. Each of the benchmarking data were scored by analysts using best available qualitative analysis and quantitative statistics. (Where data were unavailable, national or state estimates were used). Data were then trend balanced against 21 global trends. The final index had a zeitgeist (analyst confidence) factor added and the score reduced to a three-factor score for Cultural Assets, Human Infrastructure and Networked Markets. For city classification, these scores were competitively graded into 5 bands (Nexus, Hub, Node, Influencer, Upstart). The top 33% of Nexus and Hub (and selected Node cities of future interest) final graded scores were ranked by analysts based on trends over 2-5 years. A node ranking is considered globally competitive.

**Sources:**
2thinknow Innovation Cities™ Program (2014 Index)

### Intellectual property protection*

**Definition:**
Leading business executives’ responses to the question in the World Economic Forum’s *Global Competitiveness Report 2014-15* that asks, "In your country, how strong is the protection of intellectual property, including anti-counterfeiting measures?" [1 = extremely weak; 7 = extremely strong]. The 2014 edition of the Survey captured the opinions of over 14,000 business leaders in 148 economies between February and June 2014.

**Sources:**

### Entrepreneurial environment*

**Definition:**
The Global Entrepreneurship and Development Index measures the '3A's' of entrepreneurial development: attitudes, aspirations and activity. The index was created by the Global Entrepreneurship and Development Institute to help provide better understanding of economic development by analyzing the contextual nature of business formation, expansion, and growth.

**Sources:**
The Global Entrepreneurship and Development Institute (GEDI Index 2014)

### Technology readiness

### Internet access in schools*

**Definition:**
Leading business executives’ responses to the question in the World Economic Forum’s *Global Competitiveness Report 2014-15* that asks, "In your country, how widespread is Internet access in schools? [1 = nonexistent; 7 = extremely widespread]". The 2014 edition of the Survey captured the opinions of over 14,000 business leaders in 148 economies between February and June 2014.

**Sources:**
### Broadband quality score

**Definition:**
Based on millions of recent test results from Pingtest.net, this global broadband index from Ookla compares and ranks consumer broadband connections around the globe. Our overall broadband index score encompasses the following weighted metrics that were collated over a six-month period to generate an average: upload speed (40%), download speed (40%), quality of connection (10%), and value/cost (10%).

**Sources:**
Ookla - broadband testing and web-based network diagnostic applications

### Mobile broadband speed

**Definition:**
Based on millions of recent cellular test results from Ookla Speedtest iOS and Android apps, this index compares and ranks cellular upload and download speeds around the globe. Each city receives a score based on the rolling mean speed in megabits per second (mbps) over the previous 30 days. Only tests taken within 300 miles of the server are eligible for inclusion in the index. Data were collected and averaged over a three month period in 2015.

**Sources:**
Ookla - broadband testing and web-based network diagnostic applications

### ICT usage

**Definition:**
Ericsson’s *Networked Society City Index 2014* measures the performance of 40 cities from two perspectives: their maturity in information and communications technology (ICT) and triple bottom line, specifically sustainable urban development in a connected society. The ICT usage score is based on three variables—technology use, individual use, and public and market use. Within technology use, the following metrics were analyzed: mobile phone subscriptions per 100 habitants, number of smartphones per capita, percentage with a computer at home, and number of tablets per capita. Within individual use, the following metrics were considered: Internet usage as a percentage of the population and social networking penetration. Within public and market use, the following metrics were analyzed: open data and web presence, and electronic and mobile phone payments.

**Sources:**
The Networked Society City Index 2014, Ericsson

### Software development and multimedia design

**Definition:**
Combination of scores for each city in *fDi* magazine’s Best Cities for Software Development and the Best Cities for Multimedia Design Centres. Both *fDi* indices weight a city’s performance 70% based on the quality of the location and 30% based on the cost of the location. The software design index is based on an assessment of 120 quality competitiveness indicators. These indicators include availability and track record in ICT, availability of specialized-skills professionals such as scientists and engineers, access to venture capital, R&D capabilities, software experts, quality of ICT infrastructure and specialization in software development. The Multi-Media Design Centre rankings are based on an assessment of 120 quality competitiveness indicators, including the size of the location’s leisure and entertainment sector, its specialization and track record, information technology infrastructure, quality of life and skills availability.

**Sources:**
fDi Intelligence
**Digital security**

*Definition:*
This variable measures a city’s levels of digital security based on factors such as dedicated cyber security teams (input) and the frequency of identity theft (output). Input metrics measured are privacy policy, citizen awareness of digital threats, public-private partnerships, level of technology employed, and dedicated cyber security teams. Output metrics are frequency of identity theft, percentage of computers infected, and percentage with Internet access. Data are produced by the Economist Intelligence Unit’s Safe Cities Index 2015.

*Sources:*
- EIU Safe Cities Index 2015

---

**City Gateway**

**Hotel rooms**

*Definition:*
Count of all hotel rooms within each city.

*Sources:*
- CBRE: Netherlands Hotel MarketreView
- Beijing Statistical Yearbook 2013
- Shanghai Statistical Yearbook 2013
- Eurostat
- Horwath Hotel, Tourism and Leisure: Special Market Reports – Colombia
- Chicago Convention and Tourism Bureau
- Hotel News Now: New supply no concern to NYC owners
- Hotel Council of San Francisco: San Francisco’s hotel tax revenue at all time high
- Jones Lang Lasalle: Hotel Intelligence Los Angeles
- Dubai Tourism
- Jones Lang Lasalle: 2014: A New Investment Record, Asia Pacific Property Digest
- Jones Lang Lasalle: 2014: A New Investment Record, Asia Pacific Property Digest
- Gauteng Factsheet
- Jones Lang Lasalle: Hotel Intelligence Malaysia
- W-Hospitality Group
- Jones Lang Lasalle: Hotel Intelligence Mexico
- HVS - In Focus: Milan, Italy: The view on the cities tourism industry before and after EXPO 2015
- Jones Lang Lasalle: Hotel Intelligence, Moscow
- HVS - Hotels in India, trends and opportunities
- Jones Lang Lasalle: Hotel Intelligence Paris
- Reuters in the Daily Mail
- Global Hotel Network - GHN Market Report: Sao Paulo
- Jones Lang Lasalle: Spotlight on Seoul
- Jones Lang Lasalle: A Sunnier Outlook for Leasing, Asia Pacific Property Digest
- Jones Lang Lasalle: On Point, Nordic City Report
- Jones Lang Lasalle: Australian and New Zealand Hotel development Register
- Savilles World Research Asian Cities Report, Japan Hospitality
- Corporate Meetings Network: Canada’s site for corporate meeting planners
### International tourists

**Definition:**
Annual international tourist arrivals for 100 cities collected by Euromonitor International. Euromonitor’s figures include travelers who pass through a city, as well as actual visitors to the city.

**Sources:**
- Euromonitor International’s top 100 city destinations ranking 2016
- Bogota District Institute of Tourism
- U.S. Department of Commerce: Office of Travel and Tourism Industries
- MasterCard 2014 Global Destination Cities Index
- Stockholm Business Region

### International association meetings

**Definition:**
A measure combining both the number of international association meetings per city in 2014 and the compound annual growth rate (CAGR) from 2009-2014. The meetings measured take place on a regular basis and rotate between a minimum of three countries. Figures provided by the International Congress and Convention Association.

**Sources:**
- International Congress and Convention Association

### Incoming/Outgoing passenger flows

**Definition:**
Total number of incoming and outgoing passengers, including originating, terminating, transfer and transit passengers in each of the major airports servicing a city. Transfer and transit passengers are counted twice. Transit passengers are defined as air travelers coming from different ports of departure who stay at the airport for brief periods, usually one hour, with the intention of proceeding to their first port of destination (includes sea, air and other transport hubs).

**Sources:**
- Amsterdam Airport Schiphol
- Airport- world and Beijing Capital Airport media centre
- Schiphol
- Berlin Brandenburg Airport
- El Dorado International airport
- Fly Chicago
- Port Authority of NY and NJ
- San Francisco International Airport
- Oakland International Airport
- Los Angeles World Airports
- Long Beach Airport
- Dubai Airports
- Hong Kong International Airport
- Airports Council International (ACI)
- Airports Company South Africa
- Malaysia Airports Holdings Berhad
- Federal Airports Authority of Nigeria
- Airport World
- London Heathrow Airport
- London Gatwick Airport
- London Stansted Airport
- London City Airport
- Aena Aeropuertos
- Aeropuerto international de la ciudad de Mexico
- National Agency for Civil Aviation
- Airline Network News and Analysis (ANNA)
- CSIA airport
**Airport to CBD access**

*Definition:*
A measure of the ease of using public transit to travel between a city’s central business district and the international terminal of its busiest airport in terms of international passenger traffic. Cities are separated into categories according to whether a direct rail link exists, if so the number of transfers required, and if not whether there is a public express bus route to the airport. Cities with direct rail links are preferred to those with express bus services. Cities with rail links with the fewest transfers are ranked higher than those with more. Within categories, cities are ranked against one another according to the cost of a single one-way, adult weekday trip and the length of the trip, with each factor weighted equally.

*Sources:*
- Netherlands Railways
- Amsterdam Info
- Travel China guide
- Explore Metro
- Explore Shanghai
- Berliner Verkehrsbetriebe (BVG)
- Berlin.de
- Bogota-airport.com
- Chicago Transit Authority
- Port Authority of New York and New Jersey
- Bay Area Rapid Transit
- Metro Planner
- Government of Dubai
- MTR
- Soekarno-Hatta International Airport
- BusBandra
- To and from the airport
- Gautrain
- KLIA Ekspres
- Murtala Muhammed International Airport
- Heathrow Express
- Metro Madrid
- GoMadrid
- Mexico City Public Transport System
- World Travel Guide
- Malpensa Express
- Sheremetyevo International Airport
- Aeroexpress
- Moscow Metro
- BEST
- E-Rail
- Paris by Train
- Real Bus Company
- Rio.com
- Netviagem
- Visit Korea (Korea Tourism Organization)
- SMRT
- Arlanda Express
World Top 100 airports

**Definition:**
Each city receives a score based on the ranking of that city's top airport in the World's Top 100 Airports ranking, compiled by Skytrax. The World Airport Awards are based on survey questionnaires completed by more than 13 million airline customers between May 2014 and January 2015 across 550 airports worldwide. The survey evaluates travellers’ experiences across different airport service and performance indicators from check-in, arrivals, transfers, shopping, security and immigration to departure at the gate.

**Sources:**
Skytrax World Airport Awards

Airport connectivity

**Definition:**
A measure of the number of routes operating from the airports servicing a city as identified by World Airport Codes. A greater weight is given to international destinations, but domestic routes are also included so as not to penalize countries with larger land areas.

**Sources:**
World Airport Codes
## Transportation and infrastructure

### Mass transit coverage

**Definition:**
Ratio of kilometers of mass transit track to every 100 square kilometers of the developed and developable portions of a city’s land area. A city’s developable land area is derived by subtracting green space and governmentally protected natural areas from total land area.

**Sources:**
- UrbanRail
- Amsterdam Tips
- Senate Department for Urban Development and the Environment
- Instituto de Desarrollo Urbano
- Chicago Transit Authority
- San Francisco Municipal Transport Agency
- Bay Area Rapid Transit (BART)
- Hopstop
- LA Metro
- Dubai Metro
- MTR Corporation
- MRT Jakarta
- Gautrain
- MYRapid
- Lagos Metropolitan Area Transport Authority (LAMATA)
- Transport for London (TfL)
- London Overground
- Metro Madrid
- Mexico Metro
- Azienda Trasporti Milanesi
- Moscow Mayor’s Office
- Metro Rio
- Metro Sao Paulo
- Seoul City Government
- Singapore Land Transport Authority
- Arriva
- NSW Bureau of Transport Statistics
- Sydney Trains
- Toronto Transit Commission

### Affordability of public transport

**Definition:**
The affordability of the longest mass transit rail trip from a city’s boundary to the CBD, calculated by using a city’s average hourly wage (UBS Prices and Earnings 2015) to determine the amount of time a citizen needs to work to be able to buy a single ticket. The cost of a bus trip is used in cities where there are no rail systems.

**Sources:**
- GVB Amsterdam
- City of Beijing
- Shanghai Metro
- Landes Berlin
- Trans Milenio
- Transit Chicago
- Metropolitan Transportation Authority
- BART
- LA Metro
- Dubai Metro
- MTR Corporation
## Licensed taxis

**Definition:**
Number of officially licensed taxis in each city divided by the total population and then multiplied by 1,000.

**Sources:**
- Gemeente Amsterdam
- Beijingtrip.com
- Tour-Beijing.com
- visitberlin.de
- Angloinfo
- TimeOut
- Taxicab Factbook
- San Francisco Municipal Transportation Agency
- City of Los Angeles Taxi Services
- The LA Times
- Gulf News
- Government of Hong Kong
- Jakarta Post
- City of Johannesburg, Department of Transport
- Greater Kuala Lumpur/ Klang Valley Land Public Transport Master Plan
- Taxi Transformation Plan (SPAD - Land Public Transport Commission)
- Office of the Governor Lagos State
- Gov.uk
- esmadrid.com
- Reuters
- El financeriero
- Ciao Milano
- Eurasian Development Bank
- Mid-day News India
- The Economist
- Tech Crunch
- Bloomberg
- Taxi Singapore
- Statistics Sweden
- Crikey Media
- Tokyo Hire-Taxi Association (THTA)
- Toronto’s Taxi Cab Industry Review
**Major construction activity**

*Definition:*
Major construction activity is composed of three equally weighted measures: the number of planned and under construction buildings in the Emporis database; the number of properties sold and recorded by Real Capital Analytics’ database; and construction employment from Oxford Economics. The Emporis database is the count of planned and under construction buildings categorized as a high rise, skyscraper, low rise, hall, or stadium; the number of properties sold is based on the number of properties valued at more than $10 million, recorded between February and July 2015; and construction employment is taken as a percentage of total employment.

*Sources:*
Emporis
Real Capital Analytics
Oxford Economics

---

**Housing**

*Definition:*
Measure of availability, diversity, cost and quality of housing, household appliances and furniture, as well as household maintenance and repair. This measure is based on the Mercer Quality of Living 2014 survey. Tied cities were differentiated by looking at the annual percentage change in house prices.

*Sources:*
Mercer Quality of Living 2014 reports
International Monetary Fund (IMF) – House Prices Around the World

---

**Traffic congestion**

*Definition:*
Measure of traffic congestion and congestion policies for each city scored on the level of congestion as well as the modernity, reliability and efficiency of public transport. Assessment based on the Mercer Quality of Living 2014 survey. Tied cities were differentiated using the ease of commute variable.

*Sources:*
Mercer Quality of Living 2014 reports

---

**Ease of commute**

*Definition:*
PwC employees in each of the firm’s offices in the 30 cities were instructed: "On a scale from 1 to 10, where 1 is difficult and 10 is easy, please rate your commute to work". Data provided by the PwC employee survey conducted for the We, the Urban People study.

*Sources:*
PwC Employee Survey 2013/2015
# Health, safety and security

## Road safety*

*Definition:*
A count of the estimated number of road deaths in each country per 100,000 inhabitants. Raw figures are calculated by the World Health Organisation based on 2013 survey data and are published in the Global Status Report on Road Safety 2015.

*Sources:*
World Health Organisation - Global Status Report on Road Safety 2015

## Health system performance*

*Definition:*
Measurement of a country’s health system performance made by comparing healthy life expectancy with healthcare expenditures per capita in that country, adjusted for average years of education (years of education is strongly associated with the health of populations in both developed and developing countries). PwC global healthcare team adapted methodology from the 2001 report “Comparative efficiency of national health systems: cross-national econometric analysis”.

*Sources:*
World Bank
World Health Organization
CIA World Factbook
United Nations Statistics
### End-of-life care*

**Definition:**
Ranking of countries according to their provision of end-of-life care. The Quality of Death Index by the Economist Intelligence Unit assesses the availability, affordability and quality of palliative care for adults in 80 countries across the world. The index scores countries across 20 indicators grouped in five categories: palliative and healthcare environment, human resources, affordability of care, quality of care and community engagement. These indicators are grouped into qualitative and quantitative categories and are normalized to form an overall index score.

**Sources:**
2015 Quality of Death Index, Economist Intelligence Unit

### Crime

**Definition:**
Weighted combination of Mercer Quality of Living 2014 survey crime score (50%); intentional homicide rate per 100,000 of the city population (30%); and the Numbeo Crime Index, which is an estimation of the overall crime level in each city based on how safe citizens feel (20%).

**Sources:**
Mercer Quality of Living 2014 reports  
Numbeo Crime Index 2015  
UNDOC  
FBI Crime statistics  
Dubai Police  
Crime Stats SA  
Mayor’s Office for Policing and Crime  
The Rio Times  
Argentina Independent Newspaper  
City- Data.com  
UNDP  
iOL news  
ISTAT  
Insight Crime  
The Economist  
Index Mundi  
Swedish National Council for Crime Prevention  
Bureau of Crime Statistics and Research (BOCSAR)

### Political environment

**Definition:**
Measure of a nation’s relationship with foreign countries, internal stability, law enforcement, limitations on personal freedom and media censorship. Data is from the Mercer Quality of Living 2014 survey.

**Sources:**
Mercer Quality of Living 2014 reports
Security and disease risk

**Definition:**
An analysis of the potential effects of crises on economic output in each city, calculated by measuring the percentage of GDP at risk from a series of individual health and security threats between 2015 and 2025. The nine threats measured were cyber attack, market crash, nuclear accident, oil price shock, sovereign default, terrorism, power outage, human pandemic, and plant pandemic. Data are taken from the Lloyd’s City Risk Index 2015–2025.

**Sources:**
- Lloyd’s City Risk Index 2015–2025
- Cambridge Centre for Risk Studies

Sustainability and the natural environment

Natural disaster exposure

**Definition:**
A measure of a city’s exposure to natural disaster risk, calculated by PwC’s actuarial and forensics practice using data from Swiss Re’s CatNet GDP Loss Index and the People Risk Index. This variable measures the economic and people effect of river and coastal floods, earthquakes, windstorms, and tsunamis. The economic effect is measured by lost GDP output in the immediate aftermath of an event relative to the country’s GDP. The people effect is both the potential for fatalities and casualties, as well as people who need to be evacuated and are unable to access their home or workplace (in the immediate aftermath of an event) as a proportion of the population of the city. The indices are derived from Swiss Re’s Mind the risk study (http://www.swissre.com/rethinking/climate_and_natural_disaster_risk/Mind_the_risk.html), results of which are available at CatNet (http://www.swissre.com/clients/client_tools/about_catnet.html).

**Sources:**
- PwC Actuarial and Forensics Practice
- Swiss Re Mind the Risk Study

Natural disaster preparedness*

**Definition:**
This measure takes into account each city’s disaster preparedness. Using a method developed by PwC’s actuarial and forensics practice, each city receives a score based on its preparedness. This measure considers whether the city has put in place early warning systems, made efforts to reduce the underlying risk factors, regularly conducts training drills, and implements strategies to increase public awareness. Fifty percent of the score is taken at a country level from the UNISDR’s web platform, PreventionWeb, which has collated national progress reports on the implementation of the UN’s 10-year plan to make the world safer from natural hazards, the Hyogo Framework for Action. Each city’s average performance in the variables of public transport systems, health system performance, and operational risk climate are also factored into the disaster preparedness measure to make up the remaining 50%.

**Sources:**
- PwC’s actuarial and forensics practice
- PreventionWeb
### Thermal comfort

**Definition:**
A thermal comfort score was created for each city by calculating the average deviation from optimal room temperature (72 degrees Fahrenheit). January, April, July and October heat indices were calculated for each city using an online tool that integrates average high temperature and corresponding relative evening humidity during each month. A final thermal comfort score was derived by first taking the difference between a city’s heat index for each month and optimal room temperature and then averaging the absolute values of these differences.

**Sources:**
- World Metrological Society
- Weatherbase
- NOAA
- Worsley School

### Recycled waste

**Definition:**
Percentage of municipal solid waste diverted from landfill. This includes, but is not limited to, recycling and captures other methods such as waste-to-energy.

**Sources:**
- Financial times
- China Statistical yearbook 2013
- Senatsverwaltung fur Stadtentwicklung and Umwelt
- Association Business Commitment for Recycling in Colombia (Asociación Compromiso Empresarial para el Reciclaje en Colombia -Cempre)
- Sustainable Chicago, Office of the Mayor 2015
- NYC Mayor's Office of Sustainability - Sustainability and Solid Waste: Doubling NYC's diversion rate by 2017
- PBS Newshour
- City of Los Angeles Bureau of Sanitation
- Al Khaleej
- Environmental Protection Department, Hong Kong
- PwC Indonesia
- Jakarta Post
- PwC South Africa
- PwC Malaysia
- Ricardo Energy & Environment
- Gov.uk ENV18
- Madrid City Council
- Secretaria de medio ambiente y recursos naturales
- AMSA Group
- Unified Interdepartmental Statistical Information System
- The Bombay Community Public Trust
- Mairie de Paris
- National Agency for Environmental Sanitation
- Terra
- Seoul Metropolitan Government
- Ministry of the Environment & Water Resources
- Swedish Institute
- City of Sydney
- Statistics Japan
- City of Toronto
## Air pollution

**Definition:**
Combination of measures of particulate matter 10 micrometers (PM10) outdoor air pollution levels from the World Health Organisation (WHO) and the Numbeo Pollution Index of overall pollution in each city. The WHO’s Public Health and Environment database provides annual mean concentrations of PM10 in diameters or less, reflecting the degree to which urban populations are exposed to this fine matter. The Numbeo Pollution Index is generated via survey-based data. Numbeo attributes the biggest weight to air pollution, then to water pollution/accessibility as the two main pollution factors. A small weight is given to other pollution types.

**Sources:**
- World Health Organization
- Public Health and Environment (PHE) Database
- Numbeo Air Pollution Index 2015

## Public park space

**Definition:**
Proportion of a city’s land area designated as public recreational and green spaces to the total land area. Excludes undeveloped rugged terrain or wilderness that is either not easily accessible or not conducive to use as public open space.

**Sources:**
- Gemeente Amsterdam
- China Statistical Yearbook 2014
- Senate Department for Urban Development and the Environment
- District Department of Culture
- Recreation and Sports (Secretaría Distrital de Cultura, Recreación y Deporte – SCRD)
- Parkscore index by The Trust for Public Land
- Government of Dubai
- The Government of the Hong Kong Special Administrative Region Planning Department
- Jakarta Post
- Gauteng City Region Observatory
- Pemandu
- Lagos State Parks and Garden Agency (LASPARK)
- City of London
- City of Madrid
- Redalyc
- City of Milan
- PwC Russia
- Municipal Corporation of Greater Mumbai
- Paris Convention and visitors Bureau
- INEA: Instituto estadual do ambiente
- Prefeitura de Sao Paulo
- Convention on Biological Diversity
- Seoul Municipal Government
- Singapore Urban Redevelopment Authority
- Stockholm City Statistics
- City of Sydney
- Tokyo Statistical Yearbook 2013
- City of Toronto
### Water-related business risk

**Definition:**
Water risks in a city related to quality, quantity, and regulatory risk. Quality risks are defined as the exposure to changes in water quality that may impact industrial production systems, resulting in the need for further investment or an increase in the operational costs of water treatment. Risks related to quantity are defined as the exposure to changes in water quantity (e.g., droughts or floods) that may impact a company’s direct operations, supply chains, and/or logistics. Regulatory risk refers to the unpredictability of regulations within the business environment. These risks arise when an unexpected change in water-related law or regulation increases a business’s operating costs, reduces the attractiveness of an investment, or changes its competitive landscape. Data produced by the World Resources Institute with Aqueduct.

**Sources:**
World Resources Institute with Aqueduct

### Demographics and livability

#### Entertainment and attractions

**Definition:**
Cultural experience from the *A.T. Kearney Global Cities Index* is measured by the number of diverse attractions in a city, including the number of major sporting events a city hosts; the number of museums, performing arts venues, and culinary establishments; the number of international travelers; and the number of sister city relationships.

**Sources:**
A.T. Kearney Global Cities Index 2014

#### Quality of living

**Definition:**
Score based on more than 30 factors across five categories: socio-political stability, healthcare, culture and natural environment, education and infrastructure. Each city receives a rating of either acceptable, tolerable, uncomfortable, undesirable or intolerable for each variable. For qualitative indicators, ratings are awarded based on the Economic Intelligence Unit analysts’ and city contributors’ judgments. For quantitative indicators, ratings are calculated based on cities’ relative performances on a number of external data points. Data sourced from the Economist Intelligence Unit’s liveability ranking.

**Sources:**
The Economist Intelligence Unit - Liveability Ranking and Overview 2014
### Working age population

**Definition:**
Proportion of a city’s population aged 15-64 to the total population of the city.

**Sources:**
- Statistics Bureau of Amsterdam
- National Bureau of Statistics of China
- Statistik Berlin
- Index Mundi
- American Community Survey 5 year 2009-2013 estimates
- Baruch College
- San Francisco Health Improvement Partnership
- Government of Dubai
- Hong Kong Special Administrative Region Government
- Department of Communication, Informatics and Public Relations of Jakarta Capital City
- Bureau of market research, Johannesburg
- Department of Statistics Malaysia
- Lagos State
- Office of National Statistics
- INE - Instituto Nacional de Estadística
- INEGI - Instituto Nacional de Estadística y Geografía
- Istat
- Moscow City Government
- Government of India, Ministry of Home Affairs
- UrbiStat
- IBGE - Instituto Brasileiro de Geografia e Estatística
- Statistics Korea
- Singapore Government - National Population and Talent Division (NPTD)
- Statistics Sweden
- Australian Government, Department of Employment
- Tokyo Metropolitan Government
- Ontario Ministry of Finance

### City brand

**Definition:**
The *Guardian* Cities global brand survey measures two aspects of a city’s brand: its “assets”—attractions, climate, infrastructure (particularly transport), safety, and economic prosperity—and its “buzz,” a combination of social media (Facebook likes and Twitter sentiment analysis) and media mentions. The assets and buzz elements were both given a score out of 10; the numbers were then added to produce a total score.

**Sources:**
The Guardian: Cities global brand barometer (produced by Saffron Consultancy)

### Relocation attractiveness

**Definition:**
PwC employees in each of the firms’ offices in the 30 cities were instructed: "Based on the other 29 cities in Cities of Opportunity, please rank the top three cities that you would like to work in most". Data provided by the PwC employee survey conducted for the *We, the Urban People* study.

**Sources:**
PwC Employee Survey 2013/2015
**Senior wellbeing**

*Definition:* The *Global AgeWatch Index* presents a unique snapshot of the situation of older people in 96 countries. It highlights which countries are doing best for their older populations and how this links with policies toward pensions, health, education, employment, and the social environment in which older people live. The overall score takes account of income security, capability, enabling environment, and health status of the over 60s.

*Sources:* Global AgeWatch Index

---

**YouthfulCities Index**

*Definition:* A measure produced by YouthfulCities, a global database that measures, compares, and ranks 55 cities across 20 urban attributes using a total of 101 indicators. The indicators consist of primary and secondary data that Urban Decoders (a globally dispersed team of young urban researchers) collect locally and submit using collaborative, cloud-based research workbooks. The YouthfulCities Index is an ambitious collaborative effort to analyze the largest cities around the world from a unique youth perspective to rank them as best suited for young people aged 15–29. It looks at how youth live, work, and play in their urban setting in order to examine how cities are serving their youth. It asks how youth can be better integrated and engaged in their cities.

*Sources:* YouthfulCities.com

---

**Economic clout**

**Number of Global 500 headquarters**

*Definition:* Number of Global 500 headquarters located in each city, as per the Fortune Global 500 list.

*Sources:* 2014 Fortune Global 500

---

**Employment growth**

*Definition:* 2014-2016 annual growth rate of employment in the city. Data provided by Oxford Economics.

*Sources:* Oxford Economics

---

**Financial and business services employment**

*Definition:* The number of jobs in financial and business services activity as a share of total employment in the city. Financial services include banking and finance, insurance and pension funding, and activities auxiliary to financial intermediation. Business services include a mix of activities across the following sub-sectors: real estate and renting activities, IT and computer related, R&D, architectural, engineering and other technical activities, legal, accounting, bookkeeping and auditing activities, tax and consultancy, advertising, and professional scientific and technical services and business services where not elsewhere classified. Data provided by Oxford Economics.

*Sources:* Oxford Economics
<table>
<thead>
<tr>
<th><strong>Attracting FDI</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Definition:</strong> Coordinated variable ranking the number of greenfield (new job-creating) projects plus the total US$ value of greenfield capital investment activities in a city that are funded by foreign direct investment (FDI). Data cover the period from January 2005 through December 2014 provided by fDi Intelligence.</td>
</tr>
<tr>
<td><strong>Sources:</strong> The Financial Times - FDI Intelligence</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Productivity</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Definition:</strong> Productivity is calculated by dividing GDP in 2015 US$ by employment in the city. Data provided by Oxford Economics.</td>
</tr>
<tr>
<td><strong>Sources:</strong> Oxford Economics</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Rate of real GDP growth</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Definition:</strong> 2014-2016 GDP annual growth rate in real terms expressed in 2015 US$. Data provided by Oxford economics.</td>
</tr>
<tr>
<td><strong>Sources:</strong> Oxford Economics</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Ease of doing business</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Ease of starting a business</strong>**</td>
</tr>
<tr>
<td><strong>Definition:</strong> Assessment of the bureaucratic and legal hurdles an entrepreneur must overcome to incorporate and register a new firm. Accounts for the number of procedures required to register a firm; the amount of time in days required to register a firm; the cost (as a percentage of per capita income) of official fees and fees for legally mandated legal or professional services; and the minimum amount of capital (as a percentage of per capita income) that an entrepreneur must deposit in a bank or with a notary before registration and up to three months following incorporation. Assessment scores gathered from Doing Business 2015 report, the World Bank Group. U.S. cities were differentiated from each other using the United States Small Business Friendliness survey by Thumbtack.com in partnership with Kauffman Foundation.</td>
</tr>
<tr>
<td><strong>Sources:</strong> Doing Business 2015 report, the World Bank Group Thumbtack.com</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Resolving insolvency</strong>**</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Definition:</strong> This topic identifies weaknesses in existing bankruptcy law and the main procedural and administrative bottlenecks in the bankruptcy process. Assessment scores gathered from Doing Business 2015; the World Bank Group.</td>
</tr>
<tr>
<td><strong>Sources:</strong> Doing Business 2015 report</td>
</tr>
</tbody>
</table>
### Ease of entry: Number of countries with visa waiver*

**Definition:**
Number of nationalities able to enter the country for a tourist or business visit without a visa. Excludes those nationalities for whom only those with biometric, diplomatic or official passports may enter without a visa.

**Sources:**
- Government of The Netherlands
- Chinese Embassy website (Thailand)
- Federal Foreign Office website
- Visados.com
- US Department of State
- US Embassy in Ottawa, Canada
- UAE Government portal
- Hong Kong Immigration website
- Embassy of the Republic of Indonesia in London
- South African Dept of Home Affairs
- Ministry of foreign Affairs Malaysia
- UK Border Agency website
- GoSpanishAbroad
- Mexico national institute of immigration
- Ministry of foreign affairs
- Ministry of Foreign Affairs of the Russian Federation
- Bureau of Immigration, India
- French Ministry of Foreign and European Affairs
- Consulate General website (NYC)
- Ministry of Foreign Affairs (Republic of Korea)
- Singapore immigration website
- Government offices of Sweden
- National Visas Australia
- Ministry of Foreign Affairs Japan
- Canadian Immigration website

### Number of foreign embassies or consulates

**Definition:**
Number of countries that are represented by an embassy, consulate, high commission, depute high commission or representative office in each city. Figures sourced from Embassypages.com

**Sources:**
- Embassypages.com
- US Department of State
- Ministry of Foreign Affairs of the Russian Federation

### Level of minority shareholder protection**

**Definition:**
Measurement of the strength of minority shareholder protection against misuse of corporate assets by directors for their personal gain. The Strength of the Investor Protection Index is the average of indices that measure “transparency of transactions,” “liability for self-dealing” and “shareholders’ ability to sue officers and directors for misconduct.” Assessment scores gathered from Doing Business 2015, The World Bank Group.

**Sources:**
- Doing Business 2015 report, the World Bank Group
Operational risk climate*

**Definition:**
Quantitative assessment of the risks to business profitability in each of the countries. Assessment accounts for present conditions and expectations for the coming two years. The operational risk model considers 10 separate risk criteria: security, political stability, government effectiveness, legal and regulatory environment, macroeconomic risks, foreign trade and payment issues, labor markets, financial risks, tax policy, standard of local infrastructure. The model uses 66 variables, of which about one-third are quantitative. Data produced by Economist Intelligence Unit’s Risk Briefing.

**Sources:**
Economist Intelligence Unit’s Risk Briefing

Workforce management risk

**Definition:**
Ranking based on staffing risk in each city associated with recruitment, employment, restructuring, retirement and retrenchment. Risk was assessed based on 30 factors grouped into five indicator areas: demographic risks associated with labor supply, the economy and the society; risks related to governmental policies that help or hinder the management of people; education risk factors associated with finding qualified professionals in a given city; talent development risk factors related to the quality and availability of recruiting and training resources; and risks associated with employment practices. A lower score indicates a lower degree of overall staffing risk. Rank scores sourced from the 2013 People Risk Index produced by Aon Consulting.

**Sources:**
Aon Consulting 2013 People Risk Index

Tax efficiency

**Definition:**
Combination of the number of tax payments and the time required to comply by businesses during their second year of operation. The tax payments element reflects the total number of taxes and contributions paid, the method of payment, the frequency of payment, the frequency of filing, and the number of agencies involved for the case-study company. Time to comply measures the time taken to prepare, file, and pay three major types of taxes (corporate income taxes, value-added taxes, and labor taxes). Data provided by PwC UK from Paying Taxes 2016; taxes are accurate for the year ended 31 December 2014. The Paying Taxes 2016 report can be found at http://www.pwc.com/gx/en/paying-taxes/.

**Sources:**
PwC UK Paying Taxes team

Cost

Corporate total tax rate

**Definition:**
The corporate total tax rate measures the amount of taxes and mandatory contributions payable by the businesses in the second year of operation, expressed as a share of commercial profits. The corporate total tax rate is designed to provide a comprehensive measure of the cost of all the taxes a business bears. Data provided by PwC UK from Paying Taxes 2016; taxes are accurate for the year ended 31 December 2014. Some cities that were not included in the Paying Taxes 2016 study were calculated separately by our PwC local office using the through-the-cycle methodology. The Paying Taxes 2016 report can be found at http://www.pwc.com/gx/en/paying-taxes/.

**Sources:**
PwC UK Paying Taxes team
### Personal tax

**Definition:**
The personal tax data reflect the average employee effective tax rate across manager, assistant, and support staff levels in each city economy. The employee effective tax rates were generated by PwC UK using data supplied for *Paying Taxes 2016*. Taxes are accurate for year ended 31 December 2014. The *Paying Taxes 2016* report can be found at [http://www.pwc.com/gx/en/paying-taxes/](http://www.pwc.com/gx/en/paying-taxes/).

**Sources:**
PwC UK Paying Taxes team

### Cost of business occupancy

**Definition:**
Annual gross rent divided by square feet of Class A office space. Gross rent includes lease rates, property taxes, maintenance and management costs. Data produced by CBRE Global Office Rents in US$.

**Sources:**
CBRE: Prime Office Occupancy Costs December 2014  
Cushman & Wakefield: Office Space Across the World 2014  
Knight Frank: Africa Report 2015

### Cost of Living

**Definition:**
A relative measure of the price of consumer goods by location, including groceries, restaurants, transportation and utilities. The Consumer Price Index measure does not include accommodation expenses such as rent or mortgage. Figures provided by Numbeo.

**Sources:**
Numbeo Cost of Living Index 2015

### Affordability of rent

**Definition:**
A measure of the affordability of rental accommodation in a city, calculated by offsetting the monthly rental cost of a 120m² apartment against a city's average wages (UBS Prices and Earnings 2015). Rental prices were sourced from the Global Property Guide – where the cost of a 120m² apartment was not available, the closest equivalent was used.

**Sources:**
Global Property Guide  
UBS Prices and Earnings 2015

### Purchasing power

**Definition:**
Domestic purchasing power is measured by an index of net hourly wages (where New York = 100) excluding rent prices. Net hourly wages divided by the cost of the entire basket of goods and services excluding rent. The basket of goods relates to 122 goods and services. Data sourced from UBS Prices and Earnings 2015.

**Sources:**
UBS Prices and Earnings 2015

* Country-level data  
** Based on most populous city.