

Cities of Choice

Global City Ranking

June 2021



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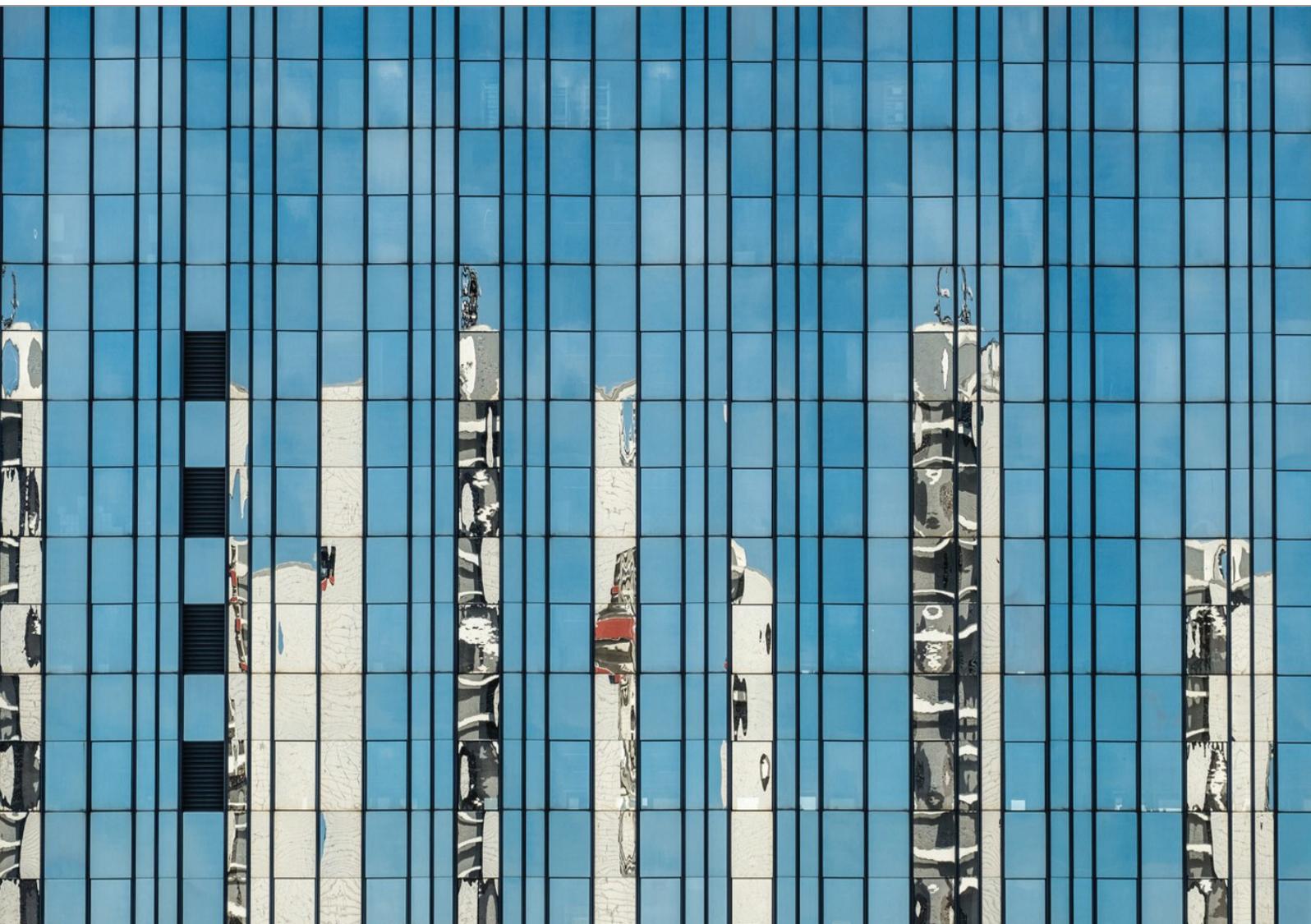
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Why do we need
a new ranking for cities?



The challenge of using rankings as a city management tool

In recent decades we have observed a steady growth of interest in urban development among both professionals and the general public. Rapid urbanization and the growing economic role of cities are not the only things to have had an impact on this. The rapid increase in the population's mobility, flows of capital and ideas, tourist flows, and the emergence of a "creative class" that has new demands, have all raised expectations for the quality of the urban living environment. The choice of which city to study or work in, visit, or invest in, has become more difficult.

International city rankings were designed to meet an emerging demand for analysis and benchmarking of cities in terms of their level of development and quality of life. Over the past 10 to 15 years, several hundred different international rankings have been released that examine cities from many angles and are intended for many audiences, including employees with international companies, students, tourists, and investors.

Naturally, city administrations have made use of this new tool as well. Many cities keep track of their position in the rankings, and even make efforts to progress by using the rankings as a sort of marketing tool. It would follow that this abundance of assessment tools would also help with city management by setting long-term goals for achieving a certain position in the rankings, and using the dynamics to track progress and adjust direction. But in practice, despite the wide selection available, city rankings have failed to become an effective comprehensive tool to assess and manage cities.

This is partly due to numerous methodology issues (quality and comparability of data, reliability of expert assessment, consistency and continuity of the methodology involved), but there is a more fundamental challenge. Different rankings have different goals and audiences, and focus on different topics, thereby producing contradictory results. For example, Helsinki is simultaneously in the top 20% of the Mercer Quality of Living City Ranking, the bottom 25% of the AIRINC Global Cities Index (Financial Rank), and the Top 5 of the Prosperity & Inclusion City Seal and Awards Index (PICSA Index), which is focused on "inclusive prosperity." None of the cities is in the top 20% of all three indices at the same time. This leads to a reasonable question — which ranking is more important? Within which ranking should changes in position be taken as a performance indicator? Which city should be accepted as a benchmark?

To qualify as a city management tool, the ranking must provide a comprehensive view of the city's development, and align various priorities. In this study, we have tried to create exactly this kind of a universal measurement tool for cities.

Residents' wellbeing as a basis for assessing cities

In recent decades, we have seen a trend of urban development priorities shifting away from resolving infrastructure problems to addressing the needs of the people. This trend stems from the fact that high satisfaction among residents increasingly contributes to the sustainable development of a city, and therefore becomes beneficial to its administration.

Another trend we have seen over the past two decades is using subjective metrics of people's satisfaction, happiness, and wellbeing as a tool for measuring progress. In particular, in 2009 a commission led by Nobel laureate Joseph Stiglitz recommended using subjective metrics of wellbeing as an indicator of quality of life and social progress, and in 2013, OECD issued recommendations for measuring subjective wellbeing^{1,2}.

As a result, in recent years, human satisfaction and happiness have become development priorities for advanced cities. For example, Dubai laid out a new development program in 2016 called the Happiness Agenda, and set the goal of making the UAE's capital "the happiest city on Earth" by creating the conditions for its residents' subjective wellbeing to grow in line with the OECD approach. In Europe, the metrics for its residents' happiness and satisfaction are used to assess urban development: since 2004, the European Commission has conducted a regular satisfaction survey of residents of major European Union cities, and the UK's Office for National Statistics (ONS) has measured the "personal wellbeing" of urban residents since 2012.

BCG Henderson Institute has developed an alternative subjective metric to measure city progress: the City Advocacy Index (Advocacy). This is a sociological metric that measures a person's satisfaction with the city and their willingness to associate their life with it. It is calculated based on the respondents' answers to five questions:

1. Are you satisfied to live in [City]?
2. How likely are you to recommend [City] to a friend from another city as a place to live and work?
3. Have you recommended or criticized [City] as a place to live and work in the last 12 months?
4. Do you see your children living in [City] 20 years from now?
5. Do you believe [City] will prosper in the future?

1. According to these guidelines, subjective wellbeing is a generalization of the notion of "happiness", and includes three components: (1) a person's assessment of their life satisfaction, (2) positive and negative feelings and emotions (this effect is usually measured in relation to a particular moment in a person's life), and (3) eudaimonic wellbeing, which is related to a wide range of subjective experiences that can be described through prosperity, functioning positively, and an active and meaningful life.

2. OECD Guidelines on Measuring Subjective Well-being, 2013.

Why is people's happiness important for city leaders?

There is no doubt that, in cities, living environment is a major contributor to people's happiness, and that it affects most factors that drive it—from physiological needs to social integration. But does a rational city leader really need to work to increase the happiness of city residents?

As city residents improve their wellbeing and quality of life, their needs are changing and becoming more complex. Our analysis shows that there are six reasons that make residents' satisfaction and happiness increasingly important for cities:

- 1. Talent attraction.** The importance of skilled, talented residents for cities' economic growth has increased. Talent drives innovation and technological know-how, develops creative industries, and brings in capital. Our research shows that liveability and happiness drive talent attraction and in return economic development.
- 2. Resource conservation.** Research, such as that conducted by Dan Buettner^a, shows happiness can be connected to a healthy lifestyle and longer life. This in turn reduces the pressure on the health care system and resources connected to it.
- 3. Project support.** Cities need their residents' support to resolve structural problems. Cities need structural megaprojects that often last longer than the political voting cycle, and the authorities have to ensure residents' buy-in to avoid resistance to long-term structural investment projects.

4. Avoiding conflicts. New needs and demands can cause conflicts of interest between groups of people who use the same urban spaces in different ways. The city needs to proactively address these new needs and behaviors to avoid conflicts.

5. Election results. Recent MIT research^b shows that happier people are both more likely to participate in elections and to reelect the incumbent party or candidate in city government.

6. Creating virtuous cycles. Finally, happiness can create happiness. It depends on being in caring social relationships with other (happy) people (Harvard Study of Adult Development). Thus, an initial focus on happiness can start a virtuous cycle for the city and its residents.

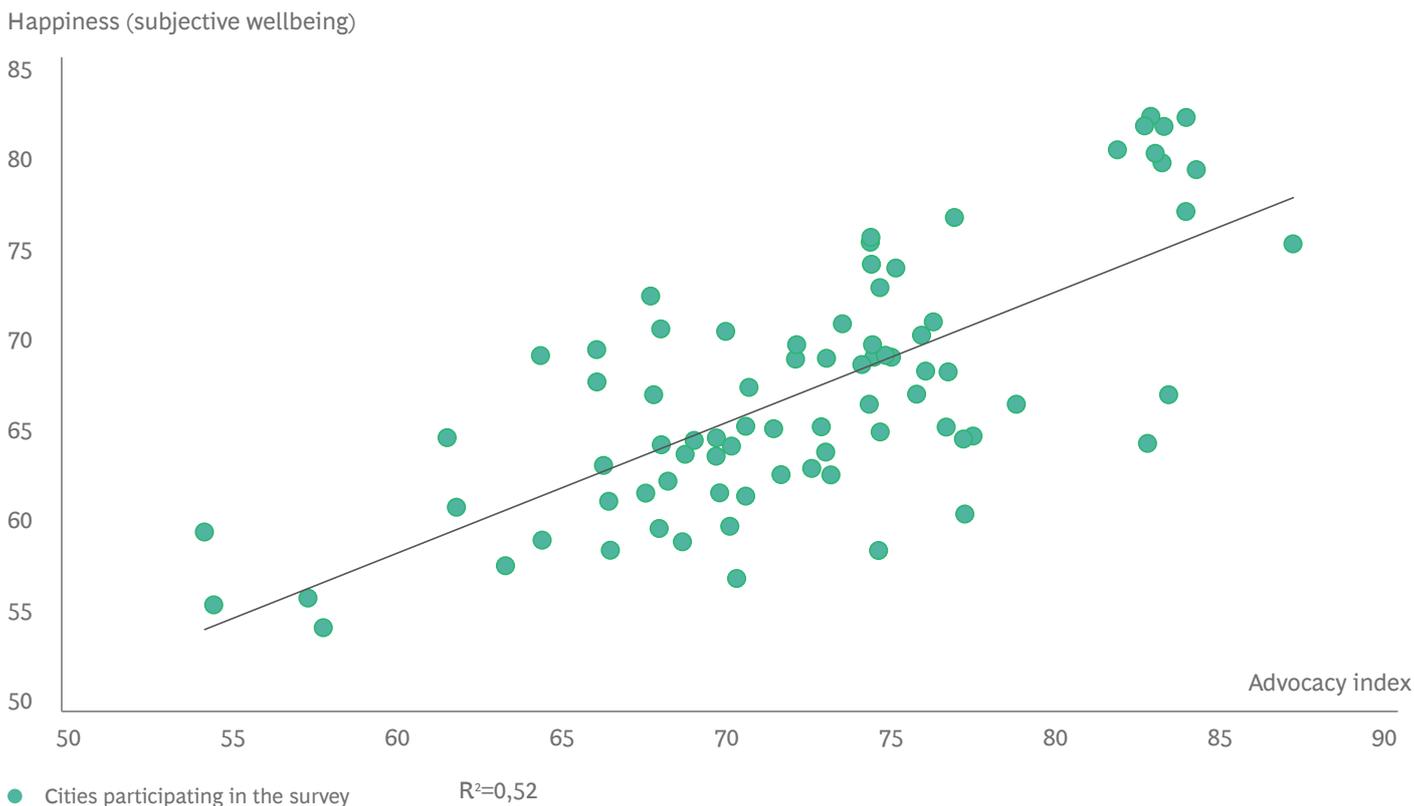
So it follows that residents' happiness is becoming more important than it ever has been. Even if the city government is not ready to use happiness as a target metric, it is necessary to at least understand the current state of residents' wellbeing and measure it systematically.



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a. "The Blue Zones: Lessons for Living Longer From the People Who've Lived the Longest", National Geographic Society, 2010
b. "Happiness and Voting Behavior" World Happiness Report, George Ward, MIT 2019

Figure 1 - Advocacy index measures city's contribution to the prosperity of its residents



The Advocacy Index is better suited to assess an urban living environment than subjective wellbeing, which also depends on factors not related to the city: social and economic events that occur outside of the city, and personal circumstances, such as relationships in the family. That explains about 50% of the variance in the subjective wellbeing score between cities (*see Figure 1*), and can be interpreted as the contribution made by the urban environment to a person's subjective wellbeing.

Using Advocacy as a city metric provides a number of benefits:

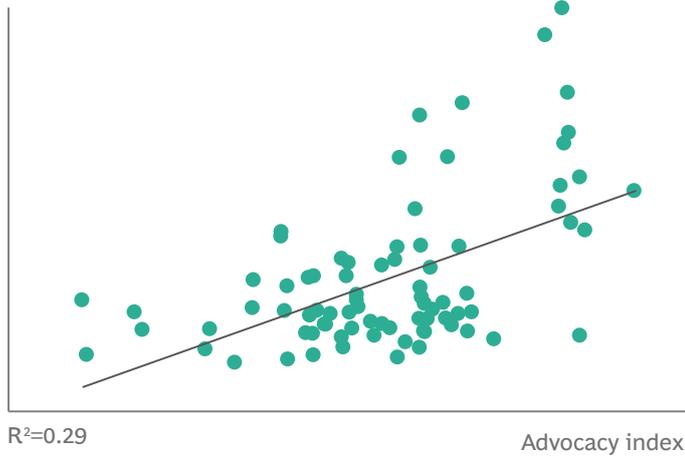
1. High advocacy encourages people to implement life strategies that contribute to a city's long-term prosperity: cities with a higher Advocacy score have higher levels of entrepreneurial activity, trust in the authorities, birth rates, and influxes of highly skilled migrants (and lower outflows of people from the city). (*See Figure 2.*)
2. It depends on the level of maturity across all key areas of urban life: education, health, transportation, the job market, the quality of social capital, state-run institutions, etc., since each of these directly affects a person's attitude toward the city.
3. It depends not only on the measurable indicators of the state of urban infrastructure and services but also on the convenience, efficiency, and emotional responses—which are more difficult to measure but are no less important in addressing people's needs.

All this makes the Advocacy Index a **universal “human-centric” target function and performance indicator for the city**, despite its simplicity. By increasing the index score, the administration makes the city more sustainable and its residents happier, while changes in the index score provide an objective view of the shifts in the quality of the urban living environment. Moreover, Advocacy can be broken down to the level of satisfaction with individual elements in the urban environment, and this will show how each element contributes to the dynamic. Based on this, it seems logical to **make Advocacy the basis for a universal and comprehensive city ranking**, as discussed in the previous section.

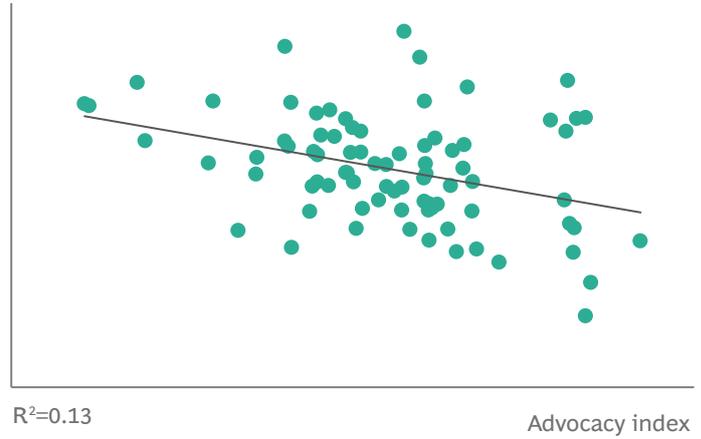
Unfortunately, Advocacy itself does not enable objective comparison of cities (See inset). However, **it is possible to build a tool that would combine both a human-centric Advocacy approach and objectivity**. This would be an index that measures the objective conditions that shape city Advocacy (and therefore personal wellbeing). This index should be made with statistical indicators that measure all the important elements inherent in the living environment. The weights assigned to the indicators included in the index should reflect the importance of the respective area to a person's city advocacy.

Figure 2 - Advocacy index as the key human-centric indicator of a city`s performance

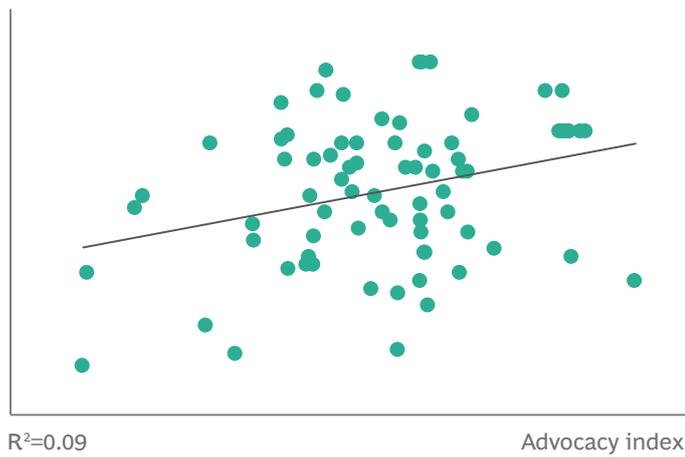
Level of entrepreneurial activity



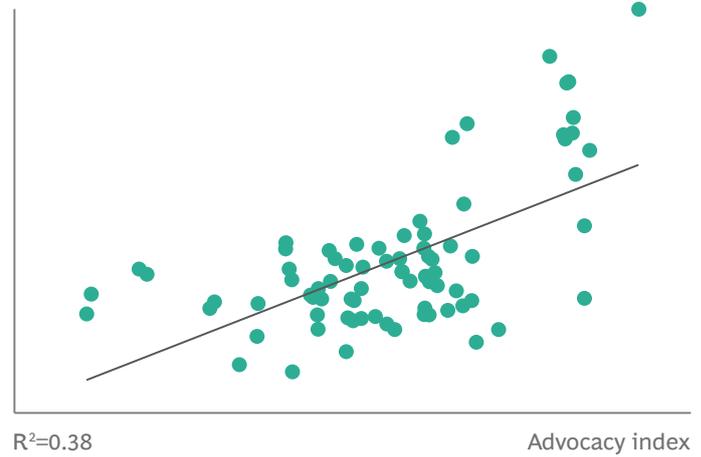
Share of the population ready to leave the place they live in the foreseeable future



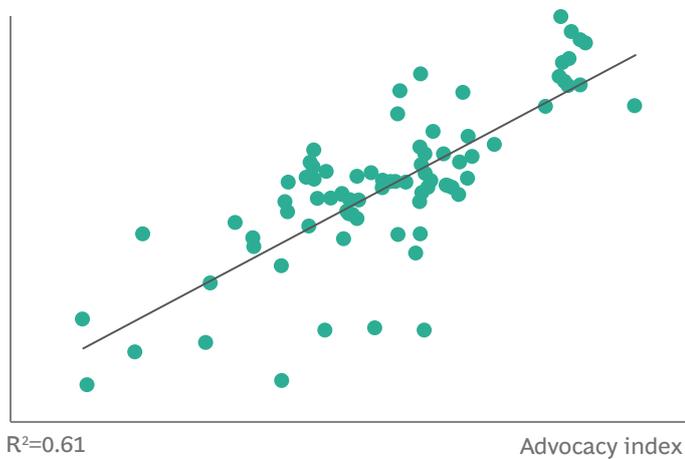
Total birth rate



Inflow of migrants with a higher education



Trust in the local authorities



● Cities participating in the survey

Challenges of using Advocacy index for city comparison

Unfortunately, due to its subjective nature, Advocacy cannot be used to directly compare two cities, and any attempt to do so yields seemingly counterintuitive results. For example, Ho Chi Minh City is one of the leaders using an Advocacy index, while Paris (where most aspects of urban life are much better developed) scores significantly below average.

That is because Advocacy is affected both by the fundamental parameters of the city and subjective perception factors that cannot be compared between cities.

On the one hand, this represents the level of expectations: each person establishes a subjective “baseline” which, along with objective factors, affects that person’s satisfaction with the city. This baseline varies considerably among countries and cities — for example, the level of expectations is lower in developing countries like Vietnam.

On the other hand, there are national and cultural differences: representatives from different cultures may systematically demonstrate different levels of optimism when talking about their own life situations.



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By taking into account the importance of different city elements, this index becomes a useful tool in the “new reality” we find ourselves in following the outbreak of the coronavirus infection. The crisis has intensified uncertainty, called for extensive changes in people’s behavior, and imposed an additional psychological burden on everyone. For years to come, this will translate into how people evaluate their wellbeing while living in a city. This will result (and has already partially resulted) in a shift in people’s priorities: the perceived level of safety, and the city’s ability to bounce back from emergencies, confidence in the future, and trust in the administration will become paramount. The index described above can reflect and incorporate these changes.

We have reviewed more than 180 different rankings, indices, and studies measuring various aspects of living in a city to understand whether they can be used to assess the objective factors behind residents’ satisfaction. Even though 25 of those indices are regularly updated, have a high rate of citation, and focus on city residents’ needs and wellbeing, we came to the conclusion that none of them satisfies our purpose of making an objective and comprehensive comparison of cities in terms of their ability to provide conditions for the wellbeing of residents. This is due to the following factors:

- Failure to reflect all the directions in which a city is developing, with many rankings focusing on just a few dimensions, such as infrastructure or public services, while ignoring others
- Lack of justification for the structure and weights or failure to reflect residents’ priorities in the structure and weights of the ranking subdimensions
- Lack of transparency of assessment results at the level of individual subdimensions

Based on this, we decided to develop a fundamentally new city scoring system that would meet all the requirements described above. Five key steps were performed to build this ranking:

1. We defined 27 scoring subdimensions that reflect all major residents’ needs and found 155 relevant indicators that provide a comprehensive assessment for each of them
2. We defined weights for each subdimension that reflect its importance for the residents
3. We selected 45 cities based on their position in existing rankings, development dynamics and data availability
4. For these cities, we collected the data across 155 indicators; this included gathering of available statistics, our own calculations and a global survey of 25,000 residents in 80 cities around the world
5. Lastly, we calculated the integral score for each city that allowed us to build the final city ranking

These steps and results obtained are discussed in detail in the remaining sections of this report.

Cities of Choice ranking as a system of objective, human-centric cities assessment



Key principles used as the basis for the ranking

This study aimed to create a tool to assess and benchmark the achievements of cities, and track the trajectory of their development throughout all major areas of urban life. This assessment should be as objective as possible, and should be made from the perspective of an individual resident.

Given the considerations outlined in Chapter 1, and the drivers behind an Advocacy score (see Section 2.2), we have taken the objective ability of a city to foster advocacy and wellbeing among its residents as the main assessment criterion. This ability is achieved by:

- Offering a high quality of life and unique experience in key life situations thanks to the availability and quality of its infrastructure, resources, and services, and the efficiency of the processes that occur.
- Providing opportunities for the professional development of its residents in areas that they find interesting and relevant.
- Creating conditions for social interaction, an atmosphere of mutual respect and trust, and equal opportunities in society.
- Creating an open dialogue between residents and the authorities wherein the voice of the people is heard and taken into account when decisions regarding how the city develops are made.
- Being able to change quickly, anticipating and exceeding the expectations of residents.
- Developing continuously in line with current trends.

While developing the ranking methodology, we took several assumptions and requirements for the end result as its cornerstone:

1. The ranking structure should reflect the drivers behind residents' satisfaction with their city.
2. The weightings of the ranking subdimensions should reflect the residents' priorities, accounting for specifics of each city's residents (for this purpose, the system of ranking weights was adjusted for each city, see Appendix 3).

3. Priority should be given to statistical indicators (88% of ranking indicators are statistics, rather than subjective perceptions of the respondents).
4. The ranking should not be adjusted for the country context or for the degree of influence that the city administration has (for example, the assessment included indicators that the city administration has no impact on: climate, the availability of loans, etc.).

The Cities of Choice ranking based on these principles is a fundamentally new tool, and the only ranking that is both human-centric and provides an objective assessment. The key difference from other comprehensive rankings is that its structure is based on the preferences and priorities held by residents. In addition, due to the use of statistical indicators, the ranking ensures an objective assessment and comparability between cities and is not biased by the cultural specifics or differences in levels of expectations (unlike assessment systems that are based on residents' subjective satisfaction and wellbeing).

Another important advantage of the Cities of Choice ranking is the unique nature of the data used. The availability of high-quality, comparable data at the city level is limited, and it is impossible to collect objective statistics for many aspects of city life based exclusively on public information. Therefore, out of the 155 indicators included in the calculations, only about 70% are drawn from public or paid sources. The remaining 30% are the results of BCG analysis obtained through global surveying or using our own calculations and modeling (including geospatial tools).

The global survey of city residents was conducted in the spring of 2020 using an online questionnaire in 80 cities around the world (a control group of cities was added to the 45 participants in the ranking). We received a total of 25,000 replies. The sampling structure in each city matched the population structure by gender, age, and income. The questionnaire contained 120 questions, some of which addressed people's subjective perceptions³, while others targeted objective facts about respondents' lives and behavior (such as frequency of physical activity).

3. A major part of this data was not included in the rankings, and was used to identify residents' preferences and calculate the weights for various indicators, see Appendix 3

Ranking structure and calculation methodology

The methodology used in the calculation rankings is governed by three elements:

- The structure of the ranking reflecting the drivers behind residents' city Advocacy score
- The weights applied to each subdimension to calculate the final score
- The indicators used to measure each of the subdimensions

Drivers behind the Advocacy Index and the ranking's structure

By now, a significant number of academic studies have been published on what subjective wellbeing is, and what drives it (and related concepts such as happiness and life satisfaction)⁴. We reviewed the findings following these studies and, given the goals of our efforts, focused only on those drivers that depend upon a person's environment. We also used the results from the global survey to substantiate that these drivers have a significant impact on city Advocacy score as well. As a result, we identified two groups of drivers behind residents' city Advocacy score.

The first group represents satisfying residents' needs. These needs vary and are determined by the social roles that people may play, with each role corresponding to a different set of needs. We identified a total of 23 needs that range from basic needs (like housing and safety) to the need to feel part of the community, or to have an impact on what is taking place around you. These needs were grouped into four blocks based on their nature — economic opportunities, quality of life, social capital, and interactions with authorities — and formed the foundation of the ranking structure⁵.

The second group is the speed at which the environment changes. An individual's level of happiness depends not only upon what they possess, but also on what they expect to gain, and their expectations tend to adapt to reality. Yuval Noah Harari notes, "Homo sapiens is just not built

for satisfaction. Human happiness depends less on objective conditions and more on our own expectations. Expectations, however, tend to adapt to conditions, including the conditions of other people. When things improve, expectations balloon, and so even dramatic improvements in conditions might leave us as dissatisfied as before."⁶ Since expectations are guided, among other things, by our past experiences, rapid positive changes enable outpacing the residents' expectations, as opposed to the situation of gradual positive changes over time. This explains much of the Advocacy Index gap between Paris and Ho Chi Minh City that we mentioned in Chapter 1. Generally speaking, our analysis shows a clear link between the city Advocacy score and the speed of change in its fundamental conditions.

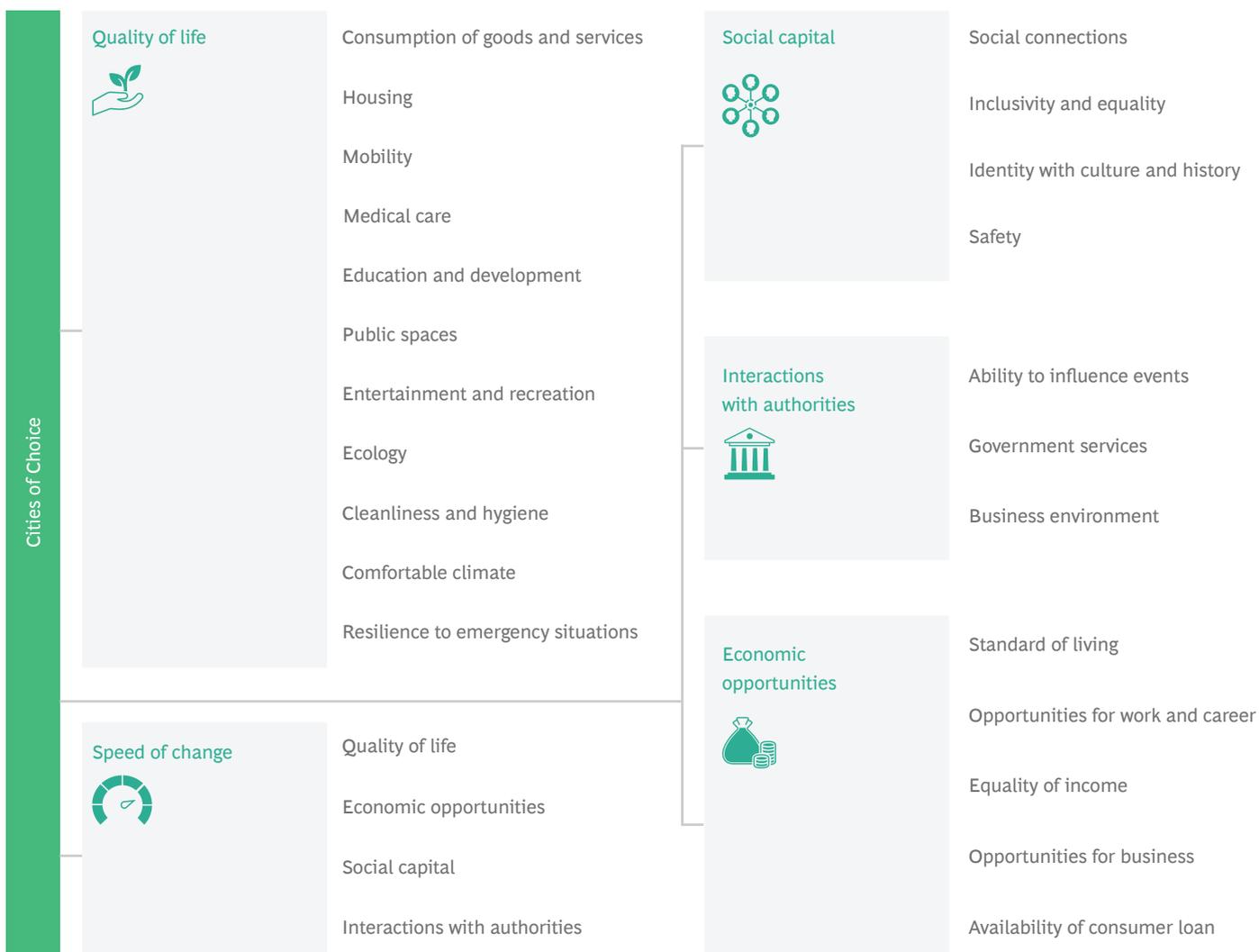
Based on these factors, we formed a ranking structure composed of 27 subdimensions grouped into five blocks. The first four blocks in the ranking correspond to the basic blocks describing various needs, and the fifth block accounts for the speed of change. (**See Figure 3.**)

4. For an overview of more than 40 of the most significant studies on this topic, see Sirgy, M. Joseph (2012). *The Psychology of Quality of Life: Hedonic Well-Being, Life Satisfaction, and Eudaimonia*.

5. We identified six of residents' roles: consumers, workers, individuals and family members, members of society, entrepreneurs, and citizens. For each role, we selected key needs that resulted in the final set of 23 needs. The Quality of life block included the needs related to infrastructure and services provided to residents and excluded e.g. safety that was put into the Social capital block.

6. Y. N. Harari, *21 Lessons for the 21st Century*

Figure 3 - Ranking structure



Weights of the ranking subdimensions

In a ranking that covers a wide range of assessment areas, the choice of weightings can have a dramatic impact on the final rankings for the cities. Therefore, as discussed above, it was necessary to choose weightings for the subdimensions that reflect their importance for residents' city Advocacy score.

The importance was estimated based on the results of the global survey. For each city, the importance score was adjusted to best reflect the priorities held by its residents. As a result, the individual weights for the subdimensions were calculated for each city and normalized to 100% (see Figure 4). For details on the weights selection approach, see Appendix 3.

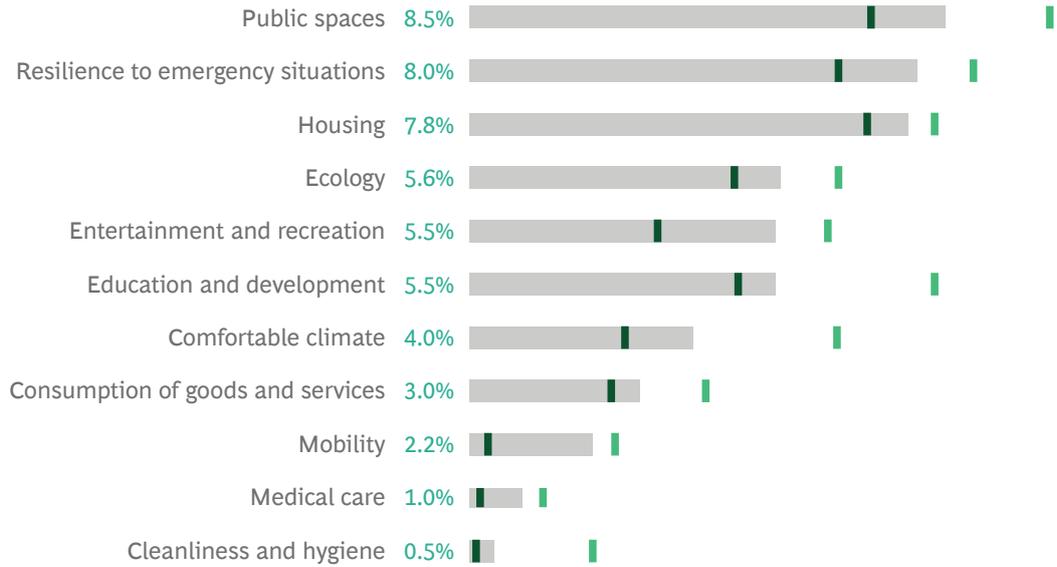
Selecting indicators

For each of the 27 subdimensions of the ranking, we created a set of indicators with a certain weight assigned to each (in most cases, all indicators within a subdimension were assigned the same weight). Thus, a separate subindex was created for each of the 27 subdimensions. In calculating the final score, the weights defined in the previous step were applied to each of the 27 subindices.

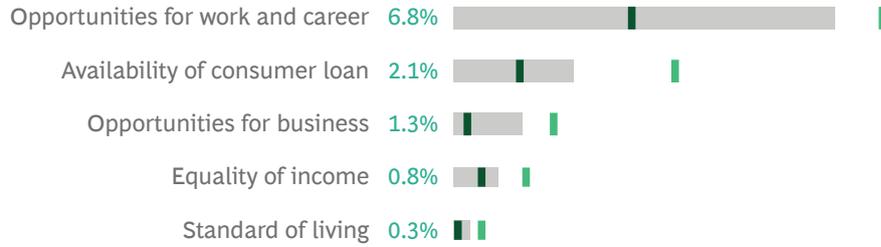
The principles for selecting the indicators and a complete list of 155 indicators with data sources and weights within the area are available in Appendix 2.

Figure 4 - Weighting for the ranking subdimensions

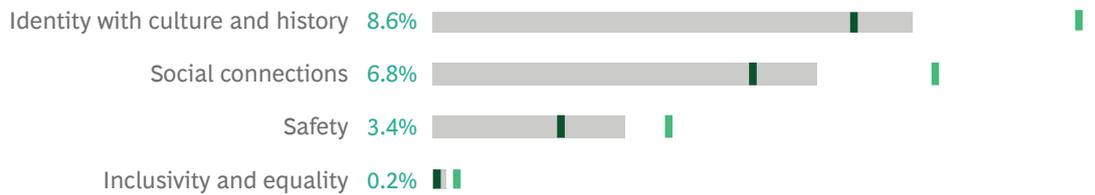
Quality of life



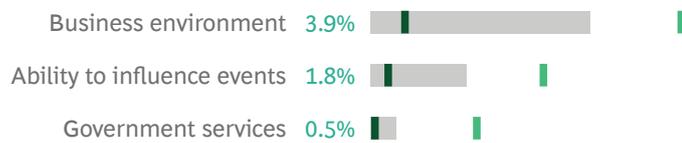
Economic opportunities



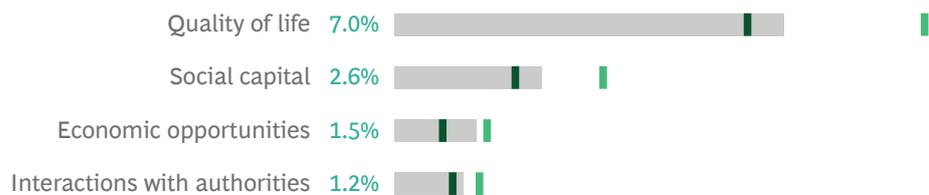
Social capital



Interactions with authorities



Speed of change



Average for all cities
 Minimum for all cities
 Maximum for all cities

Selecting the cities for the ranking

A city was included in the ranking if it was a top performer in at least one of the four blocks representing residents needs: economic opportunities, quality of life, interactions with authorities, and social capital. For this, we looked at the most cited rankings⁷ and chose the top 25 cities for each. We also added 16 cities that were of interest in terms of the dynamics governing their development. A number of cities were excluded in the course of data

collection and processing due to the limited availability of comparable statistical data and representative samples for the surveys. However, we preserved as much diversity as possible in terms of the representation of different parts of the world in the ranking⁸. As a result, 45 cities made it to the final list. (See Figure 5.) We plan to extend this list in future editions of the ranking.

Figure 5 - 45 cities included in the ranking



7. For example, the Quality of Living City Ranking (developed by Mercer Consulting), Global Livability Index (developed by Economist Intelligence Unit), The Global Financial Centers Index (developed by Z/Yen).

8. This version of the ranking does not include cities in Africa, Eastern Europe, and some other parts of the world, due to the timing of the data collection and processing, but they will be included in the 2021 ranking.

Where in the world
does it feel good to live?
Ranking results



Cities of choice

The overall results of the ranking for the 45 cities are shown *in Figure 6*. The results are also presented for each of the five blocks that compose the ranking: Quality of life, Economic opportunities, Social capital, Interactions with authorities, and Speed of change.

The results are, to a certain extent, what would be expected. Many cities that are considered advanced are at the top of the ranking. At the level of individual ranking blocks, there is significant overlap with the most cited city rankings that have a similar assessment focus⁹.

Still, there were some unexpected results: a number of the expected leaders — Paris, Toronto, Vancouver — ended up in the middle of the list, while a few fast-growing cities that rarely top the global rankings joined the group of leaders. This is due to the nature of the approach adopted that covered all the important areas of life and took into account the speed of change, the use of mainly statistical indicators, and an assessment process from the perspective of city residents (rather than a potential expatriate, for example).

So what makes a city a leader? An analysis of the leaders in each of the ranking blocks helps answer this question.

Leadership in the Quality of life block depends directly on the availability of a well-developed infrastructure and high-quality housing. In the context of the pandemic, the city's resilience in bouncing back from emergencies became particularly important.

Leadership in the Economic opportunities block implies good conditions for career and business development combined with reasonable price levels that help maintain a high standard of living.

Leadership in the Social capital block requires, on one hand, that residents identify with the city, its culture and history, and on the other hand, that the city provides conditions for maintaining meaningful social relations and a high level of security and trust.

Leadership in the Interactions with authorities block is held by those cities that traditionally have a high level of respect for the authorities, or a high degree of institutional development.

Finally, leadership in the Speed of change block is enabled by the high level of dynamics in the Quality of life, Social capital, and Interactions with authorities blocks. Interestingly, most of the leaders in this block demonstrate

mediocre dynamics of Economic opportunities.

We see cities using diverse strategies to build necessary advantages and achieve supreme positions in the mentioned areas. While a comprehensive analysis of such strategies is a topic for a separate report, some examples are provided in the insets below.

Therefore, to achieve high results in different subdimensions, a city needs to have different strengths. None of the cities can boast strong results across all five blocks of the ranking. Then what makes a city a leader in the ranking? How can you find the balance among the different aspects of city development and provide the best conditions for the residents? Looking at the top of the ranking, it could be posited that there is no single recipe or strategy. We can distinguish four groups of cities that managed to create the best conditions for the wellbeing of their residents in different ways (Figures 8–11 show examples of cities from each group and the details involved in assessing them).

“Global megapolises” — the largest cities that hold global importance. These are mature cities: they rank high throughout all the blocks in the ranking but do not have a very high speed of change. Examples of these cities are London and New York.

“Specialist cities” — smaller cities that score very high on the Economic opportunities block (especially in terms of career and business opportunities). They achieve this primarily through specializing in certain sectors of the economy or markets. These cities are also notable for their high quality of life, but they score more modestly on the Social capital and Interactions with authorities blocks. These are also mature cities with a low speed of change. Zurich and San Francisco are some examples of cities in this group.

“Comfortable cities” are smaller than “Global megapolises”, and guarantee an exceptionally high quality of life for their residents. However, unlike the cities in the first and second groups, these cities have worse economic conditions. Their speed of change is also low. Examples of cities belonging to this group: Vienna, Copenhagen, Sydney, and Helsinki.

“New stars” are cities that have entered a phase of active change within the last 10 to 20 years. They are characterized by a noticeable imbalance in the development of individual blocks; at the same time, these cities have the highest speed of change. Examples of cities in this group: Abu Dhabi and Beijing.

9. For example, the “Quality of life” block largely backs up the results of the Mercer Quality of Living City Ranking (all 9 cities in the top 20% of the “Quality of life” block are also in the top 20% of the Mercer ranking). Likewise, the “Economic opportunities” block shows a significant overlap with the AIRINC Global 150 Cities Index — Financial Rank (6 of the 9 cities in the top 20% of the block are also in the top 20% of the AIRINC Index).

Figure 6 - Cities of Choice – Global City Ranking

RANK	CITY	COUNTRY	TOTAL SCORE (MAX 100)	SCORES FOR 5 BLOCKS				
				QUALITY OF LIFE	ECONOMIC OPPORTUNITIES	SOCIAL CAPITAL	INTERACTIONS WITH AUTHORITIES	SPEED OF CHANGE
1	London	UK	65,7	68	69	77	65	35
2	New York	USA	64,9	65	71	74	66	45
3	Helsinki	Finland	60,2	67	64	55	64	34
4	Copenhagen	Denmark	59,8	64	57	56	56	52
5	Abu Dhabi	UAE	59,4	50	78	61	71	73
6	Madrid	Spain	59,3	60	43	74	48	54
7-8	Beijing	China	59,2	45	60	81	33	94
7-8	Vienna	Austria	59,2	72	48	55	45	33
9	Zurich	Switzerland	58,7	69	79	47	43	30
10	Sydney	Australia	58,3	64	44	58	71	40
11	Singapore	Singapore	57,9	55	70	45	77	70
12	Seattle	USA	57,7	64	71	40	56	47
13	San Francisco	USA	57,4	62	81	47	57	31
14	Stockholm	Sweden	57,2	60	64	65	49	31
15	Amsterdam	Netherlands	57,1	60	57	68	52	31
16	Dublin	Ireland	53,4	57	71	54	38	28
17-18	Dubai	UAE	53,2	47	72	58	73	44
17-18	Hamburg	Germany	53,2	60	54	46	41	38
19-20	Los Angeles	USA	52,6	52	56	58	43	48
19-20	Toronto	Canada	52,6	60	53	36	76	36
21-22	Shanghai	China	51,2	40	44	64	45	91
21-22	Wellington	New Zealand	51,2	58	49	33	83	40
23	Melbourne	Australia	51,1	58	41	36	73	43
24	Philadelphia	USA	50,8	55	50	36	54	55
25	Miami	USA	49,8	55	47	35	48	54
26	Paris	France	49,7	56	55	57	45	10
27	Montreal	Canada	49,5	53	49	37	73	41
28	Delhi	India	49,2	30	36	81	35	94
29-30	Berlin	Germany	48,7	52	47	57	39	29
29-30	Vancouver	Canada	48,7	57	45	32	62	39
31	Tel Aviv	Israel	46,4	44	49	43	59	56
32	Rome	Italy	45,4	47	26	58	36	42
33	Barcelona	Spain	44,5	46	31	59	43	31
34	Auckland	New Zealand	44,3	48	30	32	79	35
34	Mumbai	India	44,3	21	46	85	25	84
36	Istanbul	Turkey	41,6	31	41	54	29	71
37	Mexico City	Mexico	39,7	34	28	63	14	47
38	Seoul	South Korea	39,3	39	41	31	68	37
39	Kuala Lumpur	Malaysia	38,3	35	45	36	45	46
40	Buenos Aires	Argentina	36,1	37	18	48	28	33
41	Ho Chi Minh	Vietnam	35,8	19	36	64	14	69
42	Hong Kong	China	33,0	33	38	18	52	41
43	Sao Paulo	Brazil	28,4	25	5	40	10	58
44	Rio De Janeiro	Brazil	22,5	15	1	44	5	54
45	Santiago	Chile	20,8	15	12	26	31	44

The colors reflect the place of the city in the respective block

■ Position 1-9
 ■ Position 10-18
 ■ Position 19-27
 ■ Position 28-36
 ■ Position 37-45

Making cities a better place by building trust

As demonstrated by its presence in multiple subdimensions in the Cities of Choice methodology, trust is one of the strongest actionable levers for ensuring a city's sustainable development. It plays a critical role in the advocacy and attractiveness of cities. Its importance for cities can be seen from several standpoints:

- Trust itself is one of the resident's key needs and affects the fulfillment of other needs through meaningful relationships and pro-social behavior
- Trust reduces transaction costs, acting as a "lubricant" for business and everyday life
- Trust reduces uncertainty, increasing residents' predisposition for long-term investment

Trust, in essence, is the confidence that someone or something will deliver on a promise or behave as expected. To build trust, the city should improve on its three foundational elements: competence, fairness, and transparency—demonstrating that it can deliver on the promise, is willing to do so, and is subject to outside scrutiny.

These foundational elements can be improved upon in two ways: directly, through "emulating the tribe," or indirectly, by designing for trust. Emulating the tribe relies on the power of resident engagement: being part of a community or having a say in city affairs. However, achieving engagement is only possible when people appreciate its relevance. Residents won't vote for a citywide project if they do not see how it will affect their lives. To achieve engagement, cities need to cascade impacts and benefits to the neighborhood level and delegate to local communities the decisions that affect those benefits.

Designing for trust relies on city leaders taking a structured approach to building systemic trust into their cities' fabric. This active role can be adopted by using digital and non-digital tools to either enhance trust through the reputation improvements of certain players (for example, the city itself) or embed trust in the structure of interactions through instruments (for example, user reviews and ratings), rules, and processes. This makes trust less personal and more automatic.



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*Managing Director & Senior Partner,
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Improving quality of life with smart city solutions

In many cases, smart city projects have been the opposite of people-centric; they have been technology focused and technology driven. Becoming resident focused is one of the key trends in the evolution of cities. But does a smart city project improve quality of life? The answer is both yes and no. Do you have to have a smart city program to become a city of choice? Clearly: no. Can smart city approaches and smart city solutions help improve a city's position as a city of choice? Clearly: yes.

So how can a smart city also become a city of choice? Here are three suggestions:

1. **Create participation** when you build your smart city strategies by ensuring residents' input in co-production, co-delivery and co-evaluation of the main urban challenges and potential solutions^a. For example:
 - Ottawa used Smart City 2.0 collaborative and consultative approach: the development of the strategy has been done in consultation with knowledge-based businesses, smart city eco-system stakeholders and many other residents of the city^b
 - The city of Pune (India) took several measures to ensure effective public participation in its smart-city plan: in Phase I 3 million resident inputs were received in 45 days^c
 - The city of Heraklion (Greece) "Heraklion: Smart City" strategic plan was developed by the Municipality of Heraklion in cooperation with the city's major stakeholders

2. **Establish strict customer orientation** when ramping up smart city solutions: assess resident-user journeys and focus on customers' pain points and requirements. For example:
 - The Estonia e-government experience shows government services profit greatly when they can be done digitally with a focus on user experience. Not only are they cheaper (e-voting is 20 times cheaper than regular voting)^d, they also increase residents' satisfaction with government by providing higher quality and better accessibility
3. Implement **solutions that lead to citizens engaging with the city** and with each other, such as resident engagement tools, collaborative tools, and social platforms. For example:
 - San Francisco Civic Bridge recruits private sector professionals to volunteer their time to work alongside government employees on critical city issues^e
 - In Moscow, the "Active Citizen" platform allows residents to vote on the city's issues, and the "Our City" platform allows residents to report city utilities and services concerns^f
 - Several global cities use new digital tools to engage citizens, using tools like Civocracy, Illico, Citizenlab or Civy.^g



Thilo Zelt
Managing Director & Partner,
Berlin

a. https://www.oecd.org/cfe/cities/OECD_Policy_Paper_Smart_Cities_and_Inclusive_Growth.pdf

b. https://documents.ottawa.ca/sites/documents/files/smart_city_strategy_en.pdf

c. <https://smartnet.niua.org/sites/default/files/webform/Smart%20Pune-Citizen%20Engagement%20Case%20Study.pdf>

d. <https://e-estonia.com/e-governance-saves-money-and-working-hours/>

e. <https://www.innovation.sfgov.org/civic-bridge>

f. <https://www.mos.ru/en/city/projects/smartcity/>

g. <https://hub.beesmart.city/en/solutions/top-civic-engagement-solutions-smart-cities>

Figure 7 - Example of a “global megapolis”



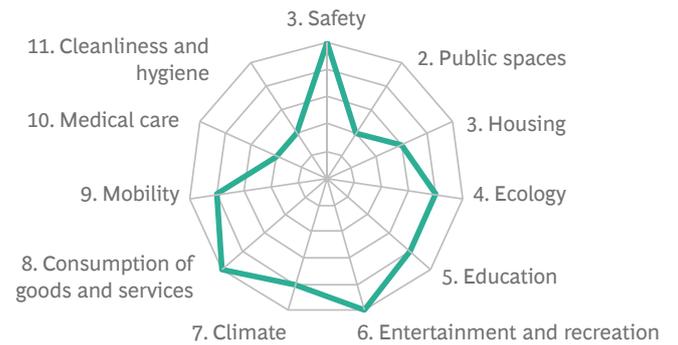
New York

	QUALITY OF LIFE	65
	ECONOMIC OPPORTUNITIES	71
	SOCIAL CAPITAL	74
	INTERACTIONS WITH AUTHORITIES	66
	SPEED OF CHANGE	45

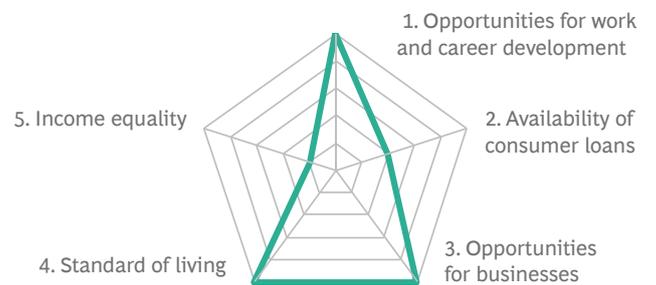
■ Positions 1–9
 ■ Positions 10–18
 ■ Positions 19–27
 ■ Positions 28–36
 ■ Positions 37–45

1. The consistency of indicators is defined by their importance (weight) in calculating the cumulative value. The importance decreases clockwise
2. The colors reflect the place of the city in the corresponding area or block

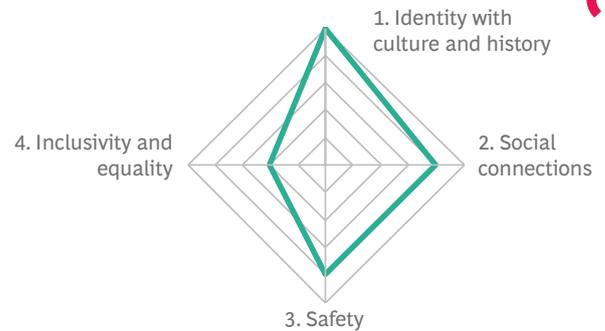
Quality of life



Economic opportunities



Social capital



Interactions with authorities

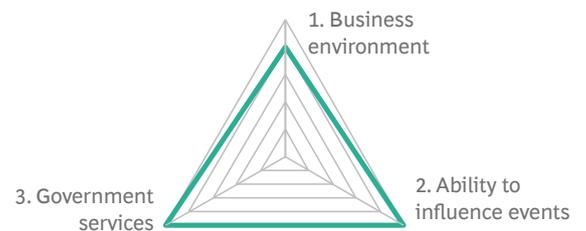


Figure 8 - Example of a “specialist city”



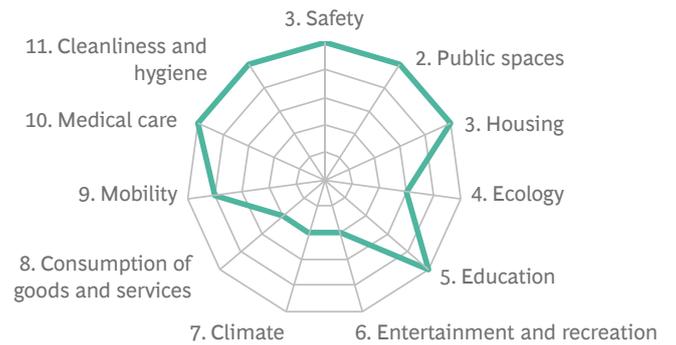
Zurich

	QUALITY OF LIFE	69
	ECONOMIC OPPORTUNITIES	79
	SOCIAL CAPITAL	47
	INTERACTIONS WITH AUTHORITIES	43
	SPEED OF CHANGE	30

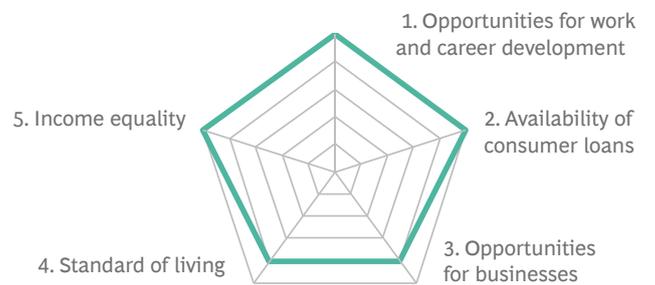
■ Positions 1–9 ■ Positions 10–18 ■ Positions 19–27 ■ Positions 28–36 ■ Positions 37–45

1. The consistency of indicators is defined by their importance (weight) in calculating the cumulative value. The importance decreases clockwise
2. The colors reflect the place of the city in the corresponding area or block

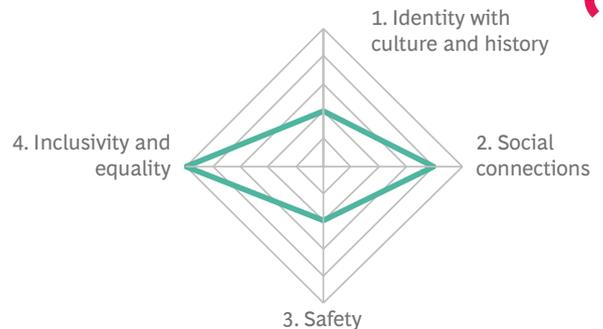
Quality of life



Economic opportunities



Social capital



Interactions with authorities

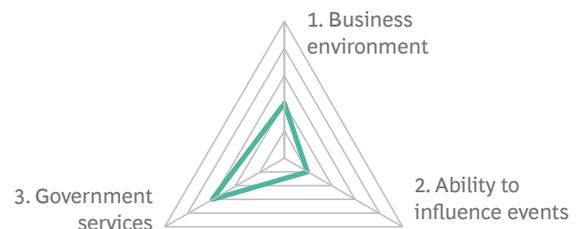


Figure 9 - Example of a “comfortable city”



Sydney



QUALITY OF LIFE

64



ECONOMIC OPPORTUNITIES

44



SOCIAL CAPITAL

58



INTERACTIONS WITH AUTHORITIES

71



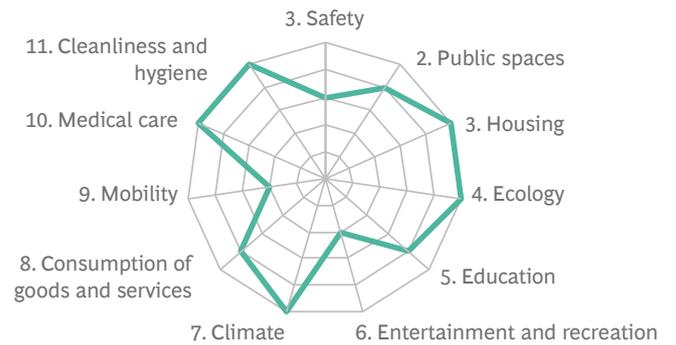
SPEED OF CHANGE

40

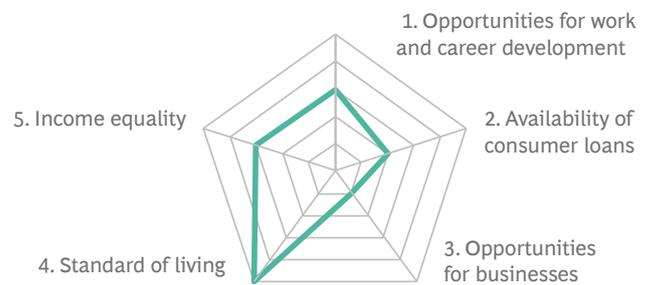
■ Positions 1–9 ■ Positions 10–18 ■ Positions 19–27 ■ Positions 28–36 ■ Positions 37–45

1. The consistency of indicators is defined by their importance (weight) in calculating the cumulative value. The importance decreases clockwise
2. The colors reflect the place of the city in the corresponding area or block

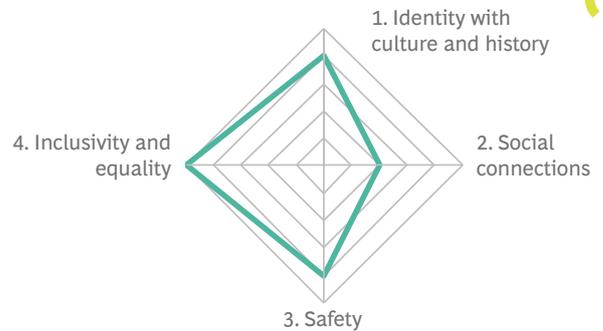
Quality of life



Economic opportunities



Social capital



Interactions with authorities

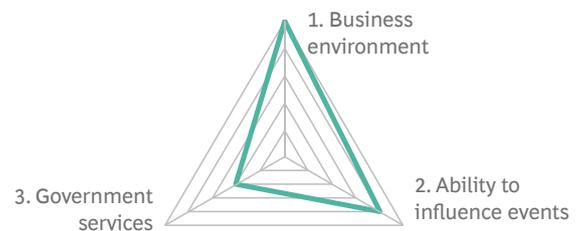


Figure 10 - Example of a “new star” city



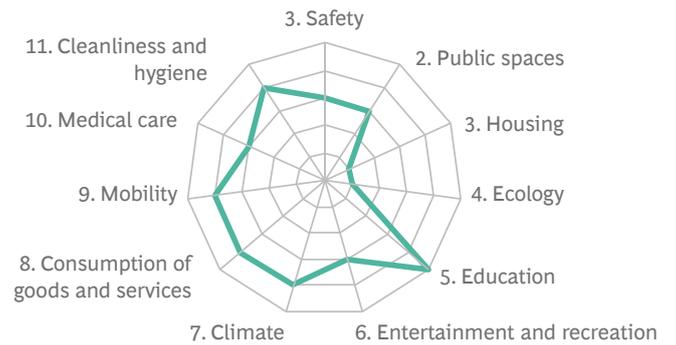
Beijing

	QUALITY OF LIFE	45
	ECONOMIC OPPORTUNITIES	60
	SOCIAL CAPITAL	80
	INTERACTIONS WITH AUTHORITIES	33
	SPEED OF CHANGE	94

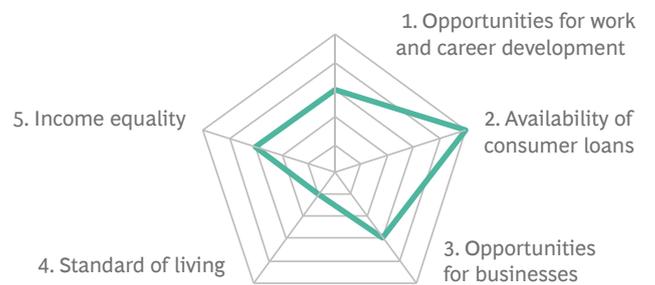
■ Positions 1–9
 ■ Positions 10–18
 ■ Positions 19–27
 ■ Positions 28–36
 ■ Positions 37–45

1. The consistency of indicators is defined by their importance (weight) in calculating the cumulative value. The importance decreases clockwise
2. The colors reflect the place of the city in the corresponding area or block

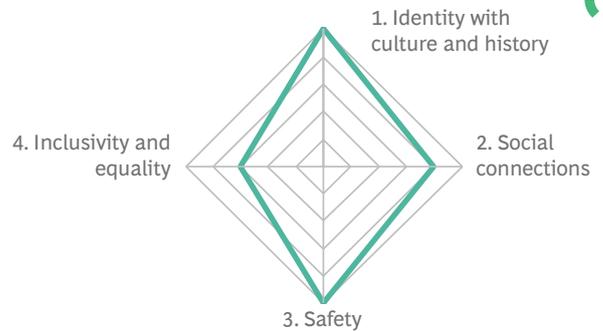
Quality of life



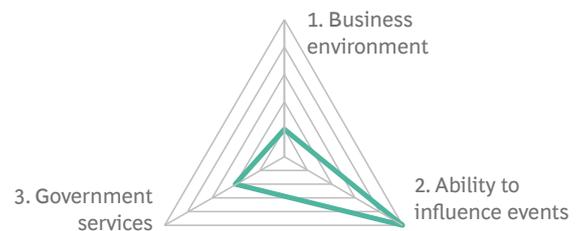
Economic opportunities



Social capital



Interactions with authorities



Relationship between the balance and speed of development

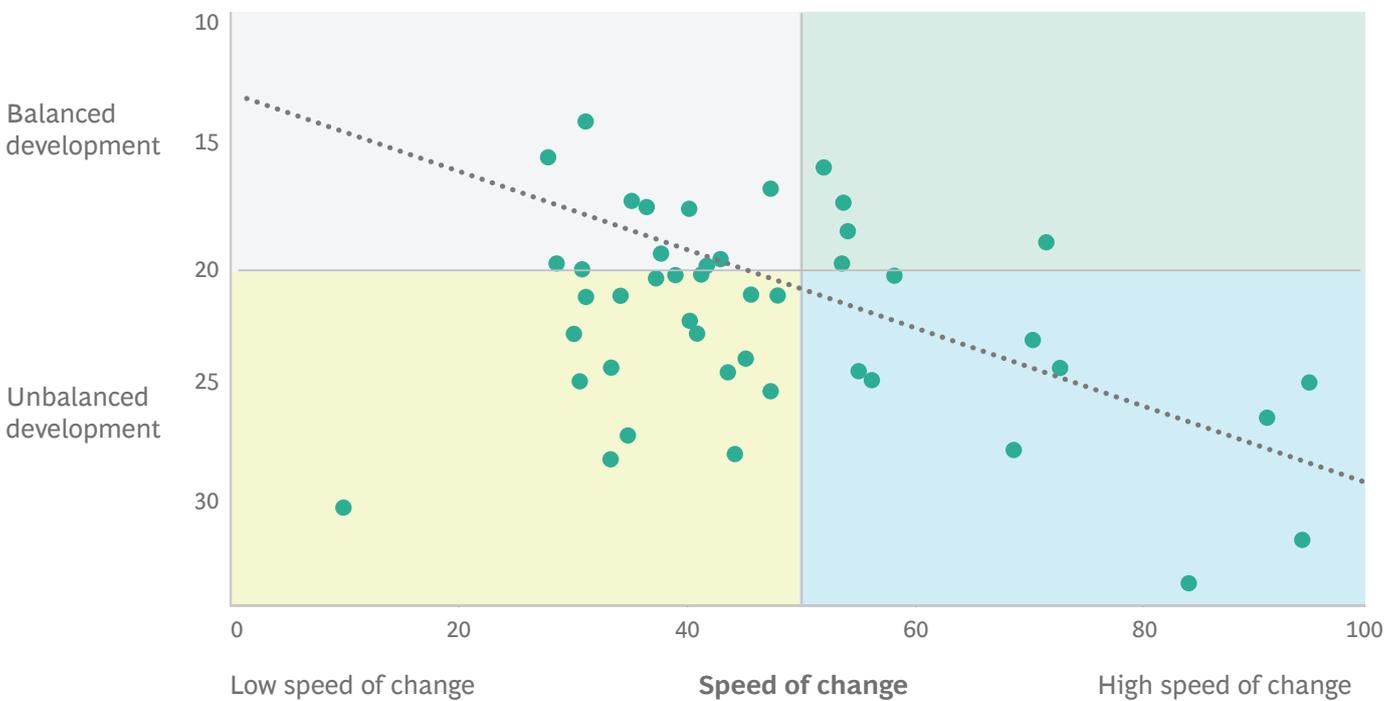
The cities with a high speed of change typically demonstrate imbalanced development across different subdimensions (**Figure 11**): fast-developing cities often bet on making a breakthrough in a small number of areas. As the speed of development declines, the level of development evens out.

The “new star” cities have the greatest potential to increase the wellbeing and satisfaction of their residents. On one hand, there are a significant number of areas

where they lag behind—where you would expect the response to improvements in the form of increased resident satisfaction to be genuinely noticeable. On the other hand, they show a high speed of change, which means they have the resources and management capabilities to accommodate rapid change. To capture the potential to increase their Advocacy score, these cities need to adjust the vector of development, investing more in areas where they lag behind without losing their overall momentum.

Figure 11 - Relationship between the balance and speed of development

Score variability*



Note: Standard deviation of city indicators by area of focus

Emerging market cities: becoming cities of choice through fast positive change

Large emerging market cities can conjure negative images of traffic, informal housing, and crime. However, our ranking shows that there are some emerging market cities that are contradicting this image.

The four highest ranking emerging market cities are located in China (Beijing and Shanghai) and the UAE (Abu Dhabi and Dubai). These cities have decisive and innovative governments with a clear agenda in shaping their cities. At the same time, they share a people-centric strategic focus that is reflected, for example, in Shanghai's 2040 plan and Dubai's Happiness Agenda. So it's not surprising that these cities tend to excel in the "Speed of change" block of the ranking.

They also rank high in the "Social capital" block, with leading scores in the "Social interactions" and "Safety" subdimensions, reflecting the strength of their communities. In addition, these cities were able to convert the economic success of their countries into high scores on the "Economic opportunities" block, especially in the areas of employment and business opportunities.

However, the quality of life remains relatively low in these cities as well as the rest of the emerging market slate. In particular, we see consistently low scores for emerging market cities in "Medical care" and "Ecology" subdimensions.

- **Medical care:** this results from the relatively low standard of medical infrastructure, especially in places like India and many South American countries, which also experienced a dramatic impact from COVID.
- **Ecology:** even though this topic is top of mind around the world, we still see a mixed level of dedication from emerging market cities' governments on tackling it. Congestion and pollution remain key challenges in many of these cities.

There is no doubt this list will be changing dynamically in future editions of the ranking as we see other emerging market cities moving up the ranks, driven by their investments in infrastructure and fast positive change. We look forward to the dynamics of vibrant metropolises such as Delhi, Mumbai, Istanbul, and Ho Chi Minh City.



Nikolaus S. Lang
*Managing Director & Senior Partner,
Global Leader, Global Advantage practice*

From conditions to prosperity

As discussed in previous sections, the index measures the objective conditions the city has for the prosperity of its residents, and the development of their city Advocacy score. While the Advocacy index is also affected by subjective perception factors, such as level of expectations and national and cultural factors, it is important to understand to what extent cities manage to convert fundamental conditions into the Advocacy score of their residents.

A comparison of the ranking results and the City Advocacy Index for each of the 45 cities shows that fundamental parameters have only limited effect on Advocacy score. They explain less than 10% of variance in Advocacy, while each additional point in the ranking adds about 0.15 points to the Advocacy score. Most of the variance in the Advocacy index between cities is driven by the subjective factors and perception, rather than fundamental factors.

What conclusions can city leaders draw from these results? Does this mean that the satisfaction and happiness of a city's resident lies in the "trap" represented by subjective factors, and that it is impossible to significantly increase resident satisfaction by improving the fundamental conditions that exist in a city?

We don't see it that way. There are three reasons why cities that improve the quality of the living environment can expect to see an increase in residents' Advocacy index and the associated behavioral changes.

First, comparison of the ranking results and the Advocacy score reflects the long-term relationship between conditions and residents' satisfaction, with their expectations largely adapted to the living environment. Over a relatively short horizon, an improvement in environmental parameters will yield a noticeably higher result.

Second, the fundamental conditions that the ranking measures reflect the availability and quality of elements of the urban environment, including the infrastructure and services available in the city. However, to fully address people's needs, it is also important to ensure that they have successful experiences while using these elements. For example, equipping a bus with air conditioning and Wi-Fi will not make the trip more pleasant if it is 30 minutes late, or runs along a badly planned route. A good experience requires things like high-quality processes,

spatial proximity of the infrastructure, a variety of service delivery formats, etc. Working on these factors will significantly increase the return on investment into fundamentals expressed as an increase in Advocacy score.

Third, the analysis of satisfaction among different segments of city residents shows that less well-informed residents often perceive fundamental conditions to be worse than do better informed ones. For example, childless people rate the education system significantly worse than those who are exposed to it every day, which is reflected in their level of City Advocacy. This means that improvements need to go hand in hand with effective communication to better convert them into increased residents' advocacy and to manage their expectations.

Therefore, to ensure conversion of fundamental improvements into Advocacy score, the cities should strive to apply resident-centric approach in every step of strategic change — from planning to implementation and evaluation (See example on Mobility):

1. Understand the baseline: Measure the level of residents' advocacy and understand the key pain points in the different areas of life in the city
2. Set clear targets and measure against them: Select target areas for development and set resident-centric KPIs based on the pain points and their importance to the residents
3. Improve processes end-to-end: Construct change program along the residents' life experience in the selected area
4. Engage the residents: Communicate and explain the goals and the plan of the city development, engage the residents to build a joint program of action

All this will allow the cities improve the urban living environment, increasing the satisfaction and happiness of their residents and thus achieving higher positions in our future rankings.

Improving advocacy through resident-focused mobility planning

Mobility is one of the key contributors to residents' Advocacy index. It is one of the top expenses for most cities, but also an area of massive innovation and entrepreneurship as many new mobility alternatives emerge.

Despite this, commuting issues are only getting worse. Congestion is growing, transit options remain inequitable, and even in cities considered among the most livable in the world, some 20% of surveyed residents report that their commute is neither easy nor efficient. Ongoing urbanization, increasing diversity of mobility players, and complexity of transportation networks are only part of the problem. The other problem is the focus of traditional management approaches on big-picture, excessively expansive solutions, capacity related KPIs, and isolated individual verticals.

Our analysis shows that infrastructural parameters have only limited effect on residents' Advocacy index. What matters more to people is their end-to-end life experiences — or “resident journeys” — and the commuting journey is among the most important.

To build the best experience, the mobility planning approach must become resident-focused. This means focusing on improving the end-to-end journey for residents rather than optimizing individual modes and services in isolation. This also requires measuring KPIs that are rele-

vant to the people (such as total travel time including the first and last mile, and convenience) instead of capacity related or technical KPIs.

We've found that the resident-focused lens can reveal otherwise unforeseen or even seemingly counterintuitive solutions that can resolve pain points more quickly, more simply, and with little investment. This approach will deliver three broad sets of initiatives:

- Optimization of existing solutions and processes with a focus on the interfaces between adjacent steps and service providers
- Focused investments that address the white spaces and bottlenecks in service offerings
- Large structural investments designed in a way to address the residents' most severe pain points rather than instituted purely for the sake of capacity expansion

We already see cities like Los Angeles and Copenhagen that have undertaken mobility or transportation projects that stand out because of their relation to the resident journey. These are encouraging examples, however, development of a comprehensive and deliberate resident-focused mobility strategy is yet to come.



Joël Hazan
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BCG Henderson Institute Fellow, Paris*

Appendices



Appendix 1. Cities' results for individual subdimensions in the ranking

RANK	CITY	COUNTRY	TOTAL SCORE (MAX 100)	SCORES FOR 5 BLOCKS				
				QUALITY OF LIFE	ECONOMIC OPPORTUNITIES	SOCIAL CAPITAL	INTERACTIONS WITH AUTHORITIES	SPEED OF CHANGE
1	London	UK	65,7	68	69	77	65	35
2	New York	USA	64,9	65	71	74	66	45
3	Helsinki	Finland	60,2	67	64	55	64	34
4	Copenhagen	Denmark	59,8	64	57	56	56	52
5	Abu Dhabi	UAE	59,4	50	78	61	71	73
6	Madrid	Spain	59,3	60	43	74	48	54
7-8	Beijing	China	59,2	45	60	81	33	94
7-8	Vienna	Austria	59,2	72	48	55	45	33
9	Zurich	Switzerland	58,7	69	79	47	43	30
10	Sydney	Australia	58,3	64	44	58	71	40
11	Singapore	Singapore	57,9	55	70	45	77	70
12	Seattle	USA	57,7	64	71	40	56	47
13	San Francisco	USA	57,4	62	81	47	57	31
14	Stockholm	Sweden	57,2	60	64	65	49	31
15	Amsterdam	Netherlands	57,1	60	57	68	52	31
16	Dublin	Ireland	53,4	57	71	54	38	28
17-18	Dubai	UAE	53,2	47	72	58	73	44
17-18	Hamburg	Germany	53,2	60	54	46	41	38
19-20	Los Angeles	USA	52,6	52	56	58	43	48
19-20	Toronto	Canada	52,6	60	53	36	76	36
21-22	Shanghai	China	51,2	40	44	64	45	91
21-22	Wellington	New Zealand	51,2	58	49	33	83	40
23	Melbourne	Australia	51,1	58	41	36	73	43
24	Philadelphia	USA	50,8	55	50	36	54	55
25	Miami	USA	49,8	55	47	35	48	54
26	Paris	France	49,7	56	55	57	45	10
27	Montreal	Canada	49,5	53	49	37	73	41
28	Delhi	India	49,2	30	36	81	35	94
29-30	Berlin	Germany	48,7	52	47	57	39	29
29-30	Vancouver	Canada	48,7	57	45	32	62	39
31	Tel Aviv	Israel	46,4	44	49	43	59	56
32	Rome	Italy	45,4	47	26	58	36	42
33	Barcelona	Spain	44,5	46	31	59	43	31
34	Auckland	New Zealand	44,3	48	30	32	79	35
34	Mumbai	India	44,3	21	46	85	25	84
36	Istanbul	Turkey	41,6	31	41	54	29	71
37	Mexico City	Mexico	39,7	34	28	63	14	47
38	Seoul	South Korea	39,3	39	41	31	68	37
39	Kuala Lumpur	Malaysia	38,3	35	45	36	45	46
40	Buenos Aires	Argentina	36,1	37	18	48	28	33
41	Ho Chi Minh	Vietnam	35,8	19	36	64	14	69
42	Hong Kong	China	33,0	33	38	18	52	41
43	Sao Paulo	Brazil	28,4	25	5	40	10	58
44	Rio De Janeiro	Brazil	22,5	15	1	44	5	54
45	Santiago	Chile	20,8	15	12	26	31	44

The colors reflect the place of the city in the respective area or block

■ Position 1-9
 ■ Position 10-18
 ■ Position 19-27
 ■ Position 28-36
 ■ Position 37-45

Appendix 2. Indicators and data sources used

The indicators for the 27 subdimensions in the ranking were selected based on the following principles:

1. Based on expert opinions, we defined a set of six criteria for a “good city” corresponding to the needs of a modern resident for each of the 27 subdimensions. For example, for the Mobility subdimension (in the Quality of life block) the following criteria for a “good city” were determined: high connectivity between different districts, low traffic and road congestion, comfort and safety, shared consumption, integration of different modes of transport, and maturity of digital services. Then we selected indicators within each area that were in line with the criteria defined for a “good city.”
2. Data was researched and collected using all available public and paid sources, including the global resident survey mentioned above, along with our own estimates and calculations performed using the following methods:
 - **Model calculations.** For example, in the Housing subdimension, the values of the “Average mortgage payment relative to average monthly household disposable income” indicator were calculated based on the assumptions about the average size of the household, the average availability of living space per capita, the average cost of 1 square meter of housing, the average mortgage rate, and the average household income.
 - **Geoanalytics.** For example, in the Public spaces subdimension, the “Percentage of the city’s area allocated for green spaces” indicator was calculated using geoanalytical data.
 - **Scoring.** For example, in the Mobility subdimension, the “Number of available types of public transport” indicator was calculated by giving the city one point for each of the 13 types of transport.

The complete list of indicators with data sources is provided below.

QUALITY OF LIFE			
HOUSING			
INDICATOR	UNIT OF MEASUREMENT	WEIGHT WITHIN THE SUB-DIMENSION	SOURCE
Number of square meters of living space per person	m ² / person	0.1	Open sources
Availability of an application / service with full coverage of all potential offers for real estate sales The indicator has a value between 0 and 2; 1 point is added for the availability of an application with real estate offers that enable mortgage application ; 1 point is added if the number of the real estate offers exceeds 0.2% of the city population	score	0.1	Open sources
Number of hours that a person needs to work to purchase 1 m ² of housing The indicator reflects the average number of hours a city resident needs to work to purchase 1 m ² of housing based on the average cost of 1 m ² of housing and the average salary after taxes	hours	0.1	Numbeo, national statistical offices, open sources, BCG calculations
Average mortgage payment relative to average monthly household disposable income	%	0.1	BCG calculations
Availability of an application / service with full coverage of all potential real estate rental offers	yes / no	0.1	Open sources, BCG calculations
Share of rental housing in total housing offered for rent and sale on major website / app	%	0.1	Open sources

QUALITY OF LIFE

HOUSING

INDICATOR	UNIT OF MEASUREMENT	WEIGHT WITHIN THE SUB-DIMENSION	SOURCE
Share of the rental housing available to renting with animals According to the most popular real estate rental websites	%	0.1	Open sources
The average cost of renting a one-room apartment outside the city's downtown area in relation to the average monthly disposable income for a household	%	0.1	BCG calculations
Quality of housing (survey) Score calculated as a weighted average of respondents' answers to the statement "I am satisfied with my house / apartment"	score	0.1	BCG global survey
Population density	people / km ²	0.1	Open sources
CONSUMPTION OF GOODS AND SERVICES			
Square meters of retail space per 100,000 population	m ²	0.125	Open sources
Variety of general or special department stores within the city (score)	score	0.125	2thinknow
Number of local farmers' markets with the opportunity to buy fresh food, per 100,000 population	number	0.125	2thinknow, BCG calculations
Number of points of sale per 100,000 population	thousands	0.125	2thinknow, BCG calculations
Accessibility of grocery stores (survey) Score calculated as a weighted average of respondents' answers to the statement "There is a grocery store within walking distance from my house"	score	0.125	BCG global survey
Penetration rate of non-cash payments Calculated index that assesses the level of penetration of non-cash payments based on the following data: the number of ATMs; the possibility of non-cash payments in hotels and small stores; the prevalence of contactless mobile payments	score	0.125	2thinknow, open sources, BCG calculations
Share of the population using Internet sales channels	%	0.125	2thinknow
Online services availability for the delivery of everyday purchases The indicator takes the "Yes" value if it is possible to make a delivery within 4 hours, covering most of the city, and "No" otherwise	yes / no	0.125	Open sources

QUALITY OF LIFE

MOBILITY

INDICATOR	UNIT OF MEASUREMENT	WEIGHT WITHIN THE SUB-DIMENSION	SOURCE
Average time lost in traffic jams per resident	hours	0.0556	TomTom, INRIX
Average length of the road network and driveways relative to the number of vehicles Average length of the road network and driveways per vehicle, including courtyard areas	km / vehicle	0.0556	Open sources, BCG calculations
Number of cars available for carsharing services per 1,000 population	number	0.0556	Open sources
Number of taxis per 1,000 population	number	0.0556	Open sources
Number of types of public transport available The indicator has a value between 0 and 13, depending on the availability of the following types of transport in the city: subway, bus, streetcar, trolley, cable car, monorail, taxi, social taxi, city bike rental, commuter trains, electric bus, car sharing, and water transport	score	0.0556	Open sources
Length of subway lines / area of the city	km / km ²	0.0556	Open sources, BCG calculations
Number of passengers that use subway per day / city population	%	0.0556	Open sources, BCG calculations
Availability of buses that run at nighttime	yes / no	0.0556	Open sources
Cost of a monthly public transport ticket / monthly earnings	%	0.0556	Numbeo, open sources, BCG calculations
Proximity of stations / bus stops to home / place of work / study (survey) Score calculated as a weighted average of respondents' answers to the statement "Station / bus stop I use is too far from my house / work / school"	score	0.0556	BCG global survey
Number of deaths as a result of traffic accidents per 100,000 population per year	people	0.0556	Open sources, BCG calculations
Availability of information about parking online and opportunity to pay for parking online The indicator takes a "Yes" value if there is information online on the availability, operations, and locations for parking and it is possible to pay for parking online, and a "No" otherwise	yes / no	0.0556	Open sources

QUALITY OF LIFE

MOBILITY

INDICATOR	UNIT OF MEASUREMENT	WEIGHT WITHIN THE SUB-DIMENSION	SOURCE
Time to commute from home to place of work / study (survey) Average time based on responses to the question “How long is your usual trip from home to work/study?”	minutes	0.0556	BCG global survey
Availability of Wi-Fi connection in train railcars and at subway stations, in buses, and at aboveground public transport stops	yes / no	0.0556	Open sources
Availability of dedicated lanes for public transport	yes / no	0.0556	Open sources
Quality of public transport (survey) Score calculated as a weighted average of respondents’ answers to the statement “The public transport I use is modern, and I am satisfied with its quality”	score	0.0556	BCG global survey
Number of bikes and scooters for rent per 100,000 population	number	0.0556	Open sources, BCG calculations
Infrastructure for alternative modes of transport: length of bike paths relative to the length of the road network	km / 100,000 km	0.0556	Open sources, BCG calculations

ENTERTAINMENT AND RECREATION

Number of museums per 100,000 population	number	0.0714	Open sources, BCG calculations
Number of theaters per 100,000 population	number	0.0714	Tripadvisor, World Cities Culture Forum, open sources, BCG calculations
Number of cinemas per 100,000 population	number	0.0714	World Cities Culture Forum, Cinema Treasures, open sources, BCG calculations
Number of restaurants per 100,000 population	number	0.0714	Tripadvisor, BCG calculations
Number of stadiums per 100,000 population	number	0.0714	Google Maps, open sources, BCG calculations

QUALITY OF LIFE

ENTERTAINMENT AND RECREATION

INDICATOR	UNIT OF MEASUREMENT	WEIGHT WITHIN THE SUB-DIMENSION	SOURCE
<p>Availability of options for entertainment and recreation (survey)</p> <p>Score calculated as a weighted average of respondents' answers to the statement "I can always find opportunities for leisure and entertainment (e.g. restaurant, cinema, theatre, etc.)"</p>	score	0.0714	BCG global survey
Availability of special entertainment and cultural events for the elderly	yes / no	0.0714	Open sources
Number of fitness centers and swimming pools per 100,000 population	number	0.0714	Google Maps, open sources, BCG calculations
Number of museum visits per year	million	0.0714	Open sources
Number of theater visits per year	million	0.0714	Open sources, BCG calculations
Number of international film festivals	number	0.0714	Open sources
Number of Michelin-rated restaurants	number	0.0714	Michelin, open sources
<p>The presence of significant events in popular sports</p> <p>The indicator has a value between 0 and 4, where 1 point is given for soccer matches (Champions League, Europa League, Asian Football Confederation Champions League, FIFA Club World Cup), 1 point for tennis tournaments (Grand Slam and Masters Series), 1 point for Formula One rounds (all three types of competitions are accounted for over 2 years), and 1 point for hockey games (Champions Hockey League and National Hockey League playoffs) played in the city over a five-year period</p>	score	0.0714	Open sources
Share of adult population that regularly practices sports (1 or more times per week)	%	0.0714	BCG global survey

PUBLIC SPACES

Percentage of the city's area allocated for green spaces	%	0.2	BCG estimate based on geoanalytics, open sources
<p>Time spent outdoors each week</p> <p>The indicator has a value between 0 (the person does not spend any time outdoors) and 100 (the person spends more than 8 hours per week outdoors)</p>	score	0.2	BCG global survey

QUALITY OF LIFE

PUBLIC SPACES

INDICATOR	UNIT OF MEASUREMENT	WEIGHT WITHIN THE SUB-DIMENSION	SOURCE
<p>Availability of public spaces (survey)</p> <p>Score calculated as a weighted average of respondents' answers to the statement "I can always find where to go for a walk (e.g. parks, squares, etc.)"</p>	score	0.2	BCG global survey
<p>Quality of public spaces (survey)</p> <p>Score calculated as a weighted average of respondents' answers to the statement "In my experience, public spaces (e.g. parks, squares, etc.) are clean, in good condition and well-equipped"</p>	score	0.2	BCG global survey
Quality of street lighting	W / cm ² / sr	0.2	https://therevelator.org/cities-ranked-light-pollution/

EDUCATION AND DEVELOPMENT

<p>Availability of preschool education (survey)</p> <p>Share of respondents who noted "Preschool education is too expensive or not accessible" as one of the most common problems with pre-school education</p>	%	0.143	BCG global survey
<p>Literacy rate among residents over the age of 15</p> <p>Country-level indicator</p>	%	0.143	World Bank
<p>Number of students per teacher</p> <p>Country-level indicator</p>	people	0.143	Open sources, BCG calculations
<p>Quality of preschool education (survey)</p> <p>Score calculated as a weighted average of respondents' answers to the statement "People I know and I are satisfied with the quality of preschool education provided to my/their children"</p>	score	0.143	BCG global survey
<p>PISA test results</p> <p>Total score in mathematics, reading, and science literacy tests</p>	score	0.143	OECD (Program for International Student Assessment)
<p>International Olympiad results across 8 disciplines (index)</p> <p>The number of international Junior Olympiad medal winners weighted based on medals won (gold — 3 points / silver — 2 points / bronze — 1 point) in mathematics, computer science, physics, chemistry, biology, geography, science, astronomy& astrophysics in 2019</p>	number	0.143	Open sources
<p>Availability of online courses for schoolchildren funded by the government</p>	yes / no	0.143	Aurora Institute

QUALITY OF LIFE

ECOLOGY

INDICATOR	UNIT OF MEASUREMENT	WEIGHT WITHIN THE SUB-DIMENSION	SOURCE
Air quality: PM _{2.5} content	µg/m ³	0.167	WHO
Air quality: PM ₁₀ content	µg/m ³	0.167	WHO
Air quality: NO ₂ content	µg/m ³	0.167	https://air-quality.com/
Air quality: O ₃ content	µg/m ³	0.167	https://air-quality.com/
Existence of measures and initiatives to help preserve the climate A city receives 0 points if it is not part of the C40 alliance and has no emission reduction strategy, 1 point if one of the conditions is met, and 2 points if both conditions are met	score	0.167	C40 Cities, open sources
Share of solid household waste that is recycled or recovered	µg/m ³	0.167	WHO

CLEANLINESS AND HYGIENE

Quality of garbage collection and removal services (survey) Score calculated as a weighted average of respondents' answers to the statement "I am satisfied with garbage collection and removal in the city"	score	0.5	BCG global survey
Quality and cleanliness of sidewalks (survey) Score calculated as a weighted average of respondents' answers to the statement "In my experience, sidewalks are clean, in good condition, and convenient"	score	0.5	BCG global survey

MEDICAL CARE

Number of doctors per 10,000 population	people	0.111	Open sources
Number of hospital beds per 100,000 population	number	0.111	Open sources
Availability of a single telephone number to call for medical assistance	yes / no	0.111	WHO, open sources
Percentage of medical institutions that use electronic medical records	%	0.111	Open sources
Share of respondents that see medical personnel as lacking in politeness or competence (survey) Share of respondents who noted "Personnel is rude or incompetent" as one of the most common problems when visiting a medical facility	%	0.111	BCG global survey

QUALITY OF LIFE

MEDICAL CARE

INDICATOR	UNIT OF MEASUREMENT	WEIGHT WITHIN THE SUB-DIMENSION	SOURCE
Life expectancy at birth This ranking uses country-level indicators for some of the cities	years	0.111	UN, national statistical offices, BCG calculations
Average healthy life expectancy This ranking uses country-level indicators for some of the cities	years	0.111	WHO, open sources
Number of nurses per 100,000 population	people	0.111	Open sources, BCG calculations
Number of ambulances per 100,000 population	number	0.111	Open sources, BCG calculations

COMFORTABLE CLIMATE

Average number of hours of sunshine per year	hours / year	0.333	https://www.currentresults.com/ , open sources
Number of months with a comfortable daytime temperature Number of months when the temperature does not exceed +25 degrees, or does not fall below +16 degrees Celsius	number	0.333	Open sources, BCG calculations
Number of months with extreme daytime temperatures Number of months when the temperature exceeds +35 degrees, or falls below 0 degrees Celsius	number	0.333	Open sources, BCG calculations

RESILIENCE TO EMERGENCY SITUATIONS

Level of exposure to natural disasters and estimated potential impact of natural disasters (index) Rated between 0 and 5, where 5 is the most favorable situation in terms of natural disasters. Includes exposure to earthquakes, extreme temperatures, floods, and wildfires	score	0.0588	2thinknow
Number of security cameras per city unit of area Including cameras located in the subway system	number / km ²	0.0588	Open sources, BCG calculations
Number of ambulances per 100,000 population	number	0.0588	Open sources, BCG calculations
Number of hospital beds per 100,000 population	number	0.0588	Open sources, BCG calculations

QUALITY OF LIFE
RESILIENCE TO EMERGENCY SITUATIONS

INDICATOR	UNIT OF MEASUREMENT	WEIGHT WITHIN THE SUB-DIMENSION	SOURCE
Number of doctors per 10,000 population	people	0.0588	Open sources, BCG calculations
Number of artificial lung ventilators per 100,000 population	number	0.0588	Open sources, BCG calculations
Number of intensive care beds per 100,000 population	number	0.0588	Open sources, BCG calculations
Number of police officers per 100,000 population	people	0.0588	Open sources, BCG calculations
Number of emergency service personnel per 100,000 population	people	0.0588	Open sources, BCG calculations
Number of deaths from natural disasters in the last 10 years per 100,000 population	people	0.0588	Open sources, BCG calculations
Stability of the city's economic system in the event of economic instability Regression equation coefficient $y=ax+b$, where x is the country's real GDP growth and y is city's real GDP (GRP) growth	coefficient	0.0588	BCG calculations
Level of development for the insurance system: ratio of gross written premium to GDP Country-level indicator	%	0.0588	OECD, open sources
Availability of free city-level psychological support services The indicator takes on a "Yes" value if there is a 24/7 public hotline that does not cover the entire country, but only a particular city, otherwise the value is a "No".	yes / no	0.0588	Open sources, BCG calculations
Mortality rate from infectious diseases Average number of deaths from infectious diseases per year per 100,000 population, including deaths from bacterial and viral infections	people	0.0588	2thinknow, open sources, BCG calculations
Number of victims of terrorist attacks in the last 10 years per 100,000 population	people	0.0588	Global Terrorism Database
Number of deaths from terrorist attacks in the last 10 years per 100,000 population	people	0.0588	Global Terrorism Database
Average city GDP annual loss from 22 man-made and natural threats	%	0.0588	Lloyd's City Risk Index

ECONOMIC OPPORTUNITIES

OPPORTUNITIES FOR WORK AND CAREER

INDICATOR	UNIT OF MEASUREMENT	WEIGHT WITHIN THE SUB-DIMENSION	SOURCE
<p>Ratio of employed residents to working age residents</p> <p>The indicator is calculated as the ratio of the number of employed residents to the working-age population. Therefore, it includes jobs occupied by labor migrants, etc.</p>	%	0.3	Oxford Economics, national statistical offices, BCG calculations
<p>Opportunities for professional self-realization (survey)</p> <p>Score calculated as a weighted average of respondents' answers to the statement "I can realize myself professionally"</p>	score	0.1	BCG global survey
<p>Number of head offices of major global companies located in the city</p>	number	0.1	Fortune Global 500
<p>GDP (PPP) per worker</p>	USD / year	0.3	Open sources, BCG calculations
<p>Education and development opportunities provided by companies to their employees</p>	score	0.1	WEF, The Global Competitiveness Report
<p>Existence of attractive work opportunities (survey)</p> <p>Score calculated as a weighted average of respondents' answers to the statement "I see many attractive job opportunities"</p>	% of respondents who selected these answers	0.1	BCG global survey

STANDARD OF LIVING

<p>Average annual household income before taxes (PPP)</p>	USD / year	0.5	BCG calculations
<p>Average annual expenditure per person adjusted for price level</p>	USD / year	0.5	BCG calculations

AVAILABILITY OF CONSUMER LOAN

<p>Availability of consumer loan (survey)</p> <p>Score calculated as a weighted average of respondents' answers to the statement "I can always get a loan if needed"</p>	score	0.5	BCG global survey
<p>Average interest rate for consumer loans</p> <p>Weighted average interest rate for all new loans, including mortgages</p>	%	0.5	Eurostat, open sources

ECONOMIC OPPORTUNITIES

OPPORTUNITIES FOR BUSINESS

INDICATOR	UNIT OF MEASUREMENT	WEIGHT WITHIN THE SUB-DIMENSION	SOURCE
Share of entrepreneurs / people that intend to start their own businesses (survey) Share of respondents who answered “Yes, I own a business “ or “Yes, I’m taking steps to start it” to the question “Do you own a business, or are you taking any steps to start it?”	%	0.25	BCG global survey
Total tax and contribution rate	%	0.25	Paying taxes — World Bank and PWC
Service industry share in the city economy	%	0.25	Oxford Economics, national statistical offices, BCG calculations
Number of startups per 1,000 population	number	0.25	2thinknow, BCG calculations

EQUALITY OF INCOME

GINI coefficient for income distribution	USD / year	0.5	BCG calculations
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SOCIAL CAPITAL

SOCIAL CONNECTIONS

Feeling of loneliness Weighted average of the scores received as answers to the question “Overall, how did you feel yesterday? (On a scale from 1 to 10, where 1 is “Not at all” and 10 is “Strongly”)?”	score	0.167	BCG global survey
Participation in the activities of clubs, associations, and various communities Share of people participating in the activities of recreational, athletic, cultural, political, or charitable clubs, associations, and communities at least once a year (country-level indicator)	%	0.167	Open sources, BCG calculations
Number of neighbors whom the respondent knows personally (survey) Estimate based on respondents’ answers to the question “How many neighbors do you know personally?”	people	0.167	BCG global survey

SOCIAL CAPITAL

SOCIAL CONNECTIONS

INDICATOR	UNIT OF MEASUREMENT	WEIGHT WITHIN THE SUB-DIMENSION	SOURCE
Number of neighbors to whom the respondent would entrust their children (survey) Estimate based on respondents' answers to the question "How many neighbors would you trust to look after your children?"	people	0.167	BCG global survey
Level of racial tolerance (index)	score	0.167	Nomad List
Respect between people (survey) Score calculated as a weighted average of respondents' answers to the statement "People around me are respectful, helpful and kind with others"	score	0.167	BCG global survey

INCLUSIVITY AND EQUALITY

Share of employed disabled people in the total number of working-age disabled people	%	0.333	Open sources
Equality of opportunities for women (survey) Share of women who answered "Completely agree" or "Tend to agree" to the statement "People have equal opportunities regardless of gender, ethnicity/race, religion, sexual orientation, or other social or personal characteristics"	%	0.333	BCG global survey
Percentage of public transport accessible for disabled people	%	0.333	Open sources

SAFETY

Total number of crimes per year per 100,000 population Includes all petty crimes, thefts, assault, rape and murder crimes	number	0.333	Websites of local law enforcement agencies, national statistical offices, 2thinknow, BCG calculations
Number of murders per year per 100,000 population	number	0.333	Websites of local law enforcement agencies, national statistical offices, 2thinknow, BCG calculations
Number of security cameras per city unit of area Including cameras located in the subway system	number / km ²	0.333	Open sources, BCG calculations

SOCIAL CAPITAL

IDENTITY WITH CULTURE AND HISTORY

INDICATOR	UNIT OF MEASUREMENT	WEIGHT WITHIN THE SUB-DIMENSION	SOURCE
Number of UNESCO cultural heritage sites	number	0.333	UNESCO
Feeling proud of the city's culture and history (survey) Score calculated as a weighted average of respondents' answers to the statement "I am proud of the history and culture of the city"	score	0.333	BCG global survey
The number of films from the IMDb top 250 list that were set in the city	number	0.333	https://www.imdb.com/

INTERACTIONS WITH AUTHORITIES

ABILITY TO INFLUENCE EVENTS

Availability of instruments and channels fore residents to influence the way the city is managed The indicator takes on a "Yes" value if there is a special tool or channel for residents to influence the decisions on city infrastructure, city services, and other aspects of city management, otherwise it is a "No"	yes / no	0.5	Open sources
Ability to influence things in the city (survey) Score calculated as a weighted average of respondents' answers to the statement "I feel that I can influence things in this city"	score	0.5	

GOVERNMENT SERVICES

E-Government Development Index, ranking score The ranking uses recalculated LOSI (Local Online Service Index) ranking value where available, otherwise – adjusted country-level value	score	1	UN (E-Government Development Index), LOSI (Local Online Service Index)
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BUSINESS ENVIRONMENT

Position in the Doing Business rating Country-level indicator	score	0.5	World Bank (Doing Business)
Conditions for social entrepreneurship	score	0.5	Survey (The best countries to be a social entrepreneur)

SPEED OF CHANGE

QUALITY OF LIFE

Dynamics of quality of life in the city (survey) Share of respondents who answered "Completely agree" or "Tend to agree" to the statement "Overall, the city has become a better place to live in the last 3 years"	%	0.1	BCG global survey
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SPEED OF CHANGE

QUALITY OF LIFE

INDICATOR	UNIT OF MEASUREMENT	WEIGHT WITHIN THE SUB-DIMENSION	SOURCE
Average mortgage payment relative to average monthly household disposable income: average annual growth rate (since 2014)	%	0.1	Open sources, BCG calculations
Average cost of renting an apartment versus the average monthly income: average annual growth rate (since 2014)	%	0.1	Numbeo, open sources, BCG calculations
Number square meters of living space per person: average annual growth rate (since 2010)	%	0.1	2thinknow, open sources, BCG calculations
Number of new subway stations built within the last 10 years (from 2010 till 2020)	number	0.1	Open sources
Average life expectancy at birth: average growth rate (since 2010)	%	0.1	UN, national statistical offices
Students' results in the PISA test: change over 10 years Differences in the total scores from 2009 and 2018 (tested every three years)	score	0.1	OECD (Program for International Student Assessment)
Number of retail outlets per 100,000 population: change since 2012 Ratio between the values for the indicators in 2012 and 2020	%	0.1	2thinknow, BCG calculations
Air quality: PM10 content, average annual growth rate (2010–2016)	%	0.1	WHO
Air quality: PM2.5 content, average annual growth rate (2010–2016)	%	0.1	WHO

ECONOMIC OPPORTUNITIES

GINI coefficient: average annual growth rate (since 2010)	%	0.2	2thinknow, open sources, BCG calculations
Ratio of employed residents to working-age residents: average annual growth rate (since 2010)	%	0.2	Oxford Economics, national statistical offices, BCG calculations
Change in financial situation (survey) Score calculated as a weighted average of respondents' answers to the statement "My financial situation has improved in the last 3 years"	score	0.2	BCG global survey

SPEED OF CHANGE

ECONOMIC OPPORTUNITIES

INDICATOR	UNIT OF MEASUREMENT	WEIGHT WITHIN THE SUB-DIMENSION	SOURCE
The average rate for job growth per year (since 2010)	%	0.2	Oxford Economics, national statistical offices, BCG calculations
Average annual growth rate for real household income (since 2010)	%	0.2	Oxford Economics, national statistical offices, BCG calculations

SOCIAL CAPITAL

Number of crimes per year per 100,000 population: average annual growth rate (since 2010)	%	0.333	Websites of local law enforcement agencies, national statistical offices, 2thinknow, BCG calculations
Number of murders per year per 100,000 population: average annual growth rate (since 2010)	%	0.333	Websites of local law enforcement agencies, national statistical offices, 2thinknow, BCG calculations
Change in openness and tolerance (survey) Score calculated as a weighted average of respondents' answers to the statement "People in the city have become more open to communication and tolerant in the last 3 years"	score	0.333	BCG global survey

INTERACTIONS WITH AUTHORITIES

E-Government Development Index (EGDI): change of the place held in the rating over 10 years (from 2010 till 2020) The indicator is calculated as the difference between the percentage ranks assigned at the beginning and at the end of the assessment period	%	0.333	UN (E-Government Development Index)
Change of the place held in the Doing Business Rating over 10 years (from 2010 until 2020) The indicator is calculated as the difference between the percentage ranks assigned at the beginning and at the end of the assessment period	%	0.333	World Bank (Doing Business)
Change in level of trust in the city authorities (survey) Score calculated as a weighted average of respondents' answers to the statement "I trust the city authorities more than I did 3 years ago"	%	0.333	BCG global survey

Appendix 3. Selecting the weights for ranking subdimensions

One of the principles for the ranking is to match the weights for different areas with residents' priorities while assuming that those priorities may vary across different cities, requiring appropriate adjustments to be made in the coefficients. Since a direct survey usually does not enable accurate identification of respondents' preferences, they need to be identified using indirect methods.

As part of the study, we conducted a global survey of 25,000 residents defining the level of city advocacy, satisfaction¹⁰ with each of the 23 needs, and assessing the speed of change across four main blocks of needs (a total of 27 subdimensions). With this data, using multivariate regression, we were able to answer the question: how much, all other things being equal, would the same change in satisfaction¹¹ for each of the needs increase the level of advocacy? The coefficients obtained show the average importance of each of the areas for the person, in other words, the resident's preferences. These coefficients can be translated directly into ranking weights when the ranking is developed.

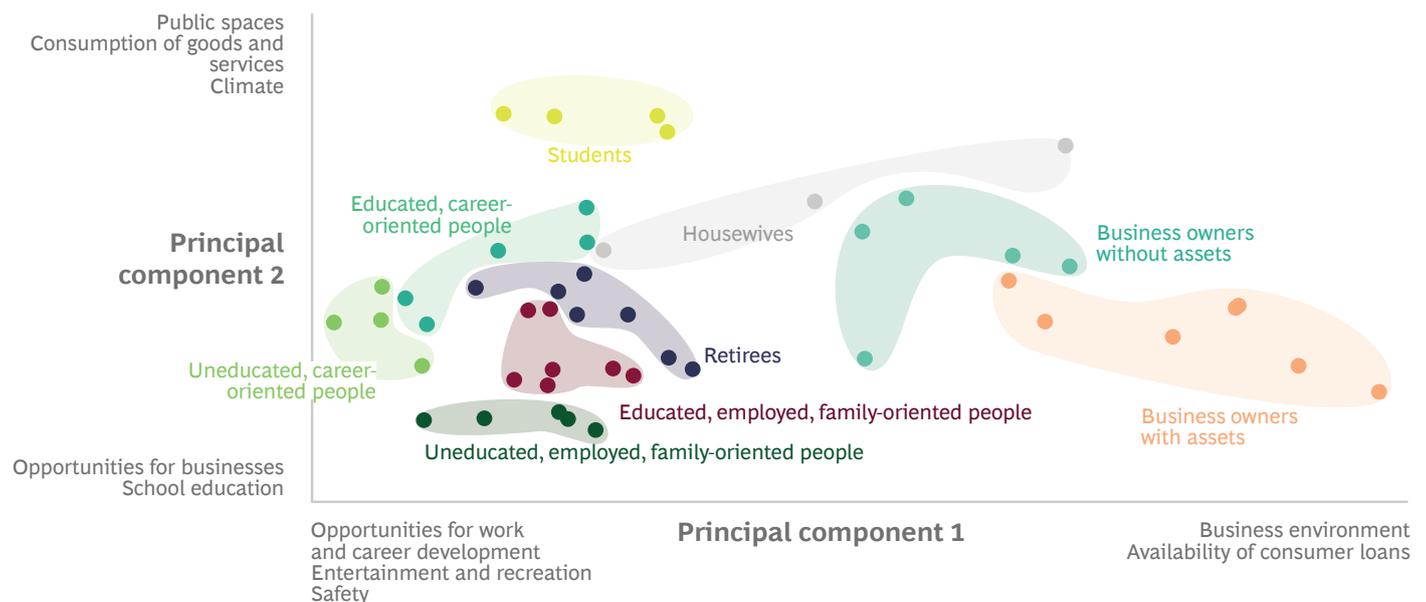
For this analysis, the entire sample of respondents was pre-divided into nine segments, which were homogeneous in terms of their preferences and sociodemographic parameters within the group, but significantly different from one another in terms of their preferences. The coefficients were calculated for each of the segments. Based on the share of each segment in the city population, weighted averages of these coefficients was calculated for each city

and subsequently translated into ranking weights. This means that we were able to take into account the differences in preferences among cities, and adapt the ranking weights accordingly for each of the 45 cities (see Figure 4 in Section 2.2).

To identify the nine preference-based segments, we used advanced data analysis consisting of three steps.

1. In the first step, we divided the sample of respondents into 50 random groups, and assessed the average preferences in each group. This analysis helped us identify six sociodemographic parameters that best explain differences in preferences: gender, education, age, economic status (working/entrepreneur/not working), family, and the availability of real estate.
2. In the second step, we regrouped all the respondents in line with these six parameters. We obtained a total of 46 groups, and assessed the preferences for each of them.
3. In the third step, using the hierarchical clustering method, these 46 groups were combined into nine segments based on preference scores and sociodemographic parameters. Figure 14 presents the preferences for these 46 groups (dots), and the nine segments into which they were combined, along with the axes that correspond to the first two principal components related to preferences.

Figure 12 - 9 segments of residents and their preferences



10. In order to assess satisfaction, we asked several questions regarding the availability, quality, and overall experience inherent in the subdimension, and then selected the combination of scores that best explained the Advocacy.

11. In the analysis, satisfaction across all directions was normalized so that it had the same standard deviation.

Appendix 4. Data normalization and weighting

When calculating the score for a particular area, each of the included indicators was normalized as follows:

- The value was converted into a Z-score for a sample of 45 cities (a value with a sample mean equal to zero and a standard deviation equal to one). If necessary, the Z-score was multiplied by -1 so that a larger value corresponds to a better city
- The Z-score was converted into points ranging from 0 to 100, so that $Z \leq -2$ corresponds to 0 points, $Z \geq 2$ corresponds to 100 points, and $-2 < Z < 2$ is converted to $[50 + Z \times 25]$

This way, the 2–3% of cities, on average, with the best scores for the indicator receive 100 points, and the 2–3% of cities with the lowest scores receive 0 points. The resulting transformed variables are added within the subdimension, with the weights chosen for them.

Then the obtained sum is transformed again in a similar way, which forms the resulting score for each area that is distributed, on average, as follows:

- “Average” cities get **50 points**
- 2–3% of the “best” cities out of **45 get 100 points**
- 2–3% of the “worst” cities out of **45 get 0 points**
- 25% of the “best” cities get **67 points or more**
- 25% of the “worst” cities get **33 points or fewer**

To calculate the aggregate ranking score, these scores are weighted using each subdimension’s weight and added (see Section 2.2 and Appendix 3).



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